EMEP Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe

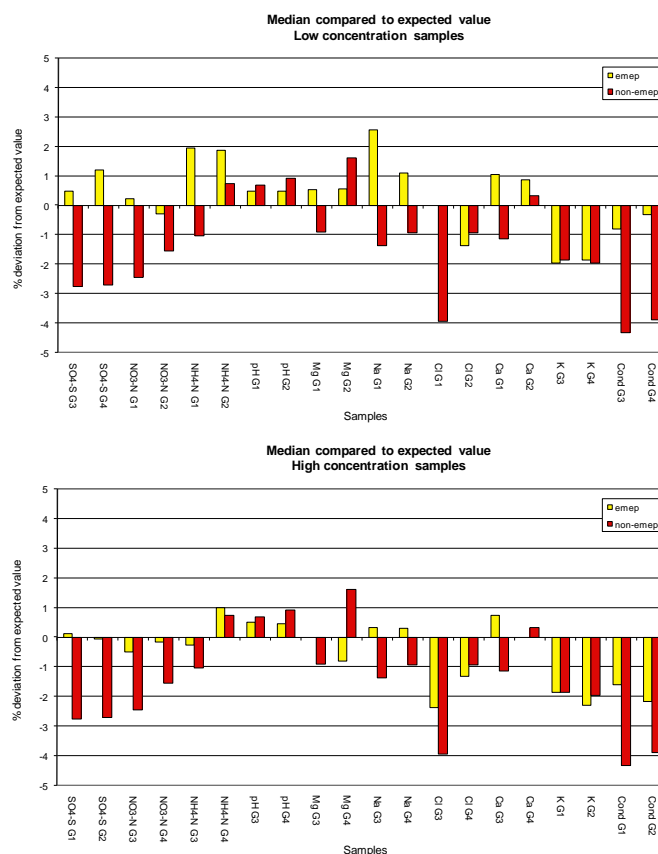# The twenty-third and twenty-fourth intercomparison of analytical methods within EMEP

Hilde Th. Uggerud and Anne-Gunn Hjellbrekke

**EMEP Co-operative Programme for Monitoring and Evaluation
of the Long-range Transmission of Air Pollutants
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2

Contents

4

The twenty-third and twenty-fourth intercomparison of analytical methods within EMEP

1. Introduction

36 different laboratories in European countries are performing chemical analysis of air and precipitation samples within EMEP (Co-operative Programme for Monitoring and Evaluation of Long-range Transmission of Air Pollutants in Europe). Since the measurement programme is based on individual national networks, the participating laboratories apply different sampling and analytical methods. Most of the methods used are described in the manual for sampling and chemical analysis (EMEP, 1996).

In order to improve the data comparability and to get a picture of the different laboratories' performance, interlaboratory comparisons are organised by the Chemical Co-ordinating Centre (CCC) at the Norwegian Institute for Air Research (NILU). So far twenty-four intercomparisons have been arranged (Hanssen, 1988, 1990; Hanssen et al., 1983; Hanssen and Ladegård, 1984, 1985, 1987; Hanssen and Skjelmoen, 1992, 1994, 1995, 1996, 1997, 2001; Thrane, 1978, 1980a, 1980b, 1981; Uggerud et al., 2001, 2002, 2003, 2004; Hjellbrekke et al., 2005).

Since 2000 the laboratory intercomparisons within EMEP have also been open for participation of laboratories from other networks.

This report gives the results of the twenty-third interlaboratory test.

2. Organisation of the intercomparisons

2.1 The twenty-third intercomparison

The samples for the twenty-third intercomparison (see Table 2) were prepared and distributed to 91 laboratories in July 2005.

Most of the laboratories had returned their results to the CCC within one month after the deadline given as 15 October 2005. A total of 65 laboratories have returned their results. This includes 32 EMEP-laboratories.

The participating laboratories received the theoretical (expected) values by e-mail 18.11.2005. The laboratories were given the opportunity to compare their results with the expected ones, and give corrected values if obvious mistakes e.g. misprints had occurred. A few corrections were reported. In those cases the corrected values are used in this report. In accordance with the decision of the Steering Body of EMEP, the results are presented in such a way that the different laboratories are identified. Tables 3a and 3b give the names of the participating laboratories together with the numbers used when presenting the results in tables and figures.

Information received on the analytical methods used is given in Tables 4–7.

2.2 The twenty-fourth intercomparison

The samples for the twenty-fourth intercomparison were prepared and distributed to 90 laboratories in July 2006.

Most of the laboratories had returned their results to the CCC within one month after the deadline given as 15 October 2005. A total of 63 laboratories have returned their results. This includes 32 EMEP-laboratories.

The participating laboratories received the theoretical (expected) values by e-mail 13.12.2006. The laboratories were given the opportunity to compare their results with the expected ones, and give corrected values if obvious mistakes e.g. misprints had occurred. A few corrections were reported. In those cases the corrected values are used in this report. In accordance with the decision of the Steering Body of EMEP, the results are presented in such a way that the different laboratories are identified. Tables 3a and 3b give the names of the participating laboratories together with the numbers used when presenting the results in tables and figures.

Information received on the analytical methods used is given in Tables 34–38.

3. Data handling

The data reported for the twenty-third intercomparison from the participants are presented in Tables 8, 10, 12, 14 and 16–26.

The data reported for the twenty-fourth intercomparison from the participants are presented in Tables 39, 41, 43, 44, 46 and 48–58.

3.1 Data analysis

The reported values are presented in the tables in decreasing order together with the number of the laboratory. The expected (theoretical) value, the number of results, the arithmetic mean value, the median, the standard deviation and the relative standard deviation in percent are also given. After the first statistical run with all results included, the calculation was repeated with the outliers excluded. The outliers (unused) are defined as the results more than two standard deviations from the mean value in the first run.

The ratio between expected values (theoretical) to reported values, the ratio between measured to calculated conductivity and the ratio between equivalent concentrations of anions to equivalent concentrations cations, are presented in tables.

3.2 Bar plots

Bar-plots are used for the graphical presentation of the data. Figures 2–16 are showing the relative deviation from expected value for the different laboratories. There is one plot for each single sample.

Figure 17 gives median compared to expected value for the results reported by EMEP-laboratories and the other participating laboratories, respectively.

3.3   Youden plot

The Youden plot is a graphical method to analyse inter-laboratory data where the samples are ordered in pairs with similar concentrations. One plot is made for each pair of samples and gives results for all participating laboratories. The plots visualize both systematic and random errors.
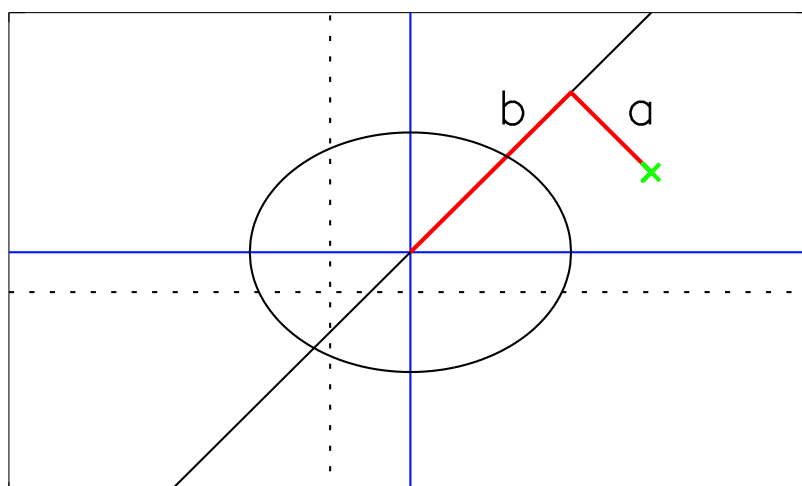
Figure 1:   Youden plot showing concentrations for a pair of samples (green), expected values (blue lines), average of measured values (dotted lines) and random and systematic errors (red lines)

The plot is draw as a scatter plot where each point represents a pair of concentrations for one laboratory. The expected values for the two samples are drawn as solid blue lines. The arithmetic average of the measured values excluding outliers are drawn as dotted lines. The solid lines divide the plot in four quadrants and a 45° reference line going through the intercept of the solid lines may be added.

If errors are due to random factors, the points will be evenly distributed around the mean value and situated in all four quadrants.

If systematic errors dominate, the results will be close to 45° reference line, and be situated in the upper right quadrant (overestimation) or lower left quadrant (underestimation).

Drawing a line from a given point perpendicular on the 45° reference line gives two line segments, one from the point to the intercept on the reference line (a), and one continuing from the intercept to the point representing the expected values (b). The lengths of these line segments are measures of the random and systematic errors respectively.

Ellipses with radii corresponding to the data quality objectives (DQO, Table 1) are added in each plot. The data points are colour coded depending on the magnitude of errors as given in Table 1.

In Figures 18–33 the reported data are presented in Youden plots.

Table 1:   Youden plot parameters.

Radii	Components
10%	SO_2 in abs.sol, NO_2 in abs.sol.
20%	SO_2, HNO_3 and NH_3 in impregnated filter
Radii = DQO	**Components**
10% accuracy or better	SO_4^{2-}, NO_3^-
15% accuracy or better	NH_4^+, Cl^-, Ca^{2+}, K^+, Mg^{2+}, Na^+ , cond, H+ (from pH)
0.1 units	pH
Criteria	**Colour**
Within 0.5*DQO	Blue
Within DQO	Green
Within 2*DQO	Orange
> 2*DQO	Red

3.4   Estimating random and systematic errors from laboratory comparisons

Table 30 presents relative random and relative systematic errors obtained by the different laboratories in the analysis of each parameter in the precipitation samples. The calculation method and assumptions used are given in Chapter 3.4.1 and Chapter 3.4.2.

3.4.1 Estimating random errors

Systematic errors or bias in the laboratory analyses give a constant shift in the results from the expected ones at a particular concentration level. It is assumed that laboratories taking part in comparisons will obtain results near the expected ones when this bias is removed, and that the differences between expected and obtained results more often will be close to zero than not. A triangular distribution, based upon this assumption, can be used to quantify the random errors in the laboratory results (Eurachem/CITAC, 2000).
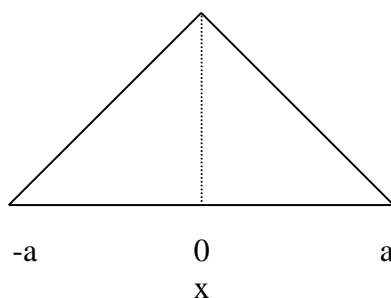
The triangle distribution is symmetric with a baseline 2a. The height in the triangle will be 1/a when the triangle area equals 1. The standard uncertainty is given by

$$u(x) = \frac{a}{\sqrt{6}} \tag{1}$$

and more than 95% of the data will be within $\pm 2 \cdot u(x)$. The distance from -a to a (i.e. 2a) is called the range. When applied on the laboratory comparison results, the range equals the distance between the largest and smallest of the four differences between expected and found concentrations. As long as the bias can be assumed to be constant for the samples in the comparison of a specific component, it cannot have an effect on the distance corresponding to 2a. The bias may be dependent upon the concentrations, but can be considered approximate constant for the concentrations used here in the comparison of the main components in precipitation, since the differences between the concentrations are small.

L and T represent the laboratories' and the expected concentrations respectively, and D is the difference. The difference for the lowest concentration is

$$D_1 = L_1 - T_1 \tag{2}$$

and the differences are D_1, D_2, D_3, D_4 in increasing order.

The range is $D_4 - D_1$ and the standard uncertainty for the differences u(D) becomes

$$u(D) = \frac{\left(D_4 - D_1 \right)}{\left(2 \cdot \sqrt{6} \right)}. \tag{3}$$

The average expected concentration T for the four samples is given by

$$T = \frac{\left(T_1 + T_2 + T_3 + T_4 \right)}{4} \tag{4}$$

The relative standard uncertainty, RSD, for 4 samples is given by $\frac{u(D)}{T}$, or

$$RSD = \frac{2 \cdot \left(D_4 - D_1 \right) \cdot 100}{\sqrt{6} \cdot \left(T_1 + T_2 + T_3 + T_4 \right)} \%, \tag{5}$$

and 95 per cent of the laboratory results in this comparison are expected to be within $\pm 2 \cdot RSD$.

If the data quality objectives (DQO) likewise are looked upon as 95 percentiles, then 95 per cent of the laboratory analytical results should not be more than 10 or 15 per cent from the correct values (10 per cent for S and N containing components and 15 per cent for other components).

10

Correspondingly, the values 2·RSD should therefore be less than 10 or 15 per cent in order to comply with the DQO.

3.4.2 Estimating systematic errors

An estimation of bias in single measurements requires a long data series, and four samples as we normally have in laboratory comparison, are merely able to give an indication of the bias or a very coarse estimate.

Coarse estimates have been performed here in the cases where the four samples had similar concentrations and where all four laboratory results were either higher or lower than the expected concentrations. The median of the differences D_i, as defined above, was taken as a measure of the bias, B, in these cases.

$$B = median[D_i] \qquad (6)$$

A relative bias, RB, was also calculated based upon the average expected concentration T, as defined in (4).

$$RB = \frac{4 \cdot median[D_i] \cdot 100}{(T_1 + T_2 + T_3 + T_4)}\% \qquad (7)$$

4. Results – 23rd intercomparison

4.1   Sulphur dioxide in absorbing solution (A-samples)

Four samples and one blank solution were distributed to the laboratories that use the hydrogen peroxide absorption solution method. The results are given in Table 8, Figures 2 and 18. For those laboratories that reported a blank value this has been subtracted from the reported results. The ratios of measured value to expected value are presented in Table 9.

The sulphate concentration in the sample solutions correspond to a SO_2 concentration in air of 2.33–7.79 µg S m^{-3}, when 70 ml absorbing solution and 3.6 m^3 sampling volume is used.

Values for SO_2 in absorbing solution were reported by 8 laboratories.

4.2   Sulphur dioxide and nitric acid on impregnated filter (B-samples)

Five impregnated filter samples (including one blank) for determination of sulphur dioxide were analysed by 21 laboratories. The value reported for the blank filter was subtracted from the other values before the data were used.

The amount of sulphur on the distributed filters corresponds to air concentrations between 0.48-3.20 µg S m^{-3} when 25 m^3 is sampled.

In addition to sulphate, nitrate was added to the same impregnated filters for determination of HNO_3-N. The value reported for the blank filter was subtracted from the other values before using the data.

The amount of nitrogen on the distributed filters corresponds to air concentrations between 0.46 µg N m^{-3}–1.05 µg N m^{-3} when 25 m^3 sampling volume is used.

Sulphur dioxide results show prevalence of systematic versus random errors. The systematic error is most clearly for the low concentration samples. Even so, most values are within 20% of expected value.

A few reported values for nitric acid on impregnated filters are more than 20% away from expected value. Youden plot shows that for the low concentration filters a prevalence of systematic versus random. For the high concentration filters the reported results show good agreement with expected value.

The results are presented in Tables 10 and 12 and Figures 3, 4, 19 and 20.

4.3 Nitrogen dioxide in absorbing solution (C-samples)

Results from analysis of C-samples will not be reported this year due to error in the samples distributed.

4.4 Ammonia on impregnated filters (J-samples)

For the third time impregnated filters for determination of ammonia were distributed. Six impregnated filters inclusive two unidentified blank filters were sent to 27 laboratories. 18 laboratories have reported their analytical results. The two blank values reported by each laboratory were averaged and subtracted from the other values reported before the data were used. The results are shown in Table 14 and Figures 6 and 22.

The amount of nitrogen on the filters correspond to air concentrations between 0.36-1.60 µg N m^{-3}, if 25 m^3 sampling volume is used.

Several reported values are more than 20% away from expected value. Youden plot shows that for the low concentration filters a considerable number of random errors are present. For the high concentration filters the reported result mostly lies within DQO.

4.5 Precipitation (G-samples)

Four precipitation samples were distributed and 2547 single results from 65 laboratories were reported. 108 results were identified as outliers. This is ~4% of the data, which is about the same as obtained earlier. It should be noted that 56% of the outliers are caused by seven laboratories. The results are presented in Tables 16–26 and Figures 7–16 and 23–33.

4.5.1 Conductivity and ion balance

In EMEP, conductivity measurements are mainly used for quality control reasons. When all the main ions in the precipitation have been measured, conductivity values are compared with values calculated from the reported results. Table 27 gives the ratios of the measured to the calculated values.

Low concentration ions do not contribute much to the sum of ionic conductivities. By looking at the ratio of measured to calculated conductivity, errors in determination of low concentration ions may not be revealed. To include low concentration ions in the quality control, ion balance control must be used. This ratio should be used as a tool in the quality control system for those laboratories that measure all main components. The ratios of equivalent concentrations of anions versus equivalent concentrations of cations are shown in Table 28.

The Youden plots of conductivity show mainly systematic error. This may be due to bad calibration of the instrument.

5. Results – 24th intercomparison

5.1   Sulphur dioxide in absorbing solution (A-samples)

Four samples and one blank solution were distributed to the laboratories that use the hydrogen peroxide absorption solution method. The results are given in Table 39, Figures 32 and 48. For those laboratories that reported a blank value this has been subtracted from the reported results. The ratios of measured value to expected value are presented in Table 40.

The sulphate concentration in the sample solutions correspond to a SO_2 concentration in air of 2.72–8.58 µg S m^{-3}, when 70 ml absorbing solution and 3.6 m^3 sampling volume is used.
Values for SO_2 in absorbing solution were reported by 7 laboratories.

5.2   Sulphur dioxide and nitric acid on impregnated filter (B-samples)

Five impregnated filter samples (including one blank) for determination of sulphur dioxide were analysed by 19 laboratories. The value reported for the blank filter was subtracted from the other values before the data were used.

The amount of sulphur on the distributed filters corresponds to air concentrations between 0.40-2.88 µg S m^{-3} when 25 m^3 is sampled.

In addition to sulphate, nitrate was added to the same impregnated filters for determination of HNO_3-N. The value reported for the blank filter was subtracted from the other values before using the data.

The amount of nitrogen on the distributed filters corresponds to air concentrations between 0.39 µg N m^{-3}–1.31 µg N m^{-3} when 25 m^3 sampling volume is used.

Sulphur dioxide results show prevalence of systematic versus random errors. The systematic error is most clearly for the low concentration samples. Even so, most values are within 20% of expected value.

A few reported results for low concentration of sulphur dioxide are more than 20% away from expected value. For the high concentration filters the reported results show good agreement with expected value.

A few reported values for nitric acid on impregnated filters are more than 20% away from expected value. Even so, most values are within 20% of expected value.

The results are presented in Tables 41 and 43 and Figures 33, 34, 49 and 50.

5.3 Nitrogen dioxide in absorbing solution (C-samples)

The four samples distributed are made to represent both absorption solutions and extracts from iodide-impregnated glass filters. The samples contained known amount of sodium nitrite diluted in water. In order to assure sample stability and to give the laboratories the opportunity to use the matrix they use in their daily routine, the distributed samples were to be diluted 1:10. The results should be reported as the diluted concentrations. The 10 times diluted samples correspond to air concentrations between 2.55-5.9 µg NO_2-N m^{-3}, when 70 ml absorbing solution and 1.4 m^3 is sampled. When 4 ml extraction solution and 0.7 m^{-3} sampling volume is used, the samples correspond to air concentrations between 0.29-0.67 µg NO_2-N m^{-3}.

The results are presented in Table 44 and Figures 35 and 51. The average ratio is presented in Table 42. 2 of 18 laboratories have an average ratio between 0.90 and 1.10, which is a quite satisfactory result.

5.4 Ammonia on impregnated filters (J-samples)

Six impregnated filters inclusive two unidentified blank filters were sent to 27 laboratories. 18 laboratories have reported their analytical results. The two blank values reported by each laboratory were averaged and subtracted from the other values reported before the data were used. The results are shown in Table 46 and Figures 36 and 52.

The amount of nitrogen on the filters correspond to air concentrations between 0.36-1.28 µg N m^{-3}, if 25 m^3 sampling volume is used.

Several reported values are more than 20% away from expected value. Outliers are found in both low- and high concentration filters. 87 % of the reported results are within DQO.

5.5 Precipitation (G-samples)

Four precipitation samples were distributed and 2665 single results from 64 laboratories were reported. 121 results were identified as outliers. This is 4,5 % of the data, which is about the same as obtained earlier. The results are presented in Tables 48–58 and Figures 37–46 and 53–63.

5.5.1 Conductivity and ion balance

In EMEP, conductivity measurements are mainly used for quality control reasons. When all the main ions in the precipitation have been measured, conductivity values are compared with values calculated from the reported results. Table 59 gives the ratios of the measured to the calculated values.

Low concentration ions do not contribute much to the sum of ionic conductivities. By looking at the ratio of measured to calculated conductivity, errors in determination of low concentration ions may not be revealed. To include low concentration ions in the quality control, ion balance control must be used. This ratio should be used as a tool in the quality control system for those laboratories that measure all main components. The ratios of equivalent concentrations of anions versus equivalent concentrations of cations are shown in Table 60.

The Youden plots of conductivity show mainly systematic error. This may be due to bad calibration of the instrument.

6. Summary

A total of 68 laboratories participated in the twenty-third intercomparison. 32 of these laboratories are within the EMEP network.

For all the samples analysed, the deviations from theoretical values are calculated. Table 17 shows the median values compared to the expected values for all the parameters. For the EMEP laboratories the median deviations for both low- and high concentration samples are less than 3%. This is the same result as in the last intercomparison. For the other participants the median deviations for both low- and high concentration samples are less than 5%. This is slightly better than obtained in earlier.

As in earlier intercomparisons, outliers are defined as values that deviate more than two standard deviations from the mean value. Outliers occur for all samples and almost all parameters. Out of a total of 2892 single results, 122 are defined as outliers. This is 4% of the reported data, which is comparable to earlier intercomparisons.

The ratio of the median values to the theoretical values for all the parameters is presented in Table 29. All parameters show median values in good agreement with the theoretical values.

A total of 64 laboratories participated in the twenty-fourth intercomparison. 32 of these laboratories are within the EMEP network.

For all the samples analysed, the deviations from theoretical values are calculated. Figure 47 shows the median values compared to the expected values for all the parameters. For the EMEP laboratories the median deviations for both low- and high concentration samples are less than 6 %. This is an increase compared to earlier intercomparisons. For the other participants the median deviations for both low- and high concentration samples are less than 9%. This is also an increase compared to earlier intercomparisons.

As in earlier intercomparisons, outliers are defined as values that deviate more than two standard deviations from the mean value. Outliers occur for all samples and almost all parameters. Out of a total of 2983 single results, 137 are defined as outliers. This is 4,6% of the reported data, which is a slight increase compared to last year.

The ratio of the median values to the theoretical values for all the parameters is presented in Table 61. All parameters show median values in good agreement with the theoretical values.

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Appendix 1

Tables – 23rd intercomparison

18

Table 2:   Samples distributed for the twenty-third interlaboratory test.

A.	5 synthetic samples for determination of SO_2, consisting of 0.3% H_2O_2 absorbing solution and containing different concentrations of sulphuric acid. One of the samples was an unidentified blank.
B.	5 KOH-impregnated Whatman 40 filters, comprising 1 blank and 4 filters to which different amounts of sulphuric acid and nitrate salt have been added.
C.	4 synthetic samples for determination of NO_2 consisting of sodium nitrite diluted in water.
J.	6 Whatman 40 filters impregnated with 3% oxalic acid, comprising 2 blank and 4 filters to which different amounts of ammonium salt solution have been added.
G.	4 synthetic precipitation samples, containing SO_4^{2-}, NO_3^-, NH_4^+, H^+, Na^+, Mg^{2+} and Cl^-, and Ca^{2+} and K^+.

Table 3a: EMEP laboratories participating in the twenty-third laboratory intercomparison. The numbers in front of the names are used in tables and figures.

Austria	(1)	Umweltbundesamt Zweigstelle Sud, Klagenfurt
Canada	(26)	The Ontario Ministry of the Environment, Laboratory Service Branch
Croatia	(35)	Meteorological and Hydrological Service of Croatia
Czech Republic	(3)	Czech Hydrometeorological Institute, Praha
Denmark	(4)	National Environmental Research Institute. Air Pollution Laboratory
Estonia	(38)	Estonian Environmental Research Centre, Tallinn
Finland	(5)	Finnish Meteorological Institute. Air Quality Department
France	(6)	SGS Multilab
Germany	(7)	IfE Leipzig GmbH, Umweltlabor
Germany	(8)	Umweltbundesamt, Messtelle Schauinsland
Hungary	(10)	Institute for Atmospheric Physics
Iceland	(11)	Idntæknistofnun Islands (Technological Inst. of Iceland)
Ireland	(12)	Met. Eirann, Dublin
Italy	(13)	C.N.R. Istituto Inquinamento Atmosferico
Italy	(30)	Join Research centre, Ispra
Latvia	(33)	Air Pollution Observation Laboratory
Lithuania	(32)	Atmospheric Pollution Research Laboratory, Institute of Physics, Vilnius
Netherlands	(14)	National Institute of Public Health and Environmental Protection (RIVM)
Norway	(15)	Norwegian Institute for Air Research (NILU)
Macedonia	(40)	Hydrometeorological Institute, Skopje
Poland	(16)	Institute of Meteorology and Water Management, Warsaw
Poland	(39)	Environmental Monitoring Laboratory, Institute of Environmental Protection
Portugal	(17)	Laboratorio Santo Andre
Romania	(18)	Research and Engineering Institute for Environment
Russian Federation	(22)	Institute of Global Climate and Ecology
Serbia and Montenegro	(24)	Rep. Hydrometeorological Institute of Serbia
Slovakia	(31)	Slovak Hydrometeorological Institute
Slovenia	(36)	Hydrometeorological Institute of Slovenia
Spain	(19)	Centro Nacional de Sanidad Ambiental
Sweden	(20)	Swedish Environmental Research Institute (IVL), Gothenburg
Switzerland	(21)	Swiss Federal Laboratories for Materials Testing (EMPA)
Turkey	(34)	Refik Saydam Institute, Ankara
United Kingdom	(23)	AEA Technology, National Environmental Technology Centre
United States of America	(27)	Illinois State Water Survey

Table 3b: Participating laboratories outside the EMEP network.

Germany	(104)	Hessige Landwirtschafliche
Finland	(107)	The Finnish Forest Institute
Germany	(108)	Institut f. Bondenkunde und Standortlehre, Dredsten
Germany	(109)	Institut für Bondenkunde und Waldernährung
Germany	(110)	Thüringer Landesanstalt für Landwirtschaft (TTL), Jena
Germany	(112)	Niedersächsische Forstliche Versuchsanstalt (NVF)
Italy	(114)	C.N.R. Istituto Italiano di Idrobiologia
Germany	(115)	Bayerische Landesanstalt f. Wald- und Forstwirtshaft
Switzerland	(116)	Institute for Applied Plant Biology
Germany	(117)	Sächsische Landesanstalt für Forsten, Graupa
Germany	(118)	Forstliche Versuchs-und Forschungsansta
Germany	(120)	Landwirtschaftliche Untersuchungs- und Forschungsanstalt (LUFA)
Germany	(121)	Landesamt für Natur und Umwelt
Belgium	(124)	Laboratorium voor Bondemkunde, Gent
Germany	(125)	Bayerisches Landesamt für Umweltschutz, Augsburg
Italy	(126)	APPA Laboratorio Biologico Provinciale
Belarus	(133)	Institute for Problems of Natural Resources Use and Ecology
China	(135)	Hunan Research Institute of Environmental Protection Service
Denmark	(139)	Danish Centre for Forest, Landscape and Planning, Hørsholm
Luxembourg	(146)	Cellule de Recherche en Environment et Biotechnologies Public Research Center-Gabriel Lippmann
Netherlands	(148)	Alterra, Wageningen
Switzerland	(149)	WSL Zentrallabor, Birmensdorf
Spain	(150)	Fundaciòn Centro de Estudios Ambentiale des Mediterrane (CEAM)
Norway	(152)	Norwegian Forest Research Institute, Ås
Slovenia	(153)	Slovenian Forestry Institute, Ljubljana
United Kingdom	(155)	Environmental Research Branch, Farnham
Greece	(156)	Laboratory of Forest Land and Biogeochemistry, Ilisia
Hungary	(157)	Ecological Laboratory of Forest Research Institute, Sárvár
Japan	(158)	Acid Deposition and Oxidant Research Center (ADOCRC), Niigata
Ireland	(160)	Coillte Research Laboratory, Newtownmountkennedy
Thailand	(164)	Pollution Control Department (PCD), Bangkok
Viet Nam	(165)	Institute of Meteorology and Hydrology, Ha Noi

Table 4: *Analytical methods used at the participating laboratories for the determination of sulphur dioxide in absorbing solution (A).*

Method	Laboratory
1. Ion chromatography	6, 15, 19, 21, 23

Table 5: *Analytical methods used at the participating laboratories for the determination of sulphur dioxide on impregnated filters (B).*

Method	Laboratory
1. Spectrophotometry	16
2. Ion chromatography	3, 4, 5, 8, 11, 12, 13, 15, 20, 22, 31, 32, 33, 34, 36, 38, 116, 131, 138, 158
3. Capillary Ion Analysis	39

Table 6: *Analytical methods used at the participating laboratories for determination of nitric acid on impregnated filters (B).*

Method	Laboratory
1. Reduction to nitrite	16
2. Ion chromatography	3, 4, 5, 8, 11, 13, 15, 20, 22, 31, 32, 33, 34, 36, 116, 131, 138, 158
3. Capillary Ion Analysis	39

Table 7: *Analytical method for determination of ammonia on impregnated filters (J).*

Method	Laboratory
1. Spectrophotometry	3, 4, 8, 10, 16, 19, 32, 33, 34, 39, 116
2. FIA	11
3 Ion chromatography	5, 13,15, 20, 36, 131, 138, 158

Table 8:   Analytical results for sulphur dioxide in absorbing solution.

```
SO2-S in absorbing solution          SO2-S in absorbing solution
Sample no.: A1                       Sample no.: A2
Theoretical value:       0.281       Theoretical value:       0.120
Unit: µg S/ml                        Unit: µg S/ml

Run 1:                               Run 1:

Number of laboratories:      8       Number of laboratories:      8
Arithmetic mean value:  91.478       Arithmetic mean value:  32.596
Median:                  0.273       Median:                  0.113
Standard deviation     258.002       Standard deviation      91.885
Rel. st. deviation (%) 282.037       Rel. st. deviation (%) 281.896

Run 2:                               Run 2:

Number of laboratories:      7       Number of laboratories:      7
Arithmetic mean value:   0.261       Arithmetic mean value:   0.109
Median:                  0.268       Median:                  0.107
Standard deviation       0.039       Standard deviation       0.019
Rel. st. deviation (%)  15.145       Rel. st. deviation (%)  17.005

Results in decreasing order:         Results in decreasing order:

 159  730.000 (*)   23    0.268       159  260.000 (*)   23    0.107
  34    0.298       17    0.267        34    0.137       21    0.101
  15    0.280       21    0.257         6    0.122       17    0.095
   6    0.278       19    0.176        15    0.120       19    0.082


SO2-S in absorbing solution          SO2-S in absorbing solution
Sample no.: A4                       Sample no.: A5
Theoretical value:       0.401       Theoretical value:       0.200
Unit: µg S/ml                        Unit: µg S/ml

Run 1:                               Run 1:

Number of laboratories:      8       Number of laboratories:      8
Arithmetic mean value: 139.078       Arithmetic mean value:  61.422
Median:                  0.378       Median:                  0.205
Standard deviation     392.312       Standard deviation     173.171
Rel. st. deviation (%) 282.080       Rel. st. deviation (%) 281.935

Run 2:                               Run 2:

Number of laboratories:      7       Number of laboratories:      7
Arithmetic mean value:   0.375       Arithmetic mean value:   0.197
Median:                  0.376       Median:                  0.201
Standard deviation       0.023       Standard deviation       0.023
Rel. st. deviation (%)   6.252       Rel. st. deviation (%)  11.490

Results in decreasing order:         Results in decreasing order:

 159 1110.000 (*)   21    0.376       159  490.000 (*)    6    0.201
  34    0.409       15    0.370        19    0.233       21    0.180
   6    0.395       17    0.359        15    0.210       23    0.179
  23    0.379       19    0.337        34    0.209       17    0.168
```

Table 9: *The ratios of the theoretical values and the results found by the laboratories in the determination of sulphur dioxide in absorbing solutions.*

| Lab no | Measured / Expected value | | | A5 |
| | Sample no | | | |
	A1	A2	A4	A5
6	0.92	0.85	0.94	0.91
15	1.00	1.00	0.92	1.05
17	0.95	0.79	0.90	0.84
19	0.63	0.68	0.84	1.17
21	0.91	0.84	0.94	0.90
23	0.99	0.90	0.99	0.95
34	0.95	0.89	0.95	0.90
159	2598	2167	2768	2450

Table 10:   Analytical results for sulphur dioxide in impregnated filter.

```
SO2-S on impregnated filter          SO2-S on impregnated filter
Sample no.: B1                       Sample no.: B2
Theoretical value:      12.020       Theoretical value:      20.040
Unit: ug S/filter                    Unit: ug S/filter


Run 1:                               Run 1:


Number of laboratories:     21       Number of laboratories:     21
Arithmetic mean value:  13.563       Arithmetic mean value:  18.262
Median:                 11.300       Median:                 19.170
Standard deviation      12.681       Standard deviation       4.636
Rel. st. deviation (%)  93.499       Rel. st. deviation (%)  25.389


Run 2:                               Run 2:


Number of laboratories:     20       Number of laboratories:     20
Arithmetic mean value:  10.867       Arithmetic mean value:  19.174
Median:                 11.295       Median:                 19.250
Standard deviation       2.945       Standard deviation       2.057
Rel. st. deviation (%)  27.098       Rel. st. deviation (%)  10.729


Results in decreasing order:         Results in decreasing order:


 164   67.470 (*)   158   11.290      39   22.260      135   18.970
   8   13.700        20   11.260      31   21.899       34   18.809
  31   13.460         4   10.920       8   21.600        4   18.720
  33   13.124        34   10.780      33   21.507       20   18.480
  16   13.100         3   10.500      16   21.100       22   18.000
  39   12.930        22   10.300      36   20.500       38   16.100
   5   12.650        38    9.900       5   20.450      116   15.900
  36   11.870       116    8.640      32   19.540       11   15.860
 135   11.810        11    8.490     158   19.490       15   15.800
  32   11.310       165    0.010       3   19.330      165    0.017 (*)
  15   11.300                        164   19.170



SO2-S on impregnated filter          SO2-S on impregnated filter
Sample no.: B4                       Sample no.: B5
Theoretical value:      48.070       Theoretical value:      80.120
Unit: ug S/filter                    Unit: ug S/filter


Run 1:                               Run 1:


Number of laboratories:     21       Number of laboratories:     21
Arithmetic mean value:  44.651       Arithmetic mean value:  76.417
Median:                 47.555       Median:                 81.700
Standard deviation      11.060       Standard deviation      18.543
Rel. st. deviation (%)  24.771       Rel. st. deviation (%)  24.266


Run 2:                               Run 2:


Number of laboratories:     20       Number of laboratories:     20
Arithmetic mean value:  46.882       Arithmetic mean value:  80.234
Median:                 47.727       Median:                 81.751
Standard deviation       4.336       Standard deviation       6.314
Rel. st. deviation (%)   9.249       Rel. st. deviation (%)   7.870


Results in decreasing order:         Results in decreasing order:


  39   53.050        20   46.100      22   91.500       15   81.400
  33   52.148       158   45.890      39   89.490        4   77.240
  31   51.037         4   45.780      33   85.497      135   77.060
  16   50.900       135   45.130       5   85.450        8   76.800
   5   50.750        11   41.820      36   84.390      158   75.890
  36   50.330        38   41.800      31   84.039       20   75.420
  32   50.100        15   41.400     164   83.970        3   71.490
  22   49.500         3   39.970      16   82.500       38   70.900
 164   48.270       116   38.200      32   81.840      116   66.300
   8   47.900       165    0.042 (*)  34   81.803      165    0.075 (*)
  34   47.555                         11   81.700
```

Table 11: *The ratios of the theoretical values and the results found by the laboratories in the determination of sulphur dioxide on impregnated filters. The reported results are corrected for blank value (B3).*

| Lab no | Measured / Expected value | | | | Average |
| | Sample No | | | | |
	B1	B2	B4	B5	
3	0.87	0.96	0.83	0,89	0,89
4	0.91	0.93	0.95	0,96	0,94
5	1.05	1.02	1.06	1,07	1,05
8	1.14	1.08	1.00	0,96	1,04
11	0.71	0.79	0.87	1,02	0,85
15	0.94	0.79	0.86	1,02	0,90
16	1.09	1.05	1.06	1,03	1,06
20	0.94	0.92	0.96	0,94	0,94
22	0.86	0.90	1.03	1,14	0,98
31	1.12	1.09	1.06	1,05	1,08
32	0.94	0.98	1.04	1,02	0,99
33	1.09	1.07	1.08	1,07	1,08
34	0.90	0.94	0.99	1,02	0,96
36	0.99	1.02	1.05	1,05	1,03
38	0.82	0.80	0.87	0,88	0,85
39	1.08	1.11	1.10	1,12	1,10
116	0.72	0.79	0.79	0,83	0,78
135	0.98	0.95	0.94	0,96	0,96
164	5.61	0.96	1.00	1,05	2,16
158	0.94	0.97	0.95	0,95	0,95

26

Table 12:   Analytical results for nitric acid on impregnated filter.

```
HNO3-N on impregnated filter          HNO3-N on impregnated filter
Sample no.: B1                        Sample no.: B2
Theoretical value:        11.450      Theoretical value:        14.720
Unit: ug N/filter                     Unit: ug N/filter

Run 1:                                Run 1:

Number of laboratories:       20      Number of laboratories:       20
Arithmetic mean value:   11.005       Arithmetic mean value:   14.460
Median:                  11.175       Median:                  14.555
Standard deviation        1.735       Standard deviation        2.059
Rel. st. deviation (%)   15.764       Rel. st. deviation (%)   14.242

Run 2:                                Run 2:

Number of laboratories:       19      Number of laboratories:       18
Arithmetic mean value:   11.206       Arithmetic mean value:   14.432
Median:                  11.190       Median:                  14.555
Standard deviation        1.524       Standard deviation        1.351
Rel. st. deviation (%)   13.595       Rel. st. deviation (%)    9.363

Results in decreasing order:          Results in decreasing order:

  11   13.880      20   11.160          11   19.680 (*)   32   14.470
  39   13.010       4   10.980          36   16.630      165   14.200
  36   12.710      15   10.900           8   16.200       20   14.080
   5   12.670      32   10.640           5   16.170       22   14.000
   8   12.300       3   10.600          39   15.440        3   13.490
  31   12.162     135   10.480          16   15.240       15   13.300
  16   11.840      22    9.200          31   15.224       33   12.451
 158   11.710      34    8.343         135   15.160       34   12.292
 165   11.200      33    7.947         158   14.810      116   11.980
 164   11.190     116    7.180 (*)       4   14.640      164    9.740 (*)


HNO3-N on impregnated filter          HNO3-N on impregnated filter
Sample no.: B4                        Sample no.: B5
Theoretical value:        26.180      Theoretical value:        22.900
Unit: ug N/filter                     Unit: ug N/filter

Run 1:                                Run 1:

Number of laboratories:       20      Number of laboratories:       20
Arithmetic mean value:   25.950       Arithmetic mean value:   22.229
Median:                  26.520       Median:                  22.155
Standard deviation        2.479       Standard deviation        2.393
Rel. st. deviation (%)    9.551       Rel. st. deviation (%)   10.766

Run 2:                                Run 2:

Number of laboratories:       19      Number of laboratories:       18
Arithmetic mean value:   26.338       Arithmetic mean value:   22.220
Median:                  26.550       Median:                  22.155
Standard deviation        1.819       Standard deviation        1.593
Rel. st. deviation (%)    6.905       Rel. st. deviation (%)    7.168

Results in decreasing order:          Results in decreasing order:

  11   30.730     164   26.490          11   28.040 (*)   32   22.140
   5   28.370     158   25.710           5   25.070      158   22.110
  36   27.990      22   25.700          39   24.230       15   22.100
  33   27.735      20   25.640          36   23.850       20   21.400
  39   27.070       4   25.580           8   23.400        4   21.060
  16   27.000     165   25.300          16   23.240      165   20.900
  31   26.959       3   23.930         164   23.190       22   20.800
   8   26.800      34   23.103         135   23.000       34   19.743
  32   26.670      15   23.100          31   22.810       33   18.751
 135   26.550     116   18.580 (*)       3   22.170      116   16.580 (*)
```

Table 13: *The ratios of the theoretical values and the results found by the laboratories in the determination of nitric acid on impregnated filters. The reported results are corrected for blank value (B3).*

| | Measured / Expected value | | | | |
| | Sample No | | | | |
Lab No	B1	B2	B4	B5	Average
3	0.93	0.92	0.91	0.97	0.93
4	0.96	0.99	0.98	0.92	0.96
5	1.11	1.10	1.08	1.09	1.10
8	1.07	1.10	1.02	1.02	1.06
11	1.21	1.34	1.17	1.22	1.24
15	0.95	0.90	0.88	0.97	0.93
16	1.03	1.04	1.03	1.01	1.03
20	0.97	0.96	0.98	0.93	0.96
22	0.80	0.95	0.98	0.91	0.91
31	1.06	1.03	1.03	1.00	1.03
32	0.93	0.98	1.02	0.97	0.97
33	0.69	0.85	1.06	0.82	0.85
34	0.73	0.84	0.88	0.86	0.83
36	1.11	1.13	1.07	1.04	1.09
39	1.14	1.05	1.03	1.06	1.07
116	0.63	0.81	0.71	0.72	0.72
135	0.92	1.03	1.01	1.00	0.99
164	0.98	0.66	1.01	1.01	0.92
158	1.02	1.01	0.98	0.97	0.99

Table 14:   Analytical results for ammonia on impregnated filter.

```
NH3-N on impregnated filter          NH3-N on impregnated filter
Sample no.: J1                       Sample no.: J2
Theoretical value:       20.050      Theoretical value:       12.030
Unit: ug N/filter                    Unit: ug N/filter


Run 1:                               Run 1:


Number of laboratories:      18      Number of laboratories:      18
Arithmetic mean value:   19.997      Arithmetic mean value:   11.938
Median:                  19.895      Median:                  11.655
Standard deviation        2.485      Standard deviation        1.739
Rel. st. deviation (%)   12.425      Rel. st. deviation (%)   14.568


Run 2:                               Run 2:


Number of laboratories:      17      Number of laboratories:      17
Arithmetic mean value:   20.377      Arithmetic mean value:   11.677
Median:                  20.000      Median:                  11.410
Standard deviation        1.948      Standard deviation        1.383
Rel. st. deviation (%)    9.558      Rel. st. deviation (%)   11.846


Results in decreasing order:         Results in decreasing order:

  13   23.760     116   19.790         13   16.370 (*)    36   11.410
  31   23.631     135   19.655         31   14.002        20   11.390
  19   22.438      15   19.400        135   13.505       165   10.700
   8   21.800     165   18.800         19   13.468        34   10.656
  32   21.700     158   18.755         33   12.867         5   10.650
  11   21.650       5   18.650         11   12.850        15   10.500
  33   21.212      34   17.493        116   12.490        39   10.225
  20   20.450      39   17.225         32   12.430       158   10.155
  36   20.000      10   13.532 (*)      8   11.900        10    9.315


NH3-N on impregnated filter          NH3-N on impregnated filter
Sample no.: J4                       Sample no.: J6
Theoretical value:        9.020      Theoretical value:       40.100
Unit: ug N/filter                    Unit: ug N/filter


Run 1:                               Run 1:


Number of laboratories:      18      Number of laboratories:      18
Arithmetic mean value:    8.618      Arithmetic mean value:   38.746
Median:                   8.402      Median:                  39.213
Standard deviation        2.132      Standard deviation        3.903
Rel. st. deviation (%)   24.741      Rel. st. deviation (%)   10.074


Run 2:                               Run 2:


Number of laboratories:      17      Number of laboratories:      17
Arithmetic mean value:    8.227      Arithmetic mean value:   39.363
Median:                   8.355      Median:                  39.255
Standard deviation        1.383      Standard deviation        2.986
Rel. st. deviation (%)   16.814      Rel. st. deviation (%)    7.585


Results in decreasing order:         Results in decreasing order:

  34   15.256 (*)  158    8.355        32   46.160        36   39.170
  11   10.750     165    8.200          8   42.700        20   39.070
 135    9.935      32    7.830         13   42.140       135   39.045
  36    9.560       8    7.500         19   42.117        31   38.712
  19    9.537      20    7.150         33   40.431         5   37.150
  13    9.300      33    7.062        116   39.490        15   36.600
  31    8.841      39    6.585         11   39.450        39   35.225
 116    8.790      15    6.300        165   39.300        34   33.156
   5    8.450      10    5.714        158   39.255        10   28.262 (*)
```

Table 15: *The ratios of the theoretical values and the results found by the laboratories in the determination of ammonia on impregnated filters. The reported results are corrected for an average blank value (J2 and J5).*

| Lab No | Measured / Expected value | | | | Average |
| | Sample No | | | | |
	J1	J3	J4	J6	
5	0.93	0.89	0.94	0.93	0.92
8	1.09	0.99	0.83	1.06	0.99
10	0.67	0.77	0.63	0.70	0.70
11	1.08	1.07	1.19	0.98	1.08
13	1.19	1.36	1.03	1.05	1.16
15	0.97	0.87	0.70	0.91	0.86
19	1.12	1.12	1.06	1.05	1.09
20	1.02	0.95	0.79	0.97	0.93
31	1.18	1.16	0.98	0.97	1.07
32	1.08	1.03	0.87	1.15	1.03
33	1.06	1.07	0.78	1.01	0.98
34	0.87	0.89	1.69	0.83	1.07
36	1.00	0.95	1.06	0.98	1.00
39	0.86	0.85	0.73	0.88	0.83
116	0.99	1.04	0.97	0.98	1.00
135	0.98	1.12	1.10	0.97	1.04
158	0.94	0.84	0.93	0.98	0.92
165	0.94	0.89	0.91	0.98	0.93

Table 16:   Analytical results for sulphate in precipitation samples.

```
Sulphate in precipitation
Sample no.: G1
Theoretical value:        1.558
Unit: µg/ml

Run 1:
Number of laboratories:        65
Arithmetic mean value:      1.535
Median:                     1.540
Standard deviation          0.156
Rel. st. deviation (%)     10.133

Run 2:
Number of laboratories:        62
Arithmetic mean value:      1.549
Median:                     1.540
Standard deviation          0.070
Rel. st. deviation (%)      4.549

Results in decreasing order:
139   2.050 (*)   110   1.540
124   1.770       114   1.540
107   1.720       125   1.540
148   1.710        36   1.539
133   1.633       156   1.537
 13   1.630        10   1.537
 35   1.627        20   1.536
 39   1.626        26   1.532
  7   1.619        32   1.524
 15   1.610        17   1.522
  3   1.602        38   1.520
104   1.600       158   1.520
150   1.600       115   1.510
116   1.600       120   1.510
 21   1.594        11   1.505
  5   1.593       135   1.505
 33   1.590       121   1.505
146   1.581       165   1.502
118   1.580       152   1.500
 14   1.580       160   1.500
 34   1.574       164   1.490
 23   1.570       112   1.490
  8   1.570       155   1.490
 18   1.567        31   1.483
 27   1.561       153   1.473
 24   1.560        30   1.460
  1   1.560        19   1.425
  4   1.557       126   1.422
 16   1.554       149   1.420
 22   1.551       109   1.334
117   1.550       108   1.030 (*)
 12   1.540       157   0.690 (*)
  6   1.540
```

```
Sulphate in precipitation
Sample no.: G2
Theoretical value:        1.773
Unit: µg/ml

Run 1:
Number of laboratories:        65
Arithmetic mean value:      1.743
Median:                     1.769
Standard deviation          0.179
Rel. st. deviation (%)     10.259

Run 2:
Number of laboratories:        64
Arithmetic mean value:      1.761
Median:                     1.769
Standard deviation          0.107
Rel. st. deviation (%)      6.068

Results in decreasing order:
107   2.050       114   1.760
139   2.030        38   1.760
110   2.000         6   1.760
148   1.910        20   1.754
124   1.900       152   1.750
133   1.885        12   1.750
 18   1.866        36   1.748
116   1.850        26   1.742
 13   1.850       117   1.740
 32   1.846       115   1.730
  7   1.836       158   1.730
 35   1.835        17   1.728
146   1.830       125   1.720
  3   1.818        22   1.719
 39   1.816       165   1.711
 21   1.815       160   1.700
  5   1.811       112   1.700
 34   1.811       153   1.695
 15   1.810       121   1.695
104   1.810       135   1.676
150   1.810       120   1.670
 23   1.800        30   1.670
 16   1.798       155   1.651
 14   1.790       164   1.650
  8   1.790       126   1.632
 24   1.790        31   1.631
118   1.780       149   1.616
 11   1.772        19   1.568
 10   1.770       109   1.534
  1   1.770       156   1.487
 33   1.770       108   1.480
  4   1.770       157   0.600 (*)
 27   1.769
```

```
Sulphate in precipitation
Sample no.: G3
Theoretical value:        1.003
Unit: µg/ml

Run 1:
Number of laboratories:        65
Arithmetic mean value:      0.997
Median:                     1.000
Standard deviation          0.100
Rel. st. deviation (%)     10.035

Run 2:
Number of laboratories:        61
Arithmetic mean value:      0.999
Median:                     1.000
Standard deviation          0.057
Rel. st. deviation (%)      5.749

Results in decreasing order:
124   1.310 (*)   116   1.000
133   1.266 (*)   115   1.000
139   1.160        36   0.997
107   1.150        12   0.990
156   1.120       114   0.990
148   1.090         6   0.990
 32   1.070        26   0.989
  7   1.064        20   0.986
 18   1.058        11   0.985
  5   1.055        38   0.980
 13   1.050       120   0.980
146   1.043        10   0.976
 15   1.040        33   0.973
104   1.040       158   0.970
 14   1.030       160   0.970
117   1.030       165   0.968
150   1.030       155   0.964
 35   1.030       135   0.961
 21   1.022       152   0.960
 34   1.022       157   0.960
  8   1.020       112   0.950
  1   1.020       153   0.948
 39   1.019       164   0.930
  3   1.017       125   0.928
118   1.010       121   0.918
 19   1.010        22   0.917
 24   1.010       149   0.916
 31   1.008        30   0.910
  4   1.008       126   0.891
 27   1.007       109   0.826
 16   1.001       108   0.670 (*)
 23   1.000        17   0.591 (*)
110   1.000
```

```
Sulphate in precipitation
 Sample no.: G4
Theoretical value:        1.166
Unit: µg/ml

Run 1:
Number of laboratories:        65
Arithmetic mean value:      1.160
Median:                     1.170
Standard deviation          0.117
Rel. st. deviation (%)     10.065

Run 2:
Number of laboratories:        62
Arithmetic mean value:      1.163
Median:                     1.170
Standard deviation          0.063
Rel. st. deviation (%)      5.439

Results in decreasing order:
133   1.416 (*)    38   1.170
124   1.400 (*)   110   1.170
107   1.390        24   1.170
148   1.280         4   1.162
  7   1.246         6   1.160
116   1.240        12   1.160
 10   1.231        36   1.158
104   1.220        26   1.153
139   1.220       120   1.150
 15   1.220       114   1.150
 22   1.213        20   1.148
 39   1.212       152   1.140
 13   1.210        18   1.136
 35   1.209       165   1.136
  3   1.206       121   1.131
146   1.203       158   1.130
 32   1.202       160   1.130
 14   1.200       125   1.120
150   1.190        33   1.120
118   1.190       153   1.117
 21   1.188        17   1.115
 34   1.187        19   1.108
  5   1.187       164   1.100
155   1.184       112   1.100
 11   1.182       156   1.096
  8   1.180       135   1.091
117   1.180        30   1.080
 23   1.180       149   1.073
  1   1.180       126   1.045
 31   1.177       157   1.000
 27   1.177       109   0.963
 16   1.176       108   0.450 (*)
115   1.170
```

Table 17: Analytical results for nitrate in precipitation samples.

```
Nitrate in precipitation                      Nitrate in precipitation
Sample no.: G1                                Sample no.: G2
Theoretical value:        0.452               Theoretical value:        0.361
Unit: µg/ml                                   Unit: µg/ml

Run 1:                                        Run 1:
Number of laboratories:      65               Number of laboratories:      65
Arithmetic mean value:    0.484               Arithmetic mean value:    0.394
Median:                   0.450               Median:                   0.360
Standard deviation        0.215               Standard deviation        0.206
Rel. st. deviation (%)   44.302               Rel. st. deviation (%)   52.242

Run 2:                                        Run 2:
Number of laboratories:      63               Number of laboratories:      63
Arithmetic mean value:    0.450               Arithmetic mean value:    0.359
Median:                   0.450               Median:                   0.360
Standard deviation        0.056               Standard deviation        0.043
Rel. st. deviation (%)   12.477               Rel. st. deviation (%)   11.878

Results in decreasing order:                  Results in decreasing order:
121    1.988  (*)   110    0.450              121    1.598  (*)   133    0.360
157    1.130  (*)    12    0.450              157    1.430  (*)     1    0.360
139    0.620         23    0.450               14    0.460        110    0.360
 14    0.540         13    0.450              124    0.430         12    0.360
124    0.540          3    0.449              109    0.430         20    0.359
116    0.518          7    0.448               40    0.418        146    0.359
 19    0.505         22    0.446               11    0.404         16    0.357
 10    0.503        165    0.441              156    0.395         39    0.355
 11    0.502        158    0.440               10    0.391          3    0.355
 40    0.499         38    0.440               36    0.386          7    0.355
 36    0.490         34    0.440               34    0.382        152    0.350
  5    0.470         24    0.440                5    0.381        158    0.350
155    0.468        133    0.440              139    0.380         13    0.350
135    0.462        112    0.440              126    0.373         24    0.350
 35    0.460        114    0.440              115    0.372        114    0.350
156    0.460        104    0.440               26    0.370        165    0.350
 15    0.460        152    0.440              108    0.370        150    0.350
118    0.460         16    0.439              118    0.370        104    0.350
126    0.460         33    0.439               15    0.370        107    0.345
 17    0.460         31    0.437              112    0.370        117    0.340
  6    0.460        125    0.434               17    0.370        153    0.340
 21    0.459        107    0.434               35    0.368        120    0.340
 39    0.459        150    0.430              155    0.366        160    0.340
 27    0.458        109    0.430               27    0.363         33    0.339
 26    0.457        117    0.430               21    0.363         22    0.338
115    0.455        120    0.430              135    0.362        116    0.336
  8    0.453        153    0.420                8    0.362        125    0.330
146    0.453        160    0.420               32    0.361         31    0.329
 20    0.453        149    0.407                4    0.361        149    0.328
 32    0.453         30    0.402              164    0.360         30    0.327
  1    0.452        108    0.370               23    0.360         19    0.325
  4    0.450        148    0.110               38    0.360        148    0.090
164    0.450                                    6    0.360


Nitrate in precipitation                      Nitrate in precipitation
Sample no.: G3                                Sample no.: G4
Theoretical value:        0.615               Theoretical value:        0.643
Unit: µg/ml                                   Unit: µg/ml

Run 1:                                        Run 1:
Number of laboratories:      65               Number of laboratories:      65
Arithmetic mean value:    0.635               Arithmetic mean value:    0.672
Median:                   0.609               Median:                   0.640
Standard deviation        0.275               Standard deviation        0.287
Rel. st. deviation (%)   43.284               Rel. st. deviation (%)   42.686

Run 2:                                        Run 2:
Number of laboratories:      64               Number of laboratories:      64
Arithmetic mean value:    0.602               Arithmetic mean value:    0.638
Median:                   0.608               Median:                   0.640
Standard deviation        0.068               Standard deviation        0.074
Rel. st. deviation (%)   11.354               Rel. st. deviation (%)   11.596

Results in decreasing order:                  Results in decreasing order:
121    2.749  (*)    16    0.607              121    2.873  (*)   133    0.640
157    0.740          7    0.605              157    0.860         24    0.640
 11    0.694         34    0.604               11    0.762        118    0.640
 10    0.682        135    0.603               10    0.708        104    0.640
124    0.680        155    0.602               14    0.700         13    0.640
 14    0.670        104    0.600               36    0.695          7    0.639
 36    0.664        120    0.600              108    0.690         16    0.639
  5    0.655        133    0.600               35    0.675         26    0.637
139    0.650         12    0.600               22    0.673        116    0.636
 35    0.639        152    0.600              124    0.670         34    0.631
 15    0.630        158    0.600                5    0.668        158    0.630
 19    0.625        114    0.600               39    0.667        139    0.630
146    0.625        165    0.599              146    0.660        114    0.630
 39    0.625         17    0.597              155    0.660         38    0.630
 27    0.622         31    0.592               15    0.660        117    0.630
 21    0.621        150    0.590               27    0.656        165    0.629
  6    0.620        117    0.590              156    0.654        135    0.626
 38    0.620        125    0.588               21    0.652        107    0.625
115    0.618        107    0.587              110    0.650         31    0.624
  4    0.616        116    0.584              164    0.650        150    0.620
  1    0.615        109    0.580               23    0.650        120    0.620
126    0.615        108    0.580              115    0.648         17    0.620
 20    0.613        153    0.580               32    0.646        112    0.620
  8    0.612         33    0.574                1    0.644        125    0.616
 24    0.610        112    0.570               20    0.644        109    0.610
 32    0.610        149    0.565               19    0.643         40    0.601
 13    0.610         22    0.560              126    0.642         33    0.600
118    0.610        160    0.560                8    0.642        153    0.600
164    0.610         40    0.547                3    0.641        149    0.592
110    0.610         30    0.541               12    0.640        160    0.580
 23    0.610        156    0.536              152    0.640         30    0.566
 26    0.609        148    0.140                4    0.640        148    0.150
  3    0.609                                    6    0.640
```

Table 18:   Analytical results for ammonium in precipitation samples.

```
Ammonium in precipitation                   Ammonium in precipitation
Sample no.: G1                              Sample no.: G2
Theoretical value:       0.257              Theoretical value:       0.160
Unit: µg/ml                                 Unit: µg/ml

Run 1:                                      Run 1:
Number of laboratories:       65            Number of laboratories:       65
Arithmetic mean value:    0.264             Arithmetic mean value:    0.169
Median:                   0.262             Median:                   0.163
Standard deviation        0.073             Standard deviation        0.057
Rel. st. deviation (%)   27.810             Rel. st. deviation (%)   33.473

Run 2:                                      Run 2:
Number of laboratories:       62            Number of laboratories:       62
Arithmetic mean value:    0.259             Arithmetic mean value:    0.165
Median:                   0.262             Median:                   0.162
Standard deviation        0.040             Standard deviation        0.034
Rel. st. deviation (%)   15.299             Rel. st. deviation (%)   20.746

Results in decreasing order:                Results in decreasing order:
  31    0.594 (*)  135   0.261                18    0.457 (*)  135   0.161
  18    0.527 (*)  104   0.260                31    0.315 (*)   24   0.160
 112    0.350      114   0.260               112    0.260      109   0.160
 133    0.349      117   0.260               156    0.252      117   0.160
  11    0.324      109   0.260               133    0.248      114   0.160
 156    0.320      160   0.260                 3    0.227      118   0.160
   3    0.312      146   0.259               150    0.210      124   0.160
 121    0.304       36   0.257                34    0.204       12   0.160
 152    0.300       10   0.255                11    0.196       16   0.160
 125    0.295       26   0.254               125    0.192        6   0.160
 110    0.290        1   0.251               152    0.190      158   0.160
  15    0.290        6   0.250                15    0.190        7   0.158
 164    0.290      115   0.250               121    0.187       36   0.158
  34    0.281      118   0.250                19    0.186       26   0.157
  13    0.280       24   0.250                13    0.180       10   0.157
 107    0.277        8   0.250               110    0.180      107   0.156
 116    0.275       35   0.247               164    0.180      115   0.153
  33    0.274        7   0.247               149    0.177        8   0.153
  32    0.274        5   0.246                33    0.172       35   0.152
  23    0.270       14   0.242                32    0.171       40   0.151
  19    0.270      153   0.240               116    0.171      165   0.151
 139    0.270      126   0.237               104    0.170      160   0.150
 108    0.270       16   0.236                23    0.170      126   0.146
  12    0.270      120   0.210               139    0.170       14   0.146
 124    0.270      157   0.200               108    0.170      153   0.140
 158    0.270       40   0.198               146    0.166      148   0.130
 165    0.267      148   0.190                21    0.166      120   0.110
   4    0.265       30   0.173                20    0.164       30   0.108
  39    0.265       22   0.167                 1    0.164      157   0.090
 149    0.264      155   0.160                39    0.163      155   0.073
  21    0.264      150   0.137                 5    0.163       22   0.060
  20    0.262       17   0.000 (*)             4    0.163       17   0.000 (*)
  27    0.262                                  27    0.163


Ammonium in precipitation                   Ammonium in precipitation
Sample no.: G3                              Sample no.: G4
Theoretical value:       0.385              Theoretical value:       0.401
Unit: µg/ml                                 Unit: µg/ml

Run 1:                                      Run 1:
Number of laboratories:       65            Number of laboratories:       65
Arithmetic mean value:    0.402             Arithmetic mean value:    0.422
Median:                   0.383             Median:                   0.405
Standard deviation        0.118             Standard deviation        0.093
Rel. st. deviation (%)   29.401             Rel. st. deviation (%)   22.088

Run 2:                                      Run 2:
Number of laboratories:       64            Number of laboratories:       63
Arithmetic mean value:    0.388             Arithmetic mean value:    0.408
Median:                   0.383             Median:                   0.405
Standard deviation        0.041             Standard deviation        0.045
Rel. st. deviation (%)   10.587             Rel. st. deviation (%)   10.974

Results in decreasing order:                Results in decreasing order:
  18    1.283 (*)  135   0.382                40    0.999 (*)   16   0.405
   3    0.484        1   0.381                18    0.716 (*)    4   0.405
 156    0.472      108   0.380                11    0.521       39   0.404
 112    0.470      110   0.380               133    0.501        5   0.403
  11    0.465      117   0.380               121    0.491      135   0.402
 121    0.462      153   0.380               112    0.490        1   0.401
 150    0.452      118   0.380                31    0.481       13   0.400
 152    0.440       16   0.380               150    0.468        6   0.400
  31    0.439       10   0.380               156    0.458      117   0.400
 125    0.421      149   0.380                19    0.444      109   0.400
  15    0.420        6   0.380               125    0.443      160   0.400
 133    0.419       24   0.380               152    0.440      108   0.400
  32    0.412       13   0.380               124    0.440       24   0.400
 158    0.410       35   0.379                15    0.440        8   0.398
 139    0.410       26   0.379                32    0.434       26   0.398
 164    0.410        8   0.377               139    0.430       35   0.397
 124    0.410      165   0.377               104    0.430        7   0.395
  19    0.409       34   0.376                17    0.427      118   0.390
 116    0.405        7   0.376                20    0.426      115   0.390
  20    0.402      160   0.370               116    0.424      165   0.388
  33    0.400      109   0.370               149    0.424       14   0.388
 104    0.400       14   0.368                 3    0.423      153   0.380
 114    0.400      115   0.366                33    0.422      110   0.380
   5    0.393      120   0.360                23    0.420      126   0.378
  36    0.392      107   0.356               164    0.420      107   0.373
  23    0.390      126   0.353                12    0.420      120   0.370
  12    0.390       40   0.352               158    0.420       34   0.358
  21    0.390      155   0.317                36    0.415      157   0.330
  27    0.388      157   0.300                21    0.413       22   0.314
  39    0.387       22   0.293                27    0.410      148   0.310
 146    0.386      148   0.290               114    0.410      155   0.293
   4    0.384       30   0.258               146    0.406       30   0.265
  17    0.383                                  10    0.405
```

Table 19:   Analytical results for pH in precipitation samples.

```
pH in precipitation                        pH in precipitation
Sample no.: G1                             Sample no.: G2
Theoretical value:        4.100            Theoretical value:        4.040
Unit: pH-unit                              Unit: pH-unit

Run 1:                                     Run 1:
Number of laboratories:      65            Number of laboratories:      65
Arithmetic mean value:    4.126            Arithmetic mean value:    4.054
Median:                   4.130            Median:                   4.070
Standard deviation        0.092            Standard deviation        0.081
Rel. st. deviation (%)    2.226            Rel. st. deviation (%)    2.004

Run 2:                                     Run 2:
Number of laboratories:      58            Number of laboratories:      61
Arithmetic mean value:    4.138            Arithmetic mean value:    4.070
Median:                   4.135            Median:                   4.070
Standard deviation        0.047            Standard deviation        0.052
Rel. st. deviation (%)    1.142            Rel. st. deviation (%)    1.278

Results in decreasing order:               Results in decreasing order:
156   4.420 (*)  116   4.130                30   4.200      109   4.060
153   4.310 (*)  104   4.130               156   4.200       16   4.060
124   4.290      160   4.130               153   4.190      114   4.060
 19   4.244       12   4.120               150   4.160       21   4.060
150   4.200      126   4.120                19   4.150       31   4.060
110   4.200       16   4.120                 8   4.130       10   4.060
 26   4.190       36   4.120               124   4.130      155   4.060
 14   4.190       33   4.120               112   4.120       34   4.054
 30   4.190      155   4.120                26   4.120       33   4.050
  8   4.190       21   4.120                15   4.120       12   4.050
112   4.190       39   4.110                14   4.110        3   4.042
 35   4.180      165   4.110               110   4.100        6   4.040
 22   4.180      135   4.110               158   4.100       39   4.040
148   4.180       11   4.110                22   4.100      160   4.040
 15   4.180      146   4.110                35   4.100      121   4.030
115   4.170        3   4.102               107   4.090       24   4.030
 20   4.170      164   4.100               115   4.090      135   4.030
120   4.160       24   4.100                20   4.090      104   4.030
158   4.160       13   4.100               152   4.090      139   4.020
152   4.160        6   4.090                27   4.090        7   4.020
117   4.150      149   4.090               118   4.090      126   4.020
 27   4.150      139   4.090                11   4.080      149   4.020
108   4.150        7   4.080               148   4.080       13   4.020
118   4.150      121   4.060               117   4.080      164   4.000
114   4.150      133   4.050                 4   4.080       23   3.980
 34   4.142        1   4.050               108   4.080      133   3.980
109   4.140       23   4.010               165   4.070        1   3.960
107   4.140       40   3.940 (*)            36   4.070       40   3.930
  4   4.140       18   3.940 (*)           120   4.070       18   3.870 (*)
 31   4.140       17   3.900 (*)             5   4.070       38   3.810 (*)
  5   4.140      157   3.860 (*)            32   4.070       17   3.800 (*)
 32   4.130       38   3.820 (*)           146   4.070      157   3.760 (*)
 10   4.130                                116   4.070


pH in precipitation                        pH in precipitation
Sample no.: G3                             Sample no.: G4
Theoretical value:        4.400            Theoretical value:        4.320
Unit: pH-unit                              Unit: pH-unit

Run 1:                                     Run 1:
Number of laboratories:      65            Number of laboratories:      65
Arithmetic mean value:    4.411            Arithmetic mean value:    4.338
Median:                   4.430            Median:                   4.340
Standard deviation        0.099            Standard deviation        0.106
Rel. st. deviation (%)    2.236            Rel. st. deviation (%)    2.454

Run 2:                                     Run 2:
Number of laboratories:      59            Number of laboratories:      60
Arithmetic mean value:    4.432            Arithmetic mean value:    4.353
Median:                   4.430            Median:                   4.350
Standard deviation        0.049            Standard deviation        0.057
Rel. st. deviation (%)    1.095            Rel. st. deviation (%)    1.317

Results in decreasing order:               Results in decreasing order:
150   4.620 (*)   34   4.425               156   4.700 (*)  120   4.340
 19   4.540       31   4.420               160   4.520      109   4.340
156   4.530      148   4.420                30   4.470      117   4.340
153   4.520       16   4.420               150   4.470       21   4.340
 14   4.500       21   4.420                19   4.451       31   4.340
110   4.500      155   4.420               153   4.440       32   4.340
146   4.500      114   4.410                14   4.420       36   4.340
 15   4.490      120   4.410               124   4.410        5   4.340
  8   4.490      109   4.410                26   4.410       34   4.338
124   4.490        5   4.410                 8   4.410      104   4.330
 26   4.480       33   4.410               110   4.400       12   4.330
 35   4.470       10   4.400               112   4.400        6   4.330
112   4.470       12   4.400                22   4.400      165   4.320
 22   4.470      139   4.400                35   4.390       39   4.310
158   4.460      164   4.400                15   4.390      121   4.310
118   4.460       24   4.390               118   4.380       24   4.310
 30   4.460      121   4.390               146   4.380        3   4.304
152   4.460      126   4.390               152   4.380      139   4.300
108   4.460        6   4.390                20   4.380      133   4.300
 20   4.460      149   4.380               115   4.370      135   4.300
107   4.450      135   4.380               116   4.370      126   4.300
 27   4.450        7   4.370               158   4.370      149   4.300
117   4.450      133   4.360                27   4.370      164   4.300
  4   4.440       13   4.350                 4   4.360        7   4.290
 36   4.440        1   4.330               108   4.360       13   4.270
116   4.440       23   4.320               148   4.360       23   4.250
115   4.440      104   4.320                11   4.360        1   4.240
 11   4.440       18   4.200 (*)           114   4.360       18   4.180
  3   4.438       40   4.190 (*)            16   4.360       40   4.080 (*)
 32   4.430       17   4.110 (*)           107   4.350       17   4.050 (*)
 39   4.430      157   4.090 (*)            33   4.350      157   4.030 (*)
160   4.430       38   4.050 (*)           155   4.350       38   3.960 (*)
165   4.430                                 10   4.340
```

Table 20:   Analytical results for strong acid calculated from pH.

```
Strong acid calculated from pH          Strong acid calculated from pH
Sample no.: G1                          Sample no.: G2
Theoretical value:        80.000        Theoretical value:        92.000
Unit: µeg/l                             Unit: µeg/l

Run 1:                                  Run 1:
Number of laboratories:        65       Number of laboratories:        65
Arithmetic mean value:     76.643       Arithmetic mean value:     90.021
Median:                    74.130       Median:                    85.110
Standard deviation         18.189       Standard deviation         19.894
Rel. st. deviation (%)     23.732       Rel. st. deviation (%)     22.100

Run 2:                                  Run 2:
Number of laboratories:        59       Number of laboratories:        61
Arithmetic mean value:     72.862       Arithmetic mean value:     85.726
Median:                    72.440       Median:                    85.110
Standard deviation          8.454       Standard deviation         10.231
Rel. st. deviation (%)     11.603       Rel. st. deviation (%)     11.935

Results in decreasing order:            Results in decreasing order:
 38   151.360 (*)   32    74.130        157   173.780 (*)   146    85.110
157   138.040 (*)    4    72.440         17   158.490 (*)    32    85.110
 17   125.890 (*)    5    72.440         38   154.880 (*)   165    85.110
 18   114.820 (*)   31    72.440         18   134.900 (*)   116    85.110
 40   114.820 (*)  109    72.440         40   117.490        36    85.110
 23    97.720      107    72.440          1   109.650         5    85.110
  1    89.130       34    72.110         23   104.710         4    83.180
133    89.130      118    70.790        133   104.710        11    83.180
121    87.100      108    70.790        164   100.000       108    83.180
  7    83.180       27    70.790        139    95.500       117    83.180
149    81.280      114    70.790        126    95.500       148    83.180
139    81.280      117    70.790          7    95.500       118    81.280
  6    81.280      152    69.180         13    95.500        27    81.280
164    79.430      158    69.180        149    95.500        20    81.280
 24    79.430      120    69.180        104    93.330       115    81.280
 13    79.430      115    67.610        121    93.330       152    81.280
  3    79.070       20    67.610        135    93.330       107    81.280
 39    77.620       15    66.070         24    93.330        22    79.430
 11    77.620       35    66.070          6    91.200        35    79.430
165    77.620      148    66.070         39    91.200       158    79.430
146    77.620       22    66.070        160    91.200       110    79.430
135    77.620        8    64.570          3    90.780        14    77.620
 12    75.860       14    64.570         12    89.130       112    75.860
 21    75.860       30    64.570         33    89.130        26    75.860
 16    75.860      112    64.570         34    88.310        15    75.860
 36    75.860       26    64.570        109    87.100       124    74.130
126    75.860      150    63.100         10    87.100         8    74.130
155    75.860      110    63.100        114    87.100        19    70.790
 33    75.860       19    57.020         16    87.100       150    69.180
104    74.130      124    51.290        155    87.100       153    64.570
116    74.130      153    48.980         31    87.100       156    63.100
160    74.130      156    38.020 (*)     21    87.100        30    63.100
 10    74.130                           120    85.110

Strong acid calculated from pH          Strong acid calculated from pH
Sample no.: G3                          Sample no.: G4
Theoretical value:        40.000        Theoretical value:        48.000
Unit: µeg/l                             Unit: µeg/l

Run 1:                                  Run 1:
Number of laboratories:        65       Number of laboratories:        65
Arithmetic mean value:     39.958       Arithmetic mean value:     47.407
Median:                    37.150       Median:                    45.710
Standard deviation         11.456       Standard deviation         13.836
Rel. st. deviation (%)     28.669       Rel. st. deviation (%)     29.185

Run 2:                                  Run 2:
Number of laboratories:        60       Number of laboratories:        61
Arithmetic mean value:     37.026       Arithmetic mean value:     44.364
Median:                    37.150       Median:                    44.670
Standard deviation          4.506       Standard deviation          6.687
Rel. st. deviation (%)     12.169       Rel. st. deviation (%)     15.074

Results in decreasing order:            Results in decreasing order:
 38    89.130 (*)   32    37.150         38   109.650 (*)  155    44.670
157    81.280 (*)   39    37.150        157    93.330 (*)   33    44.670
 17    77.620 (*)  160    37.150         17    89.130 (*)  107    44.670
 40    64.570 (*)    3    36.480         40    83.180 (*)   11    43.650
 18    63.100 (*)    4    36.310         18    66.070      148    43.650
 23    47.860       11    36.310          1    57.540       16    43.650
104    47.860       36    36.310         23    56.230        4    43.650
  1    46.770      115    36.310         13    53.700      114    43.650
 13    44.670      116    36.310          7    51.290      108    43.650
133    43.650      107    35.480        126    50.120      115    42.660
  7    42.660      117    35.480        164    50.120      116    42.660
135    41.690       27    35.480        149    50.120      158    42.660
149    41.690      118    34.670        139    50.120       27    42.660
  6    40.740       20    34.670        135    50.120       20    41.690
 24    40.740      152    34.670        133    50.120      118    41.690
121    40.740      158    34.670          3    49.660      146    41.690
126    40.740       30    34.670         39    48.980      152    41.690
139    39.810      108    34.670         24    48.980       35    40.740
164    39.810       22    33.880        121    48.980       15    40.740
 10    39.810       35    33.880        165    47.860       22    39.810
 12    39.810      112    33.880        104    46.770      110    39.810
120    38.900       26    33.110         12    46.770      112    39.810
  5    38.900        8    32.360          6    46.770      124    38.900
109    38.900       15    32.360         34    45.920        8    38.900
 33    38.900      124    32.360         21    45.710       26    38.900
114    38.900      146    31.620          5    45.710       14    38.020
 21    38.020      110    31.620         36    45.710      153    36.310
 16    38.020       14    31.620         10    45.710       19    35.400
 31    38.020      153    30.200        109    45.710      150    33.880
155    38.020      156    29.510        120    45.710       30    33.880
148    38.020       19    28.840        117    45.710      160    30.200
 34    37.580      150    23.990         31    45.710      156    19.950
165    37.150                            32    45.710
```

Table 21:   Analytical results for chloride in precipitation samples.

Chloride in precipitation
Sample no.: G1
Theoretical value: 0.162
Unit: µg/ml

Run 1:
Number of laboratories: 61
Arithmetic mean value: 0.206
Median: 0.162
Standard deviation   0.145
Rel. st. deviation (%)   70.067

Run 2:
Number of laboratories: 57
Arithmetic mean value: 0.176
Median: 0.160
Standard deviation   0.085
Rel. st. deviation (%)   48.447

Results in decreasing order:

Lab	Value		Lab	Value
157	0.730 (*)		116	0.161
133	0.711 (*)		104	0.160
124	0.630 (*)		149	0.160
110	0.500 (*)		118	0.160
156	0.473		6	0.160
108	0.470		21	0.160
112	< 0.370			
135	0.337		13	0.160
18	0.327		27	0.156
120	0.310		165	0.155
19	< 0.310			
36	0.265		8	0.155
5	0.260		3	0.155
139	0.250		34	0.154
115	0.250		7	0.153
109	< 0.250			
117	0.220		153	0.150
152	0.200		114	0.150
125	< 0.200			
155	0.193		164	0.150
158	0.190		12	0.150
24	0.180		15	0.150
30	0.178		20	0.141
11	0.177		150	0.139
4	0.173		126	0.138
39	0.171		1	0.138
38	0.170		10	0.137
146	0.169		107	0.129
22	0.169		14	0.110
32	0.167		160	0.110
			121	< 0.100
26	0.167		23	0.050
31	0.165		17	< 0.030
16	0.165			
35	0.165			
33	0.162			

Chloride in precipitation
Sample no.: G2
Theoretical value: 0.185
Unit: µg/ml

Run 1:
Number of laboratories: 63
Arithmetic mean value: 0.229
Median: 0.189
Standard deviation   0.186
Rel. st. deviation (%)   80.857

Run 2:
Number of laboratories: 58
Arithmetic mean value: 0.179
Median: 0.185
Standard deviation   0.063
Rel. st. deviation (%)   35.312

Results in decreasing order:

Lab	Value		Lab	Value
110	0.900 (*)		116	0.187
124	0.890 (*)		32	0.187
133	0.794 (*)		21	0.183
157	0.760 (*)		27	0.182
108	0.750 (*)		3	0.181
112	< 0.370			
19	< 0.310			
152	0.300		165	0.181
36	0.285		15	0.180
115	0.283		31	0.179
156	0.268		7	0.178
135	0.265		8	0.176
155	0.262		33	0.175
11	0.252		148	0.170
18	0.251		164	0.170
109	< 0.250			
117	0.250		12	0.170
146	0.228		114	0.170
118	0.210		4	0.169
158	0.210		1	0.167
5	0.201		20	0.164
38	0.200		120	0.160
24	0.200		107	0.160
125	< 0.200			
30	0.199		150	0.155
39	0.198		10	0.136
126	0.195		160	0.130
149	0.194		14	0.130
35	0.192		139	0.120
26	0.191		22	0.117
			121	< 0.100
104	0.190		23	0.080
6	0.190		17	0.030
13	0.190		109	0.000
153	0.190		112	0.000
16	0.190		125	0.000
34	0.189			

Chloride in precipitation
Sample no.: G3
Theoretical value: 0.510
Unit: µg/ml

Run 1:
Number of laboratories: 65
Arithmetic mean value: 0.519
Median: 0.496
Standard deviation   0.173
Rel. st. deviation (%)   33.402

Run 2:
Number of laboratories: 60
Arithmetic mean value: 0.486
Median: 0.492
Standard deviation   0.068
Rel. st. deviation (%)   14.052

Results in decreasing order:

Lab	Value		Lab	Value
133	1.297 (*)		30	0.495
108	1.120 (*)		164	0.490
157	1.030 (*)		38	0.490
110	1.000 (*)		13	0.490
124	0.830		158	0.490
115	0.558		32	0.489
18	0.554		34	0.489
36	0.553		165	0.485
146	0.547		31	0.480
5	0.543		118	0.480
135	0.532		125	0.480
39	0.524		116	0.475
117	0.520		11	0.471
155	0.514		126	0.471
26	0.512		153	0.470
139	0.510		120	0.460
24	0.510		112	0.460
12	0.510		1	0.456
104	0.510		33	0.452
4	0.508		121	0.449
35	0.506		150	0.448
27	0.503		10	0.439
149	0.502		107	0.438
3	0.501		109	0.430
16	0.501		19	0.422
20	0.501		148	0.410
21	0.500		14	0.410
6	0.500		160	0.400
114	0.500		23	0.390
152	0.500		156	0.338
15	0.500		22	0.253
7	0.498		17	0.165 (*)
8	0.496			

Chloride in precipitation
Sample no.: G4
Theoretical value: 0.533
Unit: µg/ml

Run 1:
Number of laboratories: 65
Arithmetic mean value: 0.554
Median: 0.526
Standard deviation   0.177
Rel. st. deviation (%)   31.961

Run 2:
Number of laboratories: 61
Arithmetic mean value: 0.527
Median: 0.526
Standard deviation   0.073
Rel. st. deviation (%)   13.940

Results in decreasing order:

Lab	Value		Lab	Value
133	1.548 (*)		16	0.526
108	1.070 (*)		34	0.524
157	1.060 (*)		8	0.523
124	0.830		20	0.522
110	0.800		158	0.520
139	0.670		6	0.520
10	0.617		32	0.519
18	0.604		30	0.518
115	0.590		4	0.517
36	0.576		165	0.515
155	0.569		31	0.514
11	0.565		13	0.510
39	0.563		156	0.506
118	0.560		125	0.500
5	0.554		152	0.500
117	0.550		153	0.500
146	0.547		120	0.500
26	0.546		126	0.498
104	0.540		33	0.495
24	0.540		112	0.490
135	0.536		107	0.479
3	0.535		1	0.479
116	0.535		121	0.476
35	0.533		150	0.463
27	0.532		19	0.450
21	0.532		14	0.440
114	0.530		23	0.420
38	0.530		109	0.420
12	0.530		148	0.410
15	0.530		22	0.405
164	0.530		160	0.370
7	0.529		17	0.193 (*)
149	0.526			

Table 22:   Analytical results for sodium in precipitation samples.

```
Sodium in precipitation                      Sodium in precipitation
Sample no.: G1                               Sample no.: G2
Theoretical value:         0.234             Theoretical value:         0.271
Unit: µg/ml                                  Unit: µg/ml

Run 1:                                       Run 1:
Number of laboratories:        64            Number of laboratories:        64
Arithmetic mean value:      0.240            Arithmetic mean value:      0.271
Median:                     0.240            Median:                     0.274
Standard deviation          0.047            Standard deviation          0.044
Rel. st. deviation (%)     19.745            Rel. st. deviation (%)     16.070

Run 2:                                       Run 2:
Number of laboratories:        59            Number of laboratories:        62
Arithmetic mean value:      0.238            Arithmetic mean value:      0.272
Median:                     0.240            Median:                     0.274
Standard deviation          0.029            Standard deviation          0.032
Rel. st. deviation (%)     12.076            Rel. st. deviation (%)     11.751

Results in decreasing order:                 Results in decreasing order:
  23    0.410  (*)    15    0.240              23    0.440  (*)    21    0.274
   5    0.361  (*)    40    0.240             126    0.358         33    0.273
 121    0.350  (*)    21    0.240             155    0.341          3    0.271
 116    0.320         34    0.237             121    0.340        164    0.270
 156    0.290         33    0.236             156    0.320         13    0.270
 157    0.290          7    0.234              31    0.319         15    0.270
 155    0.285          8    0.233             116    0.311          7    0.267
 133    0.280        164    0.230             157    0.310          8    0.266
  31    0.275        114    0.230             133    0.300         32    0.264
   4    0.271         20    0.228             158    0.300          1    0.263
 158    0.270          1    0.227              16    0.295        135    0.262
 126    0.267        165    0.225             149    0.294         20    0.261
 125    0.262        135    0.225               6    0.290        114    0.260
  14    0.259         32    0.223             160    0.290        165    0.260
 117    0.256        124    0.220             120    0.290         35    0.251
  16    0.256         12    0.220              19    0.290        109    0.250
 149    0.252        104    0.220              34    0.290        110    0.250
   6    0.250        139    0.216             125    0.287        104    0.250
 153    0.250         10    0.215               4    0.286         12    0.250
 120    0.250         35    0.214              14    0.283         24    0.250
 160    0.250        109    0.213             117    0.282        139    0.248
  19    0.250         38    0.210             153    0.280         10    0.245
 112    0.250        110    0.210              11    0.280         38    0.244
  13    0.250         24    0.210             112    0.280        107    0.241
  27    0.244        107    0.210               5    0.279        124    0.240
  36    0.242        150    0.203              27    0.279        150    0.230
   3    0.242        148    0.200              36    0.278         22    0.212
  30    0.241        118    0.180              30    0.277        118    0.210
 146    0.240         22    0.166              40    0.277        148    0.210
  11    0.240        115    0.161              26    0.276        115    0.200
  39    0.240        108    0.130  (*)         39    0.275        108    0.190
  26    0.240         17    0.080  (*)        146    0.274         17    0.100  (*)

Sodium in precipitation                      Sodium in precipitation
Sample no.: G3                               Sample no.: G4
Theoretical value:         0.588             Theoretical value:         0.646
Unit: µg/ml                                  Unit: µg/ml

Run 1:                                       Run 1:
Number of laboratories:        64            Number of laboratories:        64
Arithmetic mean value:      0.575            Arithmetic mean value:      0.631
Median:                     0.589            Median:                     0.647
Standard deviation          0.076            Standard deviation          0.093
Rel. st. deviation (%)     13.244            Rel. st. deviation (%)     14.669

Run 2:                                       Run 2:
Number of laboratories:        61            Number of laboratories:        62
Arithmetic mean value:      0.588            Arithmetic mean value:      0.645
Median:                     0.590            Median:                     0.648
Standard deviation          0.044            Standard deviation          0.050
Rel. st. deviation (%)      7.477            Rel. st. deviation (%)      7.825

Results in decreasing order:                 Results in decreasing order:
 133    0.700         27    0.589             157    0.780         22    0.647
 126    0.682         19    0.588             133    0.750         33    0.646
 155    0.681         26    0.586             126    0.745         19    0.646
  23    0.670        117    0.585             158    0.720         16    0.645
 149    0.660          8    0.583             149    0.716         26    0.643
 158    0.650        114    0.580               4    0.715          8    0.642
 156    0.640        164    0.580             120    0.710         20    0.641
 120    0.640         20    0.579             125    0.694          7    0.640
  22    0.632         31    0.578             156    0.690        114    0.640
   4    0.624        135    0.575              14    0.679        135    0.633
 125    0.618          7    0.575              34    0.670          3    0.630
  16    0.616          3    0.573              36    0.667         13    0.630
  14    0.611         13    0.570              31    0.665        164    0.630
 153    0.610          1    0.567              35    0.665          1    0.627
 121    0.610         12    0.560               6    0.660         10    0.621
 157    0.610         24    0.560             121    0.660         12    0.620
   5    0.609        165    0.552              40    0.660        109    0.616
  34    0.605        104    0.550             112    0.660        104    0.610
  36    0.605        109    0.550              15    0.660        110    0.610
 112    0.600         10    0.547              23    0.660         24    0.610
  35    0.600        110    0.540               5    0.659        165    0.600
 160    0.600         38    0.535             146    0.657        148    0.600
  15    0.600        139    0.535              32    0.657        139    0.599
  30    0.597        148    0.530              39    0.654        150    0.597
  39    0.597        107    0.529              30    0.654         38    0.597
 146    0.594        150    0.511              27    0.653        107    0.586
  32    0.593        115    0.504             153    0.650        115    0.574
  21    0.591        124    0.500              11    0.650        124    0.550
  40    0.590        118    0.480             160    0.650        118    0.530
  11    0.590         17    0.390  (*)        155    0.649         17    0.450
  33    0.590        108    0.340  (*)        117    0.648        108    0.210  (*)
   6    0.590        116    0.189  (*)         21    0.648        116    0.189  (*)
```

Table 23:   Analytical results for magnesium in precipitation samples.

```
Magnesium in precipitation              Magnesium in precipitation
Sample no.: G1                          Sample no.: G2
Theoretical value:        0.093         Theoretical value:        0.087
Unit: µg/ml                             Unit: µg/ml

Run 1:                                  Run 1:
Number of laboratories:      63         Number of laboratories:      63
Arithmetic mean value:    0.090         Arithmetic mean value:    0.085
Median:                   0.093         Median:                   0.088
Standard deviation        0.016         Standard deviation        0.018
Rel. st. deviation (%)   18.227         Rel. st. deviation (%)   21.112

Run 2:                                  Run 2:
Number of laboratories:      61         Number of laboratories:      60
Arithmetic mean value:    0.091         Arithmetic mean value:    0.085
Median:                   0.093         Median:                   0.088
Standard deviation        0.010         Standard deviation        0.010
Rel. st. deviation (%)   10.762         Rel. st. deviation (%)   11.992

Results in decreasing order:            Results in decreasing order:
  35    0.144 (*)   26    0.092           40    0.155 (*)  165    0.088
  17    0.110       13    0.092           35    0.128 (*)    8    0.088
 120    0.110      135    0.092          164    0.110       26    0.087
 164    0.110      157    0.090          120    0.100        7    0.087
 133    0.103      114    0.090           17    0.100       39    0.087
   5    0.102       24    0.090           15    0.100       30    0.087
 125    0.101      124    0.090          149    0.099       13    0.084
  34    0.101       11    0.090          133    0.094      104    0.083
 112    0.100      121    0.090            3    0.092       36    0.083
 158    0.100       36    0.089           12    0.092      118    0.082
 153    0.100      109    0.089          150    0.091      109    0.082
 156    0.100      104    0.087          125    0.091      124    0.080
  15    0.100      118    0.085           33    0.091      110    0.080
 160    0.100        1    0.083          160    0.090      139    0.080
   3    0.099      116    0.083          157    0.090        6    0.080
 146    0.099        4    0.082           24    0.090       14    0.080
  12    0.098       22    0.082           16    0.090      121    0.080
 150    0.098       20    0.081          158    0.090      148    0.080
 149    0.098      139    0.080          146    0.090       11    0.080
 117    0.096      110    0.080          156    0.090        1    0.078
  14    0.096      115    0.080          114    0.090        4    0.077
  16    0.095        6    0.080          112    0.090       20    0.074
  21    0.095      148    0.080          153    0.090      115    0.072
  10    0.095      155    0.077           10    0.089       31    0.072
  40    0.095       38    0.076          135    0.089       38    0.071
   7    0.094       31    0.075          155    0.089      116    0.069
  27    0.094      165    0.074            5    0.089       22    0.065
  19    0.094      107    0.072           19    0.088      107    0.064
  33    0.094       23    0.070           21    0.088       23    0.060
   8    0.093      126    0.070           34    0.088      126    0.050
  39    0.093      108    0.000 (*)      117    0.088      108    0.000 (*)
  30    0.093                             27    0.088


Magnesium in precipitation              Magnesium in precipitation
Sample no.: G3                          Sample no.: G4
Theoretical value:        0.111         Theoretical value:        0.124
Unit: µg/ml                             Unit: µg/ml

Run 1:                                  Run 1:
Number of laboratories:      63         Number of laboratories:      63
Arithmetic mean value:    0.108         Arithmetic mean value:    0.122
Median:                   0.111         Median:                   0.123
Standard deviation        0.020         Standard deviation        0.020
Rel. st. deviation (%)   18.176         Rel. st. deviation (%)   16.658

Run 2:                                  Run 2:
Number of laboratories:      61         Number of laboratories:      61
Arithmetic mean value:    0.109         Arithmetic mean value:    0.123
Median:                   0.111         Median:                   0.123
Standard deviation        0.011         Standard deviation        0.011
Rel. st. deviation (%)   10.251         Rel. st. deviation (%)    9.006

Results in decreasing order:            Results in decreasing order:
  35    0.177 (*)  153    0.110           35    0.179 (*)    7    0.123
  17    0.130       34    0.110          164    0.150       22    0.122
 120    0.130      157    0.110           17    0.150       30    0.121
 164    0.130       24    0.110           23    0.140       24    0.120
 149    0.126       11    0.110          160    0.140       34    0.120
 158    0.120       14    0.107          120    0.140       11    0.120
 112    0.120      109    0.106           15    0.140      139    0.120
 114    0.120        1    0.105          149    0.139      156    0.120
  15    0.120       13    0.105          146    0.133        6    0.120
 133    0.119      118    0.104          135    0.132      121    0.120
   3    0.118       20    0.104            3    0.132       14    0.119
 116    0.118       36    0.102          133    0.132      165    0.118
 150    0.118      104    0.100          114    0.130      109    0.117
 146    0.118      110    0.100          112    0.130       13    0.117
 135    0.118      124    0.100          158    0.130      118    0.116
 125    0.116      139    0.100          153    0.130       36    0.115
   5    0.116      121    0.100          150    0.130       31    0.114
 117    0.115        6    0.100          125    0.130       20    0.113
  21    0.115      148    0.100           16    0.129       40    0.112
  33    0.114      160    0.100           10    0.128        4    0.111
 155    0.114      156    0.100           21    0.128      104    0.110
  12    0.114       40    0.099            5    0.127        1    0.110
  19    0.113      165    0.099          116    0.126      110    0.110
  10    0.113        4    0.099          155    0.126      124    0.110
   8    0.113      115    0.092           19    0.126      148    0.110
  27    0.113       38    0.092          117    0.126      157    0.110
  22    0.112      126    0.090            8    0.125      126    0.107
  26    0.112      107    0.089           27    0.125       38    0.103
  16    0.111       23    0.080           12    0.124      115    0.103
  30    0.111       31    0.075           33    0.124      107    0.093
   7    0.111      108    0.000 (*)       26    0.124      108    0.000 (*)
  39    0.111                             39    0.123
```

Table 24:   Analytical results for calcium in precipitation samples.

```
Calcium in precipitation            Calcium in precipitation
Sample no.: G1                      Sample no.: G2
Theoretical value:       0.192      Theoretical value:       0.230
Unit: µg/ml                         Unit: µg/ml

Run 1:                              Run 1:
Number of laboratories:      64     Number of laboratories:      64
Arithmetic mean value:    0.201     Arithmetic mean value:    0.247
Median:                   0.195     Median:                   0.232
Standard deviation        0.054     Standard deviation        0.148
Rel. st. deviation (%)   26.938     Rel. st. deviation (%)   59.881

Run 2:                              Run 2:
Number of laboratories:      62     Number of laboratories:      63
Arithmetic mean value:    0.193     Arithmetic mean value:    0.228
Median:                   0.194     Median:                   0.232
Standard deviation        0.026     Standard deviation        0.031
Rel. st. deviation (%)   13.554     Rel. st. deviation (%)   13.480

Results in decreasing order:        Results in decreasing order:
  40    0.542 (*)   27   0.194        40    1.384 (*)  120   0.232
 126    0.350 (*)    7   0.194       157    0.290      120   0.230
 156    0.260       30   0.193       156    0.290       14   0.230
 109    0.244        4   0.190       126    0.284      121   0.230
 114    0.240      165   0.190       114    0.280       24   0.230
 157    0.240       36   0.190       109    0.272      118   0.230
 153    0.240       24   0.190       153    0.270       15   0.230
  35    0.239      110   0.190       164    0.270       19   0.228
 164    0.220       12   0.190       149    0.261       30   0.225
 121    0.220      118   0.190        16    0.260       36   0.223
 112    0.220       14   0.189       158    0.260      146   0.223
   3    0.217       19   0.188       112    0.260      110   0.220
   5    0.215      116   0.187         3    0.260        1   0.216
 158    0.210      104   0.180       108    0.250      160   0.210
  16    0.209       11   0.180         6    0.250       11   0.210
  34    0.208       23   0.180        34    0.250      116   0.202
 125    0.203        1   0.180       133    0.248      104   0.200
 155    0.203      107   0.174        35    0.244      139   0.200
 133    0.202      124   0.170        10    0.243       23   0.200
   8    0.202      160   0.170        26    0.242      148   0.200
 146    0.202       32   0.167         4    0.240       17   0.200
  26    0.200       22   0.165        13    0.240      107   0.193
  13    0.200      115   0.163       125    0.240      115   0.191
  15    0.200      135   0.161        12    0.240      124   0.190
  21    0.200       20   0.161       155    0.239       20   0.189
   6    0.200      108   0.160         5    0.239      135   0.188
 120    0.200      139   0.160        21    0.239       32   0.187
 149    0.199      148   0.160         8    0.237      165   0.184
  33    0.199       17   0.160        39    0.234       22   0.178
 117    0.198       38   0.146       117    0.233      150   0.177
  39    0.197      150   0.137         7    0.233       38   0.169
  10    0.196       31   0.125        33    0.232       31   0.150

Calcium in precipitation            Calcium in precipitation
Sample no.: G3                      Sample no.: G4
Theoretical value:       0.268      Theoretical value:       0.291
Unit: µg/ml                         Unit: µg/ml

Run 1:                              Run 1:
Number of laboratories:      64     Number of laboratories:      64
Arithmetic mean value:    0.275     Arithmetic mean value:    0.297
Median:                   0.270     Median:                   0.291
Standard deviation        0.051     Standard deviation        0.052
Rel. st. deviation (%)   18.686     Rel. st. deviation (%)   17.579

Run 2:                              Run 2:
Number of laboratories:      60     Number of laboratories:      62
Arithmetic mean value:    0.269     Arithmetic mean value:    0.297
Median:                   0.269     Median:                   0.291
Standard deviation        0.033     Standard deviation        0.039
Rel. st. deviation (%)   12.350     Rel. st. deviation (%)   13.061

Results in decreasing order:        Results in decreasing order:
  32    0.489 (*)   13   0.270        32    0.519 (*)    7   0.291
  40    0.407 (*)    7   0.267       114    0.400       13   0.290
 133    0.398 (*)   33   0.267        22    0.384       12   0.290
 139    0.350      117   0.265       133    0.373        4   0.290
  35    0.335      135   0.265       157    0.360      118   0.290
 157    0.330      146   0.265        35    0.351        1   0.289
 164    0.320       27   0.264       156    0.350       27   0.288
 109    0.313       30   0.262       126    0.348      135   0.288
 114    0.310       34   0.261        40    0.345       36   0.287
 158    0.310      118   0.260       164    0.340       19   0.286
 153    0.310       19   0.260         3    0.335       34   0.285
 156    0.310        4   0.260       158    0.330      155   0.284
   3    0.308      120   0.260       153    0.330       30   0.282
 149    0.303      107   0.259        16    0.330      160   0.280
 112    0.300       14   0.258       149    0.326      120   0.280
 116    0.299       36   0.258         6    0.320       24   0.280
  16    0.296       11   0.250       112    0.320      110   0.280
  22    0.295      110   0.250       109    0.314       23   0.280
   5    0.283       20   0.244       116    0.311       17   0.280
  26    0.283      104   0.240       125    0.309       11   0.270
 125    0.280      108   0.240        10    0.308       20   0.267
  21    0.280       17   0.240        26    0.306      139   0.260
   6    0.280      165   0.236         5    0.304      107   0.255
  10    0.279      126   0.230        21    0.302      104   0.250
   8    0.278       23   0.220        33    0.301      150   0.244
  39    0.276      148   0.220        15    0.300      124   0.240
 155    0.275      150   0.219         8    0.300      115   0.239
   1    0.271      115   0.218       121    0.300       31   0.236
  24    0.270      124   0.200        39    0.294      148   0.230
  15    0.270      160   0.200       117    0.294      165   0.210
 121    0.270       38   0.194        14    0.292       38   0.205
  12    0.270       31   0.132 (*)   146    0.292      108   0.120 (*)
```

Table 25:   Analytical results for potassium in precipitation samples.

```
Potassium in precipitation              Potassium in precipitation
Sample no.: G1                          Sample no.: G2
Theoretical value:        0.326         Theoretical value:        0.306
Unit: µg/ml                             Unit: µg/ml

Run 1:                                  Run 1:
Number of laboratories:      64         Number of laboratories:      64
Arithmetic mean value:    0.318         Arithmetic mean value:    0.310
Median:                   0.320         Median:                   0.299
Standard deviation        0.056         Standard deviation        0.099
Rel. st. deviation (%)   17.518         Rel. st. deviation (%)   31.910

Run 2:                                  Run 2:
Number of laboratories:      60         Number of laboratories:      62
Arithmetic mean value:    0.315         Arithmetic mean value:    0.296
Median:                   0.320         Median:                   0.298
Standard deviation        0.037         Standard deviation        0.046
Rel. st. deviation (%)   11.736         Rel. st. deviation (%)   15.658

Results in decreasing order:            Results in decreasing order:
110    0.550 (*)   133    0.320         110    0.960 (*)     3    0.299
156    0.490 (*)   121    0.320         126    0.534 (*)    20    0.298
 31    0.427        26    0.319         156    0.460       135    0.297
120    0.380         8    0.319         149    0.428         7    0.296
112    0.380         7    0.317         109    0.388         1    0.292
126    0.377       135    0.316          31    0.388        36    0.291
109    0.374         3    0.312         120    0.360       160    0.290
 14    0.368        36    0.311         112    0.350        11    0.290
 21    0.354        12    0.310          16    0.348       158    0.290
 16    0.350         1    0.310          21    0.330        12    0.290
  5    0.342       158    0.310          14    0.321       107    0.287
160    0.340        22    0.307           5    0.318        38    0.285
124    0.330       107    0.306         124    0.310        40    0.282
 15    0.330        38    0.303         153    0.310       104    0.280
 24    0.330         4    0.300          15    0.310       157    0.280
 13    0.330        11    0.300          24    0.310        34    0.278
 19    0.330       104    0.300         121    0.310        35    0.271
125    0.330       155    0.291          19    0.310       150    0.270
 27    0.329        40    0.291          13    0.310       114    0.270
 39    0.328        34    0.290          27    0.310        10    0.270
146    0.327       150    0.290          39    0.307         4    0.270
 32    0.325       114    0.280          33    0.307        22    0.267
117    0.324       165    0.265         146    0.306       155    0.255
 33    0.323       118    0.260         116    0.305       118    0.250
 10    0.323        23    0.260         117    0.302       139    0.250
 35    0.323       139    0.260         125    0.301        23    0.250
 20    0.322       149    0.255           8    0.300       165    0.249
157    0.320       116    0.246          26    0.300       148    0.230
148    0.320        17    0.230         164    0.300       108    0.220
153    0.320        30    0.210          32    0.300        17    0.210
164    0.320       115    0.199 (*)       6    0.300        30    0.196
  6    0.320       108    0.190 (*)     133    0.300       115    0.186


Potassium in precipitation              Potassium in precipitation
Sample no.: G3                          Sample no.: G4
Theoretical value:        0.204         Theoretical value:        0.163
Unit: µg/ml                             Unit: µg/ml

Run 1:                                  Run 1:
Number of laboratories:      64         Number of laboratories:      63
Arithmetic mean value:    0.208         Arithmetic mean value:    0.167
Median:                   0.200         Median:                   0.160
Standard deviation        0.067         Standard deviation        0.078
Rel. st. deviation (%)   32.366         Rel. st. deviation (%)   46.669

Run 2:                                  Run 2:
Number of laboratories:      62         Number of laboratories:      62
Arithmetic mean value:    0.198         Arithmetic mean value:    0.158
Median:                   0.200         Median:                   0.160
Standard deviation        0.040         Standard deviation        0.037
Rel. st. deviation (%)   20.245         Rel. st. deviation (%)   23.379

Results in decreasing order:            Results in decreasing order:
110    0.510 (*)    12    0.200         116    0.703 (*)   125    0.159
116    0.507 (*)    13    0.200         156    0.270         7    0.158
156    0.330        31    0.199         110    0.250         1    0.157
149    0.300        20    0.198         109    0.239         3    0.157
109    0.294         3    0.197         112    0.210        20    0.156
112    0.250       125    0.197         153    0.210         8    0.155
 16    0.246         8    0.197         120    0.190         6    0.150
126    0.243        22    0.196         157    0.190       133    0.150
120    0.240         1    0.194         126    0.188       158    0.150
153    0.230        36    0.191          16    0.180       104    0.150
121    0.220       114    0.190          10    0.179       160    0.150
124    0.220       158    0.190          35    0.179       164    0.150
 21    0.217       135    0.190          31    0.177        36    0.150
 10    0.215       157    0.190          21    0.173        13    0.150
  5    0.213        34    0.190          22    0.172        38    0.145
 19    0.212         6    0.190          40    0.171       135    0.141
 11    0.210        38    0.183         146    0.171       150    0.140
146    0.210       107    0.180          15    0.170         4    0.140
 15    0.210       133    0.180         121    0.170       148    0.140
 14    0.208         4    0.180         117    0.170        11    0.140
 32    0.208       104    0.180         124    0.170        34    0.140
 27    0.206       150    0.180          19    0.169       165    0.138
 40    0.206       155    0.175          32    0.164       107    0.136
 26    0.205       165    0.171          27    0.164       155    0.134
 33    0.204        23    0.170          26    0.163       114    0.130
117    0.203       118    0.160           5    0.162       118    0.130
 39    0.203       139    0.160          14    0.162       139    0.120
 35    0.201        17    0.130          33    0.161        30    0.105
  7    0.200        30    0.127          23    0.160        17    0.100
 24    0.200       108    0.110          24    0.160       108    0.040
164    0.200       148    0.090          39    0.160       115    0.028
160    0.200       115    0.089          12    0.160
```

Table 26:   Analytical results for conductivity in precipitation samples.

```
Conductivity in precipitation          Conductivity in precipitation
Sample no.: G1                         Sample no.: G2
Theoretical value:       41.800        Theoretical value:       46.300
Unit: µS/cm                            Unit: µS/cm

Run 1:                                 Run 1:
Number of laboratories:      63        Number of laboratories:      63
Arithmetic mean value:   47.331        Arithmetic mean value:   52.793
Median:                  40.600        Median:                  44.800
Standard deviation       44.749        Standard deviation       52.754
Rel. st. deviation (%)   94.546        Rel. st. deviation (%)   99.925

Run 2:                                 Run 2:
Number of laboratories:      61        Number of laboratories:      61
Arithmetic mean value:   40.128        Arithmetic mean value:   44.475
Median:                  40.540        Median:                  44.800
Standard deviation        3.462        Standard deviation        3.332
Rel. st. deviation (%)    8.628        Rel. st. deviation (%)    7.492

Results in decreasing order:           Results in decreasing order:
 104   376.000 (*)    20    40.540      104   446.000 (*)     6    44.800
 110   158.000 (*)   157    40.500      110   167.000 (*)   126    44.641
 139    51.000       158    40.300      139    55.000       150    44.600
 149    47.025       112    40.200      149    51.990        16    44.600
 150    44.600        16    40.200       18    48.200        36    44.600
 124    44.000        39    40.100      115    47.280        11    44.500
  18    43.200        35    40.100        5    47.200       158    44.500
  14    43.000        11    40.000      108    47.200        35    44.400
 115    42.650       114    40.000      117    47.000       112    44.300
  31    42.500       156    40.000       12    47.000         8    44.100
 117    42.500         4    39.900       14    47.000        22    44.100
  30    42.500         6    39.600       19    47.000        13    44.070
  19    42.400         8    39.500       31    46.900        39    43.900
 108    42.400       164    39.200       17    46.500       157    43.900
   3    42.300        22    39.000       21    46.360         7    43.800
   5    42.200         7    39.000      165    46.300       164    43.500
  12    42.200       146    38.900       27    46.200       146    43.200
  24    42.000       107    38.900       15    46.000        23    43.000
 120    42.000       148    38.700       24    46.000       107    42.800
  21    41.840       118    38.000      120    46.000        34    42.300
  17    41.750        23    38.000       30    45.900       160    42.000
  27    41.600       126    37.569       10    45.900       118    42.000
  10    41.400       160    37.000       20    45.770       153    41.720
  36    41.300       153    36.960       33    45.700        38    41.500
  15    41.200        34    36.100        3    45.700       148    41.400
 165    41.200        38    35.700      114    45.700       109    40.970
  32    41.200       109    34.270      156    45.700       124    39.000
  33    41.130       135    33.000      121    45.500       135    36.300
   1    40.900       133    32.000       32    45.300       133    36.000
 121    40.900        40    31.000        1    45.200       116    35.960
  13    40.670       116    29.420      155    45.200        40    35.000
 155    40.600                            4    44.800

Conductivity in precipitation          Conductivity in precipitation
Sample no.: G3                         Sample no.: G4
Theoretical value:       28.200        Theoretical value:       32.200
Unit: µS/cm                            Unit: µS/cm

Run 1:                                 Run 1:
Number of laboratories:      63        Number of laboratories:      63
Arithmetic mean value:   33.861        Arithmetic mean value:   38.164
Median:                  27.900        Median:                  31.900
Standard deviation       37.900        Standard deviation       39.559
Rel. st. deviation (%)  111.926        Rel. st. deviation (%)  103.655

Run 2:                                 Run 2:
Number of laboratories:      61        Number of laboratories:      61
Arithmetic mean value:   27.578        Arithmetic mean value:   31.678
Median:                  27.900        Median:                  31.700
Standard deviation        1.988        Standard deviation        2.374
Rel. st. deviation (%)    7.208        Rel. st. deviation (%)    7.495

Results in decreasing order:           Results in decreasing order:
 104   306.000 (*)     4    27.900      104   325.000 (*)     6    31.700
 110   145.000 (*)    11    27.900      110   147.000 (*)     1    31.700
 139    36.000        33    27.900      139    41.000        36    31.620
 149    31.256        13    27.850      160    38.000       165    31.500
  10    29.700       153    27.530       40    36.000         4    31.500
  18    29.700         6    27.500      149    35.634       158    31.400
 148    29.700       158    27.400       14    34.000        13    31.300
   5    29.300        16    27.400       31    33.300        35    31.300
  31    29.100       112    27.300        5    33.300       109    31.300
  14    29.000       150    27.200       19    33.000       112    31.300
  15    28.900         8    27.200       15    32.900        11    31.200
  17    28.750         7    27.200       18    32.800       107    31.100
 115    28.680        36    27.110      108    32.700       126    31.050
   3    28.600       157    27.100      146    32.600        39    31.000
  12    28.500       156    27.000       12    32.600         8    31.000
  34    28.500       126    26.961       27    32.600       156    31.000
 108    28.500        39    26.900       21    32.510        23    31.000
 117    28.400       107    26.800        3    32.500       150    31.000
  21    28.300        35    26.400       30    32.400        17    31.000
  20    28.220        22    26.200      115    32.350       153    30.720
  19    28.200       146    26.200      121    32.300        16    30.700
  30    28.200       124    26.000       10    32.300        34    30.100
 165    28.100       160    26.000      155    32.200       164    29.800
 155    28.100       109    25.900       20    32.120        22    29.800
 121    28.100       164    25.400       33    32.100       118    29.000
 114    28.100       118    25.000        7    32.100        38    28.800
  32    28.050        38    24.900       32    32.100       116    28.030
  27    28.000       116    24.460       24    32.000       148    28.000
  24    28.000        40    23.000      120    32.000       135    26.100
 120    28.000       135    22.800      117    32.000       133    26.000
  23    28.000       133    22.000      114    32.000       124    26.000
   1    27.900                          157    31.900
```

Table 27:   *Ratio of the measured to the calculated conductivity in synthetic precipitation samples (G1-G4).*

Lab.No.	Measured / Calculated value				Remarks
	G1	G2	G3	G4	
1	0.91	0.86	0.92	0.90	
3	1.01	0.98	1.04	0.98	
4	1.02	1.04	1.04	1.03	
5	1.06	1.07	1.03	1.05	
6	0.94	0.97	0.97	1.00	
7	0.90	0.92	0.93	0.95	
8	1.08	1.10	1.07	1.07	
10	1.04	1.03	1.06	1.00	
11	0.97	1.02	1.02	0.98	
12	1.05	1.04	1.02	1.03	
13	0.97	0.92	0.93	0.91	
14	1.17	1.13	1.14	1.17	
15	1.10	1.12	1.11	1.08	
16	1.00	0.99	0.99	0.99	
17	0.73	0.68	0.76	0.69	
18	0.84	0.81	0.84	0.97	NO_3^-.Mg^{2+}.Na^+. Ca^{2+} and K^+ are missing
19	1.28	1.26	1.16	1.20	Cl^- values < LOD
20	1.09	1.09	1.08	1.07	
21	1.03	1.03	1.02	1.03	
22	1.08	1.09	1.07	1.02	
23	0.79	0.85	0.92	0.88	
24	1.01	0.98	0.99	0.99	
26					Cond. is missing
27	1.08	1.09	1.05	1.07	
30	1.21	1.31	1.15	1.27	
31	1.05	1.05	1.08	1.05	
32	1.05	1.04	1.01	1.01	
33	1.01	1.01	1.02	1.05	
34	0.92	0.93	1.05	0.96	
35	1.07	1.05	0.99	1.03	
36	1.02	1.01	1.00	1.00	
38	0.55	0.62	0.58	0.56	NH_4^+ is missing
39	0.97	0.95	0.98	0.94	
40	0.66	0.70	0.75	0.88	SO_4^{2-} is missing
104	9.46	9.55	9.92	10.18	
107	0.98	0.99	1.01	0.99	
108	1.20	1.11	1.17	1.24	
109	0.92	0.95	0.99	1.06	
110	4.27	3.65	5.45	4.92	
112	1.10	1.09	1.04	1.06	
114	1.04	1.03	1.01	1.04	
115	1.16	1.13	1.09	1.09	
116	0.73	0.82	0.92	0.91	
117	1.10	1.09	1.07	1.02	
118	0.99	0.99	0.97	0.97	
120	1.11	1.07	1.01	1.03	
121	0.79	0.87	0.72	0.73	
124	1.29	0.92	0.94	0.85	
125					Cond. is missing
126	0.94	0.94	0.97	0.95	
133	0.68	0.68	0.66	0.70	
135	0.80	0.78	0.80	0.80	
139	1.12	1.13	1.23	1.23	
146	0.94	0.98	1.02	1.07	
148	1.11	0.99	1.22	1.01	

Table 27, cont.

Lab.No.	Measured / Calculated value				Remarks
	G1	G2	G3	G4	
149	1.14	1.10	1.10	1.10	
150	1.27	1.16	1.21	1.14	
152					Cond. is missing
153	1.21	1.15	1.13	1.11	
155	1.02	1.03	1.04	1.05	
156	1.39	1.26	1.07	1.36	
157	0.65	0.58	0.62	0.64	
158	1.06	1.06	1.04	1.03	
160	0.94	0.93	0.99	1.51	
164	0.94	0.89	0.91	0.90	
165	1.02	1.07	1.06	1.00	

Table 28: *Ratio of equivalent concentration of anions to the equivalent concentration of cation measured in synthetic precipitation samples.*

Lab.No.	Measured value / calculated value					Remarks
	G1	G2	G3	G4	Average	
1	0.95	0.90	0.96	0.95	0.94	
3	0.98	0.98	0.96	0.98	0.98	
4	1.06	1.07	1.04	1.02	1.04	
5	1.05	1.07	1.04	1.03	1.05	
6	0.99	0.99	1.00	0.99	0.99	
7	1.01	1.00	1.01	1.02	1.01	
8	1.14	1.16	1.08	1.08	1.11	
10	1.07	1.05	1.02	1.10	1.06	
11	1.00	1.10	1.02	1.06	1.04	
12	1.02	1.01	0.99	1.00	1.01	
13	1.02	0.99	0.99	0.99	1.00	
14	1.17	1.17	1.11	1.11	1.14	
15	1.11	1.12	1.06	1.05	1.09	
16	1.02	1.02	0.98	1.01	1.01	
17	0.75	0.69	0.57	0.71	0.68	NO_3^- and Cl^- for G2 are missing
18	0.70	0.74	0.53	0.75	0.68	NO_3^-. K^+. Ca^{2+}. Na^+ and Mg^{2+} are missing
19	1.11	0.98	1.08	1.03	1.05	
20	1.11	1.10	1.05	1.05	1.07	
21	1.04	1.04	1.01	1.02	1.03	
22	1.24	1.18	0.94	1.09	1.11	
23	0.84	0.89	0.92	0.91	0.89	
24	1.02	1.00	1.01	1.02	1.01	
26	1.12	1.12	1.05	1.06	1.09	
27	1.07	1.07	1.04	1.05	1.06	
30	1.14	1.25	1.05	1.13	1.14	
31	0.86	0.89	1.06	0.98	0.95	
32	1.10	1.16	1.02	1.00	1.07	
33	1.03	1.00	0.95	0.96	0.98	
34	1.04	1.02	1.03	1.04	1.03	
35	1.11	1.12	1.01	1.03	1.07	
36	1.07	1.08	1.07	1.05	1.07	
38	0.72	0.76	0.89	0.84	0.80	$NH4^+$ is missing
39	1.05	1.02	1.04	1.03	1.03	
40						SO_4^{2-} is missing
104	1.08	1.02	0.98	1.06	1.03	
107	1.15	1.26	1.16	1.20	1.19	
108	0.96	1.15	1.26	1.22	1.15	
109	0.93	0.95	0.94	0.94	0.94	Cl^- values < LOD
110	1.16	1.21	1.16	1.16	1.17	
112	0.96	0.98	0.91	0.94	0.95	Cl^- values < LOD
114	1.05	1.01	0.97	0.98	1.00	
115	1.19	1.18	1.16	1.17	1.18	
116	1.09	1.08	1.06	1.10	1.08	
117	1.06	1.05	1.05	1.02	1.04	
118	1.14	1.14	1.11	1.13	1.13	
120	1.08	0.99	0.96	0.98	1.00	
121	1.57	1.49	2.09	2.04	1.80	Cl^- values < LOD
124	1.60	1.45	1.43	1.33	1.45	
125						pH is missing
126	0.91	0.87	0.94	0.89	0.90	
133	1.00	1.02	1.15	1.17	1.08	

Table 28, cont.

Lab.No.	Measured value / calculated value					Remarks
	G1	G2	G3	G4	Average	
135	1.05	0.98	0.97	0.95	0.99	
139	1.37	1.11	1.09	1.06	1.16	
146	1.02	1.08	1.11	1.07	1.07	
148	1.03	1.05	0.87	0.88	0.96	Cl⁻ values < LOD
149	0.90	0.85	0.86	0.89	0.87	
150	1.29	1.21	1.15	1.10	1.19	
152						Na⁺. K⁺. Ca²⁺ and Mg²⁺ are missing
153	1.20	1.17	1.00	1.02	1.10	
155	1.07	1.03	1.00	1.13	1.06	
156	1.33	1.00	0.96	1.11	1.10	
157	0.75	0.72	0.89	0.84	0.80	
158	1.04	1.06	0.96	0.97	1.00	
160	0.98	0.96	0.99	1.05	1.00	
164	0.94	0.86	0.92	0.93	0.91	
165	1.01	1.05	1.05	1.04	1.04	

Table 29: *The ratio of the median values to the theoretical values for all parameters and samples.*

Parameter	Sample No	Median / Expected
SO$_4$-S	G1	0.99
	G2	1.00
	G3	1.00
	G4	1.00
NO$_3$-N	G1	1.00
	G2	1.00
	G3	0.99
	G4	1.00
NH$_4$-N	G1	1.02
	G2	1.02
	G3	0.99
	G4	1.01
pH (calc. from H$^+$)	G1	0.93
	G2	0.94
	G3	0.93
	G4	0.95
H	G1	0.93
	G2	0.95
	G3	0.96
	G4	0.96
Mg	G1	1.00
	G2	1.01
	G3	1.00
	G4	1.00
Na	G1	1.03
	G2	1.01
	G3	1.00
	G4	1.00
Cl	G1	1.02
	G2	1.03
	G3	0.97
	G4	0.99
Ca	G1	1.02
	G2	1.01
	G3	1.01
	G4	1.00
K	G1	0.98
	G2	0.98
	G3	0.98
	G4	0.98
Cond	G1	0.97
	G2	0.97
	G3	0.99
	G4	0.98

Table 30: Relative random and systematic errors obtained by the different laboratories in the analysis of each parameter in the precipitation samples.

Lab. no.	Na+ Random error %	Na+ Systematic error %	Cl− Random error %	Cl− Systematic error %	Ca2+ Random error %	Ca2+ Systematic error %	K+ Random error %	K+ Systematic error %	Cond. Random error %	Cond. Systematic error %
1	1	1	0	0	1	-1	3	-9	7	14
3	1	3	0	-1	10	20	1	6	3	-2
4	0	0	0	0	1	1	1	-11	3	-9
5	1	3	2	4	3	1	3	4	4	-7
6	0	-1	1	0	1	-1	4	-9	2	0
7	1	5	0	-1	1	-2	1	0	1	5
8	0	1	0	0	1	-2	1	1	6	-19
10	3	-1	3	11	1	-1	1	2	4	-6
11	2	-1	6	12	11	24	2	-3	4	-6
12	1	-1	1	0	3	3	2	4	2	-3
13	1	4	1	-1	4	3	2	-4	4	6
14	1	2	3	14	1	-5	4	-4	4	-19
15	1	3	1	2	0	11	4	9	6	-17
16	1	0	1	-1	3	-1	2	2	2	-7
17	11	-3	**3**	**-1**	5	-1	5	17	18	67
18	4	2			85	102			16	45
19	6	-7	7	1	4	8	0	1	7	-26
20	0	-1	0	0	3	4	2	-11	4	-13
21	1	2	1	1	1	2	1	3	2	-5
22	4	-2	7	-3	2	-30	9	-6	5	-16
23	1	1	1	0	2	4	18	-24	6	16
24	0	0	1	-2	1	-1	3	-2	1	1
26	1	-1	1	0	0	-1	1	0	6	-19
27	0	0	1	1	1	1	0	1	4	-11
30	1	-7	3	-12	11	-35	1	0	15	-23
31	5	-3	1	-4	38	39	10	-16	4	-6
32	3	4	1	0	3	7			3	-7
33	2	-1	2	-6	1	5	2	2	2	-5
34	1	1	3	-2	12	2	5	0	4	-5
35	1	4	2	3	1	-2	10	51	5	-15
36	1	-1	2	8	2	1	2	-6	3	-6
38	1	-1	1	-1			2	-17	14	96
39	2	3	2	2	1	1	0	0	2	-2
40			10	0	89	-7	31	-4	7	46
104	1	3	1	-2	4	4	4	-8	9	0
107	4	14	1	-3	7	-5	4	-22	5	-9
108	13	-31	10	-3	2	1			3	-11
109	2	-16	8	-5	2	0	1	-5	4	-6
110	7	0	1	0	7	2	3	-12	5	-16
112	1	-5	4	-3	2	30	2	6	6	-18
114	0	-1	0	-2	2	2	5	4	5	-7
115	2	-2	1	1	2	-3	3	-16	5	-12
116	2	4	8	-3	2	6	10	-4	2	-9
117	2	0	1	-4	1	0	1	2	4	-10
118	1	1	1	0	1	-2	1	-7	3	-12
120	3	-3	1	-4	3	-13	2	16	6	-7
121	1	-5	78	354	9	21	3	-5	4	2
124	5	16	5	13	5	6	4	-9	13	-21
125	2	-4	1	-5	1	12	2	5		
126	1	-9	1	1	2	-7	8	-21	5	2
133	6	13	1	-1	9	30	1	8	7	10
135	2	-5	2	-1	1	0	4	4	3	2
139	13	15			3	6	4	-9	2	3
146	1	3	1	1	1	1	2	6	4	-10
148	2	9	18	-79	9	-26	3	-12	8	-10
149	2	-8	1	-9	4	4	4	13	1	3
150	1	2	1	-4	25	19	1	5	5	-25
152	1	-3	1	-2	3	14			3	-13
153	1	-5	2	-6	2	-6	3	4	13	-30
155	4	-4	2	2	5	-31	7	2	2	-6
156	12	-3	9	2	5	25	7	0	20	-44
157	34	-38	74	86	4	-23	7	-2	25	80
158	0	-3	0	-2	3	5	2	6	5	-12
160	1	-3	3	-8	2	-2	11	5	11	-7
164	2	-5	1	0	2	7	4	20	5	1
165	1	-3	0	-2	3	-3	8	-9	4	-4

Table 30, cont.

Lab. no.	SO$_4^{2-}$ Random error %	SO$_4^{2-}$ Systematic error %	NO$_3^-$ Random error %	NO$_3^-$ Systematic error %	NH$_4^+$ Random error %	NH$_4^+$ Systematic error %	Mg^{2+} Random error %	Mg^{2+} Systematic error %	H$^+$ calc Random error %	H$^+$ calc Systematic error %
1	1	-3	4	-11	3	-3	2	-5	1	-2
3	2	-2	1	-2	3	14	1	-3	1	1
4	5	8	3	-3	3	-1	2	-10	2	-3
5	11	4	10	8	2	6	3	4	1	3
6	2	3	2	-2	3	7	1	-4	2	-3
7	1	-1	1	-2	1	0	1	-3	3	-5
8	0	-1	1	-3	0	4	0	-3	1	-5
10	2	-6	18	-11	2	5	9	2	2	0
11	1	1	12	7	1	-8	5	-8	2	-4
12	1	-5	2	-2	2	0	2	-4	0	1
13	3	-2	3	-3	2	2	3	0	2	-3
14	2	6	6	-21	2	-1	7	4	1	3
15	1	2	1	-2	1	2	0	2	1	1
16	3	5	2	-1	4	12	4	13	1	-4
17	4	-42	25	-71	3	-12	5	-34	2	0
18			14	20					1	4
19	2	2	28	6	1	-2	1	2	1	2
20	0	-2	1	-5	3	-11	1	-3	1	-1
21	0	1	1	-1	1	4	3	7	0	0
22	11	-7	31	-28	24	0	8	-5	1	-6
23	15	29	2	-32	6	-9	10	-18	4	0
24	1	-6	2	3	2	0	1	0	0	0
26	1	0	1	2	1	6	1	-1		
27	1	2	1	-1	1	0	0	1	1	0
30	0	2	4	0	2	-2	9	-37	1	0
31	5	7	4	-4	13	-30	17	19	1	2
32	2	0	3	-2	45	40	2	0	1	-1
33	0	0	7	-7	2	2	1	0	1	-1
34	2	4	3	-2	4	2	4	-10	7	-8
35	4	-1	1	0	9	22	8	-1	1	-5
36	1	3	7	21	1	-2	0	-6	1	0
38	3	-9	4	1	7	-28	1	-8	3	-11
39	0	2	2	4	1	2	1	0	1	-4
40	1	1			183	100	7	-4	17	-22
104	2	-7	1	1	5	-12	2	-10	134	844
107	3	-10	6	-13	5	-11	1	-9	3	-6
108	33	-40	35	159	32	-12	8	-43	1	1
109	2	-6			5	18	7	32	7	-10
110	3	-7	53	119	3	-4	93	106	6	314
112	1	3	30	20	1	12	2	19	1	-3
114	1	-2	1	-3	11	20	5	-14	2	-1
115	1	-17	6	21	4	-18	3	-49	1	2
116	51	-41	4	0	10	3	101	60	10	-20
117	2	1	6	11	1	1	2	-1	1	1
118	6	-19	7	3	1	-1	5	-20	1	-9
120	5	8	23	-8	3	-2	4	18	1	-1
121	10	10	3	-18	5	2	4	2	1	-1
124	8	-14	48	113	8	-19	2	2	10	-11
125	3	7	8	-2	1	5	2	-2		
126	6	21	6	-8	33	23	33	18	3	-4
133	8	17	55	201	20	20	3	-4	5	-22
135	0	-3	20	15	6	-7	2	-5	5	-20
139	3	-8	24	13	19	-12	4	-20	2	24
146	1	1	4	7	3	0	1	1	4	-7
148	3	-12	15	-32	5	-16	18	-20	7	-10
149	5	11	2	-1	5	13	47	5	3	12
150	4	-10	6	-13	1	-21	2	-12	5	-3
152			17	4						
153	2	3	5	-6	1	17	9	6	5	-8
155	8	14	9	10	3	3	4	-13	1	-2
156	1	12	57	8	4	24	9	56	1	-3
157	11	11	6	158	3	25	9	-4	2	-3
158	4	11	6	2	4	14	0	-6	1	-3
160	1	3	13	-24	9	-9	5	-3	12	-9
164	1	-1	2	-4	4	18	1	-2	0	-7
165	4	-7	2	-4	13	-16	6	-18	1	-1

48

Table 31: *Analytical methods used for the determination of chemical constituents in precipitation samples.*

Constituents	Methods	Laboratory
SO_4	1. Ion chromatography	1, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 19, 20, 21, 22, 23, 24, 26, 27,30, 31,32, 33, 34, 35, 36, 38, 104, 107,110, 114, 115, 116, 118, 124, 126,135, 139,146,152,153 ,156, 157, 158,160,164, 165
	2. Spectrophotometry	18, 121,
	3. ICP-AES	109, 112, 113, 117,120, 148
	4. Capillary electrophoresis	39
	5. Turbidimetry	133
NO_3	1. Ion chromatography	1, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 19, 20, 21, 22, 23, 24, 26, 27,30, 31,32, 33, 34, 35, 36, 38, 107,110, 114, 115, 116, 118,124,126, 135, 136, 139, 146, 152,153, 156, 157,158, 164, 165
	2. Spectrophotometry	40, 104, 109, 112,117, 120, 121, 133,148,160
	3. Capillary electrophoresis	39
NH_4	1. Ion chromatography	1, 5, 6, 7, 8, 12, 13, 15, 21, 22, 23, 30,31, 35, 36, 107, 115, 124, 135,136, 139, 153 ,156,158, 164,165
	2. Spectrophotometry	3, 4, 10, 11, 14, 16,18,19, 20,24, 26, 27, 32, 33, 34, 39, 40, 104, 109,110, 112, 114, 116, 117, 118, 120, 121,124, 126, 140, 133, 139, 146,148, 152, , 157, 160,
H^+	Titration	6, 31, 124, 153,165
Mg	1. Atomic absorption (AAS)	3, 4, 10, 16, 19, 22, 26, 33, 34, 38, 39, 40, 116, 133, 154, 156, 157,160
	2. Ion chromatography	1, 5, 6, 7, 8, 12, 13, 15, 20, 21, 23, 30,31, 35, 36, 107, 113, 114, 126, 135, 146, 153,158,164,165, 104, 109, 115, 117, 120,
	3. ICP-AES	11, 27, 112, 118, 121,139,148 ,152
	4. ICP-MS	14
Na	1. F-AES	4, 32, 33, 38, 39, 116, 133,156
	2. AAS	3, 10, 16, 19, 26, 27, 34, 40,124, 157,160
	3. ICP-AES	11,27, 104, 109, 110,111, 112, 115, 117,118, 120,121, 139,148,152
	4. Ion chromatography	1, 5, 6, 7, 8, 12, 13, 15, 20, 21, 22, 23, 30,31, 35, 36, 107, 114, 126, 135, 146, 153,158,164,165
	5. ICP-MS	14
Cl	1. Ion chromatography	1, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 19, 20, 21, 22, 23, 24, 26, 27,30, 31,32, 33, 34, 35, 36, 38, 104, 107,110, 114, 115, 116, 118, 124,126, 130, 131, 135,139, 146, 152, 153, 156, 157,158, 160,164,165
	2. Spectrophotometry	18, 117, 40,120, 121,148, 133,
	3. Potensiometric method	109, 112
	4. Capillary electrophoresis	39
Ca	1. AAS	3, 4, 10, 16, 19, 22, 26, 33, 34, 38, 39, 40, 116, 124,133, 154, 156, 157,160
	2. ICP-AES	11, 27,104, 109,110, 112, 115,117, 118,120, 121, 139,148
	3. Ion chromatography	1, 5, 6, 7, 8, 12,13, 15, 20,21, 23, 31, 35, 36, 107, 114, 126, 135, 153, 158,164,165
	4. AES	32
	5. ICP-MS	14
K	1. AAS	3, 4, 10, 16, 19, 26, 34, 40,124,160
	2. Ion chromatograph	1, 5, 6, 7, 8, 12, 13, 15, 20, 21, 22, 23, 30,31, 35, 36, 107,, 114, 126, 135, 146, 153, 158,164,165
	3. AES	11, 27, 32, 33,39,104, 109, 110, 112, 115, 116, 117, 118, 120,121, 133, 139,148,152, 156, 157
	4. ICP-MS	14

Appendix 2

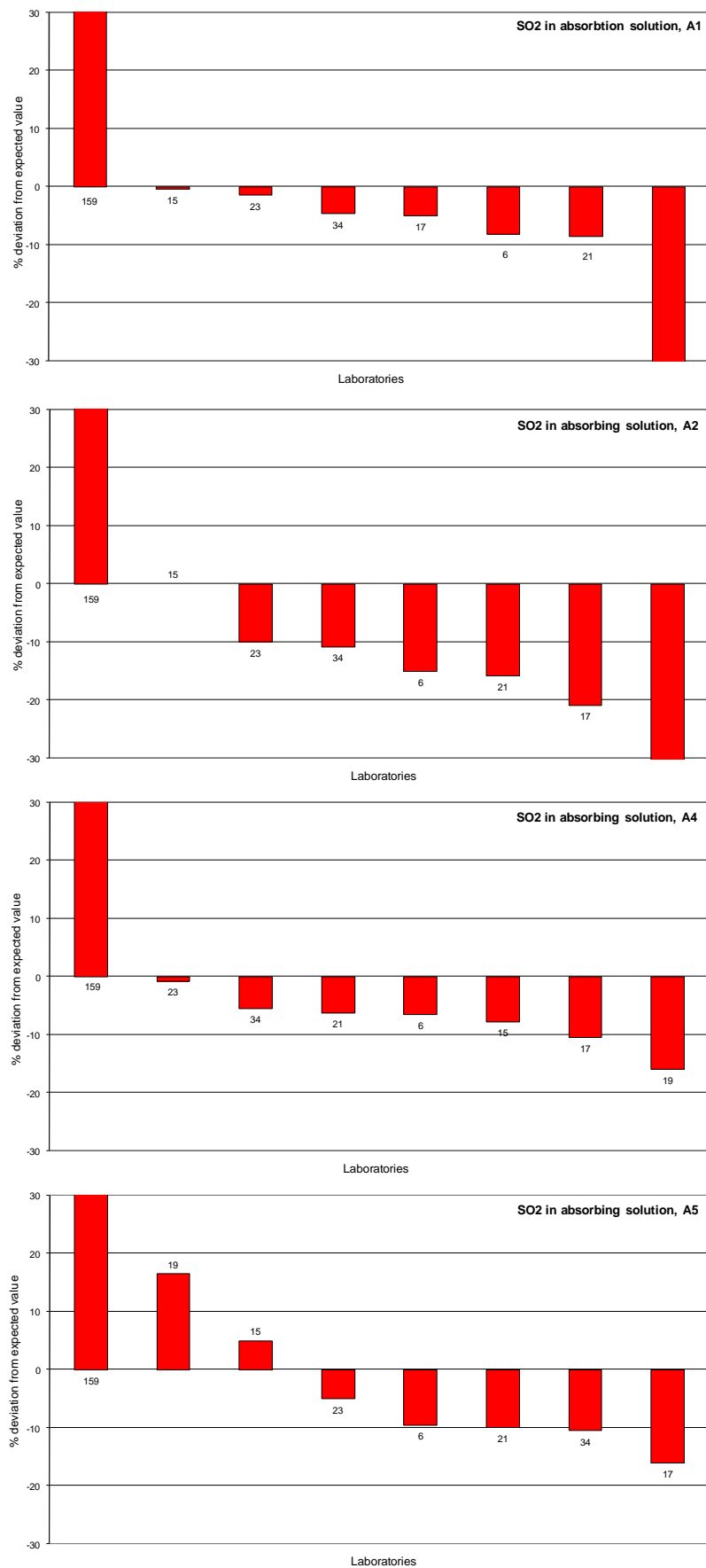# Figures – 23rd intercomparison

50
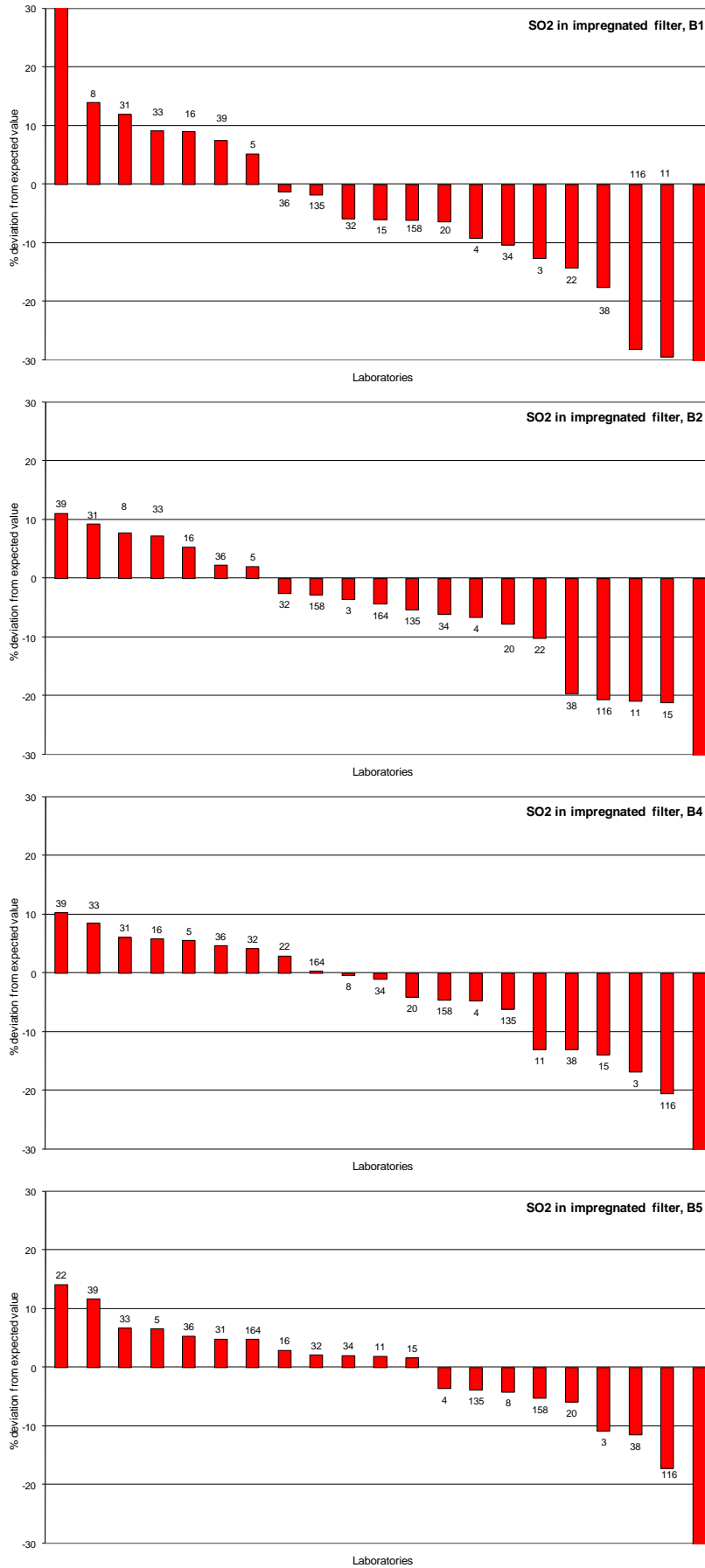
Figure 2: SO₂ in absorbing solution.

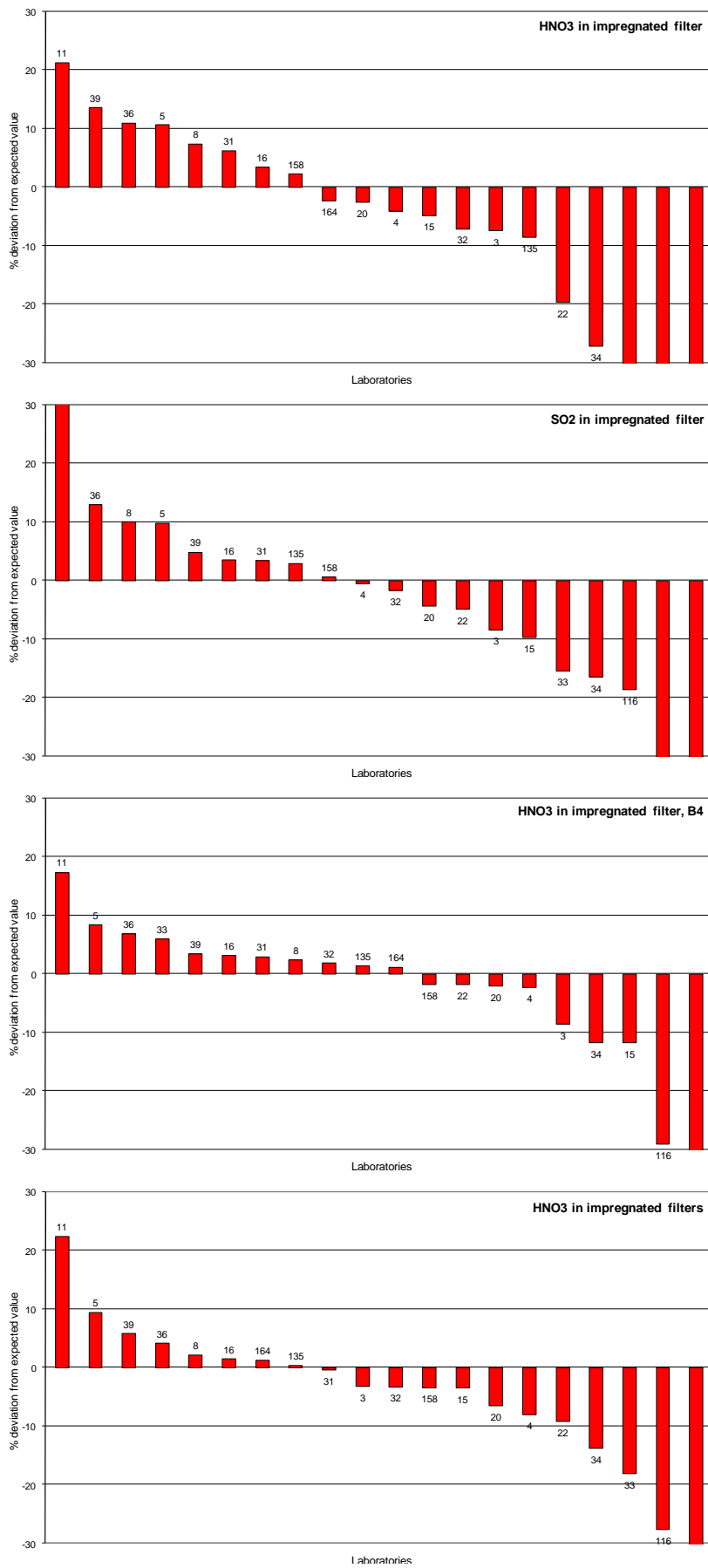*Figure 3: SO₂ in impregnated filter.*

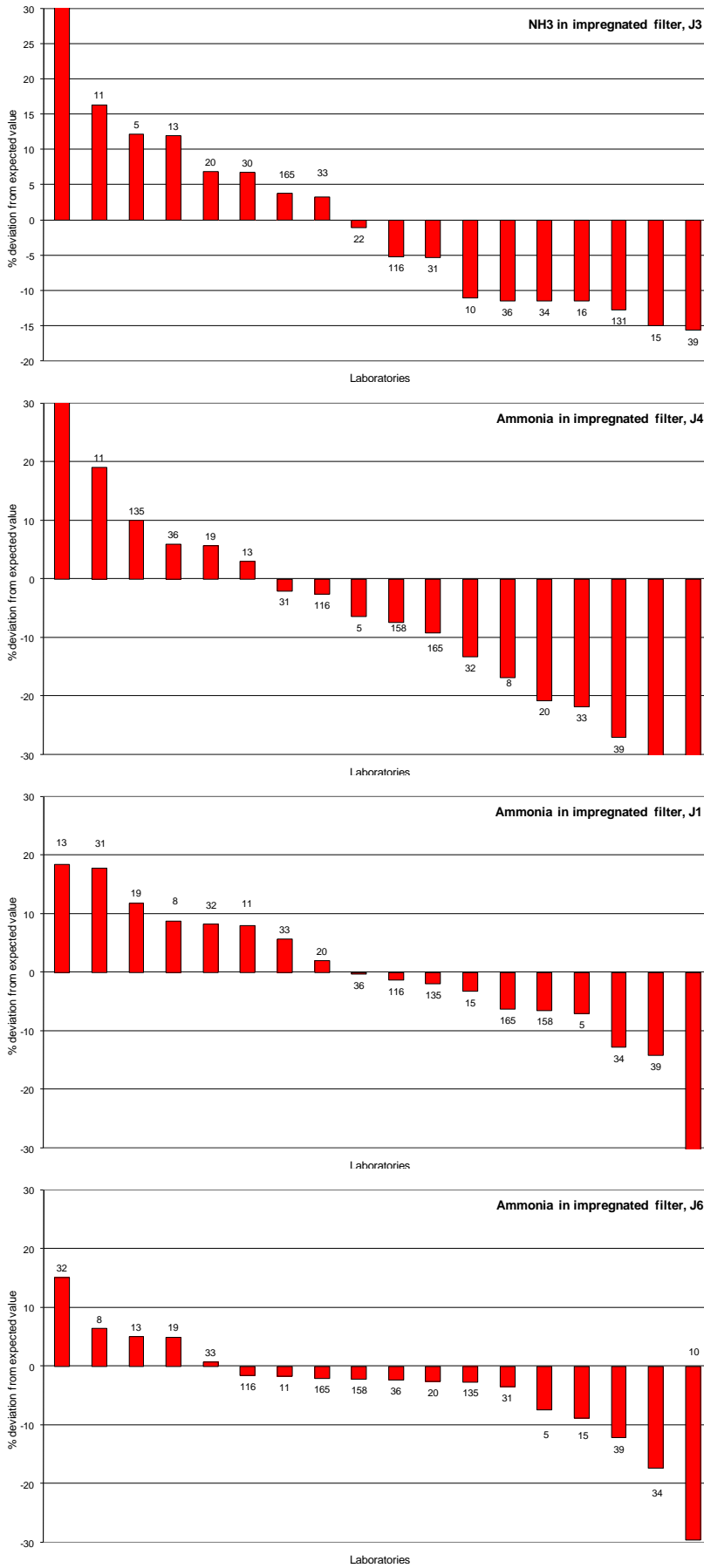*Figure 4:   HNO₃ in impregnated filter.*
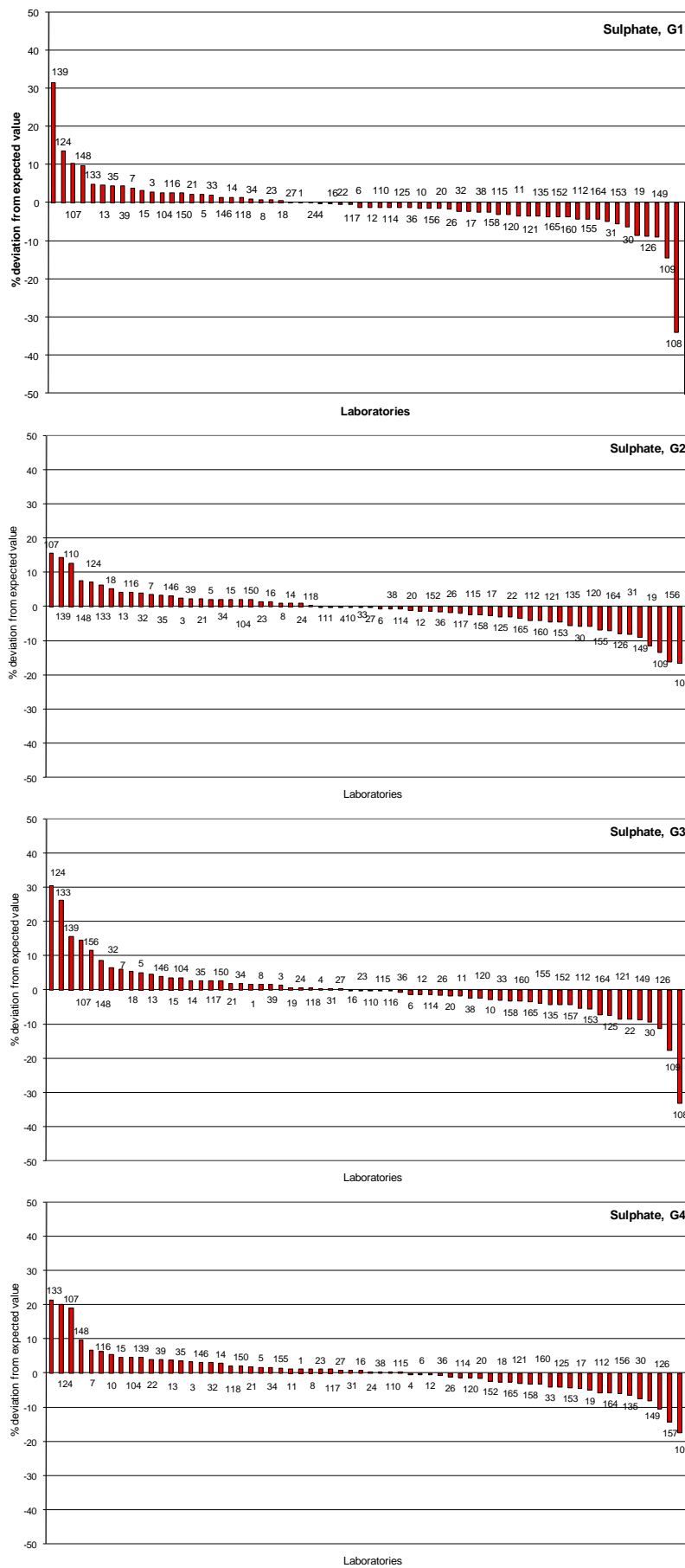
Figure 5: NH₃ in impregnated filter.

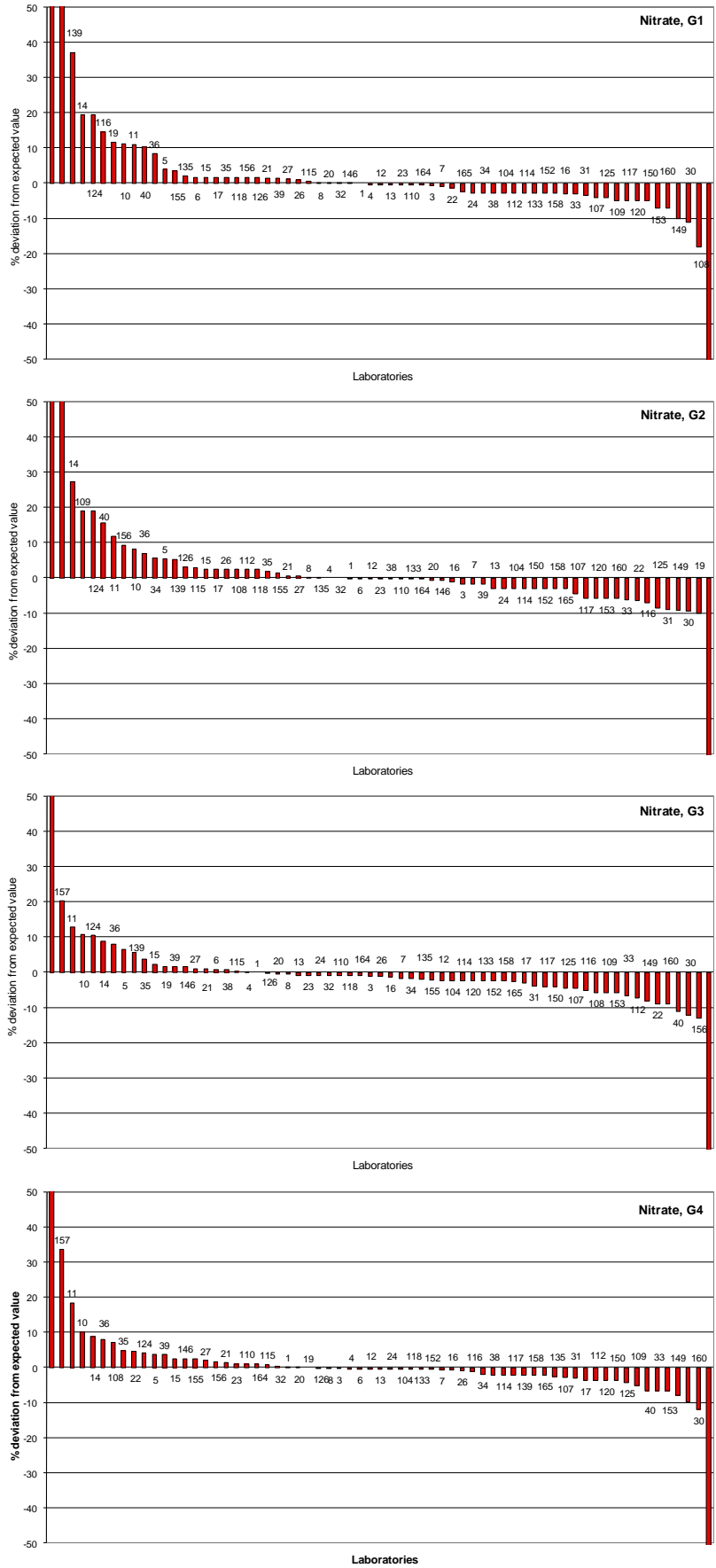*Figure 6:   Percent deviation from theoretical value for sulphate.*

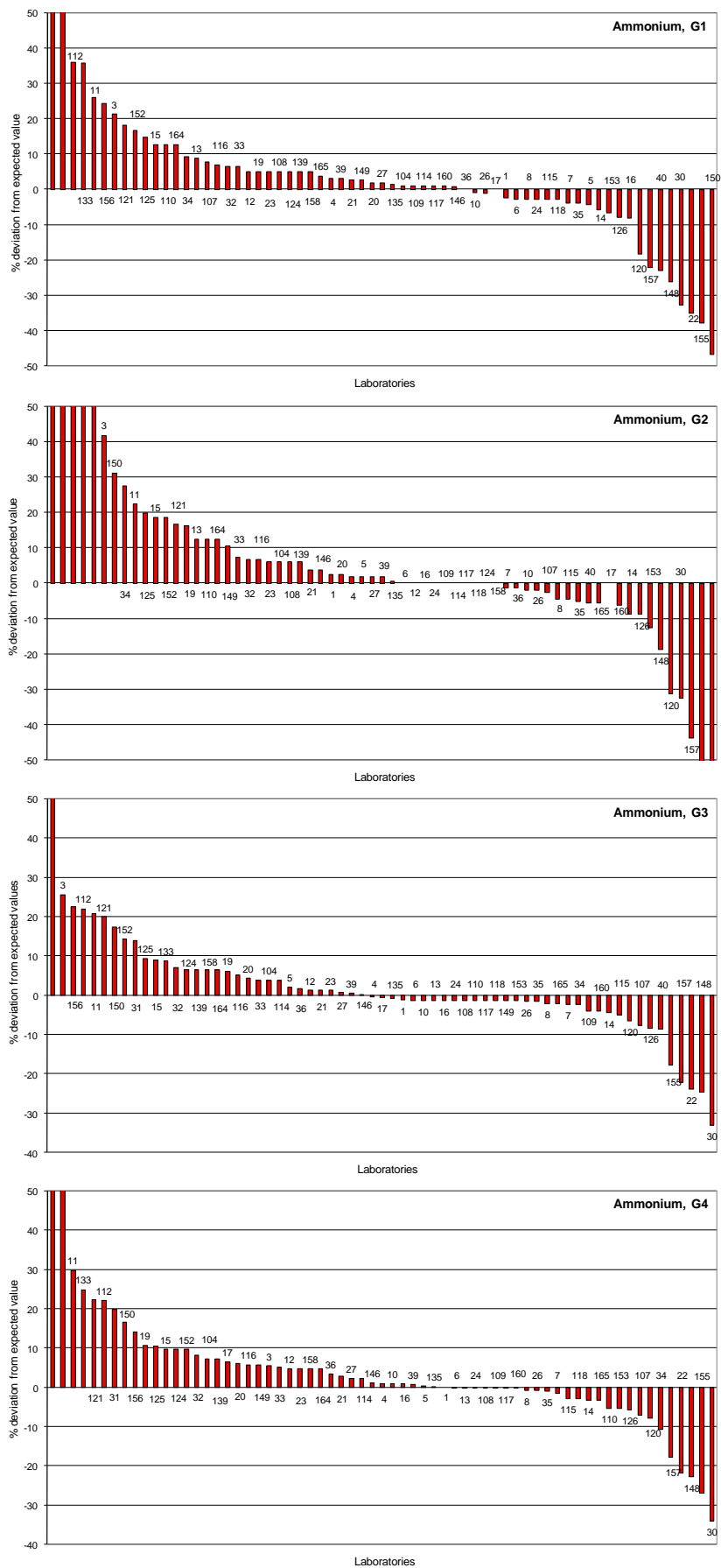*Figure 7: Percent deviation from theoretical value for nitrate.*

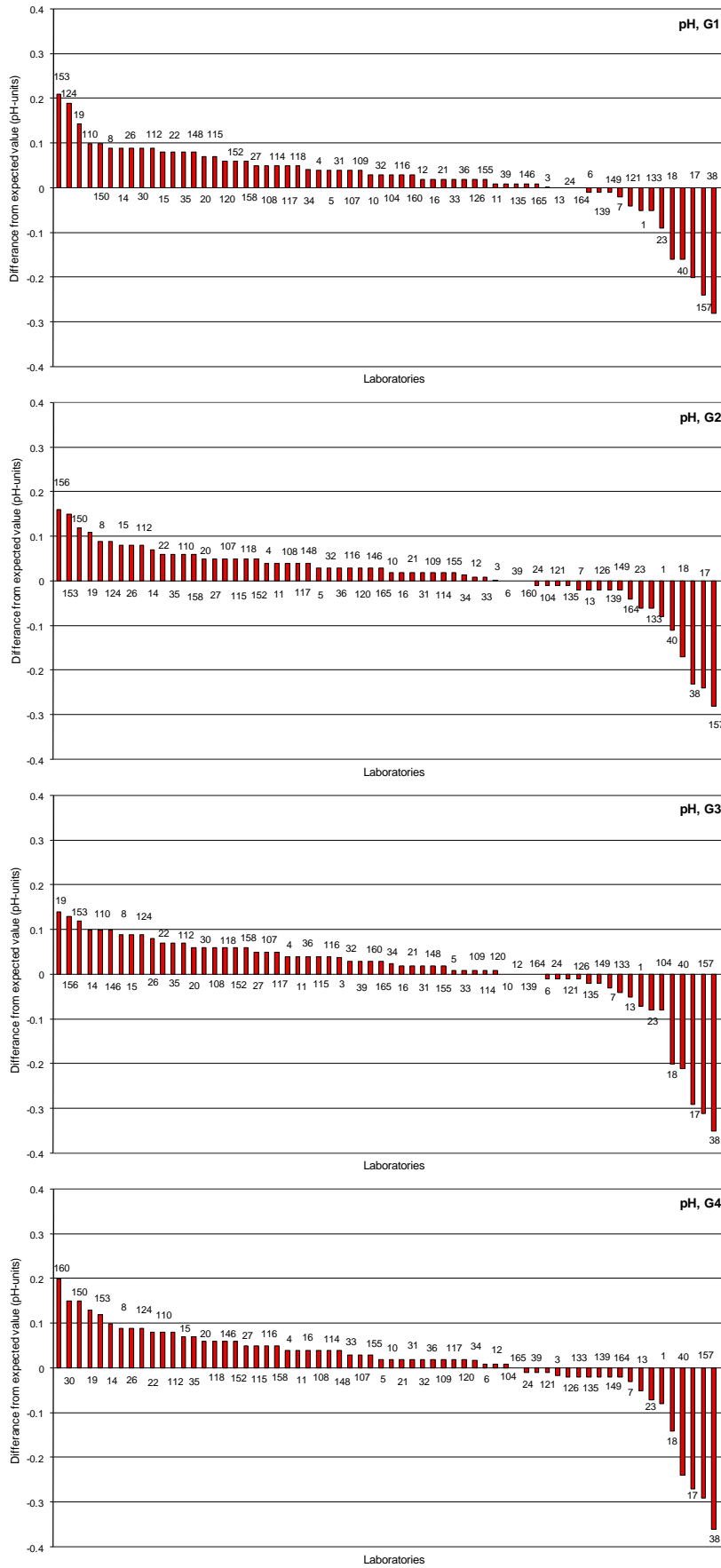*Figure 8:   Percent deviation from theoretical value for ammonium.*
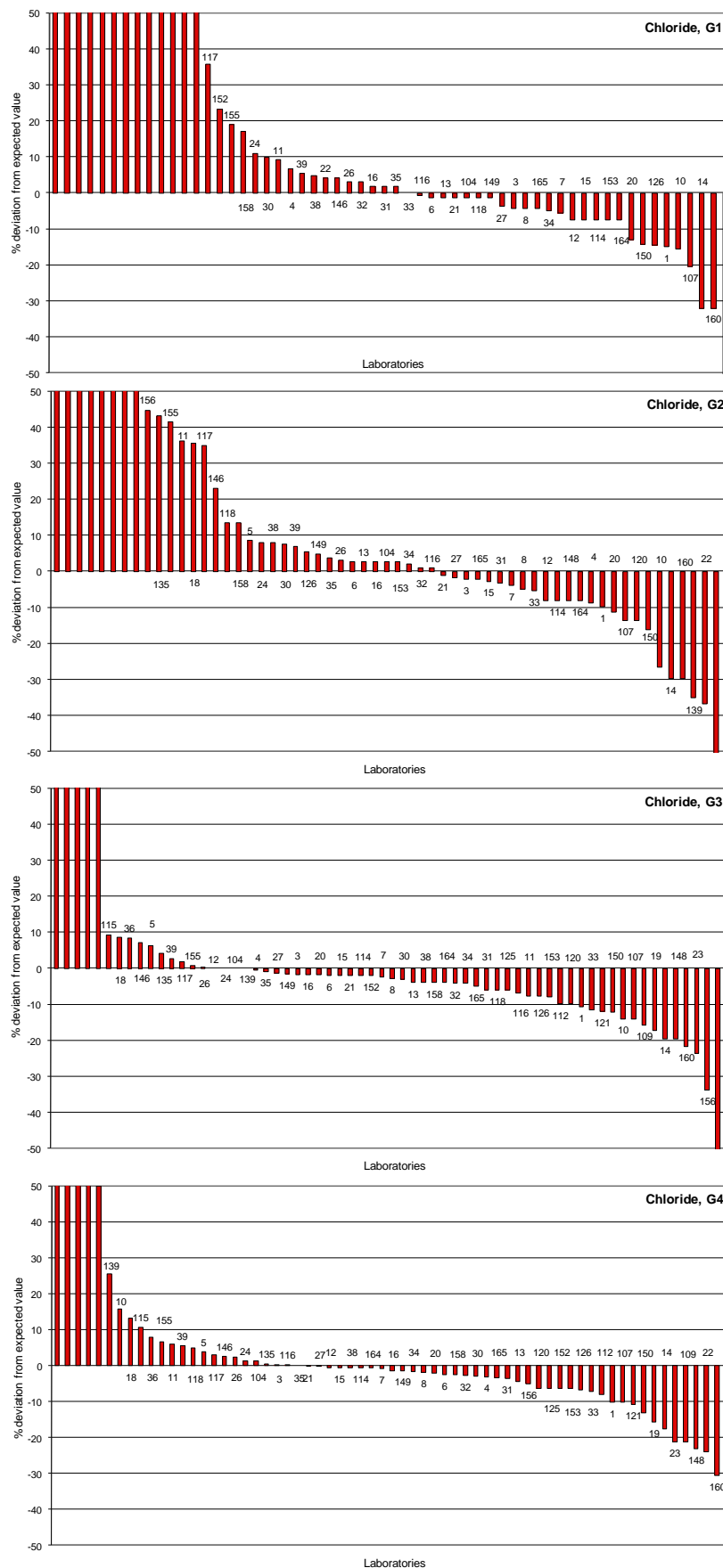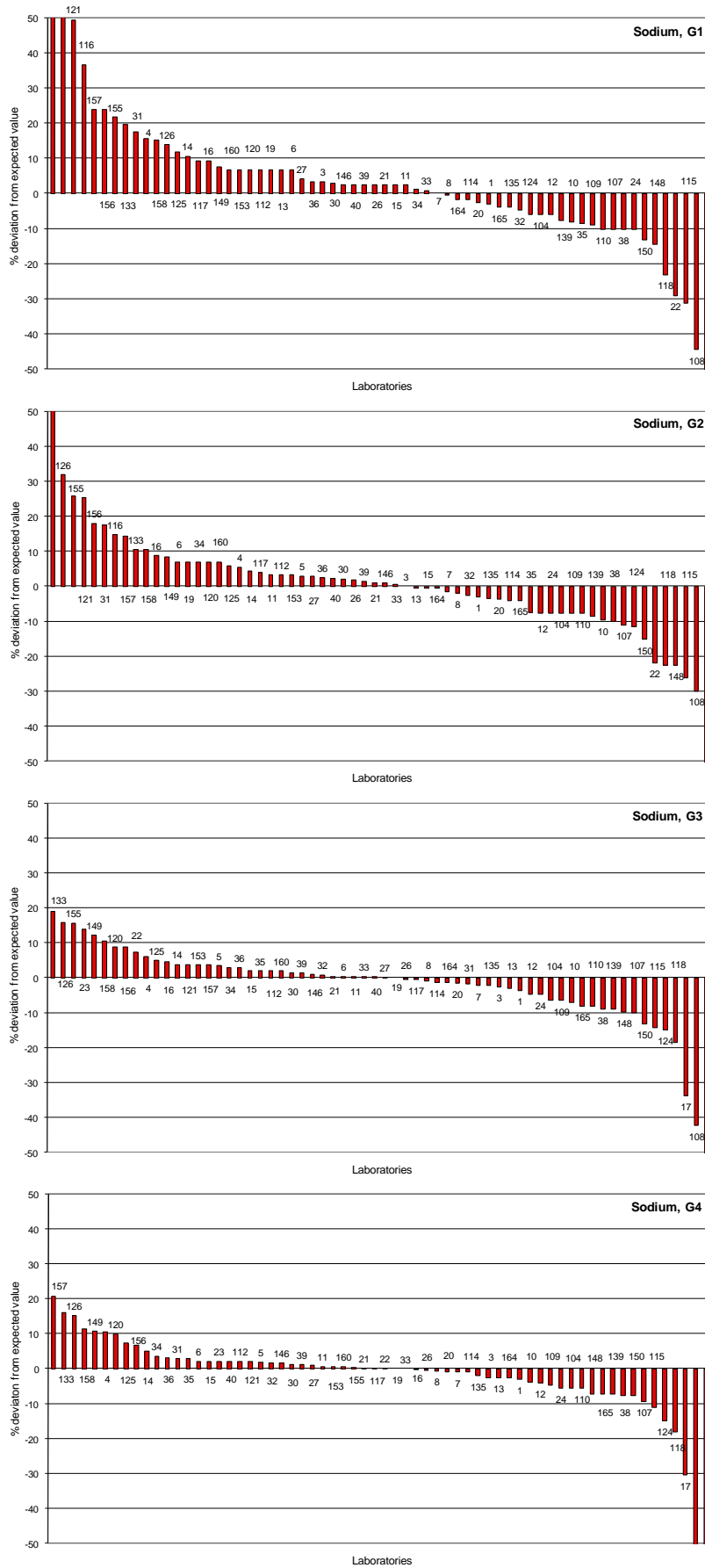
58

Figure 9: Percent deviation from theoretical value for pH.

Figure 10: Percent deviation from theoretical value for chloride.

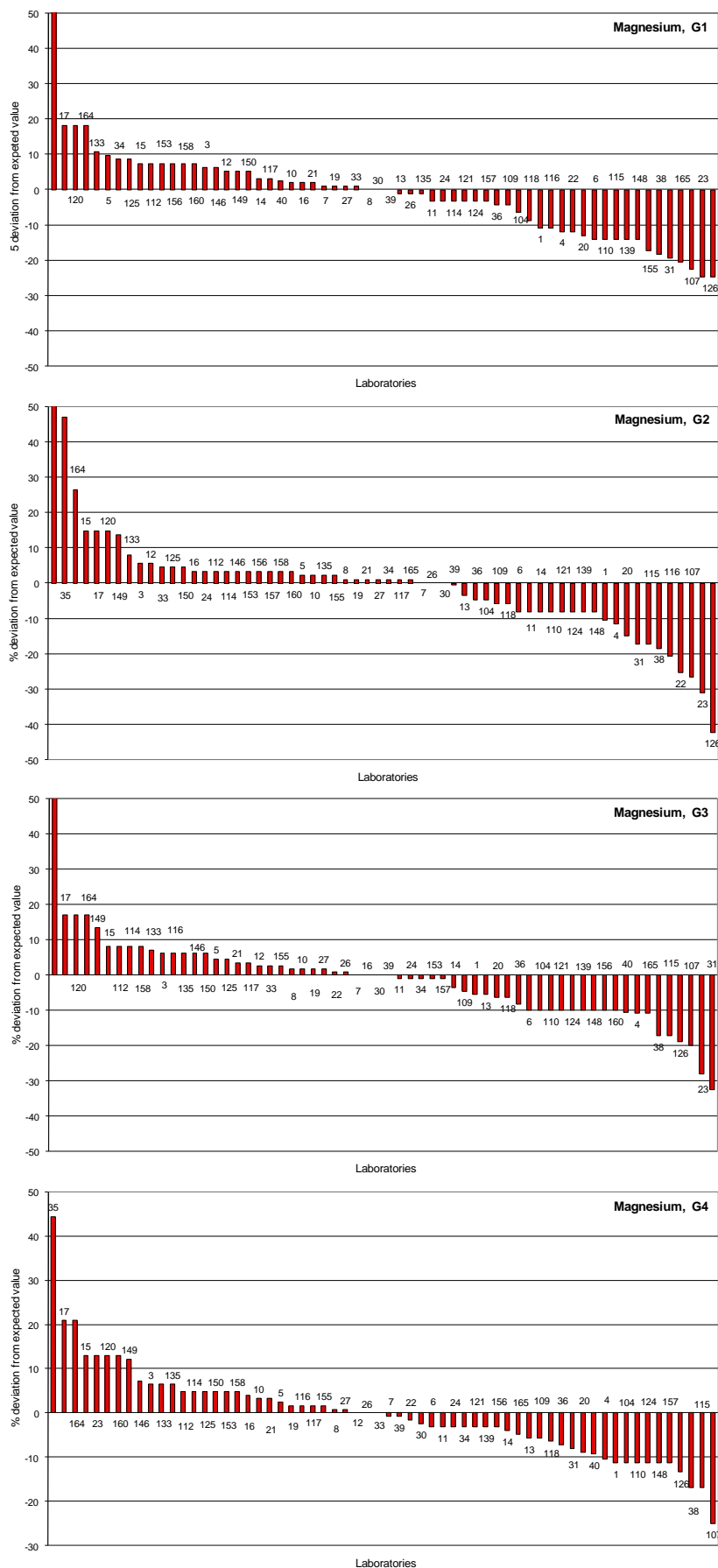*Figure 11: Percent deviation from theoretical value for sodium.*

Figure 12: Percent deviation from theoretical value for magnesium.
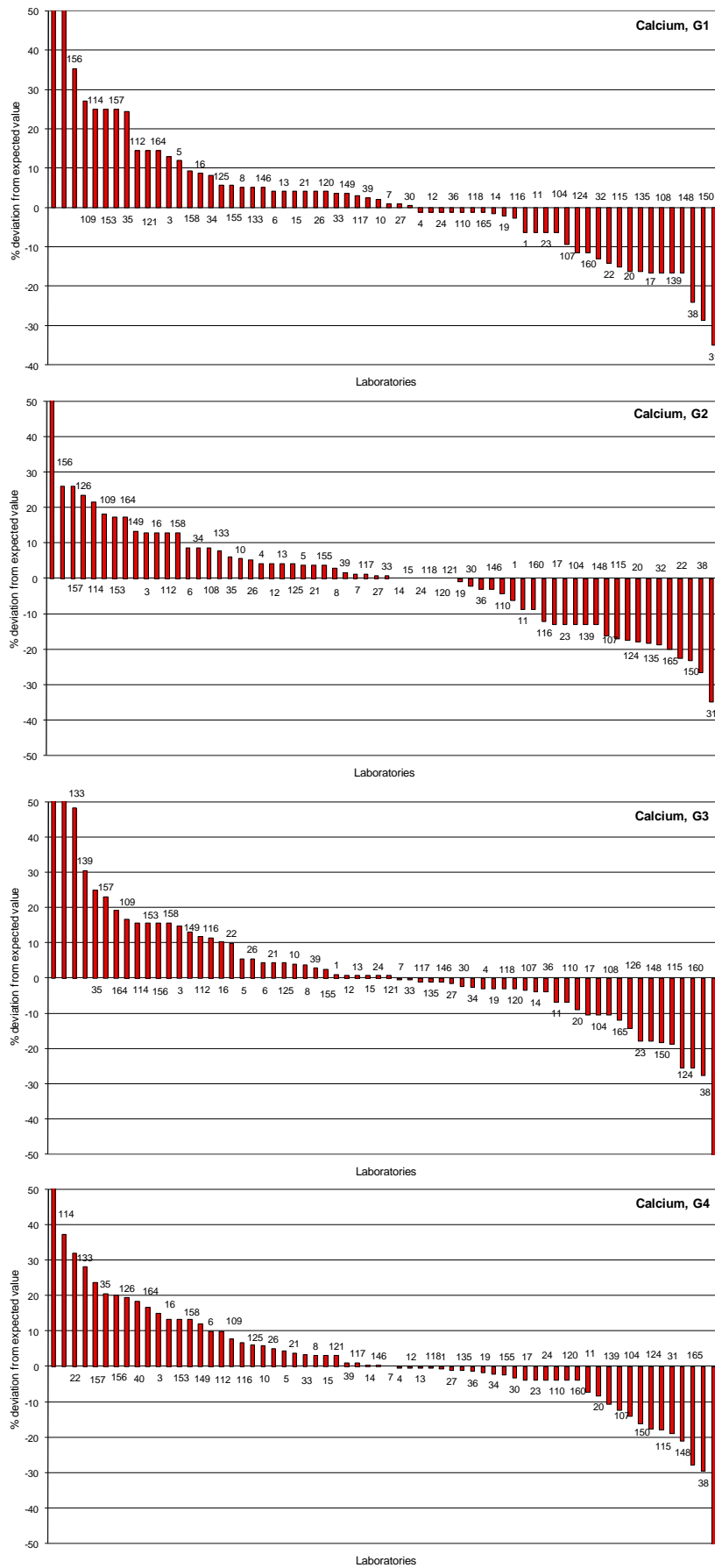
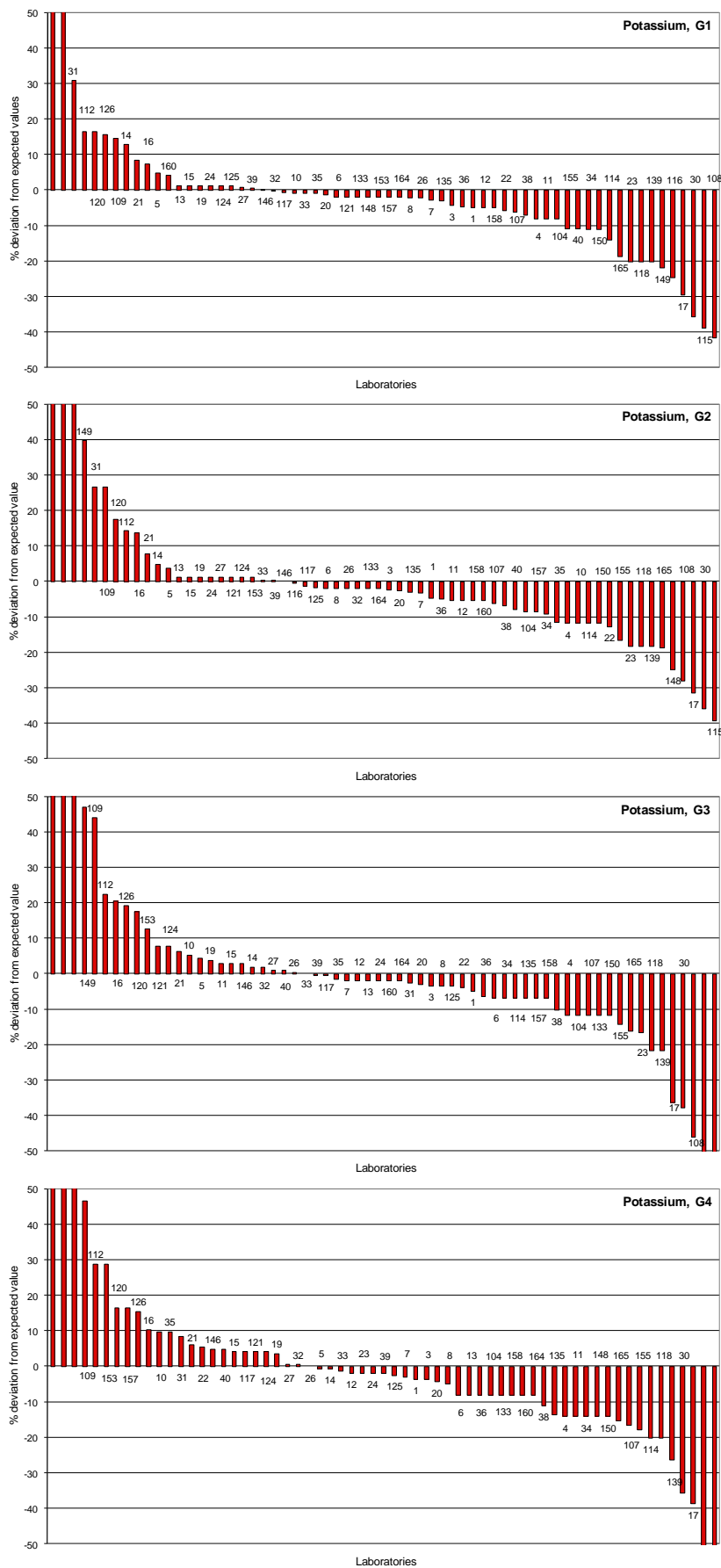*Figure 13: Percent deviation from theoretical value for calcium.*

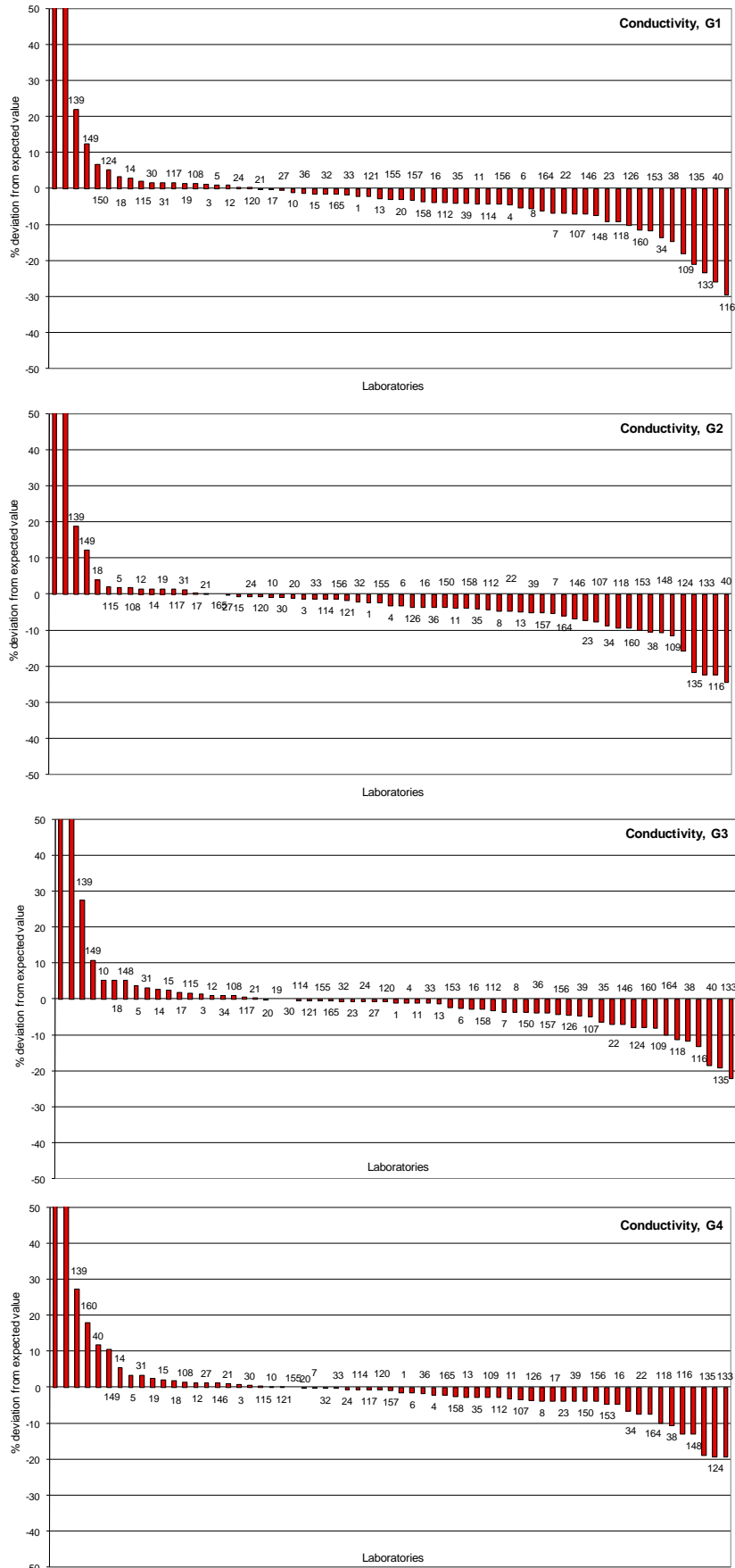*Figure 14: Percent deviation from theoretical value for potassium.*

Figure 15: Percent deviation from theoretical value for conductivity.
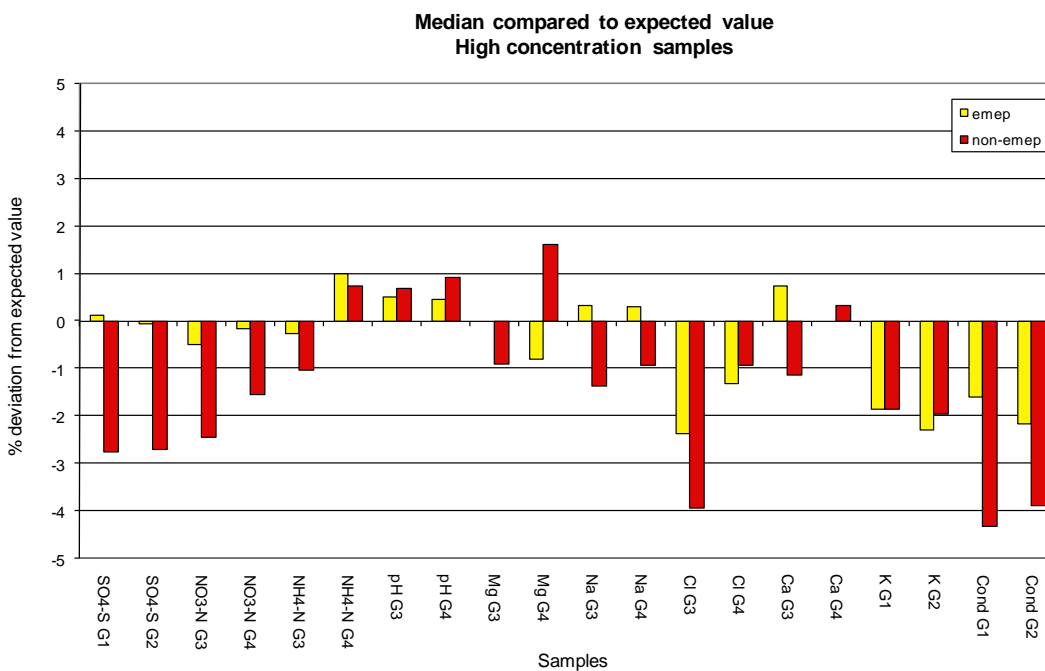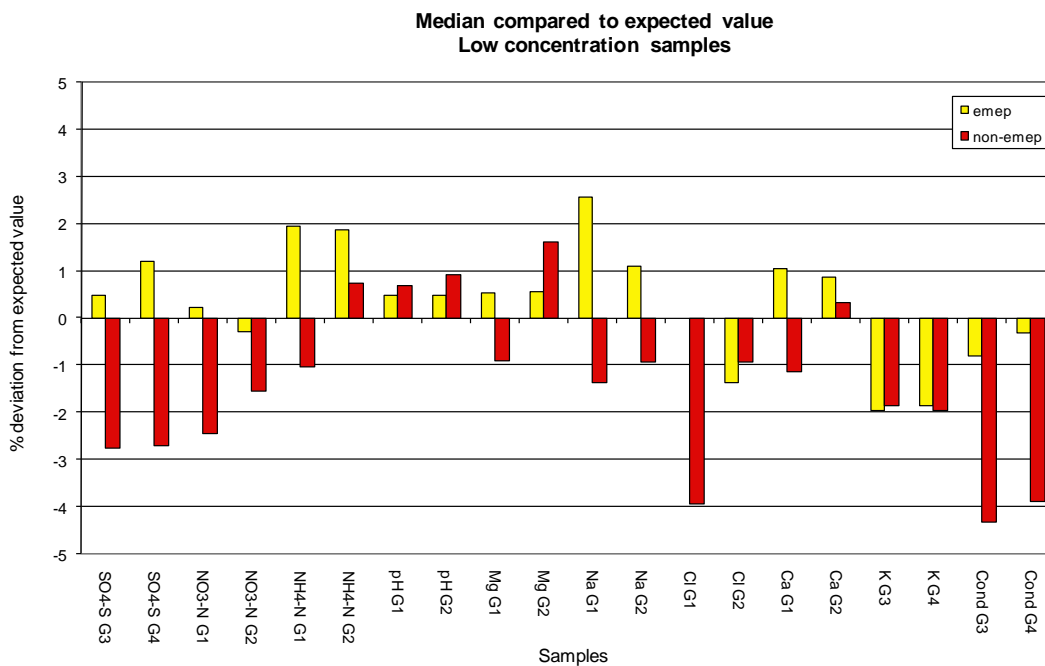
Figure 16: The median compared to theoretical value.
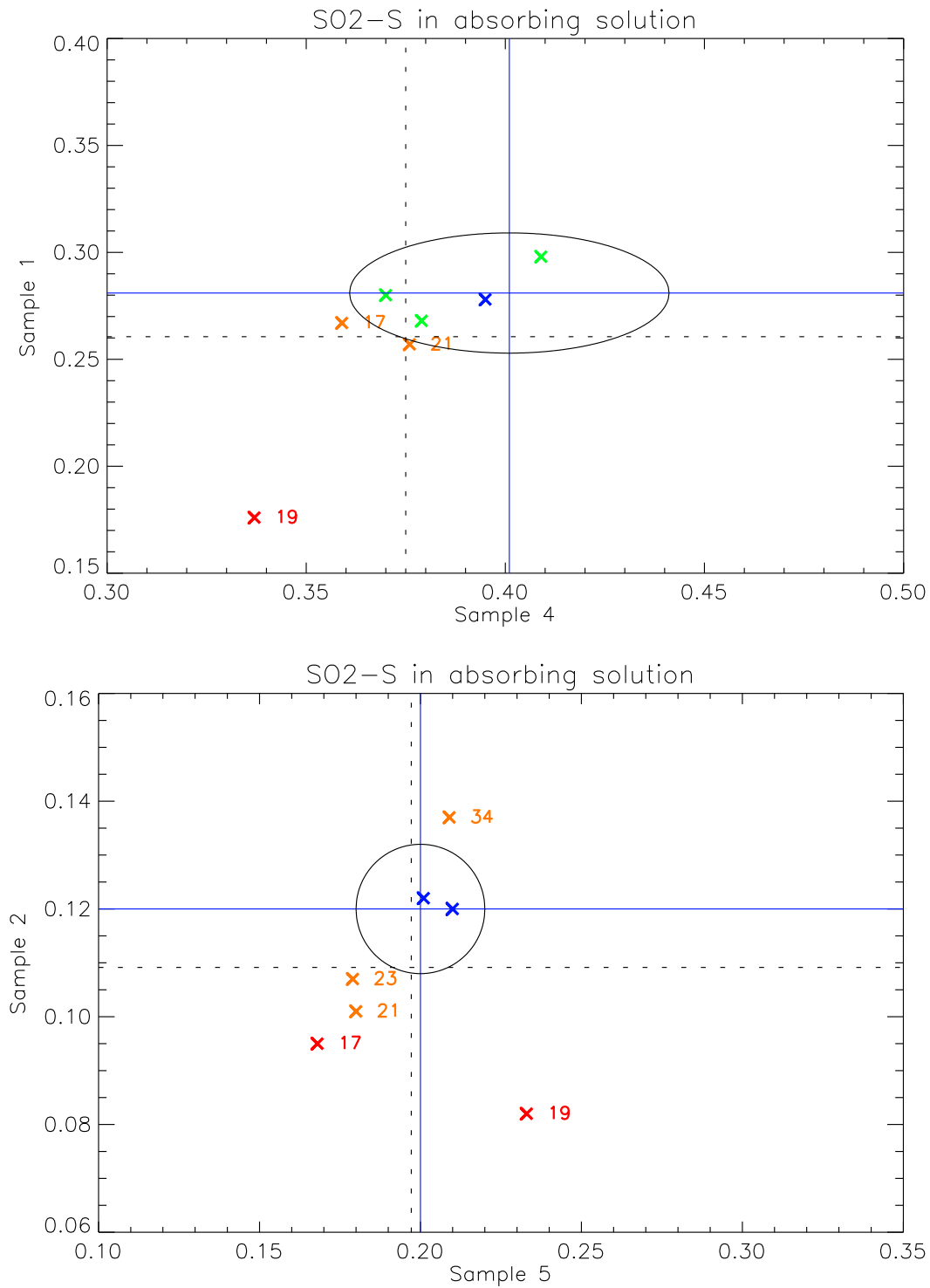
Figure 17: Youden plot of SO₂-S in absorbing solution.
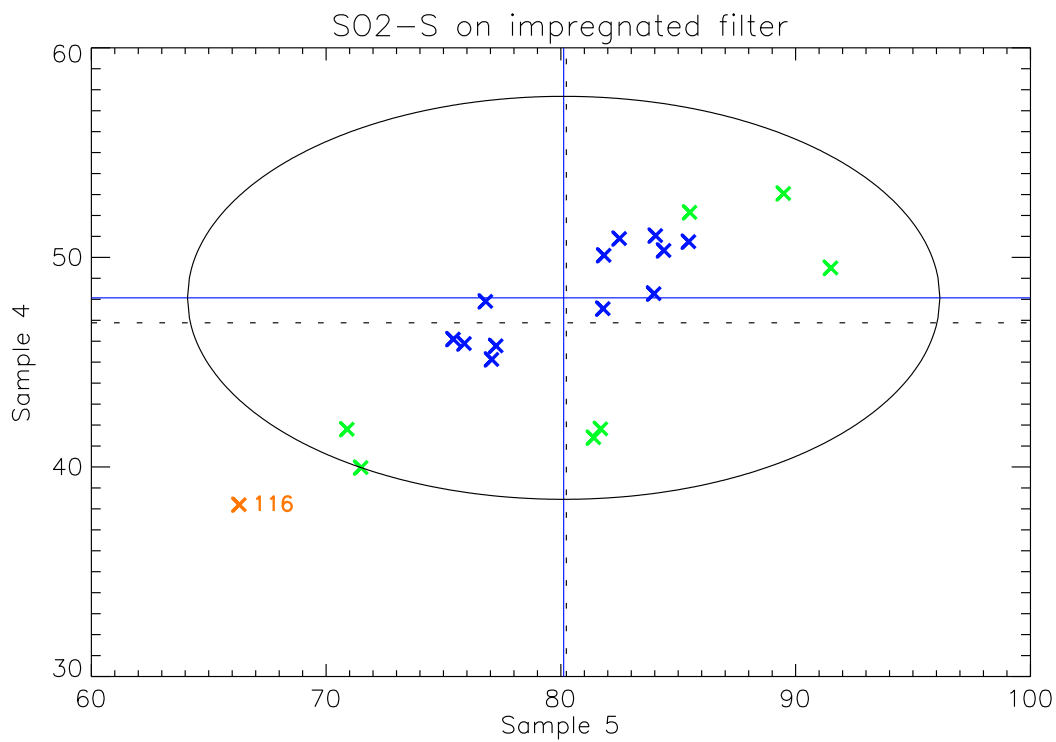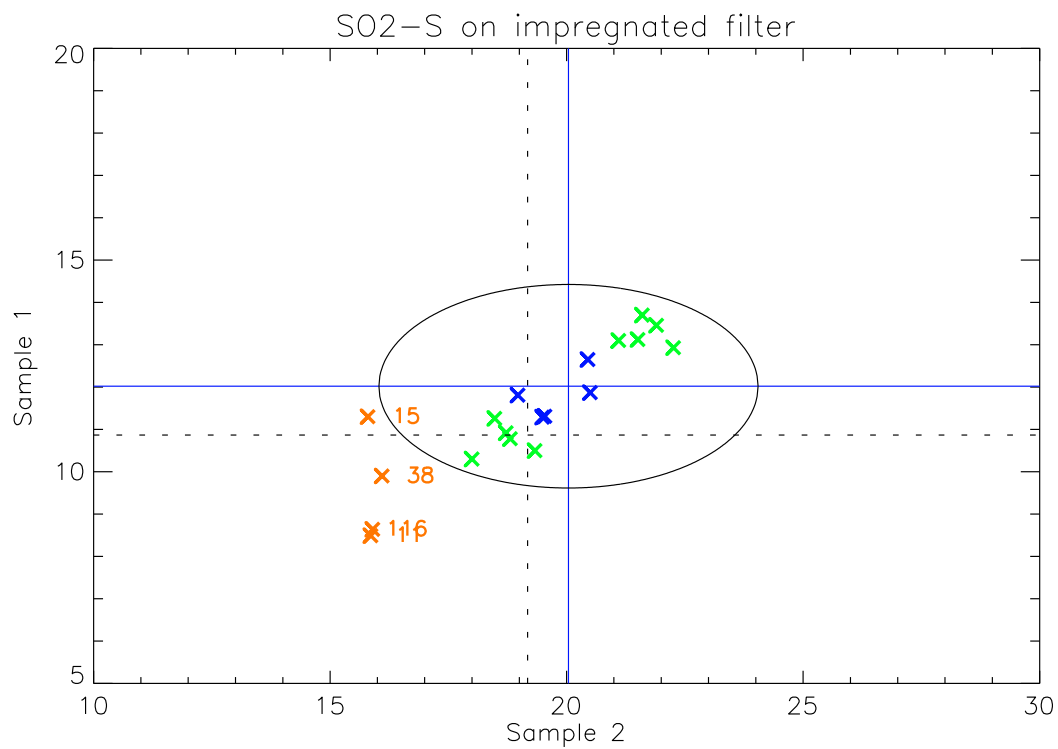
Figure 18: Youden plot of SO₂-S on impregnated filter.
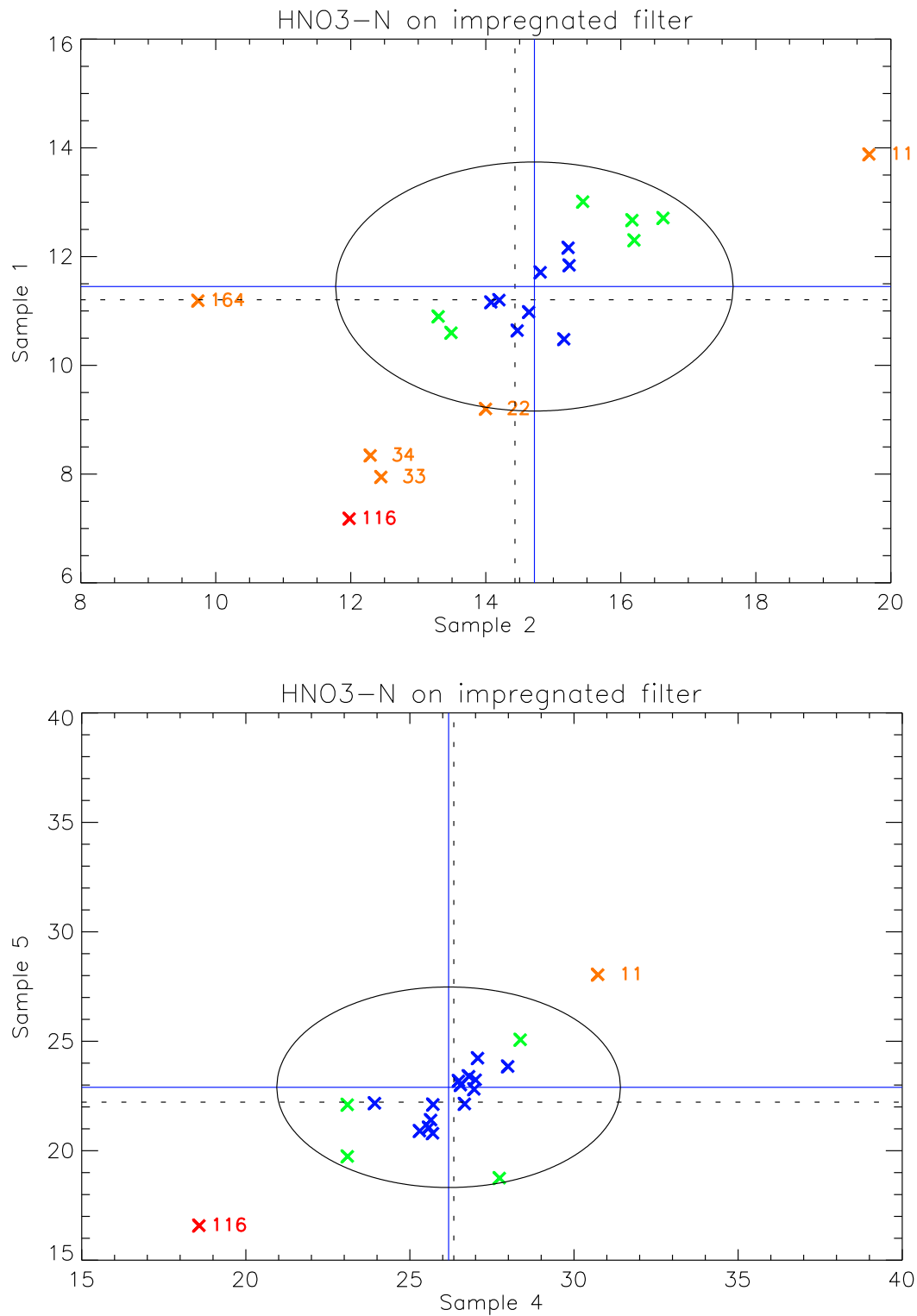
Figure 19: Youden plot of HNO_3-N on impregnated filter.
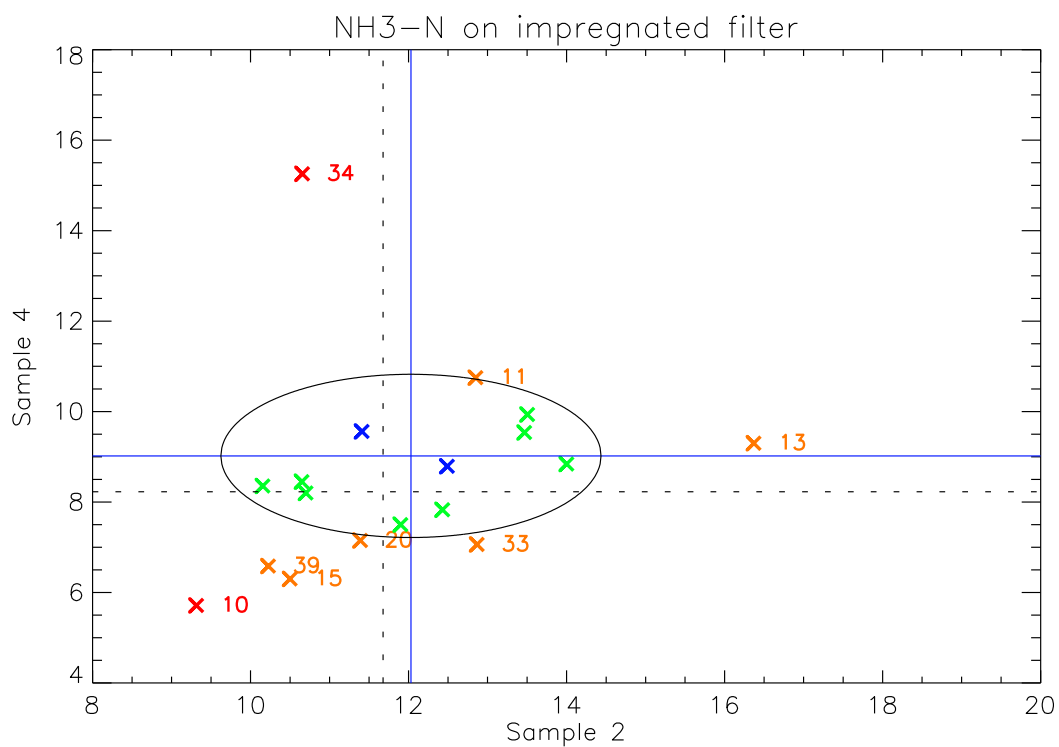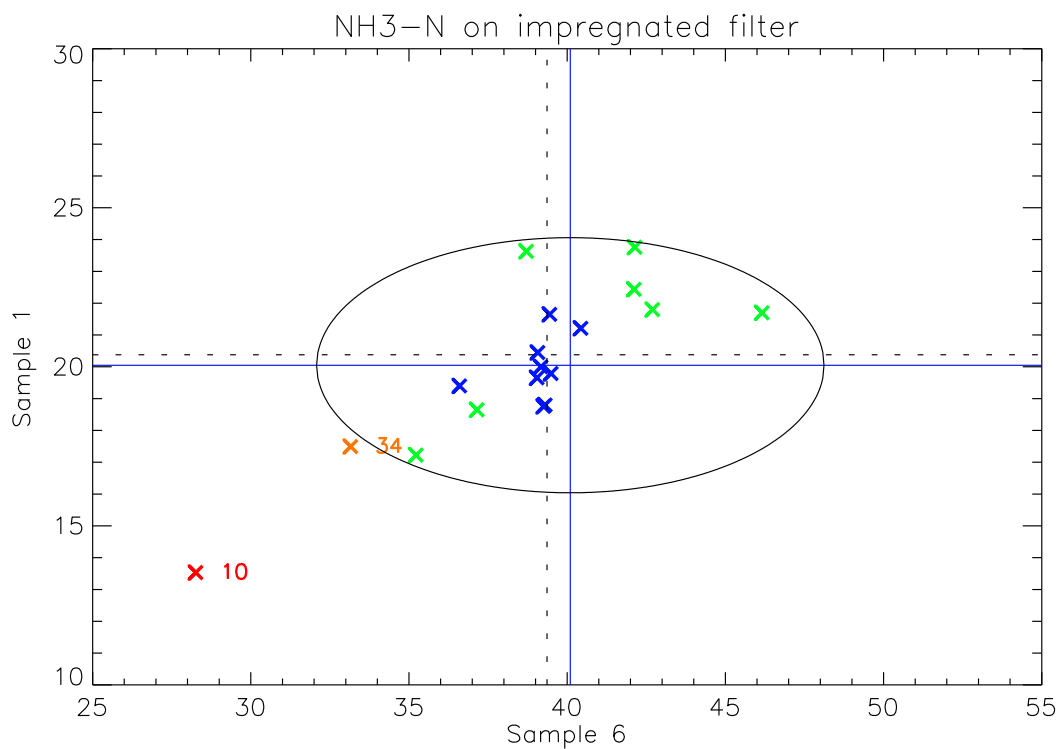
Figure 20: Youden plot of NH₃-N on impregnated filter.

Figure 21: Youden plot of Ca in precipitation.

Figure 22: Youden plot of Cl in precipitation.

Figure 23: Youden plot of conductivity in precipitation.

Figure 24: Youden plot of K in precipitation.

74
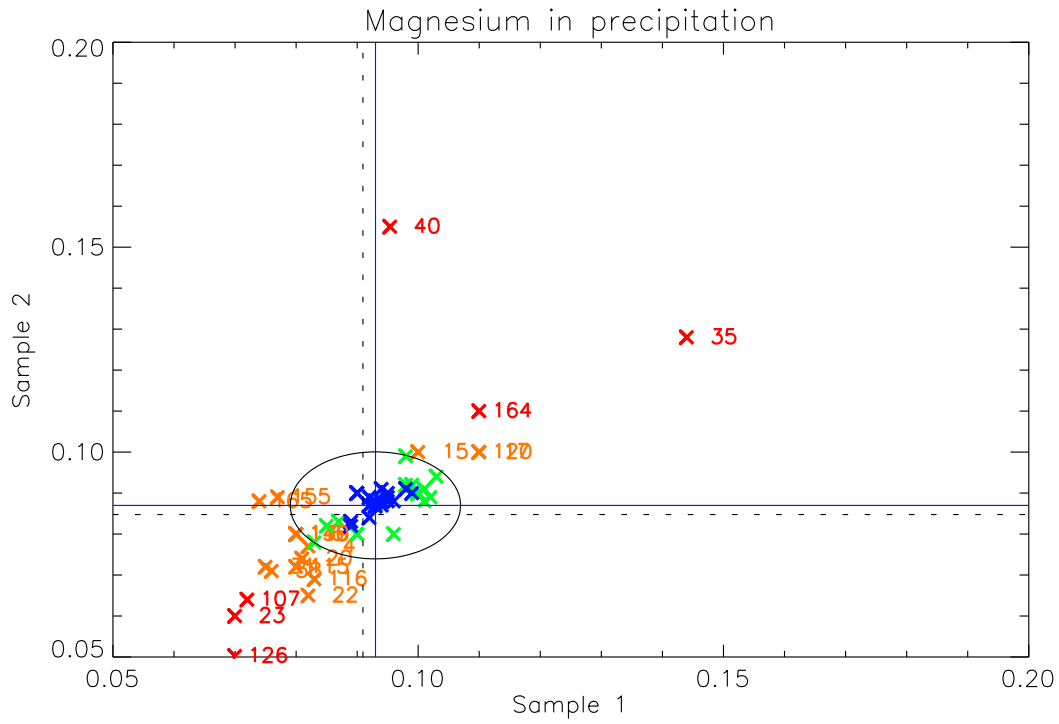
Figure 25: Youden plot of Mg in precipitation.
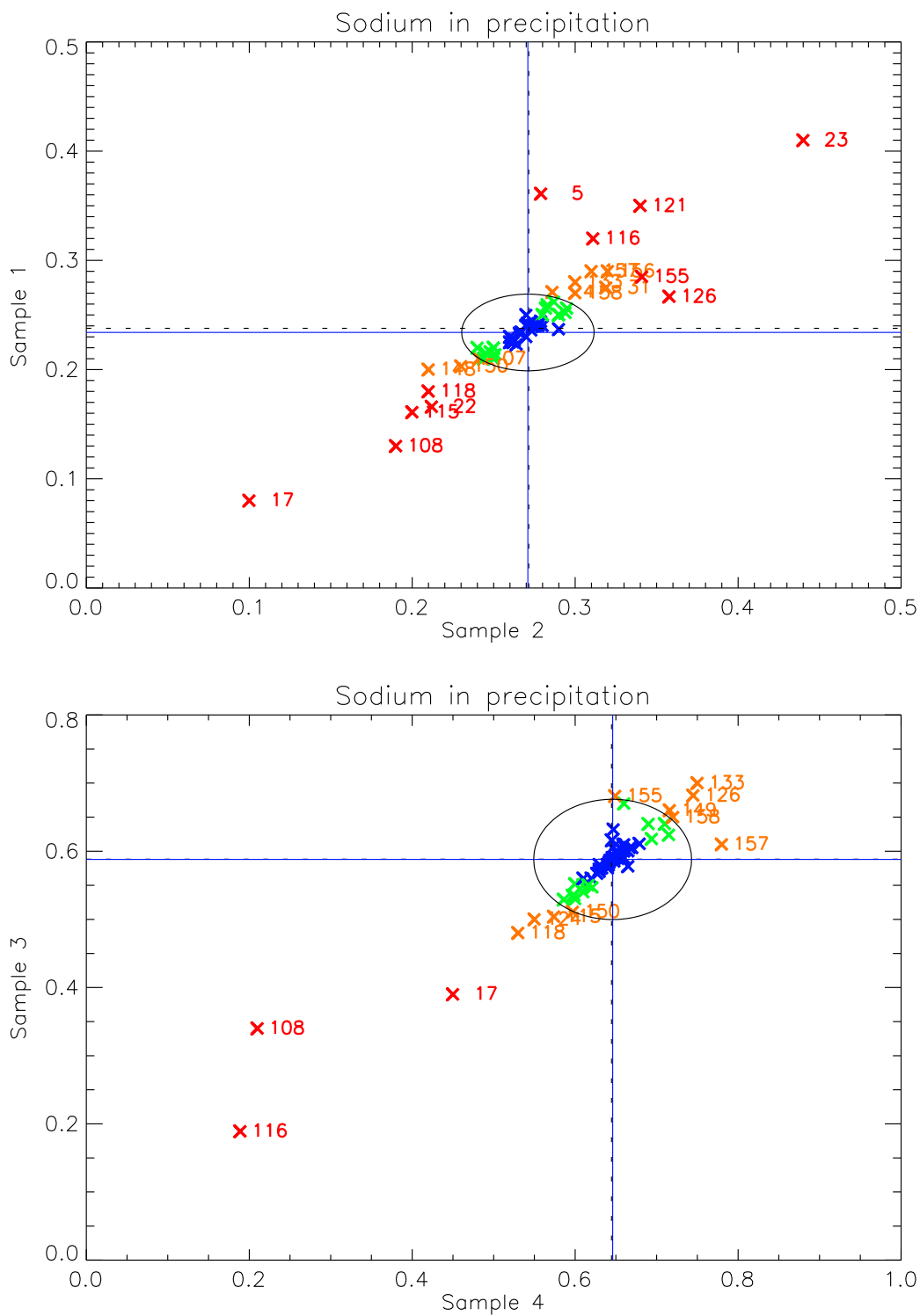
Figure 26: Youden plot of Na in precipitation.
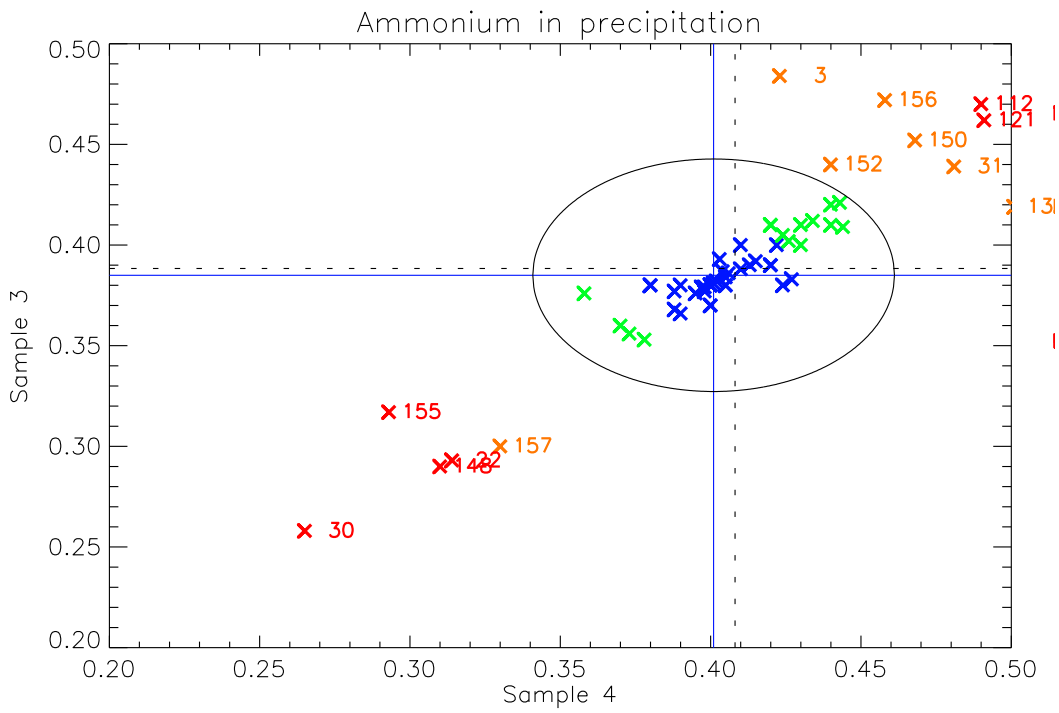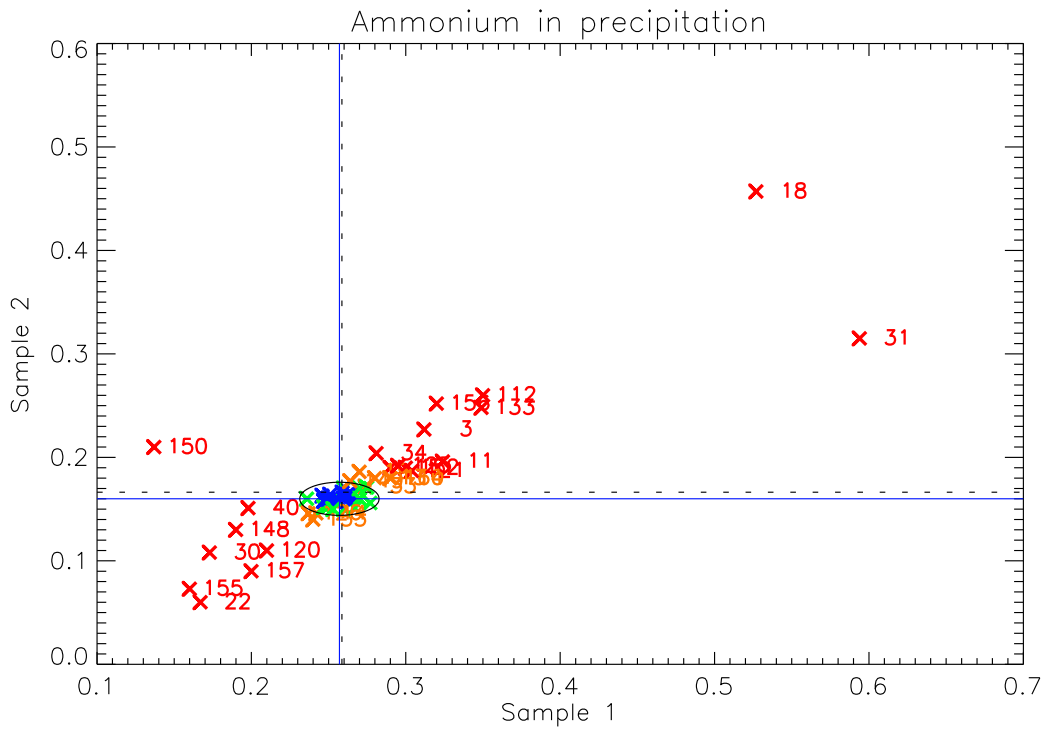
Figure 27: Youden plot of NH4-N in precipitation.
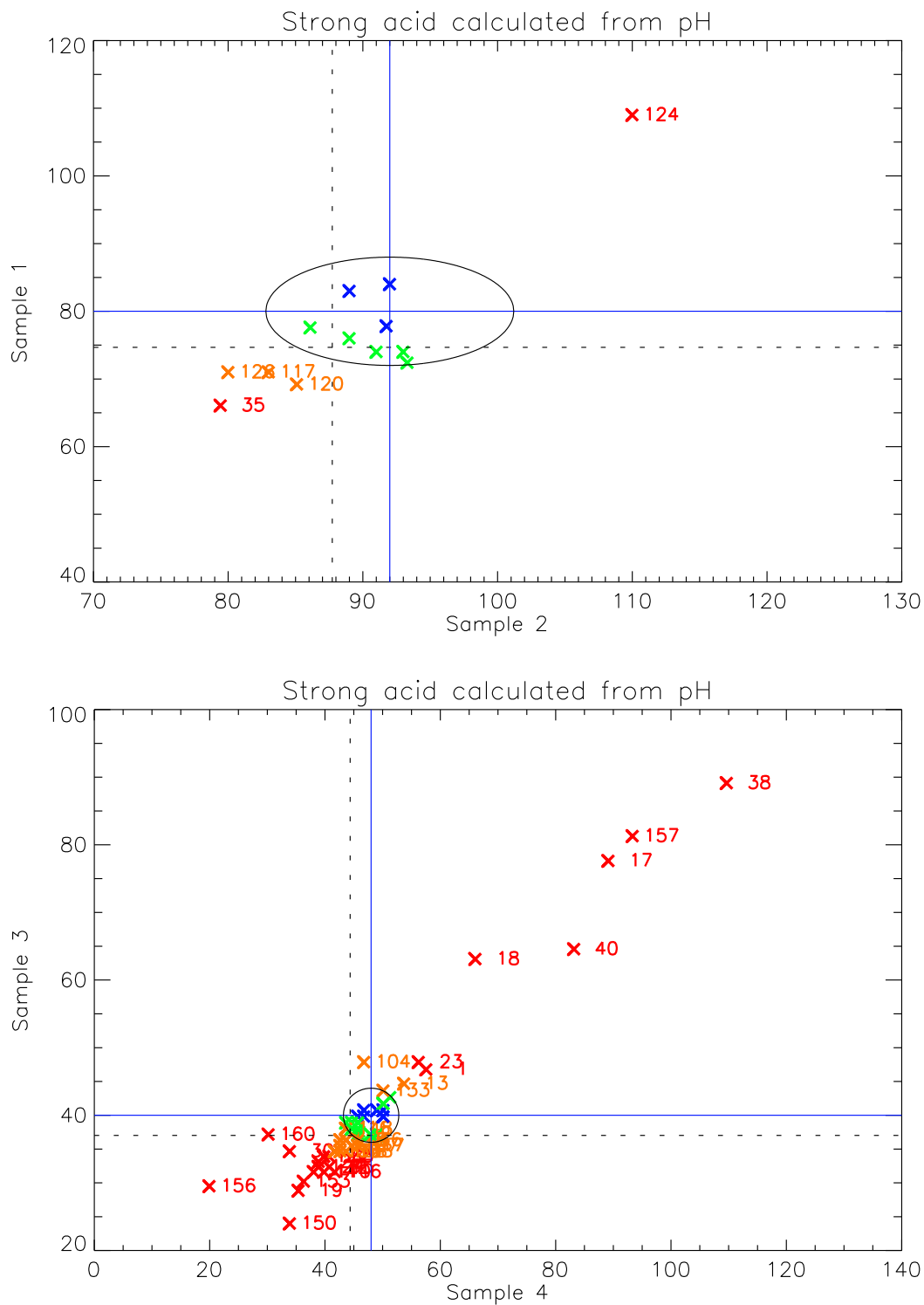
Figure 28: Youden plot of strong acid calculated from pH.
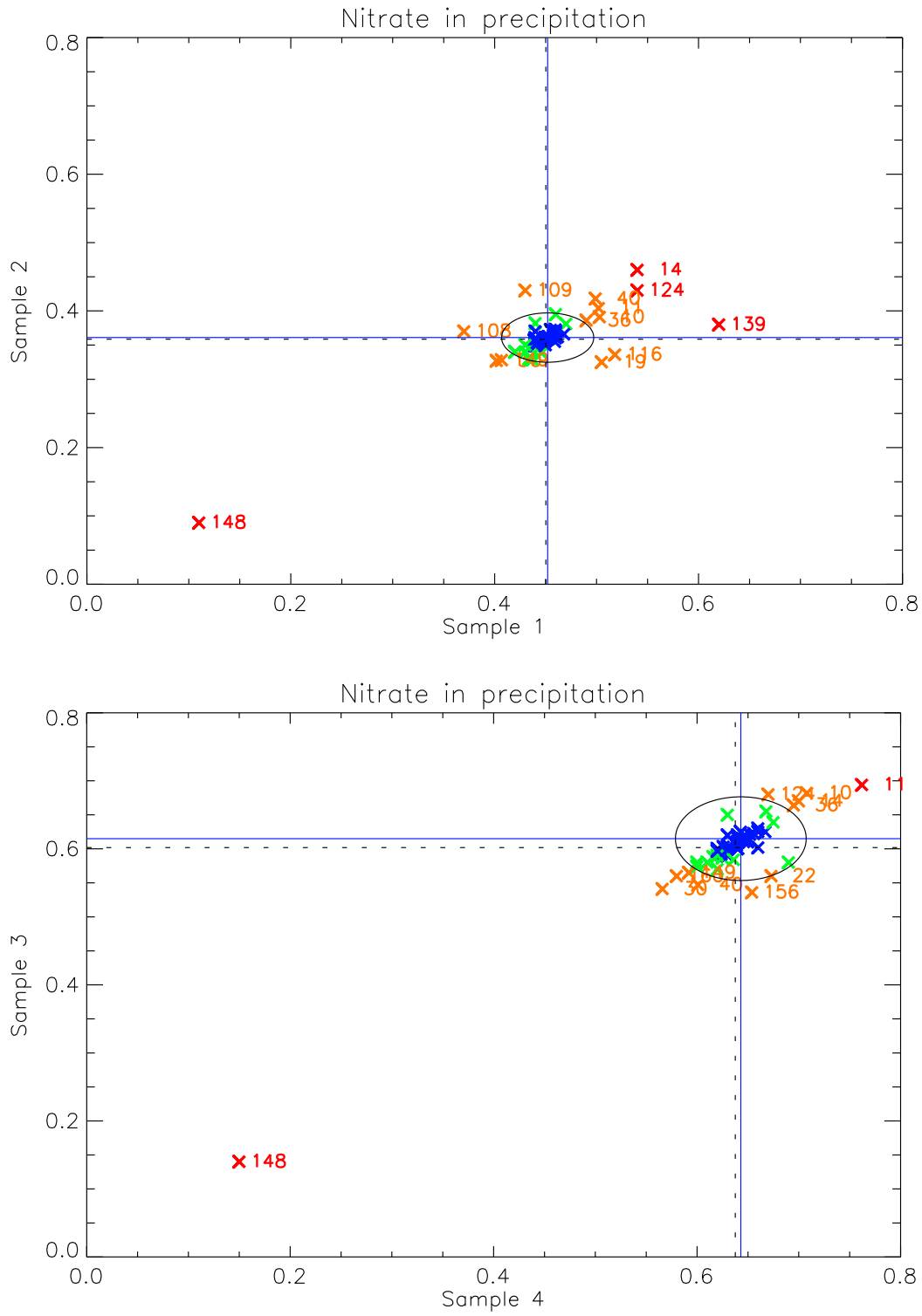
Figure 29: Youden plot of NO₃-N in precipitation.
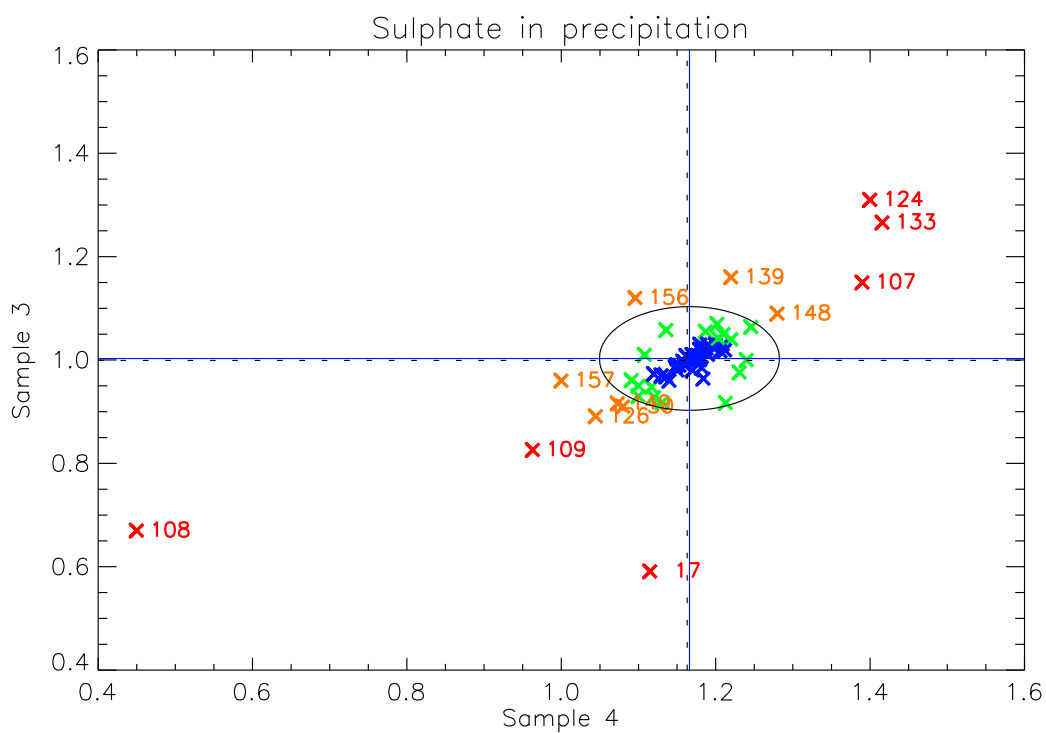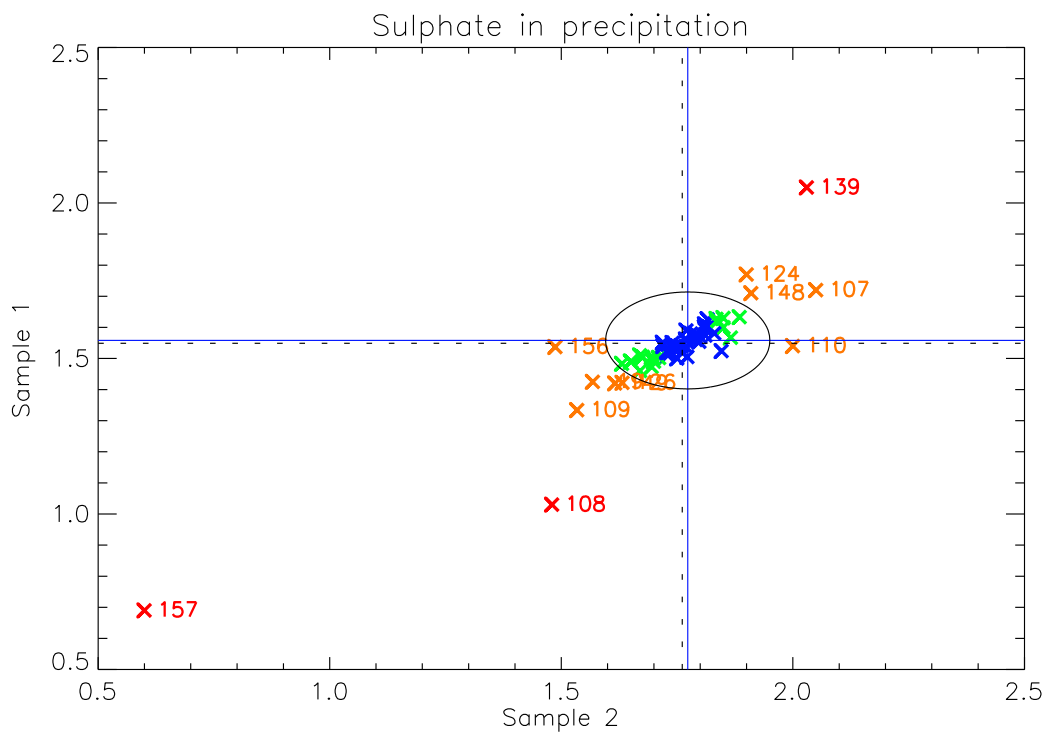
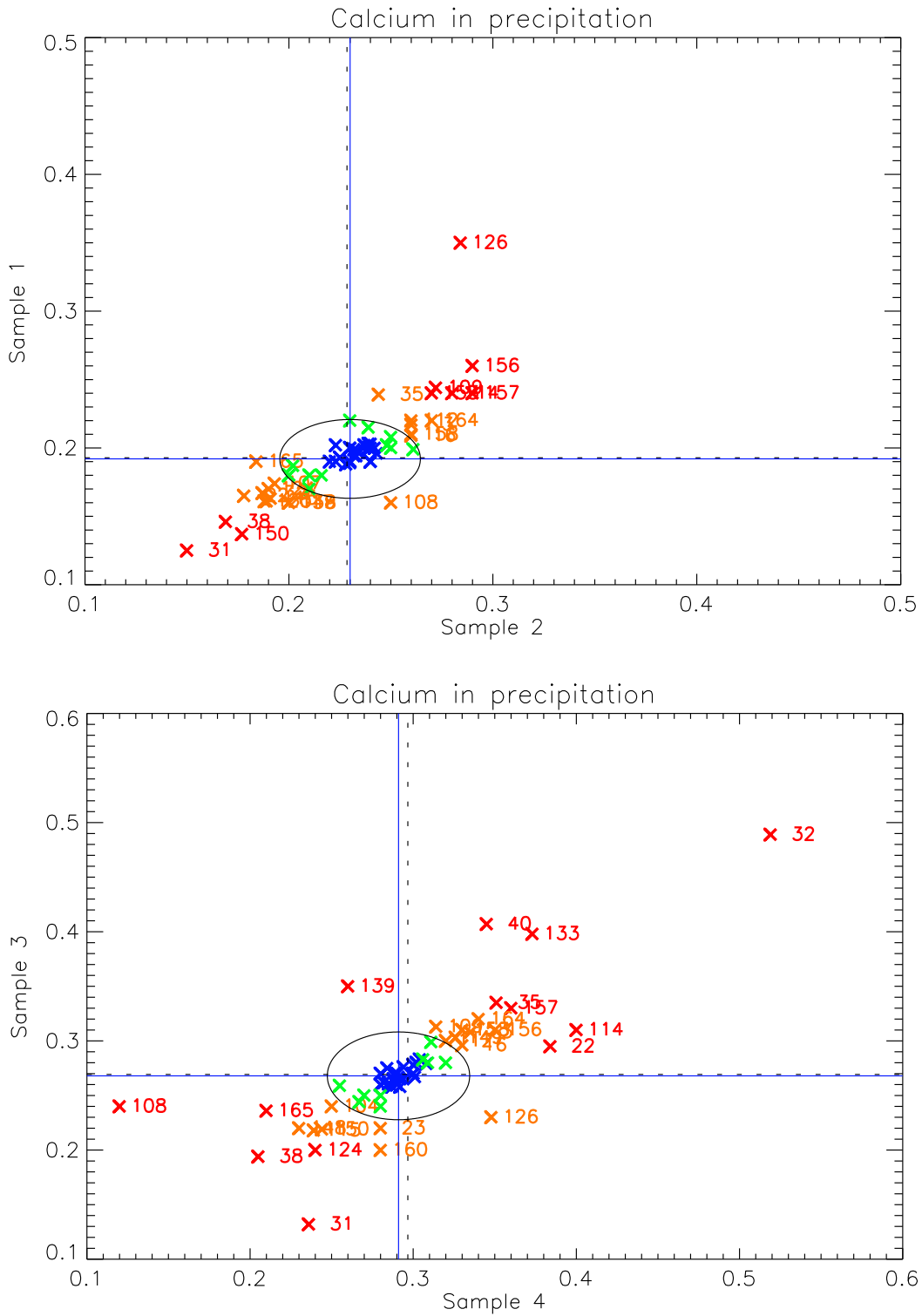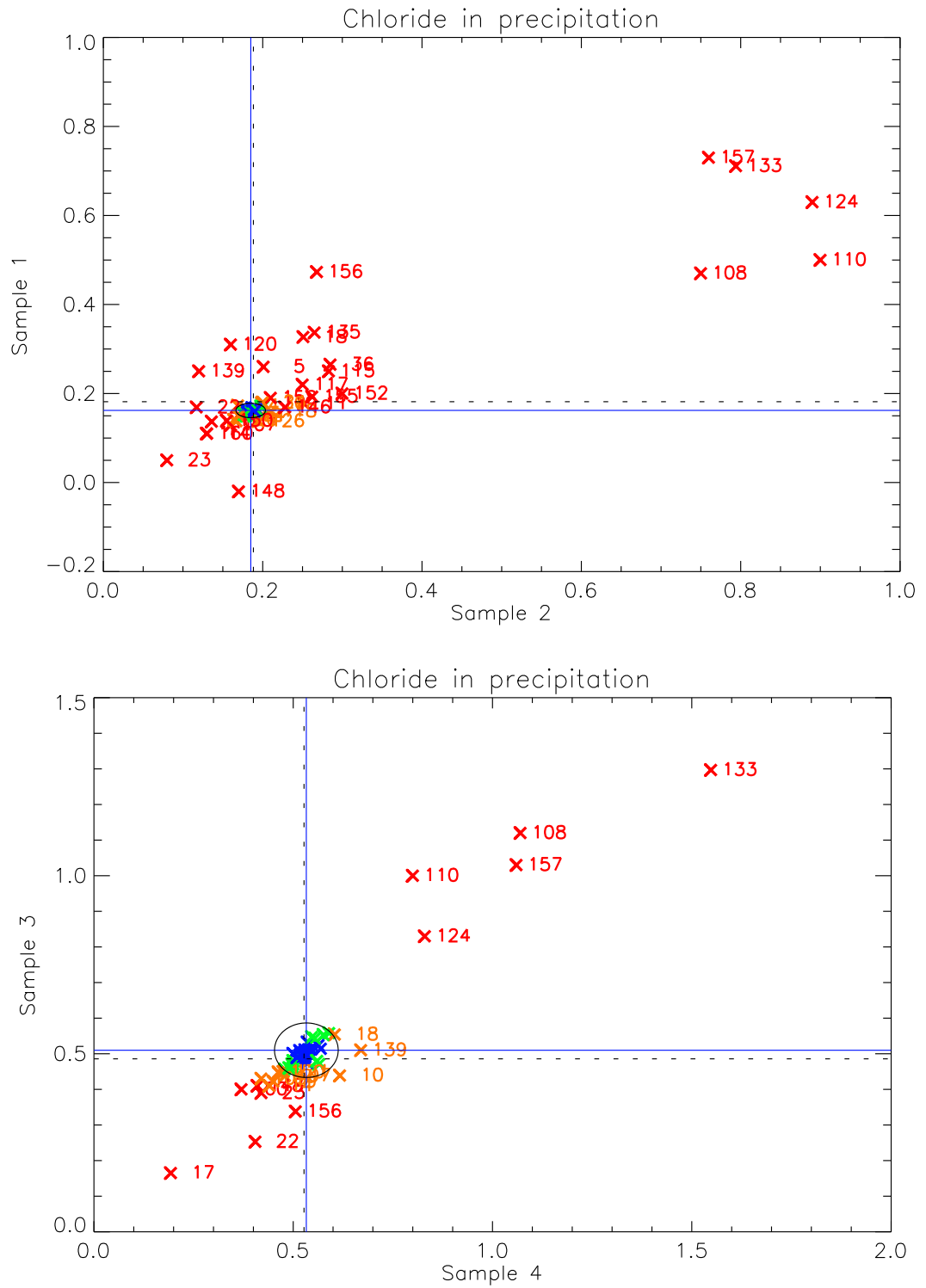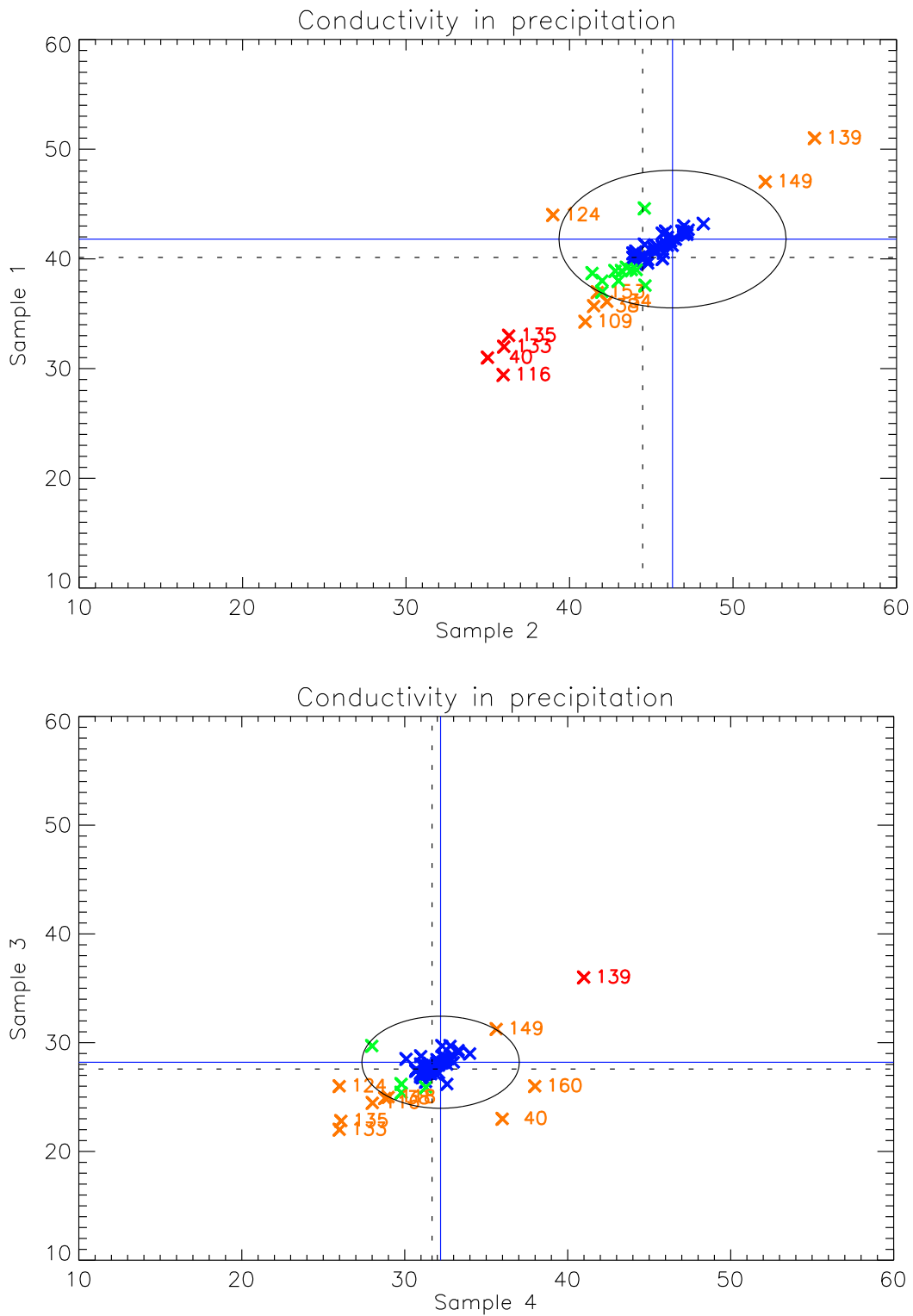*Figure 30: Youden plot of SO₄-S in precipitation.*

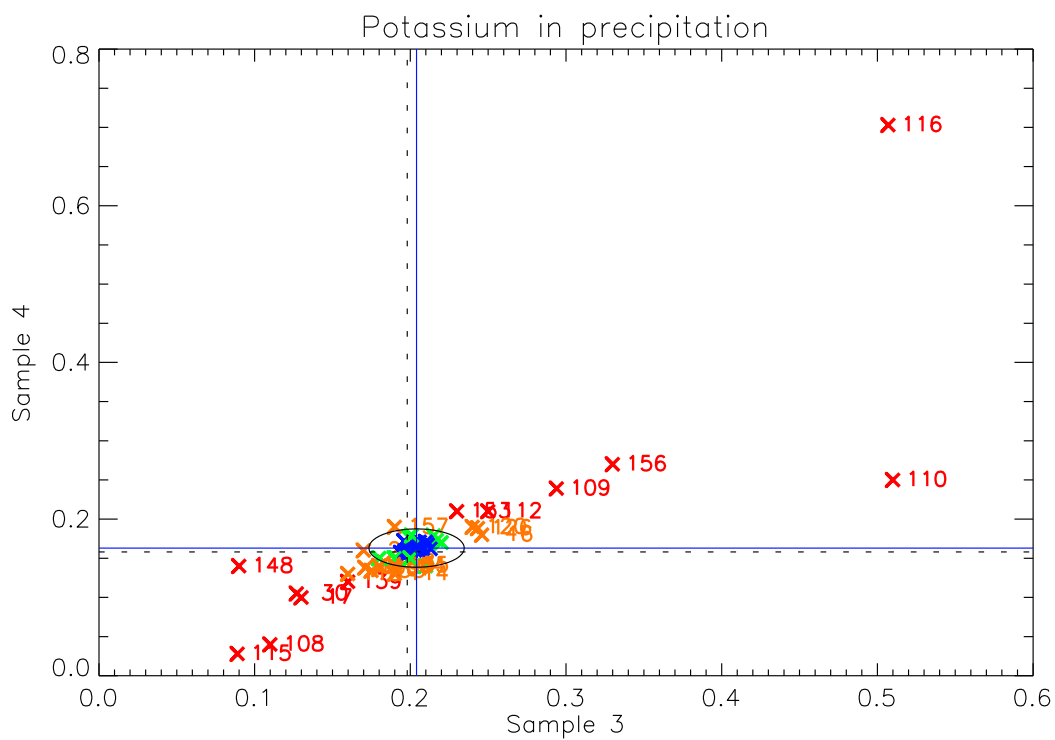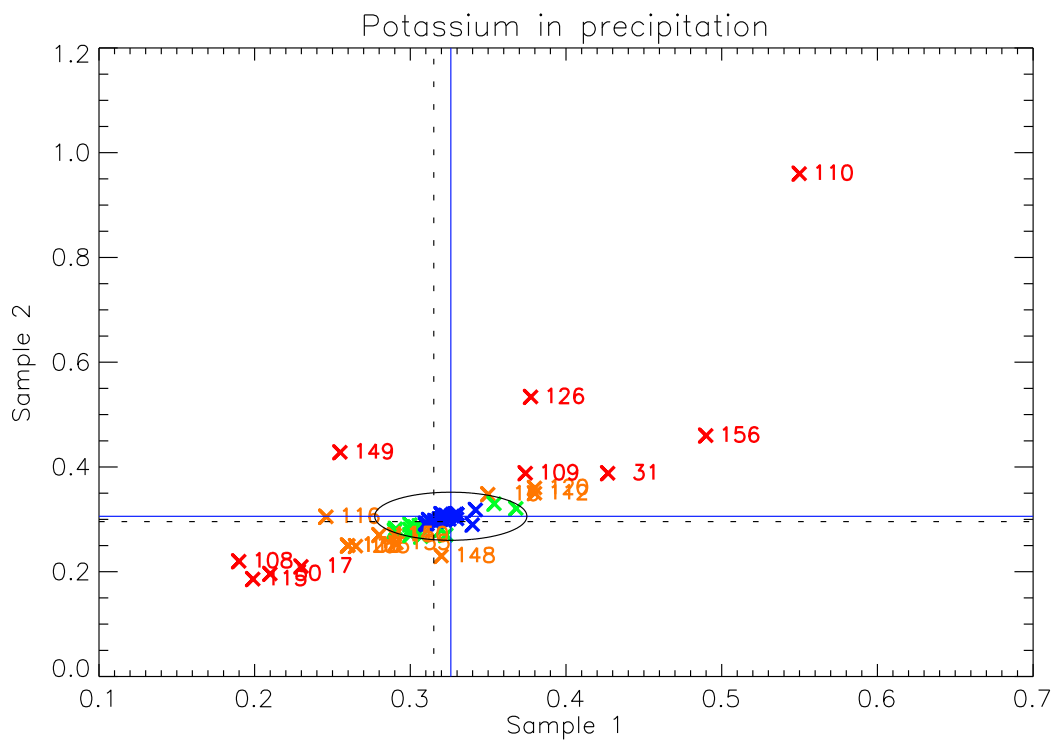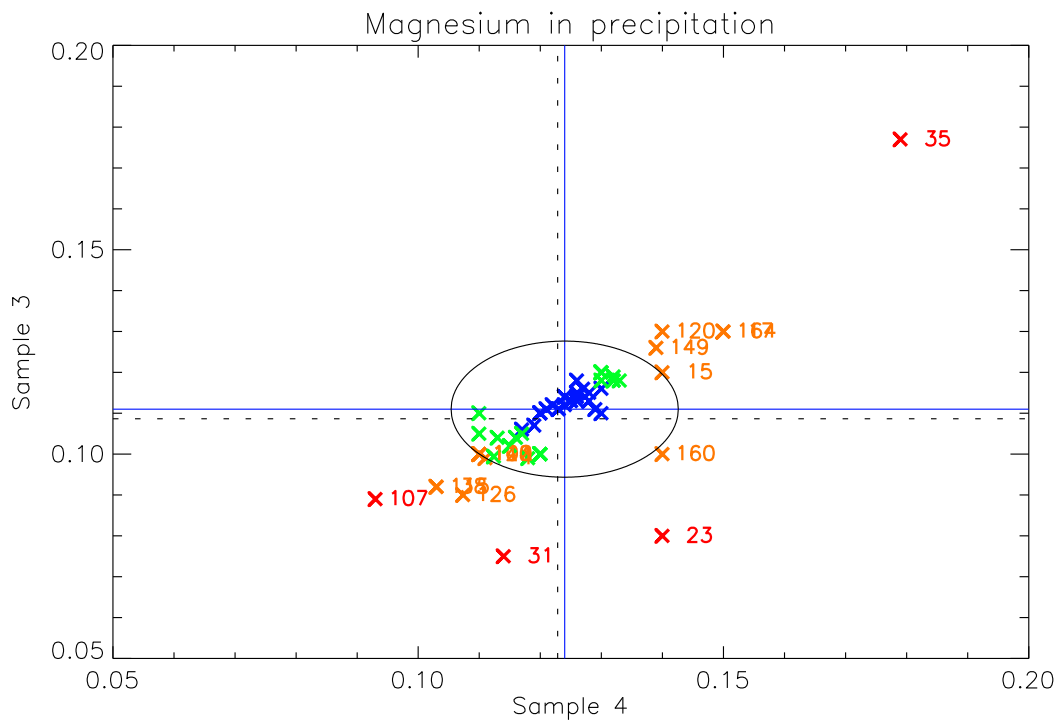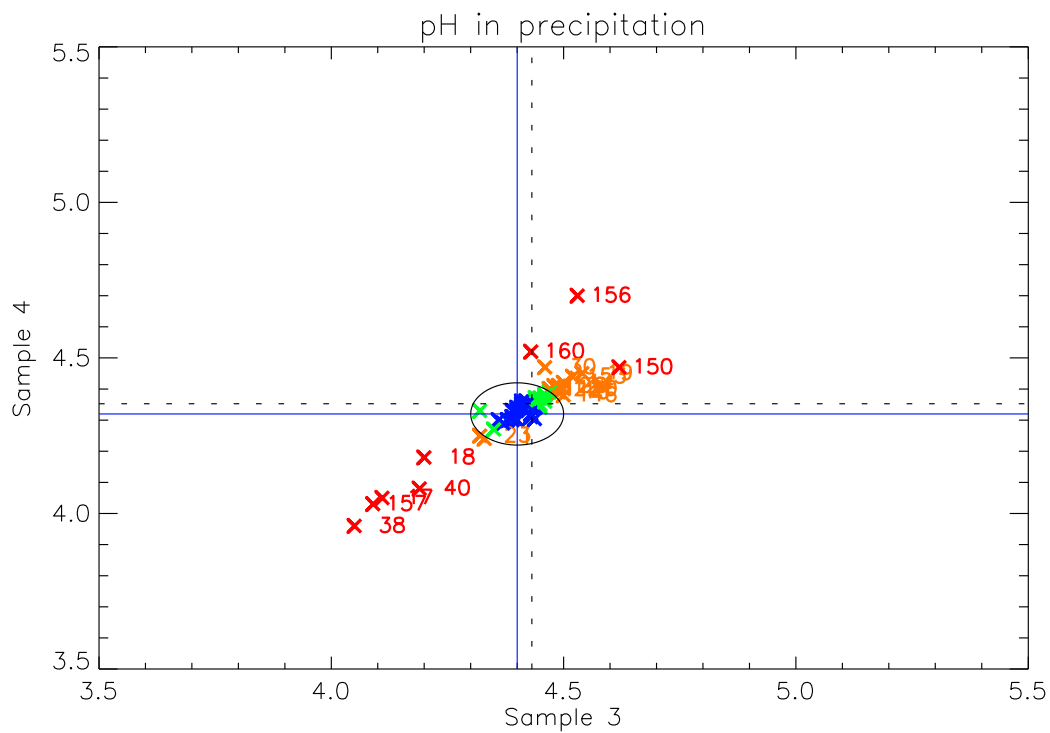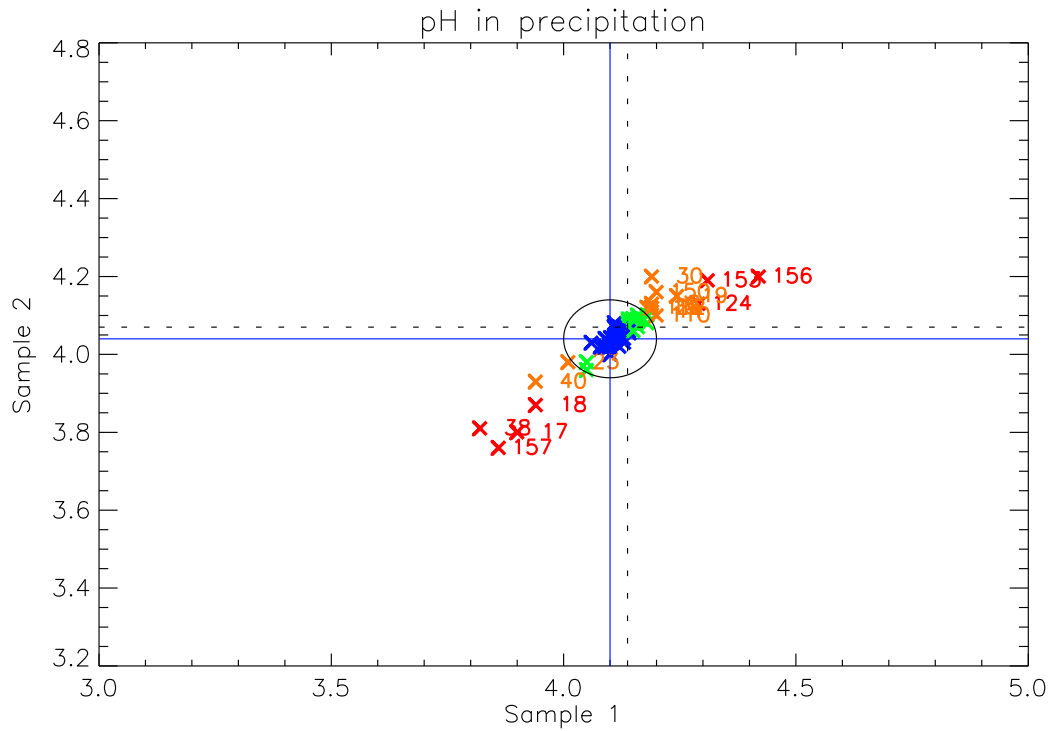*Figure 31: Youden plot of pH in precipitation.*

Appendix 3

Tables – 24rd intercomparison

82

Table 32:   Samples distributed for the twenty-fourth interlaboratory test.

A.	5 synthetic samples for determination of SO_2, consisting of 0.3% H_2O_2 absorbing solution and containing different concentrations of sulphuric acid. One of the samples was an unidentified blank.
B.	5 KOH-impregnated Whatman 40 filters, comprising 1 blank and 4 filters to which different amounts of sulphuric acid and nitrate salt have been added.
C.	4 synthetic samples for determination of NO_2 consisting of sodium nitrite diluted in water.
J.	6 Whatman 40 filters impregnated with 3% oxalic acid, comprising 2 blank and 4 filters to which different amounts of ammonium salt solution have been added.
G.	4 synthetic precipitation samples, containing SO_4^{2-}, NO_3^-, NH_4^+, H^+, Na^+, Mg^{2+} and Cl^-, and Ca^{2+} and K^+.

Table 33a: EMEP laboratories participating in the twenty-fourth laboratory intercomparison. The numbers in front of the names are used in tables and figures.

Austria	(1)	Umweltbundesamt Zweigstelle Sud, Klagenfurt
Canada	(26)	The Ontario Ministry of the Environment, Laboratory Service Branch
Croatia	(35)	Meteorological and Hydrological Service of Croatia
Czech Republic	(3)	Czech Hydrometeorological Institute, Praha
Denmark	(4)	National Environmental Research Institute. Air Pollution Laboratory
Estonia	(38)	Estonian Environmental Research Centre, Tallinn
Finland	(5)	Finnish Meteorological Institute. Air Quality Department
France	(6)	SGS Multilab
Germany	(7)	IfE Leipzig GmbH, Umweltlabor
Germany	(8)	Umweltbundesamt, Messtelle Schauinsland
Hungary	(10)	Institute for Atmospheric Physics
Iceland	(11)	Idntæknistofnun Islands (Technological Inst. of Iceland)
Ireland	(12)	Met. Eirann, Dublin
Italy	(13)	C.N.R. Istituto Inquinamento Atmosferico
Italy	(30)	Join Research centre, Ispra
Latvia	(33)	Air Pollution Observation Laboratory
Lithuania	(32)	Atmospheric Pollution Research Laboratory, Institute of Physics, Vilnius
Netherlands	(14)	National Institute of Public Health and Environmental Protection (RIVM)
Norway	(15)	Norwegian Institute for Air Research (NILU)
Macedonia	(40)	Hydrometeorological Institute, Skopje
Poland	(16)	Institute of Meteorology and Water Management, Warsaw
Poland	(39)	Environmental Monitoring Laboratory, Institute of Environmental Protection
Portugal	(17)	Laboratorio Santo Andre
Russian Federation	(22)	Institute of Global Climate and Ecology
Serbia and Montenegro	(24)	Rep. Hydrometeorological Institute of Serbia
Slovakia	(31)	Slovak Hydrometeorological Institute
Slovenia	(36)	Hydrometeorological Institute of Slovenia
Spain	(19)	Centro Nacional de Sanidad Ambiental
Sweden	(20)	Swedish Environmental Research Institute (IVL), Gothenburg
Switzerland	(21)	Swiss Federal Laboratories for Materials Testing (EMPA)
United Kingdom	(23)	AEA Technology, National Environmental Technology Centre
United States of America	(27)	Illinois State Water Survey

Table 33b: Participating laboratories outside the EMEP network.

Germany	(102)	Ökologie-Zentrum Universität Kiel
Germany	(104)	Hessige Landwirtschafliche
Finland	(107)	The Finnish Forest Institute
Germany	(109)	Institut für Bondenkunde und Waldernährung
Germany	(110)	Thüringer Landesanstalt für Landwirtschaft (TTL), Jena
Germany	(112)	Niedersächsische Forstliche Versuchsanstalt (NVF)
Germany	(115)	Bayerische Landesanstalt f. Wald- und Forstwirtshaft
Switzerland	(116)	Institute for Applied Plant Biology
Germany	(117)	Sächsische Landesanstalt für Forsten, Graupa
Germany	(118)	Forstliche Versuchs-und Forschungsansta
Germany	(120)	Landwirtschaftliche Untersuchungs- und Forschungsanstalt (LUFA)
Germany	(121)	Landesamt für Natur und Umwelt
Belgium	(124)	Laboratorium voor Bondemkunde, Gent
Germany	(125)	Bayerisches Landesamt für Umweltschutz, Augsburg
Italy	(126)	APPA Laboratorio Biologico Provinciale
Denmark	(139)	Danish Centre for Forest, Landscape and Planning, Hørsholm
Italy	(140)	C.N.R. Istituto di Ricerca sulle Acque
Austria	(147)	Institute of Pollution Research and Forest Chemistry
Netherlands	(148)	Alterra, Wageningen
Switzerland	(149)	WSL Zentrallabor, Birmensdorf
Belgium	(151)	Laboratoire de l'Unitè des Eaux et Forêst (EFOR)
Norway	(152)	Norwegian Forest Research Institute, Ås
Slovenia	(153)	Slovenian Forestry Institute, Ljubljana
United Kingdom	(155)	Environmental Research Branch, Farnham
Japan	(158)	Acid Deposition and Oxidant Research Center (ADOCRC), Niigata
Ireland	(160)	Coillte Research Laboratory, Newtownmountkennedy
Slovenia	(161)	National Institute of Chemistry
Thailand	(163)	Environmental Researching and Training Center (ERTC)
Thailand	(164)	Pollution Control Department (PCD), Bangkok
Viet Nam	(165)	Institute of Meteorology and Hydrology, Ha Noi

Table 34:   Analytical methods used at the participating laboratories for the determination of sulphur dioxide in absorbing solution (A).

Method	Laboratory
1. Ion chromatography	6, 15, 17, 21, 23,36

Table 35:   Analytical methods used at the participating laboratories for the determination of sulphur dioxide on impregnated filters (B).

Method	Laboratory
1. Spectrophotometry	16
2. Ion chromatography	3, 4, 5, 8, 11, 12, 13, 15, 20, 22, 31,32, 33, 34, 36, 38, 116, 158, 164, 165
3. Capillary Ion Analysis	39

Table 36:   Analytical methods used at the participating laboratories for determination of nitric acid on impregnated filters (B).

Method	Laboratory
1. Reduction to nitrite	16
2. Ion chromatography	3, 4, 5, 8, 11, 13, 15, 20, 22, 31,32, 33, 34, 36, 116,158, 64, 165
3. Capillary Ion Analysis	39

Table 37:   Analytical methods for determination of ammonia on impregnated filters (J).

Method	Laboratory
1. Spectrophotometry	3, 4, 8, 10, 19, 20, 32, 33, 39, 116
3. Ion chromatography	5, 13,15, 31, 36, 38,158,165

Table 38:   Analytical results for sulphur dioxide in absorbing solution.

Method	Laboratory
Ion chromatography	19, 22
Spectrophotometry	3, 8, 10, 15, 16, 20, 23, 24, 31, 32, 33, 35, 38, 39

Table 39:   Analytical results for sulphur dioxide in absorbing solution.

```
SO2-S in absorbing solution          SO2-S in absorbing solution
Sample no.: A1                       Sample no.: A3
Theoretical value:       0.240       Theoretical value:       0.140
Unit:                                Unit:

Run 1:                               Run 1:

Number of laboratories:       7      Number of laboratories:       7
Arithmetic mean value:    0.229      Arithmetic mean value:    0.136
Median:                   0.241      Median:                   0.136
Standard deviation        0.036      Standard deviation        0.021
Rel. st. deviation (%)   15.851      Rel. st. deviation (%)   15.117

Run 2:                               Run 2:

Number of laboratories:       6      Number of laboratories:       7
Arithmetic mean value:    0.241      Arithmetic mean value:    0.136
Median:                   0.244      Median:                   0.136
Standard deviation        0.015      Standard deviation        0.021
Rel. st. deviation (%)    6.412      Rel. st. deviation (%)   15.117

Results in decreasing order:         Results in decreasing order:

  17    0.263     36    0.231          17    0.170     36    0.134
  23    0.248     15    0.218          21    0.141     15    0.130
  21    0.247     19    0.153 (*)      23    0.139     19    0.100
   6    0.241                           6    0.136


SO2-S in absorbing solution          SO2-S in absorbing solution
Sample no.: A4                       Sample no.: A5
Theoretical value:       0.440       Theoretical value:       0.160
Unit:                                Unit:

Run 1:                               Run 1:

Number of laboratories:       7      Number of laboratories:       7
Arithmetic mean value:    0.416      Arithmetic mean value:    0.159
Median:                   0.420      Median:                   0.158
Standard deviation        0.036      Standard deviation        0.013
Rel. st. deviation (%)    8.581      Rel. st. deviation (%)    8.283

Run 2:                               Run 2:

Number of laboratories:       6      Number of laboratories:       7
Arithmetic mean value:    0.429      Arithmetic mean value:    0.159
Median:                   0.428      Median:                   0.158
Standard deviation        0.013      Standard deviation        0.013
Rel. st. deviation (%)    3.106      Rel. st. deviation (%)    8.283

Results in decreasing order:         Results in decreasing order:

  21    0.443     15    0.418          17    0.183     36    0.151
  23    0.442     17    0.413          23    0.166     19    0.147
   6    0.437     19    0.340 (*)      21    0.162     15    0.145
  36    0.420                           6    0.158
```

Table 40: *The ratios of the theoretical values and the results found by the laboratories in the determination of sulphur dioxide in absorbing solutions.*

Lab no.	Measured / Expected value Sample No.			
	A1	A3	A4	A5
6	1.00	0.97	0.99	0.99
15	0.91	0.93	0.95	0.90
17	1.09	1.21	0.94	1.14
19	0.64	0.71	0.77	0.92
21	1.03	1.01	1.00	1.01
23	1.03	0.99	1.00	1.04
36	0.96	0.96	0.95	0.94

Table 41:   Analytical results for sulphur dioxide in impregnated filter.

```
SO2-S on impregnated filter           SO2-S on impregnated filter
Sample no.: B2                        Sample no.: B3
Theoretical value:      24.050        Theoretical value:      10.020
Unit: ug S/filter                     Unit: ug S/filter

Run 1:                                Run 1:

Number of laboratories:     19        Number of laboratories:     19
Arithmetic mean value:  22.522        Arithmetic mean value:   9.301
Median:                 23.190        Median:                  9.500
Standard deviation       2.209        Standard deviation       1.547
Rel. st. deviation (%)   9.808        Rel. st. deviation (%)  16.636

Run 2:                                Run 2:

Number of laboratories:     18        Number of laboratories:     18
Arithmetic mean value:  22.815        Arithmetic mean value:   9.541
Median:                 23.245        Median:                  9.553
Standard deviation       1.855        Standard deviation       1.173
Rel. st. deviation (%)   8.131        Rel. st. deviation (%)  12.292

Results in decreasing order:          Results in decreasing order:

   8   25.700     20   22.727           33   11.348     15   9.420
  31   24.751     36   22.360            8   11.000     20   9.180
  15   24.700    116   21.600           16   10.950    165   9.020
   3   24.440     32   21.600            3   10.760      4   8.920
  33   24.188     38   21.270            5   10.573     38   8.770
   5   24.013    165   20.490          158   10.090     32   8.350
   4   23.740     39   20.400           36    9.860    116   7.900
  16   23.650    164   18.550           22    9.700    164   6.800
  22   23.300     11   17.250 (*)       31    9.605     11   4.980 (*)
 158   23.190                           39    9.500


SO2-S on impregnated filter           SO2-S on impregnated filter
Sample no.: B4                        Sample no.: B5
Theoretical value:      72.100        Theoretical value:      56.080
Unit: ug S/filter                     Unit: ug S/filter

Run 1:                                Run 1:

Number of laboratories:     19        Number of laboratories:     19
Arithmetic mean value:  69.999        Arithmetic mean value:  54.330
Median:                 71.400        Median:                 54.640
Standard deviation       4.631        Standard deviation       3.768
Rel. st. deviation (%)   6.616        Rel. st. deviation (%)   6.935

Run 2:                                Run 2:

Number of laboratories:     18        Number of laboratories:     18
Arithmetic mean value:  70.563        Arithmetic mean value:  54.751
Median:                 71.621        Median:                 54.980
Standard deviation       4.039        Standard deviation       3.386
Rel. st. deviation (%)   5.723        Rel. st. deviation (%)   6.184

Results in decreasing order:          Results in decreasing order:

  33   76.393     36   71.160           22   61.100    116   54.500
  22   74.900    158   70.850           33   58.655     32   53.960
  15   74.200      4   70.780           31   57.680     20   53.020
   5   74.043     20   68.920           15   57.400     38   52.470
  16   73.120     38   65.970            5   57.333     36   51.960
   3   72.110    165   65.840           16   57.230    165   50.600
 116   72.000     39   63.000          158   56.350     39   49.900
  32   71.990     11   61.620            8   55.700     11   47.700
  31   71.843    164   59.850 (*)        3   55.320    164   46.750 (*)
   8   71.400                            4   54.640
```

Table 42: *The ratios of the theoretical values and the results found by the laboratories in the determination of sulphur dioxide on impregnated filters. The reported results are corrected for blank value (B1).*

| Lab no. | Measured / expected value Sample no. | | | | |
	B2	B 3	B 4	B 5	Average
3	1.02	1.07	1.00	0.99	1.02
4	0.99	0.89	0.98	0.97	0.96
5	1.00	1.06	1.03	1.02	1.03
8	1.07	1.10	0.99	0.99	1.04
11	0.72	0.50	0.85	0.85	0.73
15	1.03	0.94	1.03	1.02	1.00
16	0.98	1.09	1.01	1.02	1.03
20	0.94	0.92	0.96	0.95	0.94
22	0.97	0.97	1.04	1.09	1.02
31	1.03	0.96	1.00	1.03	1.00
32	0.90	0.83	1.00	0.96	0.92
33	1.01	1.13	1.06	1.05	1.06
36	0.93	0.98	0.99	0.93	0.96
38	0.88	0.88	0.91	0.94	0.90
39	0.85	0.95	0.87	0.89	0.89
116	0.90	0.79	1.00	0.97	0.91
158	0.96	1.01	0.98	1.00	0.99
164	0.77	0.68	0.83	0.83	0.78
165	0.85	0.90	0.91	0.90	0.89

Table 43: Analytical results for nitric acid on impregnated filter.

```
HNO3-N on impregnated filter          HNO3-N on impregnated filter
Sample no.: B2                        Sample no.: B3
Theoretical value:       16.360       Theoretical value:        9.816
Unit: ug N/filter                     Unit: ug N/filter

Run 1:                                Run 1:

Number of laboratories:      19       Number of laboratories:      19
Arithmetic mean value:   15.757       Arithmetic mean value:   10.038
Median:                  15.966       Median:                  10.010
Standard deviation        1.329       Standard deviation        0.803
Rel. st. deviation (%)    8.432       Rel. st. deviation (%)    7.997

Run 2:                                Run 2:

Number of laboratories:      18       Number of laboratories:      18
Arithmetic mean value:   16.015       Arithmetic mean value:   10.170
Median:                  16.009       Median:                  10.100
Standard deviation        0.723       Standard deviation        0.573
Rel. st. deviation (%)    4.514       Rel. st. deviation (%)    5.633

Results in decreasing order:          Results in decreasing order:

  33   17.350      4   15.880           8   11.200      3   10.000
  15   16.900     32   15.780          15   11.100     16   10.000
   8   16.900     31   15.696          32   10.990     20    9.920
 158   16.560     38   15.600           5   10.736     11    9.860
  36   16.490     16   15.500           4   10.360    165    9.830
  22   16.350    116   15.400          33   10.304     31    9.619
   3   16.290    165   14.930          22   10.250     39    9.600
  11   16.230     39   14.400          38   10.200    116    8.900
  20   16.053    164   11.100 (*)      36   10.190    164    7.650 (*)
   5   15.966                         158   10.010


HNO3-N on impregnated filter          HNO3-N on impregnated filter
Sample no.: B4                        Sample no.: B5
Theoretical value:       32.720       Theoretical value:       29.450
Unit: ug N/filter                     Unit: ug N/filter

Run 1:                                Run 1:

Number of laboratories:      19       Number of laboratories:      19
Arithmetic mean value:   32.669       Arithmetic mean value:   28.921
Median:                  32.660       Median:                  29.490
Standard deviation        1.679       Standard deviation        2.028
Rel. st. deviation (%)    5.138       Rel. st. deviation (%)    7.012

Run 2:                                Run 2:

Number of laboratories:      18       Number of laboratories:      18
Arithmetic mean value:   32.934       Arithmetic mean value:   29.305
Median:                  32.763       Median:                  29.540
Standard deviation        1.254       Standard deviation        1.175
Rel. st. deviation (%)    3.806       Rel. st. deviation (%)    4.009

Results in decreasing order:          Results in decreasing order:

  22   35.350      3   32.500          33   31.220     31   28.998
  15   34.800      8   32.200          15   31.000    165   28.990
  33   34.605     36   32.190           5   30.716     20   28.693
   5   34.456     31   32.124          22   30.150     11   28.210
 158   33.540    165   31.700           4   30.140     32   28.120
  38   33.400     32   31.440         158   30.140    116   28.000
   4   33.360    116   31.400          38   29.700     39   27.600
  11   33.120     39   31.100           8   29.600      3   27.140
  20   32.867    164   27.900 (*)      36   29.590    164   22.000 (*)
  16   32.660                          16   29.490
```

Table 3: *The ratios of the theoretical values and the results found by the laboratories in the determination of nitric acid on impregnated filters. The reported results are corrected for blank value (B1).*

| Lab no. | Measured / expected value | | | | Average |
| | Sample no. | | | | |
	B2	B 3	B 4	B 5	
3	1.00	1.02	0.99	0.92	0.98
4	0.97	1.06	1.02	1.02	1.03
5	0.98	1.09	1.05	1.04	1.06
8	1.03	1.14	0.98	1.01	1.04
11	0.99	1.00	1.01	0.96	0.99
15	1.03	1.13	1.06	1.05	1.08
16	0.95	1.02	1.00	1.00	1.01
20	0.98	1.01	1.00	0.97	1.00
22	1.00	1.04	1.08	1.02	1.05
31	0.96	0.98	0.98	0.98	0.98
32	0.96	1.12	0.96	0.95	1.01
33	1.06	1.05	1.06	1.06	1.06
36	1.01	1.04	0.98	1.00	1.01
38	0.95	1.04	1.02	1.01	1.02
39	0.88	0.98	0.95	0.94	0.96
116	0.94	0.91	0.96	0.95	0.94
158	1.01	1.02	1.03	1.02	1.02
164	0.68	0.78	0.85	0.75	0.79
165	0.91	1.00	0.97	0.98	0.98

Table 44:   Analytical results of nitrogen dioxide in absorbing solutions.

```
NO2-N in absorbing solution           NO2-N in absorbing solution
Sample no.: C1                        Sample no.: C2
Theoretical value:        0.084       Theoretical value:        0.051
Unit: ug N/ml                         Unit: ug N/ml

Run 1:                                Run 1:

Number of laboratories:      18       Number of laboratories:      18
Arithmetic mean value:    0.086       Arithmetic mean value:    0.052
Median:                   0.085       Median:                   0.052
Standard deviation        0.004       Standard deviation        0.004
Rel. st. deviation (%)    5.055       Rel. st. deviation (%)    8.211

Run 2:                                Run 2:

Number of laboratories:      18       Number of laboratories:      17
Arithmetic mean value:    0.086       Arithmetic mean value:    0.053
Median:                   0.085       Median:                   0.052
Standard deviation        0.004       Standard deviation        0.004
Rel. st. deviation (%)    5.055       Rel. st. deviation (%)    7.091

Results in decreasing order:          Results in decreasing order:

  32    0.093    10    0.085            12    0.059     4    0.052
   3    0.091    31    0.084            32    0.058     8    0.051
  33    0.090     8    0.084            33    0.058    16    0.050
  35    0.090    16    0.083            35    0.056    39    0.049
  20    0.089    38    0.082             3    0.055    15    0.049
  22    0.089    19    0.082            10    0.054    38    0.049
  24    0.089    23    0.080            20    0.054    19    0.048
  12    0.088    15    0.079            24    0.054    31    0.047
   4    0.086    39    0.079            22    0.052    23    0.043 (*)


NO2-N in absorbing solution           NO2-N in absorbing solution
Sample no.: C3                        Sample no.: C4
Theoretical value:        0.108       Theoretical value:        0.118
Unit: ug N/ml                         Unit: ug N/ml

Run 1:                                Run 1:

Number of laboratories:      18       Number of laboratories:      17
Arithmetic mean value:    0.108       Arithmetic mean value:    0.112
Median:                   0.106       Median:                   0.116
Standard deviation        0.006       Standard deviation        0.029
Rel. st. deviation (%)    5.469       Rel. st. deviation (%)   26.212

Run 2:                                Run 2:

Number of laboratories:      18       Number of laboratories:      16
Arithmetic mean value:    0.108       Arithmetic mean value:    0.119
Median:                   0.106       Median:                   0.117
Standard deviation        0.006       Standard deviation        0.007
Rel. st. deviation (%)    5.469       Rel. st. deviation (%)    5.739

Results in decreasing order:          Results in decreasing order:

  32    0.119    19    0.105            35    0.130    38    0.116
  35    0.118    38    0.105            32    0.129    10    0.115
  12    0.114    31    0.105            24    0.126    19    0.114
  33    0.114    24    0.105            33    0.126    16    0.114
  22    0.112    16    0.104            12    0.122    15    0.111
  20    0.111    39    0.103            20    0.122    39    0.111
   8    0.110     3    0.100             8    0.120     3    0.107
  10    0.108    15    0.100             4    0.118    22    0.001 (*)
   4    0.108    23    0.100            31    0.116
```

Table 45: *The ratios of the theoretical values and the results found by the laboratories in the determination of nitrogen dioxide in absorbing solutions.*

| Lab No. | Measured / expected value | | | | Average |
| | Sample No. | | | | |
	C1	C2	C3	C4	
3	1,08	1,08	0,93	0,90	1,00
4	1,01	1,04	1,00	1,00	1,01
8	1,00	1,01	1,02	1,02	1,01
10	1,01	1,07	1,00	0,97	1,01
12	1,04	1,17	1,06	1,03	1,07
15	0,94	0,97	0,93	0,94	0,94
16	0,98	0,99	0,96	0,97	0,98
19	0,97	0,95	0,97	0,97	0,96
20	1,05	1,06	1,03	1,04	1,05
22	1,06	1,03	1,04	0,01	0,78
23	0,95	0,85	0,93		0,91
24	1,06	1,07	0,97	1,07	1,04
31	1,00	0,93	0,97	0,98	0,97
32	1,10	1,15	1,10	1,09	1,11
33	1,07	1,15	1,06	1,07	1,08
35	1,07	1,11	1,09	1,10	1,09
38	0,97	0,97	0,97	0,98	0,97
39	0,94	0,97	0,95	0,94	0,95

Table 46:   Analytical results for ammonia on impregnated filter.

```
NH3-N on impregnated filter          NH3-N on impregnated filter
Sample no.: J1                       Sample no.: J2
Theoretical value:       10.030      Theoretical value:       22.060
Unit: ug N/filter                    Unit: ug N/filter

Run 1:                               Run 1:

Number of laboratories:      18      Number of laboratories:      18
Arithmetic mean value:    9.549      Arithmetic mean value:   20.992
Median:                   9.540      Median:                  21.402
Standard deviation        1.759      Standard deviation        1.856
Rel. st. deviation (%)   18.424      Rel. st. deviation (%)    8.841

Run 2:                               Run 2:

Number of laboratories:      17      Number of laboratories:      17
Arithmetic mean value:    9.302      Arithmetic mean value:   21.298
Median:                   9.510      Median:                  21.484
Standard deviation        1.459      Standard deviation        1.367
Rel. st. deviation (%)   15.684      Rel. st. deviation (%)    6.419

Results in decreasing order:         Results in decreasing order:

  15   13.735 (*)   39   9.510         38   23.650      20   21.320
  31   11.628       19   9.451         31   22.788       4   21.150
  38   10.950       33   9.338         13   22.310      32   20.960
  13   10.900      116   9.010         15   22.135       5   20.880
   4   10.350      158   8.810         33   22.018      39   20.410
   8   10.150       32   8.270         36   22.015     165   20.310
  36    9.915      165   7.970          8   21.850     158   19.410
  20    9.670       10   6.388        116   21.720       3   17.660
   5    9.570        3   6.260         19   21.484      10   15.790 (*)


NH3-N on impregnated filter          NH3-N on impregnated filter
Sample no.: J3                       Sample no.: J4
Theoretical value:       32.080      Theoretical value:        9.020
Unit: ug N/filter                    Unit: ug N/filter

Run 1:                               Run 1:

Number of laboratories:      18      Number of laboratories:      18
Arithmetic mean value:   31.433      Arithmetic mean value:    9.442
Median:                  31.985      Median:                   8.827
Standard deviation        2.554      Standard deviation        3.975
Rel. st. deviation (%)    8.127      Rel. st. deviation (%)   42.104

Run 2:                               Run 2:

Number of laboratories:      17      Number of laboratories:      17
Arithmetic mean value:   31.849      Arithmetic mean value:    8.550
Median:                  32.120      Median:                   8.824
Standard deviation        1.906      Standard deviation        1.267
Rel. st. deviation (%)    5.983      Rel. st. deviation (%)   14.814

Results in decreasing order:         Results in decreasing order:

  13   34.160        5   31.850        165   24.590 (*)   19   8.824
  32   34.100       20   31.580         38   10.050       20   8.740
  38   33.950        4   31.250         13    9.990      116   8.560
  33   33.658      165   30.300         36    9.915       33   8.479
  36   33.215       39   30.110         31    9.588       32   7.920
  15   33.135       31   29.718          4    9.350      158   7.800
   8   33.050      158   29.110         39    9.010        8   7.750
  19   32.375        3   27.752         15    8.875       10   6.530
 116   32.120       10   24.369 (*)      5    8.830        3   5.147
```

Table 47: *The ratios of the theoretical values and the results found by the laboratories in the determination of ammonia on impregnated filters. The reported results are corrected for an average blank value (J5 and J6).*

| Lab No. | Measured / expected value Sample no. | | | | Average |
	J 1	J 2	J 3	J 4	
3	0.62	0.80	0.87	0.57	0.72
4	1.03	0.96	0.97	1.04	1.00
5	0.95	0.95	0.99	0.98	0.97
8	1.01	0.99	1.03	0.86	0.97
10	0.64	0.72	0.76	0.72	0.71
13	1.09	1.01	1.06	1.11	1.07
15	1.37	1.00	1.03	0.98	1.10
19	0.94	0.97	1.01	0.98	0.98
20	0.96	0.97	0.98	0.97	0.97
31	1.16	1.03	0.93	1.06	1.05
32	0.82	0.95	1.06	0.88	0.93
33	0.93	1.00	1.05	0.94	0.98
36	0.99	1.00	1.04	1.10	1.03
38	1.09	1.07	1.06	1.11	1.08
39	0.95	0.93	0.94	1.00	0.95
116	0.90	0.98	1.00	0.95	0.96
158	0.88	0.88	0.91	0.86	0.88
165	0.80	0.92	0.94	2.73	1.35

Table 48:   Analytical results for sulphate in precipitation samples.

```
Sulphate in precipitation              Sulphate in precipitation
Sample no.: G1                         Sample no.: G2
Theoretical value:        1.533        Theoretical value:        1.766
Unit: µg/l                             Unit: µg/l

Run 1:                                 Run 1:
Number of laboratories:       64       Number of laboratories:       63
Arithmetic mean value:    1.644        Arithmetic mean value:    1.905
Median:                   1.538        Median:                   1.757
Standard deviation        0.573        Standard deviation        0.700
Rel. st. deviation (%)   34.879        Rel. st. deviation (%)   36.745

Run 2:                                 Run 2:
Number of laboratories:       62       Number of laboratories:       61
Arithmetic mean value:    1.548        Arithmetic mean value:    1.786
Median:                   1.535        Median:                   1.757
Standard deviation        0.196        Standard deviation        0.229
Rel. st. deviation (%)   12.693        Rel. st. deviation (%)   12.837

Results in decreasing order:           Results in decreasing order:
 139    4.720 (*)  158    1.536         139    5.740 (*)  149    1.757
 104    4.530 (*)   27    1.535         104    5.320 (*)   27    1.756
  13    2.590       116    1.535          13    3.030      117    1.756
  10    2.184         5    1.525          10    2.456         5    1.755
 160    1.920        15    1.524         160    2.190        15    1.750
  14    1.760         6    1.520           7    2.015       102    1.750
   2    1.735       152    1.510           2    1.993       161    1.750
   7    1.734        26    1.505          14    1.990        32    1.741
 151    1.680       120    1.500          31    1.951        19    1.739
 107    1.660        12    1.500         151    1.930        26    1.733
  31    1.615        38    1.500         107    1.920       167    1.732
   8    1.610       166    1.500          22    1.873       152    1.730
  22    1.604       125    1.491          23    1.862       166    1.730
 153    1.604       140    1.480         147    1.840        11    1.726
   3    1.583        11    1.479           8    1.840        38    1.720
  30    1.580       118    1.470         110    1.820        12    1.720
  39    1.574       147    1.470          35    1.811       120    1.720
  24    1.570       167    1.469          30    1.810       140    1.710
  35    1.569       102    1.464           3    1.808       125    1.709
 121    1.560        36    1.460         165    1.804        36    1.694
  23    1.560        32    1.458          39    1.803       121    1.680
  21    1.554        19    1.457         115    1.790        20    1.667
 165    1.551        20    1.452          21    1.781       109    1.650
 115    1.550       109    1.410          24    1.780       112    1.620
 124    1.550       112    1.400           1    1.770        33    1.600
  16    1.548        33    1.400           4    1.768       118    1.570
   4    1.546       117    1.361         158    1.764       126    1.550
 149    1.542       126    1.320         163    1.763       148    1.500
   1    1.540       164    1.280         116    1.762       164    1.460
 110    1.540       148    1.280         124    1.760        17    1.416
 161    1.540       155    1.251           6    1.760       155    1.372
 163    1.539        17    1.240          16    1.757

Sulphate in precipitation              Sulphate in precipitation
Sample no.: G3                         Sample no.: G4
Theoretical value:        0.983        Theoretical value:        1.183
Unit: µg/l                             Unit: µg/l

Run 1:                                 Run 1:
Number of laboratories:       64       Number of laboratories:       63
Arithmetic mean value:    1.024        Arithmetic mean value:    1.222
Median:                   0.978        Median:                   1.172
Standard deviation        0.279        Standard deviation        0.334
Rel. st. deviation (%)   27.302        Rel. st. deviation (%)   27.362

Run 2:                                 Run 2:
Number of laboratories:       62       Number of laboratories:       61
Arithmetic mean value:    0.983        Arithmetic mean value:    1.171
Median:                   0.977        Median:                   1.170
Standard deviation        0.098        Standard deviation        0.093
Rel. st. deviation (%)    9.981        Rel. st. deviation (%)    7.925

Results in decreasing order:           Results in decreasing order:
 104    3.000 (*)    1    0.978         104    3.630 (*)    6    1.170
  10    1.593 (*)   15    0.976          13    1.900 (*)  102    1.166
  13    1.400       158    0.972           7    1.405      167    1.164
   7    1.190        19    0.971          14    1.380      163    1.163
  14    1.150       124    0.970         160    1.380       38    1.160
 160    1.130         6    0.970           2    1.350      149    1.159
 112    1.120       166    0.970          31    1.294       26    1.159
   2    1.095       149    0.970         121    1.290        5    1.157
  22    1.052        26    0.967         107    1.280       19    1.157
  31    1.045       167    0.965          22    1.263      152    1.150
 107    1.040        11    0.965          23    1.243       12    1.150
 153    1.037         5    0.964           8    1.240      109    1.150
 102    1.036        16    0.962         151    1.240       16    1.148
 151    1.030       110    0.960         153    1.237       11    1.146
   8    1.030       116    0.957         115    1.220      140    1.140
  24    1.010       152    0.950          24    1.210      120    1.140
 115    1.010        12    0.950          35    1.209      112    1.140
  35    1.010       109    0.950           3    1.209      110    1.140
  39    1.009       140    0.940          21    1.196      125    1.125
  23    1.007       155    0.937          10    1.194      118    1.120
   3    1.003       125    0.935          30    1.190       36    1.114
 139    1.000        20    0.932         165    1.190      126    1.110
  21    0.995        38    0.930           4    1.189       20    1.109
   4    0.990        36    0.925          27    1.186       32    1.095
  27    0.990       147    0.920          39    1.181       33    1.060
 165    0.984        32    0.905         116    1.181      117    1.059
 121    0.981       126    0.900           1    1.180      124    1.050
 118    0.980        33    0.890         147    1.180      155    1.027
 120    0.980       117    0.889         161    1.180      164    0.990
  30    0.980       164    0.800         166    1.180       17    0.956
 161    0.980        17    0.800         158    1.173      148    0.860
 163    0.979       148    0.610          15    1.172
```

Table 49: Analytical results for nitrate in precipitation samples.

```
Nitrate in precipitation                    Nitrate in precipitation
Sample no.: G1                              Sample no.: G2
Theoretical value:          0.497          Theoretical value:          0.431
Unit: µg/l                                  Unit: µg/l

Run 1:                                      Run 1:
Number of laboratories:       63           Number of laboratories:       62
Arithmetic mean value:    0.527            Arithmetic mean value:    0.471
Median:                   0.484            Median:                   0.430
Standard deviation        0.246            Standard deviation        0.224
Rel. st. deviation (%)   46.618            Rel. st. deviation (%)   47.588

Run 2:                                      Run 2:
Number of laboratories:       61           Number of laboratories:       60
Arithmetic mean value:    0.484            Arithmetic mean value:    0.432
Median:                   0.484            Median:                   0.430
Standard deviation        0.027            Standard deviation        0.028
Rel. st. deviation (%)    5.624            Rel. st. deviation (%)    6.572

Results in decreasing order:               Results in decreasing order:
 121    2.100 (*)     5   0.484            121    1.900 (*)   104   0.430
 167    1.580 (*)    21   0.482            167    1.410 (*)     6   0.430
  10    0.593        16   0.481             10    0.553       110   0.430
   2    0.549         6   0.480             13    0.480       117   0.430
  22    0.527       110   0.480              2    0.478       118   0.430
  32    0.525        26   0.479             32    0.472        24   0.430
 153    0.521       158   0.477             22    0.471       158   0.427
  13    0.520         7   0.476              8    0.468         7   0.425
   8    0.514         3   0.475             31    0.461         3   0.425
  11    0.514       155   0.474             11    0.461        15   0.422
  12    0.500       163   0.473             35    0.452       155   0.421
 151    0.500        39   0.471             12    0.450       163   0.421
 161    0.500       160   0.470            151    0.450       107   0.421
 112    0.500       117   0.470            161    0.450       120   0.420
 118    0.500       107   0.470             20    0.443       124   0.420
  23    0.499       124   0.470            165    0.443        14   0.420
  35    0.499       147   0.470             38    0.443       160   0.420
  31    0.494        15   0.469              1    0.442        19   0.418
  38    0.493        19   0.463             36    0.442       140   0.410
 148    0.492       109   0.460            148    0.441        33   0.410
 149    0.491       140   0.460            149    0.440       147   0.410
  24    0.490        14   0.460            112    0.440       125   0.406
  20    0.490        33   0.460            166    0.440       102   0.400
 104    0.490       120   0.460              5    0.439       152   0.400
 166    0.490       125   0.457             27    0.438       109   0.400
  36    0.489       116   0.455              4    0.436       116   0.398
 102    0.489        30   0.450            115    0.436       126   0.397
  27    0.488       152   0.450             23    0.433        17   0.393
   1    0.485        17   0.446             26    0.433        39   0.392
   4    0.485       126   0.438             21    0.431        30   0.380
 165    0.484       164   0.410             16    0.431       164   0.360
 115    0.484

Nitrate in precipitation                    Nitrate in precipitation
Sample no.: G3                              Sample no.: G4
Theoretical value:          0.637          Theoretical value:          0.741
Unit: µg/l                                  Unit: µg/l

Run 1:                                      Run 1:
Number of laboratories:       63           Number of laboratories:       63
Arithmetic mean value:    0.696            Arithmetic mean value:    0.807
Median:                   0.638            Median:                   0.740
Standard deviation        0.315            Standard deviation        0.374
Rel. st. deviation (%)   45.237            Rel. st. deviation (%)   46.302

Run 2:                                      Run 2:
Number of laboratories:       61           Number of laboratories:       61
Arithmetic mean value:    0.641            Arithmetic mean value:    0.741
Median:                   0.637            Median:                   0.740
Standard deviation        0.036            Standard deviation        0.038
Rel. st. deviation (%)    5.559            Rel. st. deviation (%)    5.095

Results in decreasing order:               Results in decreasing order:
 121    2.720 (*)   155   0.637            121    3.140 (*)     6   0.740
 167    2.031 (*)   107   0.637            167    2.497 (*)   110   0.740
  10    0.776       102   0.636              2    0.856       158   0.740
  22    0.715       115   0.636             22    0.851         7   0.737
   2    0.715       165   0.635             13    0.809       163   0.736
  32    0.711       158   0.635             32    0.791        20   0.736
  11    0.695         3   0.634             12    0.790       155   0.735
  13    0.682         7   0.632             31    0.788       149   0.735
 151    0.680       147   0.630              8    0.773        15   0.731
  12    0.680        19   0.629             23    0.772       160   0.730
 104    0.670       163   0.628            153    0.771       120   0.730
 153    0.669        15   0.626             11    0.770       117   0.730
   8    0.668        26   0.626            166    0.770       112   0.730
 148    0.663        16   0.625            151    0.770        26   0.729
  23    0.662        39   0.623            161    0.770        19   0.728
 166    0.660       117   0.620            148    0.768        16   0.725
  31    0.659        33   0.620            104    0.760       116   0.715
  38    0.653       124   0.620             38    0.759        10   0.714
  35    0.651       118   0.620             27    0.756        14   0.710
 161    0.650       160   0.620             21    0.755       140   0.710
  36    0.649       120   0.610             35    0.753       124   0.710
  27    0.649        14   0.610             36    0.752        33   0.710
   4    0.647       140   0.610              4    0.752        17   0.703
  21    0.646       125   0.602            147    0.750       109   0.700
   1    0.641       116   0.600            165    0.750       152   0.700
  24    0.640       109   0.600              5    0.748       126   0.699
 112    0.640        17   0.600              1    0.747       125   0.697
   6    0.640       126   0.593            115    0.745       102   0.672
 110    0.640       152   0.590            107    0.742        30   0.670
 149    0.639        30   0.570             24    0.740        39   0.660
   5    0.639       164   0.560            118    0.740       164   0.650
  20    0.638                                3    0.740
```

Table 50:   Analytical results for ammonium in precipitation samples.

```
Ammonium in precipitation                   Ammonium in precipitation
Sample no.: G1                              Sample no.: G2
Theoretical value:         0.281           Theoretical value:         0.180
Unit: µg/l                                  Unit: µg/l

Run 1:                                      Run 1:
Number of laboratories:       62           Number of laboratories:       60
Arithmetic mean value:     0.285           Arithmetic mean value:     0.180
Median:                    0.285           Median:                    0.183
Standard deviation         0.034           Standard deviation         0.040
Rel. st. deviation (%)    12.081           Rel. st. deviation (%)    21.915

Run 2:                                      Run 2:
Number of laboratories:       56           Number of laboratories:       58
Arithmetic mean value:     0.284           Arithmetic mean value:     0.186
Median:                    0.285           Median:                    0.185
Standard deviation         0.015           Standard deviation         0.026
Rel. st. deviation (%)     5.394           Rel. st. deviation (%)    13.795

Results in decreasing order:                Results in decreasing order:
  2    0.378 (*)   167   0.285               2    0.255         4   0.182
164    0.370 (*)     4   0.285             121    0.251        16   0.181
121    0.365 (*)    36   0.285             147    0.250       163   0.181
147    0.360 (*)     1   0.284             164    0.240       110   0.180
 32    0.320        21   0.284              32    0.234       107   0.180
120    0.310       158   0.282              13    0.213       102   0.180
 39    0.303        10   0.282              39    0.212        33   0.180
 31    0.301       163   0.281             124    0.200         7   0.179
 24    0.300        30   0.280              24    0.200         5   0.177
161    0.300       109   0.280              36    0.200        10   0.177
112    0.300        14   0.280             112    0.200        22   0.177
124    0.300        33   0.280             158    0.196        14   0.176
 17    0.298       166   0.280               1    0.195       118   0.175
149    0.297         6   0.280              19    0.194         6   0.170
 22    0.295       152   0.280              31    0.194       104   0.170
 26    0.294       107   0.277             125    0.194       166   0.170
 13    0.294       118   0.275              20    0.191       155   0.170
153    0.293         3   0.273             160    0.190       109   0.170
125    0.292        16   0.273              17    0.190       152   0.170
 19    0.290       126   0.273              30    0.190        38   0.170
117    0.290         5   0.272               3    0.190         8   0.167
 27    0.290       104   0.270             161    0.190       116   0.166
 15    0.290        23   0.270              12    0.190       126   0.164
160    0.290         7   0.269             140    0.190        35   0.162
110    0.290        38   0.264              15    0.190       148   0.157
 12    0.290         8   0.260             149    0.188       151   0.140
140    0.290       116   0.248              27    0.188       120   0.130
 20    0.288       148   0.245              26    0.188       165   0.108
                                                             115 <  0.080
 35    0.287       151   0.230              21    0.186        23   0.026 (*)
102    0.286       165   0.203 (*)         167    0.184       117   0.010 (*)
155    0.285       115   0.127 (*)

Ammonium in precipitation                   Ammonium in precipitation
Sample no.: G3                              Sample no.: G4
Theoretical value:         0.401           Theoretical value:         0.481
Unit: µg/l                                  Unit: µg/l

Run 1:                                      Run 1:
Number of laboratories:       62           Number of laboratories:       62
Arithmetic mean value:     0.405           Arithmetic mean value:     0.480
Median:                    0.404           Median:                    0.485
Standard deviation         0.048           Standard deviation         0.076
Rel. st. deviation (%)    11.861           Rel. st. deviation (%)    15.835

Run 2:                                      Run 2:
Number of laboratories:       56           Number of laboratories:       59
Arithmetic mean value:     0.401           Arithmetic mean value:     0.487
Median:                    0.403           Median:                    0.486
Standard deviation         0.026           Standard deviation         0.044
Rel. st. deviation (%)     6.585           Rel. st. deviation (%)     9.061

Results in decreasing order:                Results in decreasing order:
  2    0.540 (*)    10   0.403             121    0.647 (*)    21   0.484
121    0.535 (*)     4   0.403               2    0.624         4   0.481
164    0.520 (*)   116   0.402             164    0.600       117   0.480
147    0.510 (*)   126   0.402              22    0.590       160   0.480
 35    0.476       104   0.400             147    0.580        30   0.480
 32    0.464       120   0.400              32    0.549        10   0.480
  6    0.440        12   0.400             110    0.540         5   0.479
161    0.430        33   0.400              39    0.522       165   0.478
110    0.430       165   0.397             126    0.516       163   0.477
 39    0.423         5   0.397              35    0.516       116   0.476
 17    0.422        14   0.394             125    0.515        14   0.471
 36    0.420       163   0.394             149    0.507        12   0.470
 19    0.420         8   0.392              17    0.507         8   0.470
149    0.420        15   0.391              36    0.503         7   0.468
153    0.419       152   0.390             104    0.500        38   0.463
125    0.417         7   0.388             140    0.500        15   0.463
155    0.415        38   0.387               6    0.500       118   0.462
 13    0.415        31   0.387             152    0.500       166   0.460
  1    0.414       118   0.386             161    0.500       120   0.460
102    0.412       109   0.380              31    0.499        24   0.460
 20    0.410       166   0.380              27    0.497       109   0.460
140    0.410        22   0.377              19    0.497       102   0.454
117    0.410        16   0.376             158    0.494       112   0.450
 30    0.410        24   0.370             167    0.494        16   0.450
124    0.410       107   0.369             153    0.492       107   0.440
158    0.409       160   0.360             124    0.490       148   0.424
 21    0.408       148   0.359             155    0.490        23   0.403
 27    0.408         3   0.333              33    0.490         3   0.388
 26    0.407       151   0.310               1    0.488       151   0.360
167    0.406       112   0.280 (*)          20    0.486       115   0.326 (*)
 23    0.404       115   0.243 (*)          13    0.486        26   0.050 (*)
```

Table 51:   Analytical results for pH in precipitation samples.

```
pH in precipitation                        pH in precipitation
Sample no.: G1                             Sample no.: G2
Theoretical value:         4.100           Theoretical value:         4.040
Unit: pH-unit                              Unit: pH-unit

Run 1:                                     Run 1:
Number of laboratories:       58           Number of laboratories:       57
Arithmetic mean value:     4.206           Arithmetic mean value:     4.080
Median:                    4.140           Median:                    4.070
Standard deviation         0.323           Standard deviation         0.070
Rel. st. deviation (%)     7.688           Rel. st. deviation (%)     1.724

Run 2:                                     Run 2:
Number of laboratories:       56           Number of laboratories:       56
Arithmetic mean value:     4.152           Arithmetic mean value:     4.073
Median:                    4.140           Median:                    4.070
Standard deviation         0.090           Standard deviation         0.053
Rel. st. deviation (%)     2.170           Rel. st. deviation (%)     1.291

Results in decreasing order:               Results in decreasing order:
  2     6.360 (*)    6    4.140            117    4.430 (*)  148    4.070
121     5.050 (*)   27    4.140            164    4.200     149    4.070
160     4.480      124    4.140             19    4.184      12    4.070
 38     4.470      153    4.130              2    4.170     121    4.070
164     4.400      163    4.130             22    4.170     139    4.060
148     4.300      149    4.130            112    4.160     163    4.060
 19     4.232      139    4.130            166    4.150       5    4.060
166     4.220        8    4.130             14    4.140       6    4.060
 22     4.220      155    4.130             38    4.130      24    4.060
112     4.200       12    4.130            126    4.120     110    4.050
 14     4.190       32    4.130             26    4.120     152    4.050
 26     4.190       24    4.120            140    4.120      21    4.050
140     4.190       13    4.120             36    4.110      39    4.040
116     4.190       20    4.120            158    4.110      16    4.040
117     4.190        5    4.120            160    4.110      23    4.040
126     4.190       21    4.110            116    4.100     151    4.040
 17     4.180      120    4.110             17    4.100     120    4.030
158     4.170       39    4.110            118    4.090      10    4.030
 36     4.170      165    4.100            155    4.090      11    4.020
 15     4.150      151    4.090            109    4.090     165    4.020
 35     4.150       16    4.090              4    4.080      30    4.010
107     4.150       33    4.060             15    4.080       3    4.006
110     4.150       11    4.050             32    4.080      33    4.000
109     4.150        1    4.050              8    4.080     147    4.000
118     4.150      102    4.043             27    4.080      13    4.000
 30     4.150       10    4.040             35    4.080       1    3.980
152     4.150       23    4.040            107    4.080     102    3.972
  3     4.140        7    4.040            124    4.080       7    3.970
  4     4.140      147    4.000             20    4.070

pH in precipitation                        pH in precipitation
Sample no.: G3                             Sample no.: G4
Theoretical value:         4.400           Theoretical value:         4.320
Unit: pH-unit                              Unit: pH-unit

Run 1:                                     Run 1:
Number of laboratories:       59           Number of laboratories:       59
Arithmetic mean value:     4.457           Arithmetic mean value:     4.362
Median:                    4.440           Median:                    4.360
Standard deviation         0.203           Standard deviation         0.096
Rel. st. deviation (%)     4.547           Rel. st. deviation (%)     2.208

Run 2:                                     Run 2:
Number of laboratories:       57           Number of laboratories:       56
Arithmetic mean value:     4.440           Arithmetic mean value:     4.357
Median:                    4.440           Median:                    4.360
Standard deviation         0.077           Standard deviation         0.057
Rel. st. deviation (%)     1.740           Rel. st. deviation (%)     1.310

Results in decreasing order:               Results in decreasing order:
 38     5.820 (*)  148    4.430             38     4.750 (*)   8    4.360
112     4.760       32    4.430            112     4.650 (*) 109    4.350
104     4.620        2    4.430             22     4.490     163    4.350
166     4.620      149    4.430             19     4.486     152    4.350
 19     4.581      110    4.420            140     4.480     165    4.350
  1     4.500        5    4.420             14     4.470       5    4.340
 22     4.500      152    4.420              1     4.440      30    4.340
164     4.500       24    4.420            158     4.430      32    4.340
 26     4.500       12    4.420            116     4.420      24    4.340
158     4.490       21    4.410            166     4.420      13    4.330
 14     4.490       33    4.410             36     4.410     139    4.330
 36     4.480      139    4.410             26     4.400      20    4.330
117     4.480      165    4.410            155     4.400      21    4.330
140     4.470       20    4.410            164     4.400       3    4.330
 30     4.470        6    4.400            118     4.380       6    4.330
109     4.470       10    4.400              2     4.380      10    4.320
 17     4.460       16    4.400            104     4.380     160    4.320
 27     4.460       39    4.390             17     4.370     126    4.320
155     4.460       13    4.380             15     4.370      16    4.320
118     4.460       23    4.370            121     4.370      39    4.310
 35     4.460        3    4.365            124     4.370     110    4.300
107     4.450      120    4.360             35     4.370     120    4.290
124     4.450      151    4.350              4     4.370      33    4.290
126     4.450      121    4.340            117     4.370     147    4.280
  4     4.440       11    4.340            107     4.360      23    4.270
  8     4.440      102    4.333            153     4.360     102    4.262
153     4.440      147    4.300             12     4.360      11    4.260
 15     4.440        7    4.280             27     4.360       7    4.190
163     4.440      160    4.040 (*)        149     4.360     151    4.010 (*)
116     4.440                              148     4.360
```

Table 52:   Analytical results for strong acid calculated from pH.

```
Strong acid calculated from pH          Strong acid calculated from pH
Sample no.: G1                          Sample no.: G2
Theoretical value:      80.000          Theoretical value:      92.000
Unit: µeq                               Unit: µeq

Run 1:                                  Run 1:
Number of laboratories:      12         Number of laboratories:      12
Arithmetic mean value:   70.652         Arithmetic mean value:   85.655
Median:                  72.465         Median:                  82.240
Standard deviation       17.726         Standard deviation       11.634
Rel. st. deviation (%)   25.089         Rel. st. deviation (%)   13.583

Run 2:                                  Run 2:
Number of laboratories:      11         Number of laboratories:      11
Arithmetic mean value:   74.075         Arithmetic mean value:   83.169
Median:                  74.130         Median:                  81.300
Standard deviation       13.819         Standard deviation        8.205
Rel. st. deviation (%)   18.656         Rel. st. deviation (%)    9.865

Results in decreasing order:            Results in decreasing order:
 124  103.000      118   70.800          124  113.000 (*)  118   81.300
  14   82.000       35   70.790          165   95.500     155   81.280
 165   79.400      158   67.800          120   93.300     160   78.000
   6   78.000      126   66.000           14   92.000     158   77.100
 120   77.600      164   45.300            6   88.000     126   76.000
 155   74.130      160   33.000 (*)       35   83.180     164   69.200


Strong acid calculated from pH          Strong acid calculated from pH
Sample no.: G3                          Sample no.: G4
Theoretical value:      40.000          Theoretical value:      48.000
Unit: µeq                               Unit: µeq

Run 1:                                  Run 1:
Number of laboratories:      13         Number of laboratories:      13
Arithmetic mean value:   42.218         Arithmetic mean value:   46.059
Median:                  36.000         Median:                  45.000
Standard deviation       17.356         Standard deviation        8.580
Rel. st. deviation (%)   41.110         Rel. st. deviation (%)   18.628

Run 2:                                  Run 2:
Number of laboratories:      12         Number of laboratories:      12
Arithmetic mean value:   38.153         Arithmetic mean value:   43.981
Median:                  35.350         Median:                  43.830
Standard deviation        9.709         Standard deviation        4.364
Rel. st. deviation (%)   25.447         Rel. st. deviation (%)    9.923

Results in decreasing order:            Results in decreasing order:
 160   91.000 (*)  118   34.700          124   71.000 (*)   35   42.660
 124   64.000       35   34.670          120   51.300      104   42.000
  14   44.000      155   34.670          126   50.000      118   41.700
 120   43.700      164   33.100          160   48.000      155   39.810
 165   38.900      158   32.100           14   46.000      164   38.900
   6   38.000      104   24.000          165   45.000      158   37.400
 126   36.000                              6   45.000
```

Table 53:   Analytical results for chloride in precipitation samples.

```
Chloride in precipitation              Chloride in precipitation
Sample no.: G1                         Sample no.: G2
Theoretical value:        0.145        Theoretical value:        0.174
Unit: µg/l                             Unit: µg/l

Run 1:                                 Run 1:
Number of laboratories:      57        Number of laboratories:      57
Arithmetic mean value:    0.169        Arithmetic mean value:    0.218
Median:                   0.144        Median:                   0.179
Standard deviation        0.121        Standard deviation        0.140
Rel. st. deviation (%)   71.732        Rel. st. deviation (%)   64.143

Run 2:                                 Run 2:
Number of laboratories:      54        Number of laboratories:      55
Arithmetic mean value:    0.155        Arithmetic mean value:    0.195
Median:                   0.143        Median:                   0.178
Standard deviation        0.049        Standard deviation        0.064
Rel. st. deviation (%)   31.370        Rel. st. deviation (%)   32.630

Results in decreasing order:           Results in decreasing order:
  10    0.911 (*)   21    0.142          10    1.049 (*)   26    0.178
 160    0.420 (*)    7    0.141         117    0.610 (*)   32    0.177
 112 <  0.370
 153    0.320       16    0.141         160    0.440       35    0.176
  19 <  0.310
 166    0.300        3    0.140          23    0.417       27    0.173
 100 <  0.300                           112 <  0.370
 167    0.291      116    0.140         124    0.340      149    0.172
 104    0.240       15    0.140         166    0.320       16    0.172
   2    0.214      125    0.139         167    0.316        3    0.170
                                         19 <  0.310
                                        110 <  0.300
 161    0.210        8    0.139         161    0.280      102    0.170
 115    0.207       20    0.139         104    0.260       21    0.169
 151    0.200        1    0.138          22    0.233        7    0.168
 152    0.200      158    0.135         115    0.223       15    0.167
 117 <  0.200
  38    0.180       17    0.133         151    0.210       17    0.166
  24    0.180       36    0.131          38    0.210        8    0.165
  22    0.172      126    0.130           2    0.208       20    0.165
  32    0.171        6    0.130          30    0.200      158    0.162
 147    0.170      163    0.130         152    0.200      125    0.162
  30    0.170      140    0.130         148    0.200      155    0.162
   4    0.165      107    0.129         165    0.191       33    0.161
 155    0.162       33    0.129          39    0.191      140    0.160
  39    0.158      102    0.124           1    0.190        6    0.160
   5    0.151       11    0.101         120    0.190       36    0.158
  23    0.151      165    0.101          24    0.190      163    0.156
  12    0.150      124    0.100           4    0.189      107    0.156
  26    0.149      164    0.100          13    0.188      118    0.140
                   121 <  0.100
  35    0.148       14    0.091         116    0.182      126    0.140
  31    0.148      120    0.090          12    0.180       11    0.126
  13    0.146      118    0.070          31    0.180      164    0.120
 149    0.145      148   -0.100 (*)     147    0.180       14    0.111
  27    0.144                             5    0.179      121 <  0.100

Chloride in precipitation              Chloride in precipitation
Sample no.: G3                         Sample no.: G4
Theoretical value:        0.463        Theoretical value:        0.521
Unit: µg/l                             Unit: µg/l

Run 1:                                 Run 1:
Number of laboratories:      63        Number of laboratories:      63
Arithmetic mean value:    0.460        Arithmetic mean value:    0.519
Median:                   0.449        Median:                   0.505
Standard deviation        0.071        Standard deviation        0.067
Rel. st. deviation (%)   15.537        Rel. st. deviation (%)   12.917

Run 2:                                 Run 2:
Number of laboratories:      61        Number of laboratories:      58
Arithmetic mean value:    0.451        Arithmetic mean value:    0.510
Median:                   0.448        Median:                   0.503
Standard deviation        0.051        Standard deviation        0.045
Rel. st. deviation (%)   11.219        Rel. st. deviation (%)    8.879

Results in decreasing order:           Results in decreasing order:
  10    0.804 (*)   16    0.448         160    0.780 (*)   16    0.504
 160    0.660 (*)   22    0.446         167    0.673 (*)    4    0.502
 153    0.601        4    0.443         153    0.664 (*)  152    0.500
 112    0.570       36    0.443          10    0.655 (*)    6    0.500
 167    0.562      155    0.440          23    0.613       15    0.495
 166    0.560      158    0.437         166    0.600      163    0.493
 104    0.530      163    0.436         161    0.600      158    0.493
   2    0.522       15    0.434           2    0.597      155    0.492
  39    0.496      147    0.430         104    0.580      147    0.490
 115    0.493      118    0.430          30    0.560      117    0.490
  38    0.490      124    0.430         112    0.560      124    0.490
 151    0.490        6    0.430          38    0.560      148    0.490
 161    0.490       32    0.428         151    0.560       32    0.489
  23    0.487      125    0.428          35    0.558      125    0.486
  13    0.485      107    0.424          24    0.550      107    0.485
  35    0.480      126    0.420          31    0.549      118    0.480
  31    0.474      140    0.420          26    0.542      140    0.480
 149    0.471      120    0.420          13    0.542       11    0.477
  30    0.470      165    0.419         115    0.540       19    0.472
 148    0.470       33    0.416         102    0.539        1    0.471
  27    0.469        1    0.414           5    0.537       33    0.471
   5    0.468       11    0.410          27    0.531      120    0.470
  20    0.467      109    0.410         149    0.530      126    0.470
  26    0.467       17    0.410          39    0.526      109    0.460
   3    0.465      152    0.400           3    0.525       17    0.453
   8    0.463      117    0.390          20    0.523      110    0.450
  12    0.460      116    0.385           8    0.523      116    0.445
  24    0.460      110    0.370           7    0.521       22    0.435
   7    0.455      164    0.370          12    0.520      164    0.420
  19    0.454       14    0.341          21    0.510       14    0.396
  21    0.450      121    0.330         165    0.506      121    0.360 (*)
 102    0.449                            36    0.505
```

Table 54:   Analytical results for sodium in precipitation samples.

Sodium in precipitation
Sample no.: G1
Theoretical value: 0.255
Unit: µg/l

Run 1:
Number of laboratories: 63
Arithmetic mean value: 0.260
Median: 0.259
Standard deviation   0.055
Rel. st. deviation (%)   21.085

Run 2:
Number of laboratories: 61
Arithmetic mean value: 0.257
Median: 0.259
Standard deviation   0.027
Rel. st. deviation (%)   10.633

Results in decreasing order:

24	0.600 (*)	27	0.258
22	0.341	31	0.255
102	0.327	163	0.255
11	0.314	26	0.254
2	0.304	16	0.250
19	0.299	110	0.250
104	0.290	109	0.250
116	0.290	12	0.250
166	0.290	151	0.250
4	0.282	6	0.250
121	0.280	14	0.249
161	0.270	107	0.247
112	0.270	152	0.247
15	0.270	20	0.246
120	0.270	3	0.246
13	0.269	149	0.246
7	0.265	38	0.244
125	0.264	32	0.243
158	0.264	126	0.240
23	0.264	147	0.240
115	0.263	124	0.240
165	0.262	117	0.237
39	0.262	118	0.230
8	0.262	139	0.228
36	0.261	10	0.222
5	0.261	33	0.221
1	0.261	160	0.220
21	0.261	148	0.200
35	0.261	153	0.192
30	0.260	167	0.189
164	0.260	17	0.099 (*)
155	0.259		

Sodium in precipitation
Sample no.: G2
Theoretical value: 0.338
Unit: µg/l

Run 1:
Number of laboratories: 61
Arithmetic mean value: 0.360
Median: 0.347
Standard deviation   0.097
Rel. st. deviation (%)   27.016

Run 2:
Number of laboratories: 59
Arithmetic mean value: 0.345
Median: 0.343
Standard deviation   0.050
Rel. st. deviation (%)   14.556

Results in decreasing order:

117	0.896 (*)	21	0.343
23	0.708 (*)	155	0.342
22	0.532	125	0.341
24	0.500	149	0.341
161	0.420	8	0.341
115	0.417	110	0.340
165	0.415	166	0.340
2	0.390	118	0.340
102	0.386	112	0.340
116	0.382	151	0.340
35	0.381	26	0.339
121	0.370	11	0.335
6	0.360	20	0.332
13	0.357	14	0.331
4	0.353	38	0.329
7	0.353	107	0.329
36	0.352	152	0.327
5	0.351	16	0.320
32	0.350	3	0.320
30	0.350	160	0.320
12	0.350	147	0.320
158	0.350	124	0.320
164	0.350	31	0.319
120	0.350	33	0.305
109	0.350	139	0.301
104	0.350	10	0.292
27	0.350	167	0.280
1	0.348	126	0.260
163	0.347	148	0.250
39	0.347	17	0.167
15	0.347	19 <	0.120

Sodium in precipitation
Sample no.: G3
Theoretical value: 0.574
Unit: µg/l

Run 1:
Number of laboratories: 62
Arithmetic mean value: 0.571
Median: 0.579
Standard deviation   0.059
Rel. st. deviation (%)   10.379

Run 2:
Number of laboratories: 58
Arithmetic mean value: 0.570
Median: 0.579
Standard deviation   0.037
Rel. st. deviation (%)   6.433

Results in decreasing order:

112	0.840 (*)	115	0.579
24	0.700 (*)	125	0.571
2	0.645	151	0.570
35	0.642	147	0.570
22	0.631	109	0.570
6	0.630	107	0.569
3	0.617	26	0.568
32	0.605	149	0.568
5	0.604	155	0.565
102	0.602	38	0.564
30	0.600	161	0.560
121	0.600	110	0.560
4	0.594	11	0.560
7	0.593	165	0.553
36	0.592	16	0.550
27	0.592	167	0.549
120	0.590	148	0.540
23	0.590	124	0.540
13	0.590	152	0.536
8	0.589	14	0.535
20	0.588	31	0.533
15	0.587	117	0.525
158	0.586	153	0.516
39	0.586	118	0.510
1	0.585	10	0.502
163	0.583	160	0.500
164	0.580	33	0.492
166	0.580	139	0.490
12	0.580	116	0.482
104	0.580	126	0.430 (*)
21	0.579	17	0.401 (*)
		19	< 0.120

Sodium in precipitation
Sample no.: G4
Theoretical value: 0.660
Unit: µg/l

Run 1:
Number of laboratories: 63
Arithmetic mean value: 0.661
Median: 0.660
Standard deviation   0.063
Rel. st. deviation (%)   9.557

Run 2:
Number of laboratories: 59
Arithmetic mean value: 0.655
Median: 0.660
Standard deviation   0.041
Rel. st. deviation (%)   6.293

Results in decreasing order:

24	0.900 (*)	161	0.660
23	0.839 (*)	104	0.660
112	0.800 (*)	151	0.660
35	0.762	11	0.659
22	0.756	163	0.658
2	0.734	38	0.655
121	0.700	26	0.654
13	0.696	125	0.651
31	0.696	155	0.651
30	0.690	32	0.650
166	0.690	15	0.650
102	0.688	160	0.640
115	0.685	107	0.638
158	0.681	19	0.637
6	0.680	124	0.630
120	0.680	14	0.628
165	0.680	152	0.622
164	0.680	16	0.620
110	0.680	147	0.620
1	0.679	167	0.617
8	0.679	153	0.611
39	0.677	126	0.610
36	0.675	148	0.600
5	0.673	117	0.599
7	0.673	118	0.590
20	0.667	139	0.588
21	0.667	10	0.588
4	0.666	116	0.586
149	0.662	33	0.563
27	0.662	3	0.556
12	0.660	17	0.465 (*)
109	0.660		

Table 55:   Analytical results for magnesium in precipitation samples.

```
Magnesium in precipitation            Magnesium in precipitation
Sample no.: G1                        Sample no.: G2
Theoretical value:        0.085       Theoretical value:        0.093
Unit: µg/l                            Unit: µg/l

Run 1:                                Run 1:
Number of laboratories:      61       Number of laboratories:      60
Arithmetic mean value:    0.081       Arithmetic mean value:    0.093
Median:                   0.081       Median:                   0.093
Standard deviation        0.015       Standard deviation        0.017
Rel. st. deviation (%)   18.720       Rel. st. deviation (%)   18.614

Run 2:                                Run 2:
Number of laboratories:      57       Number of laboratories:      55
Arithmetic mean value:    0.080       Arithmetic mean value:    0.092
Median:                   0.080       Median:                   0.093
Standard deviation        0.009       Standard deviation        0.010
Rel. st. deviation (%)   11.577       Rel. st. deviation (%)   10.616

Results in decreasing order:          Results in decreasing order:
 126   0.140 (*)   30   0.080          126   0.150 (*)  116   0.093
   2   0.121 (*)  112   0.080          117   0.149 (*)   26   0.092
  24   0.120 (*)  161   0.080            2   0.132 (*)  166   0.092
 104   0.100       121   0.080           23   0.117       14   0.091
  35  < 0.1
  22   0.099       120   0.080           22   0.114      125   0.091
 167   0.094       109   0.080           24   0.110       11   0.091
 107   0.093       155   0.080          115   0.107      112   0.090
 163   0.090       166   0.080           12   0.103      155   0.090
   5   0.089       139   0.079          107   0.101      109   0.090
                                         35  < 0.100
   8   0.089        23   0.079          161   0.100      152   0.090
 102   0.089       115   0.078          120   0.100      121   0.090
  12   0.088         1   0.078           30   0.100      104   0.090
  10   0.087        14   0.077          167   0.100      118   0.090
   7   0.086         3   0.077          102   0.099        3   0.089
 149   0.086        38   0.076          163   0.099       36   0.088
 151   0.085       125   0.076           19   0.097      139   0.088
  26   0.085        36   0.075           33   0.096      165   0.086
 116   0.085       148   0.074           10   0.096       20   0.085
  16   0.085       153   0.074            5   0.096       38   0.084
  21   0.084       117   0.074            7   0.096        4   0.082
  39   0.084       110   0.071          158   0.096        6   0.080
  27   0.084         6   0.070          149   0.095      124   0.080
 158   0.084       147   0.070           27   0.094      110   0.079
  19   0.084       124   0.070            8   0.094      148   0.078
  15   0.083       164   0.060           13   0.094        1   0.073
  11   0.083       160   0.060           39   0.094      147   0.070
  13   0.082         4   0.060           16   0.094      164   0.070
 118   0.082        31   0.059           21   0.093      160   0.070
 152   0.082       165   0.054           15   0.093       31   0.057 (*)
  33   0.082        17   0.031 (*)      151   0.093       17   0.036 (*)
  20   0.081


Magnesium in precipitation            Magnesium in precipitation
Sample no.: G3                        Sample no.: G4
Theoretical value:        0.108       Theoretical value:        0.139
Unit: µg/l                            Unit: µg/l

Run 1:                                Run 1:
Number of laboratories:      62       Number of laboratories:      61
Arithmetic mean value:    0.107       Arithmetic mean value:    0.136
Median:                   0.105       Median:                   0.136
Standard deviation        0.017       Standard deviation        0.018
Rel. st. deviation (%)   16.122       Rel. st. deviation (%)   13.235

Run 2:                                Run 2:
Number of laboratories:      58       Number of laboratories:      56
Arithmetic mean value:    0.106       Arithmetic mean value:    0.134
Median:                   0.105       Median:                   0.135
Standard deviation        0.011       Standard deviation        0.011
Rel. st. deviation (%)   10.477       Rel. st. deviation (%)    8.126

Results in decreasing order:          Results in decreasing order:
 112   0.170 (*)  118   0.105          126   0.190 (*)  118   0.136
   2   0.150 (*)   11   0.105           22   0.188 (*)   11   0.134
  22   0.140       152   0.104            2   0.182 (*)  165   0.133
 126   0.140        23   0.104          112   0.180 (*)    1   0.133
  24   0.130       155   0.104           12   0.165      155   0.133
   3   0.126        20   0.103          107   0.153       33   0.132
 107   0.126         1   0.103           24   0.150      152   0.132
  30   0.120        13   0.103           23   0.150      161   0.130
  12   0.119        33   0.103           30   0.150        6   0.130
 102   0.115       139   0.102          167   0.145      104   0.130
 163   0.114       115   0.101            5   0.144      109   0.130
   5   0.113       125   0.101          163   0.144      110   0.130
  10   0.112       121   0.100           15   0.143      115   0.130
   8   0.111       161   0.100          102   0.143      139   0.130
 158   0.111        36   0.100          158   0.142       20   0.129
 149   0.111         6   0.100           10   0.141      153   0.127
 104   0.110       109   0.100          149   0.141       14   0.126
 120   0.110        14   0.099          120   0.140       38   0.125
 167   0.109       153   0.098           27   0.140        4   0.125
  35   0.109        38   0.097           19   0.140      148   0.124
 165   0.109         4   0.096           21   0.140       36   0.124
   7   0.109       117   0.096            7   0.140      116   0.122
  21   0.109       110   0.095          121   0.140      117   0.122
 166   0.108       148   0.093            8   0.138      147   0.120
  16   0.108       116   0.092          166   0.138      124   0.120
  19   0.108       164   0.090           26   0.138      160   0.120
  39   0.108       147   0.090           16   0.137      164   0.110
  27   0.108       124   0.090          125   0.137        3   0.109
 151   0.108       160   0.080           39   0.137       31   0.106
                                         35  < 0.100
  15   0.107        31   0.067 (*)      151   0.136       17   0.080 (*)
  26   0.106        17   0.048 (*)       13   0.136
```

Table 56:   Analytical results for calcium in precipitation samples.

```
Calcium in precipitation              Calcium in precipitation
Sample no.: G1                        Sample no.: G2
Theoretical value:        0.172       Theoretical value:        0.211
Unit: µg/l                            Unit: µg/l

Run 1:                                Run 1:
Number of laboratories:       62      Number of laboratories:       60
Arithmetic mean value:    0.188       Arithmetic mean value:    0.223
Median:                   0.177       Median:                   0.211
Standard deviation        0.054       Standard deviation        0.071
Rel. st. deviation (%)   28.701       Rel. st. deviation (%)   31.766

Run 2:                                Run 2:
Number of laboratories:       57      Number of laboratories:       58
Arithmetic mean value:    0.178       Arithmetic mean value:    0.212
Median:                   0.175       Median:                   0.210
Standard deviation        0.029       Standard deviation        0.033
Rel. st. deviation (%)   16.142       Rel. st. deviation (%)   15.465

Results in decreasing order:          Results in decreasing order:
   4    0.380 (*)    33    0.176        116    0.650 (*)    33    0.211
 116    0.379 (*)     2    0.175        117    0.438 (*)   118    0.210
  20    0.352 (*)   153    0.174        104    0.360       160    0.210
 165    0.309 (*)    13    0.173         23    0.294       147    0.210
 104    0.290       125    0.172         22    0.260       166    0.210
 148    0.240         8    0.172        165    0.248         6    0.210
  22    0.221        14    0.171        109    0.240        11    0.209
 126    0.220        36    0.171        163    0.240         7    0.208
  11    0.218       110    0.170        151    0.234         8    0.208
 102    0.213       118    0.170          2    0.231       115    0.207
 167    0.211       166    0.170        107    0.230         3    0.205
 160    0.210       120    0.170        121    0.230       158    0.204
 163    0.207       161    0.170         20    0.226         1    0.201
 151    0.202         7    0.168        102    0.224         4    0.200
  10    0.200        23    0.167         26    0.222        12    0.200
 107    0.196       158    0.165         21    0.221        24    0.200
  19    0.191         1    0.165        120    0.220       110    0.200
 147    0.190        38    0.162         30    0.220        17    0.197
 109    0.190        12    0.160         16    0.220        38    0.193
 152    0.190         6    0.160        112    0.220       155    0.192
   3    0.185       117    0.158        152    0.220        36    0.191
 115    0.185       155    0.156         10    0.220        15    0.190
   5    0.184       139    0.153        161    0.220       126    0.190
  26    0.184       124    0.150          5    0.219       139    0.188
  16    0.180        15    0.150         27    0.217       149    0.182
 112    0.180        17    0.144        167    0.216       148    0.180
  30    0.180        31    0.139         14    0.216       124    0.180
 121    0.180       164    0.130         39    0.214       164    0.170
  27    0.179       149    0.129        125    0.214        31    0.123
  21    0.179        24    0.100         13    0.211        32    0.120
  39    0.178        32    0.080 (*)


Calcium in precipitation              Calcium in precipitation
Sample no.: G3                        Sample no.: G4
Theoretical value:        0.249       Theoretical value:        0.287
Unit: µg/l                            Unit: µg/l

Run 1:                                Run 1:
Number of laboratories:       61      Number of laboratories:       62
Arithmetic mean value:    0.250       Arithmetic mean value:    0.290
Median:                   0.244       Median:                   0.287
Standard deviation        0.056       Standard deviation        0.059
Rel. st. deviation (%)   22.344       Rel. st. deviation (%)   20.212

Run 2:                                Run 2:
Number of laboratories:       59      Number of laboratories:       58
Arithmetic mean value:    0.247       Arithmetic mean value:    0.283
Median:                   0.244       Median:                   0.285
Standard deviation        0.036       Standard deviation        0.036
Rel. st. deviation (%)   14.374       Rel. st. deviation (%)   12.864

Results in decreasing order:          Results in decreasing order:
 112    0.550 (*)     7    0.244        112    0.560 (*)    26    0.287
 104    0.350        33    0.242        104    0.420 (*)     7    0.283
 165    0.341       158    0.242        160    0.410 (*)     1    0.283
  22    0.332         1    0.241         22    0.393        33    0.283
 107    0.304       115    0.241        116    0.381        27    0.281
 163    0.290        32    0.240        107    0.333         6    0.280
 116    0.282       110    0.240        165    0.331       118    0.280
 166    0.280       161    0.240        109    0.330       125    0.280
 109    0.280        12    0.240        167    0.330        11    0.277
 102    0.277        36    0.238         23    0.329        14    0.275
 121    0.270        20    0.236         32    0.320        20    0.275
  30    0.270       117    0.234        151    0.315       117    0.272
 147    0.270        11    0.233        163    0.310       110    0.270
   2    0.269       160    0.230        102    0.309       126    0.270
   3    0.269         4    0.230          2    0.306        38    0.265
 151    0.263       118    0.230        152    0.300       155    0.265
   6    0.260       155    0.229        120    0.300         8    0.263
 120    0.260        38    0.225         30    0.300        36    0.261
 152    0.260       167    0.225        158    0.295        15    0.260
  10    0.259        15    0.220          5    0.295       124    0.260
  21    0.258       124    0.220         39    0.292       139    0.253
   5    0.253       139    0.217         21    0.292       148    0.250
  39    0.252       148    0.210         10    0.292       147    0.250
 125    0.251       149    0.204        115    0.291         4    0.250
  13    0.250        24    0.200        161    0.290       164    0.240
   8    0.250       164    0.200         12    0.290         3    0.236
  27    0.248       126    0.200        121    0.290       149    0.231
  26    0.247        17    0.161        166    0.290        31    0.207
  16    0.246        31    0.143         13    0.289        24    0.200
  14    0.244       153    0.098 (*)     16    0.288        17    0.184
  23    0.244                            19    0.287       153    0.127 (*)
```

Table 57:   Analytical results for potassium in precipitation samples.

```
Potassium in precipitation                    Potassium in precipitation
Sample no.: G1                                Sample no.: G2
Theoretical value:           0.280            Theoretical value:           0.316
Unit: µg/l                                    Unit: µg/l

Run 1:                                        Run 1:
Number of laboratories:        62             Number of laboratories:        61
Arithmetic mean value:      0.287             Arithmetic mean value:      0.313
Median:                     0.271             Median:                     0.303
Standard deviation          0.143            Standard deviation          0.133
Rel. st. deviation (%)     49.939            Rel. st. deviation (%)     42.440

Run 2:                                        Run 2:
Number of laboratories:        61             Number of laboratories:        59
Arithmetic mean value:      0.269             Arithmetic mean value:      0.303
Median:                     0.270             Median:                     0.303
Standard deviation          0.036            Standard deviation          0.044
Rel. st. deviation (%)     13.449            Rel. st. deviation (%)     14.602

Results in decreasing order:                  Results in decreasing order:
 164    1.360 (*)  107    0.270               164    1.230 (*)  155    0.302
 109    0.410        4    0.270               109    0.510       22    0.301
   2    0.345      151    0.270                 2    0.387        6    0.300
 161    0.340      115    0.269               161    0.370      104    0.300
 166    0.310      152    0.268               115    0.359      118    0.300
 160    0.310      155    0.268               149    0.355       12    0.300
 120    0.300      165    0.262               160    0.340       23    0.297
  21    0.296       12    0.260                21    0.332       20    0.297
  10    0.295      158    0.260                10    0.331      117    0.294
  14    0.294        6    0.260               110    0.330      152    0.293
  22    0.293      124    0.260                 5    0.325      158    0.292
   5    0.293      126    0.260               163    0.322      166    0.290
  19    0.291       16    0.255               120    0.320        4    0.290
 112    0.290       36    0.253               112    0.320       38    0.286
 110    0.290       38    0.252                27    0.319       31    0.285
  13    0.287      118    0.250                26    0.318      147    0.280
  26    0.285       30    0.250                14    0.318      124    0.280
  27    0.282      147    0.250                 7    0.316       30    0.280
   7    0.282      121    0.250                13    0.316       16    0.270
 116    0.282      117    0.247                39    0.314      165    0.270
 104    0.280       23    0.247                11    0.311       32    0.270
  39    0.278       32    0.245               151    0.310       36    0.269
 125    0.278       20    0.242                15    0.310      139    0.254
  33    0.277       11    0.235                 3    0.310      102    0.252
 153    0.277      102    0.226               126    0.310      167    0.252
 163    0.276      139    0.223               116    0.309       35    0.233
   1    0.275       17    0.220                33    0.308       17    0.230
   8    0.275      167    0.216               125    0.308      121    0.200
   3    0.273       35    0.213                 1    0.307       24    0.200
  15    0.273       24    0.200                 8    0.306      148    0.000 (*)
                   149 <  0.200
  31    0.271      148    0.150               107    0.303

Potassium in precipitation                    Potassium in precipitation
Sample no.: G3                                Sample no.: G4
Theoretical value:           0.194            Theoretical value:           0.178
Unit: µg/l                                    Unit: µg/l

Run 1:                                        Run 1:
Number of laboratories:        62             Number of laboratories:        60
Arithmetic mean value:      0.184             Arithmetic mean value:      0.174
Median:                     0.180             Median:                     0.170
Standard deviation          0.041            Standard deviation          0.047
Rel. st. deviation (%)     22.515            Rel. st. deviation (%)     26.839

Run 2:                                        Run 2:
Number of laboratories:        59             Number of laboratories:        57
Arithmetic mean value:      0.183             Arithmetic mean value:      0.171
Median:                     0.180             Median:                     0.170
Standard deviation          0.027            Standard deviation          0.024
Rel. st. deviation (%)     14.735            Rel. st. deviation (%)     14.110

Results in decreasing order:                  Results in decreasing order:
 109    0.400 (*)    6    0.180               109    0.410 (*)    4    0.170
 149    0.264      164    0.180               164    0.270 (*)  104    0.170
   2    0.259       12    0.180                 2    0.237      120    0.170
 161    0.240      120    0.180               126    0.230       12    0.170
  31    0.234        4    0.180               161    0.230      151    0.170
                                              149 <  0.200
  11    0.230      158    0.179                31    0.199      158    0.170
 112    0.210       36    0.177                22    0.195      153    0.169
 110    0.210        3    0.176                 3    0.191      165    0.169
  13    0.204       32    0.175               160    0.190       36    0.167
  10    0.204        8    0.175               112    0.190      117    0.166
 115    0.200      117    0.174                 5    0.188       16    0.163
  21    0.200       20    0.174                10    0.187        8    0.163
 125    0.199       30    0.170               115    0.186      116    0.163
   5    0.199      118    0.170                19    0.184       35    0.162
  27    0.197      126    0.170                23    0.184      118    0.160
  26    0.195      152    0.166               163    0.183        6    0.160
   7    0.194      153    0.166                21    0.183       32    0.160
  14    0.192      116    0.164               125    0.182       20    0.157
 155    0.192       38    0.163                27    0.181      167    0.155
  39    0.192      167    0.161               110    0.180      166    0.150
 163    0.189      124    0.160                26    0.178       30    0.150
  15    0.187      104    0.160                39    0.178      124    0.150
 165    0.185      139    0.154                 7    0.177      152    0.149
 107    0.184       35    0.153                13    0.177       38    0.148
   1    0.184      102    0.152                15    0.177      139    0.143
  23    0.183      166    0.150               155    0.176      102    0.140
  16    0.183      147    0.140               107    0.173      147    0.130
  22    0.182      121    0.130                14    0.172       11    0.101
                                                               121 <  0.100
  33    0.181      148    0.110                33    0.172       24    0.100
                                                                17 <  0.077
 151    0.180       24    0.100 (*)             1    0.170      148    0.000 (*)
 160    0.180       17    0.092 (*)
```

Table 58:   Analytical results for conductivity in precipitation samples.

```
Conductivity in precipitation              Conductivity in precipitation
Sample no.: G1                             Sample no.: G2
Theoretical value:        41.773           Theoretical value:        46.810
Unit: µS/cm                                Unit: µS/cm

Run 1:                                     Run 1:
Number of laboratories:       57           Number of laboratories:       56
Arithmetic mean value:    40.562           Arithmetic mean value:    44.743
Median:                   40.800           Median:                   45.600
Standard deviation         6.068           Standard deviation         4.249
Rel. st. deviation (%)    14.959           Rel. st. deviation (%)     9.496

Run 2:                                     Run 2:
Number of laboratories:       53           Number of laboratories:       54
Arithmetic mean value:    40.802           Arithmetic mean value:    45.408
Median:                   40.800           Median:                   45.600
Standard deviation         2.240           Standard deviation         2.087
Rel. st. deviation (%)     5.490           Rel. st. deviation (%)     4.597

Results in decreasing order:               Results in decreasing order:
 121    73.600  (*)     7    40.700         120    49.000         16    45.600
  13    47.500          1    40.500         155    48.900        124    45.500
 120    45.000          2    40.500         139    48.500        109    45.500
 155    44.000        140    40.300          13    48.500         23    45.400
 139    43.900          6    40.200           5    48.000         35    45.300
  30    43.200        151    40.100          30    47.900        140    45.300
   5    43.100        109    40.100          22    47.400        158    44.900
  24    42.750         27    40.100          24    47.400        151    44.800
   3    42.700        148    40.000           1    47.300        110    44.600
  20    42.500        112    39.700           6    47.100         27    44.600
  22    42.300         39    39.600          19    46.900         11    44.400
  12    42.300        165    39.500          10    47.000        166    44.400
  33    42.300         17    39.400         165    46.800        126    44.300
  14    42.200        166    39.400           3    46.800        118    44.000
  19    42.100         11    39.400         163    46.700        112    43.600
  16    42.000        126    39.300          14    46.600        164    43.600
  10    41.900        164    39.200           4    46.500         17    43.300
  21    41.790         32    39.020         102    46.500         32    43.130
  15    41.700        110    38.900          15    46.500          2    43.100
 163    41.640        107    38.700          12    46.400          8    42.800
 147    41.600          8    38.600         147    46.400         39    42.800
   4    41.500        118    38.000          20    46.350        121    42.800
 102    41.300         36    37.600          33    46.200         36    42.300
  23    41.200        152    35.100          21    46.120        160    41.000
 117    41.100        153    33.360         149    45.950        152    40.900
 149    41.070        116    26.680  (*)       7    45.600        117    39.100
  35    41.000        160    26.000  (*)     107    45.600        116    33.530  (*)
 158    40.800         38    23.200  (*)     148    45.600         38    20.000  (*)
 124    40.800

Conductivity in precipitation              Conductivity in precipitation
Sample no.: G3                             Sample no.: G4
Theoretical value:        28.049           Theoretical value:        33.321
Unit: µS/cm                                Unit: µS/cm

Run 1:                                     Run 1:
Number of laboratories:       58           Number of laboratories:       58
Arithmetic mean value:    28.098           Arithmetic mean value:    32.324
Median:                   27.880           Median:                   32.820
Standard deviation         3.253           Standard deviation         2.327
Rel. st. deviation (%)    11.578           Rel. st. deviation (%)     7.200

Run 2:                                     Run 2:
Number of laboratories:       56           Number of laboratories:       54
Arithmetic mean value:    27.605           Arithmetic mean value:    32.598
Median:                   27.830           Median:                   32.865
Standard deviation         1.688           Standard deviation         1.658
Rel. st. deviation (%)     6.114           Rel. st. deviation (%)     5.087

Results in decreasing order:               Results in decreasing order:
 160    47.000  (*)   149    27.860         148    37.100  (*)      2    32.800
 148    36.800  (*)   109    27.800          13    36.300          7    32.800
  13    33.000         21    27.800         155    36.300        166    32.700
 155    30.800        140    27.600         120    35.000        109    32.600
   6    30.200         16    27.600           6    34.700        158    32.500
   3    29.800        117    27.600           5    34.500        102    32.400
  14    29.100         11    27.500         139    34.200        126    32.400
  22    29.000        158    27.500         160    34.000         16    32.400
   5    29.000        126    27.500           3    34.000         27    32.200
 120    29.000          2    27.400          30    33.900        151    32.200
 139    28.900         38    27.300          24    33.790         11    32.200
 147    28.900        107    26.900          19    33.600         35    32.100
 121    28.800        151    26.900          10    33.600        107    31.800
  30    28.800        110    26.900          15    33.600        110    31.800
  15    28.700         35    26.800          14    33.600        153    31.160
  24    28.530        152    26.700          22    33.400         32    31.100
   4    28.500         32    26.700           1    33.400        118    31.000
  20    28.470         39    26.500         147    33.300         17    31.000
  19    28.400         27    26.500         124    33.300        164    30.700
 124    28.300         17    26.400          33    33.300         39    30.700
  12    28.100        153    25.890         163    33.200        140    30.600
   1    28.100        164    25.800           4    33.200          8    30.500
  10    28.100          8    25.700         121    33.200         36    29.700
  23    28.100         36    25.500          12    33.200        104    29.000
 165    28.000        166    25.100          23    33.000        152    28.500
 163    28.000        118    25.000         165    32.900        149    28.190
  33    28.000        104    24.000         117    32.900        116    27.120  (*)
   7    28.000        116    23.540          21    32.890        112    26.900  (*)
 102    27.900        112    23.100          20    32.840         38    23.400  (*)
```

Table 59: *Ratio of the measured to the calculated conductivity in synthetic precipitation samples (G1-G4).*

Lab.No.	Measured / calculated value				Remarks
	G1	G2	G3	G4	
1	0.90	0.92	1.12	1.15	
2	2.48	1.06	0.93	0.97	
3	1.09	0.95	1.03	1.06	
4	1.04	1.06	1.07	1.06	
5	1.07	1.06	1.06	1.06	
6	1.03	1.05	1.07	1.06	
7	0.87	0.86	0.84	0.82	
8	0.96	0.97	0.95	0.95	
10	0.82	0.88	0.87	1.01	
11	0.91	0.95	0.98	0.98	NH_4^+ missing
12	1.07	1.05	1.03	1.04	
13	1.04	0.86	1.06	0.99	
14	1.13	1.14	1.14	1.17	
15	1.08	1.07	1.08	1.08	
16	0.99	0.98	1.00	0.99	
17	1.14	1.09	1.10	-0.02	
19					Cl^-, Ca^{2+}, K^+, and Na^+ values < LOD
20	1.05	1.05	1.04	1.01	
21	1.02	1.00	1.00	1.00	
22	1.17	1.20	1.11	1.11	
23	0.90	0.95	0.96	0.91	
24	1.04	1.04	1.04	1.03	
26					Cond missing
27	1.02	1.02	1.01	1.01	
30	1.12	0.98	1.12	1.05	
31					pH missing
32	1.00	0.99	1.00	0.97	
33	0.98	0.95	1.05	0.99	
35	1.08	1.06	1.03	1.05	
36	1.02	1.02	1.00	1.00	
38	0.91	0.50	1.93	1.04	
39	0.96	0.92	0.93	0.92	
102	0.91	0.90	0.91	0.92	
104					PH-values missing
107	0.99	1.03	1.01	0.99	
109	1.06	1.07	1.08	1.02	
110	1.02	0.98	0.99	0.94	
112	1.13	1.15	1.04	1.06	
115					pH and Cond. values missing
116	0.73	0.77	0.90	0.92	
117	1.17	1.32	1.12	1.08	
118	1.00	1.05	0.97	1.02	
120	1.10	1.05	1.00	1.03	
121	2.90	0.83	0.70	0.75	
124	1.05	1.04	1.09	1.10	
125					
126	1.11	1.11	1.08	0.98	
139					NO^{3-}, Cl^- and NH_4^+ -values missing
140					
147	0.85	0.93	0.91	0.95	
148	1.37	1.08	1.49	1.27	
149	1.05	1.03	1.03	0.90	
151	0.93	0.95	0.91	0.64	
152	0.91	0.90	1.00	0.90	
153	0.82		0.96	0.98	

Table 59, cont.

Lab.No.	Measured / calculated value				Remarks
	G1	G2	G3	G4	
155	1.15	1.20	1.19	1.23	
158	1.09	1.07	1.09	1.10	
160	0.93	0.92	1.01	0.97	
161					pH-values missing
163	1.05	1.03	1.05	1.04	
164	1.38	1.19	1.07	1.04	
165	0.95	0.97	1.01	1.02	
166	1.12	1.13	1.11	1.09	
167					pH-values missing

Table 60: *Ratio of equivalent concentration of anions to the equivalent concentration of cation measured in synthetic precipitation samples.*

| Lab.No. | Measured value/Calculated | | | | Average |
	G1	G2	G3	G4	
1	0.95	0.94	1.06	1.08	1.01
2	2.26	1.22	0.99	1.05	1.38
3	1.09	0.98	0.99	1.15	1.05
4	1.00	1.08	1.05	1.07	1.05
5	1.03	1.03	1.00	1.00	1.01
6	1.07	1.04	0.95	0.99	1.02
7	1.01	1.00	1.00	0.99	1.00
8	1.11	1.13	1.08	1.09	1.10
10	1.40	1.52	1.51	1.04	1.37
11	1.04	1.06	1.26	1.26	1.16
12	1.05	1.03	1.02	1.03	1.03
13	1.55	1.46	1.22	1.35	1.39
14	1.23	1.25	1.15	1.20	1.21
15	1.07	1.05	1.03	1.05	1.05
16	1.01	1.01	1.01	1.01	1.01
17	1.06	1.02	1.08	0.00	0.79
19					
20	0.94	1.01	0.99	0.98	0.98
21	1.02	1.02	1.01	1.01	1.01
22	1.16	1.18	1.09	1.03	1.12
23	0.96	1.02	1.01	0.98	0.99
24	0.96	1.00	1.03	1.01	1.00
26	1.10	1.10	1.06	1.37	1.16
27	1.06	1.05	1.05	1.04	1.05
30	1.09	0.95	0.99	0.98	1.00
31					
32	1.13	1.15	1.06	1.04	1.10
33	0.89	0.88	0.98	0.93	0.92
35	1.28	1.28	1.13	1.24	1.23
36	1.08	1.08	1.03	1.04	1.06
38	1.59	1.17	1.54	1.34	1.41
39	1.02	0.99	0.99	0.93	0.98
102	0.87	0.88	0.95	0.92	0.91
104					
107	1.12	1.12	1.05	1.07	1.09
109	0.94	0.93	0.96	0.94	0.94
110	1.05	1.02	0.98	0.93	1.00
112	1.03	1.06	1.09	1.02	1.05
115					
116	1.03	0.92	1.02	1.05	1.01
117	1.02	1.33	1.01	1.01	1.09
118	1.06	0.99	1.08	1.05	1.05
120	0.96	0.98	0.94	0.95	0.96
121	3.58	1.68	1.96	2.17	2.35
124	1.07	1.12	1.06	0.99	1.06
125					
126	0.95	1.00	1.02	0.91	0.97
139					
140					
147	0.83	0.96	0.84	0.96	0.90
148	1.14	1.07	0.92	1.00	1.03
149	1.13	1.05	1.01	1.06	1.06
151	1.10	1.11	1.07	0.81	1.02
152	1.06	1.01	0.98	0.99	1.01

Table 60, cont.

Lab.No.	Measured value/Calculated				Average
	G1	G2	G3	G4	
153	1.17	0.00	1.22	1.19	0.90
155	0.92	0.91	1.02	0.99	0.96
158	1.11	1.10	1.05	1.05	1.08
160	1.91	1.38	0.83	1.10	1.30
161					
163	1.03	1.01	1.00	1.00	1.01
164	0.91	0.85	0.87	0.86	0.87
165	1.02	1.01	0.97	1.01	1.00
166	1.18	1.21	1.20	1.12	1.18

Table 61: *The ratio of the median values to the theoretical values for all parameters and samples.*

Parameter	Sample no.	Median/Expected
SO$_4$-S	G1	1.00
	G2	0.99
	G3	1.00
	G4	0.99
NO$_3$-N	G1	1.01
	G2	1.00
	G3	1.00
	G4	1.00
NH$_4$-N	G1	1.02
	G2	1.01
	G3	1.00
	G4	1.00
pH	G1	1.01
	G2	1.01
	G3	1.01
	G4	1.01
H	G1	0.91
	G2	0.93
	G3	0.91
	G4	0.91
Mg	G1	0.94
	G2	1.00
	G3	0.97
	G4	0.98
Na	G1	1.01
	G2	1.02
	G3	1.01
	G4	1.00
Cl	G1	0.99
	G2	1.03
	G3	0.97
	G4	0.97
Ca	G1	1.02
	G2	1.00
	G3	0.98
	G4	0.99
K	G1	0.96
	G2	0.96
	G3	0.93
	G4	0.95
Cond	G1	0.97
	G2	0.97
	G3	0.99
	G4	0.98

Table 62:   Relative random and systematic errors obtained by the different laboratories in the analysis of each parameter in the precipitation samples.

Lab. no.	SO_4^{2-} Random error %	SO_4^{2-} Systematic error %	NO_3^- Random error %	NO_3^- Systematic error %	NH_4^+ Random error %	NH_4^+ Systematic error %	Mg^{2+} Random error %	Mg^{2+} Systematic error %	H^+ calc Random error %	H^+ calc Systematic error %
1	0	0	1	1	1	3	6	-6	15	1
2	3	14	5	13	8	35	3	38	48	-24
3	1	2	0	-1	12	-11	18	-6	9	1
4	0	0	0	1	1	1	5	-13	3	-10
5	1	-1	0	1	1	-1	1	4	2	-5
6	0	-1	0	0	6	3	3	-10	5	-5
7	1	16	0	-1	1	-4	1	1	3	21
8	1	5	0	6	1	-4	2	2	3	-8
10	20	46	12	21	1	0	1	2	7	1
11	1	-3	2	6			1	-3	4	10
12	0	-2	2	6	3	1	9	10	3	-8
13	25	65	2	8	3	4	2	-3	8	0
14	2	15	1	-4	1	-2	4	-8	7	-23
15	0	-1	0	-2	3	0	2	-1	3	-11
16	1	-1	1	-1	4	-5	1	0	1	0
17	5	-19	0	-7	2	6	2	-55	5	-14
19	2	-2	1	-2	1	4	2	0	8	-28
20	1	-6	1	1	1	2	2	-6	4	-4
21	0	1	1	1	1	1	1	0	1	-3
22	1	6	5	11	16	2	13	25	10	-27
23	2	3	2	4	19	-13	12	3	8	6
24	1	2	1	0	6	0	9	18	2	-5
26	1	-2	1	-1	54	2	1	-1	5	-18
27	1	0	1	2	1	3	1	0	3	-10
30	1	2	3	-10	1	1	6	8	9	-6
31	4	7	2	5	4	5	6	-33		
32	2	-6	2	8	3	17			4	-7
33	2	-9	1	-4	1	0	4	-4	6	8
35	1	2	1	3	11	6	0	1	2	-11
36	0	-5	0	2	2	6	4	-9	5	-17
38	1	0	0	3	1	-5	2	-10	18	-53
39	1	2	5	-5	2	8	1	-1	2	0
102	4	-1	6	-3	5	1	1	5	5	13
104	46	199	2	3	4	-2	9	-1	6	-17
107	3	8	1	-1	5	-5	4	10	3	-10
109	3	-5	2	-6	2	-5	2	-6		
110	3	-1	0	0	7	6	2	-13	7	-4
112	8	-6	2	1	17	-2	26	18	5	-35
115	1	2	0	1	1	-46	9	-7		
116	1	0	1	-5	4	-3	7	-8	7	-17
117	5	-8	1	-2	22	1	28	-11	31	-17
118	6	-5	3	0	2	-3	0	-3	3	-12
120	1	-3	1	-3	10	-3	5	1	4	4
121	6	1	66	324	12	33	3	-4	48	-9
124	4	-1	2	-2	1	4	2	-16	3	-10
125	0	-4	2	-5	3	4	3	-5		
126	4	-11	1	-7	6	-1	10	50	10	-15
139	118	233					2	-6	3	-5
140	0	-4	1	-4	1	3			6	-23
147	4	-2	2	-1	5	27	3	-18	10	14
148	4	-22	1	3	4	-12	2	-14	17	-9
149	1	-1	1	1	2	5	1	2	3	-8
151	3	7	2	4	10	-21	1	0	32	5
152	0	-2	1	-6	4	-2	2	-4	5	-5
153	1	4	1	6	1	4	1	-10	1	-7
155	10	-16	1	-1	3	2	1	-4	3	-11
158	0	0	0	0	2	3	2	2	4	-18
160	8	21	1	-2	6	1	3	-23	62	-11
161	1	0	1	3	2	6	6	-6		
163	1	0	0	-1	1	-1	1	5	2	-7
164	4	-16	2	-13	7	31	4	-23	20	-29
165	1	1	1	1	9	-11	12	-6	4	-1
166	1	-2	1	3	2	-5	2	-1	7	-28
167	1	-2	55	218	1	1	3	6		

Table 62, cont.

Lab. no.	Na+ Random error %	Na+ Systematic error %	Cl− Random error %	Cl− Systematic error %	Ca2+ Random error %	Ca2+ Systematic error %	K+ Random error %	K+ Systematic error %	Cond. Random error %	Cond. Systematic error %
1	1	2	8	-9	1	-3	1	-4	2	0
2	2	13	5	20	3	8	2	27	3	-3
3	13	-3	1	0	13	1	5	-3	2	2
4	2	4	5	-1	43	-6	3	-5	1	-1
5	2	3	1	2	1	3	1	4	0	3
6	5	5	2	-6	4	-2	1	-7	4	2
7	1	3	1	-1	0	-2	1	0	1	-2
8	1	2	1	-1	4	-1	2	-5	2	-8
10	4	-13	93	170	4	4	1	5	0	0
11	7	0	1	-14	11	-3	19	-10	2	-5
12	1	1	1	1	3	-4	2	-6	1	0
13	2	4	3	5	0	0	2	1	4	11
14	3	-4	9	-28	3	-1	3	0	1	1
15	2	2	3	-5	1	-11	1	-3	1	0
16	3	-5	2	-3	2	2	6	-8	2	-2
17	4	-38	8	-10	16	-25	7	-35	2	-6
19	6	2	5	-9	3	4	1	3	0	1
20	2	0	2	-1	34	1	3	-8	1	0
21	0	1	1	-2	1	3	2	5	1	-1
22	12	20	18	2	10	29	5	0	1	2
23	32	21	30	18	16	8	7	-6	2	-1
24	20	44	5	7	14	-26	6	-36	1	1
26	1	-1	2	1	2	2	1	1		
27	1	2	1	1	2	1	0	1	1	-4
30	2	4	4	8	2	5	2	-12	1	2
31	7	-2	3	3	13	-37	12	2		
32	4	0	8	-4	22	-22	5	-11	3	-7
33	6	-13	5	-10	2	-1	2	-3	1	0
35	9	12	4	3			11	-22	1	-3
36	1	3	1	-5	4	-7	6	-9	2	-10
38	1	-2	2	11	2	-9	0	-12	28	-38
39	1	2	3	5	0	2	0	-1	3	-6
102	4	8	5	-3	5	11	4	-20	1	-1
104	3	2	5	23	9	54	6	-5	0	-11
107	2	-2	3	-8	6	15	1	-4	2	-4
109	1	0	1	-18	4	13	17	83	2	-3
110	3	0	3	-25	3	-4	2	5	2	-5
112	24	17	9	22	52	61	2	4	5	-11
115	7	4	5	12	4	0	9	3		
116	12	-4	11	-12	72	65	5	-5	12	-26
117	55	-7	64	-10	43	-6	4	-9	8	-1
118	6	-10	5	-11	3	-2	2	-9	2	-8
120	1	3	9	-15	3	4	6	-1	2	5
121	1	6	3	-45	3	6	14	-26	39	1
124	2	-5	26	-10	1	-12	3	-13	2	-1
125	2	0	4	-7	2	0	2	0		
126	12	-14	5	-12	17	-8	13	-5	2	-5
139	5	-12			3	-12	4	-20	1	4
140			4	-9					2	-4
147	3	-4	7	-4	10	4	4	-17	1	0
148	5	-13	34	-4	19	-15	8	-44	11	3
149	1	0	1	1	5	-19	5	23	5	-2
151	1	0	4	12	3	11	1	-4	1	-4
152	3	-5	15	1	1	5	3	-10	6	-14
153	1	-13	5	44	29	-66	4	-4	7	-6
155	1	-1	6	-5	1	-8	2	-3	1	7
158	1	3	2	-6	3	-3	3	-7	1	-2
160	5	-6	10	81	25	8	7	7	38	-7
161	9	2	10	22	3	0	2	22		
163	1	1	2	-7	3	14	2	0	0	0
164	1	2	7	-23	1	-20	185	208	1	-7
165	9	3	8	-9	17	29	6	-6	2	-1
166	3	4	10	37	6	0	12	-11	3	-6
167	4	-11	7	44	12	10	7	-20		

114

Appendix 4

Figures – 24rd intercomparison

116
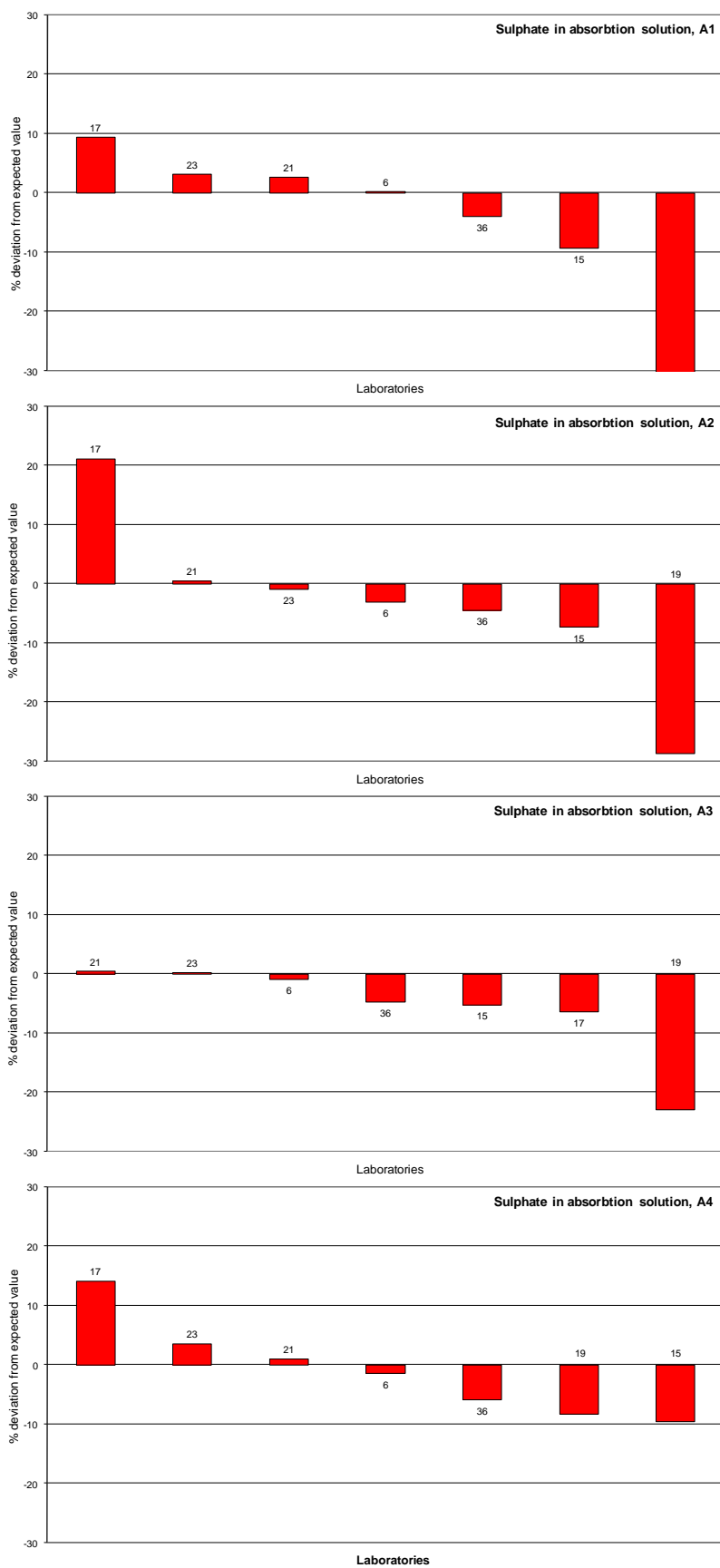
Figure 32: SO₂ in absorbing solution.
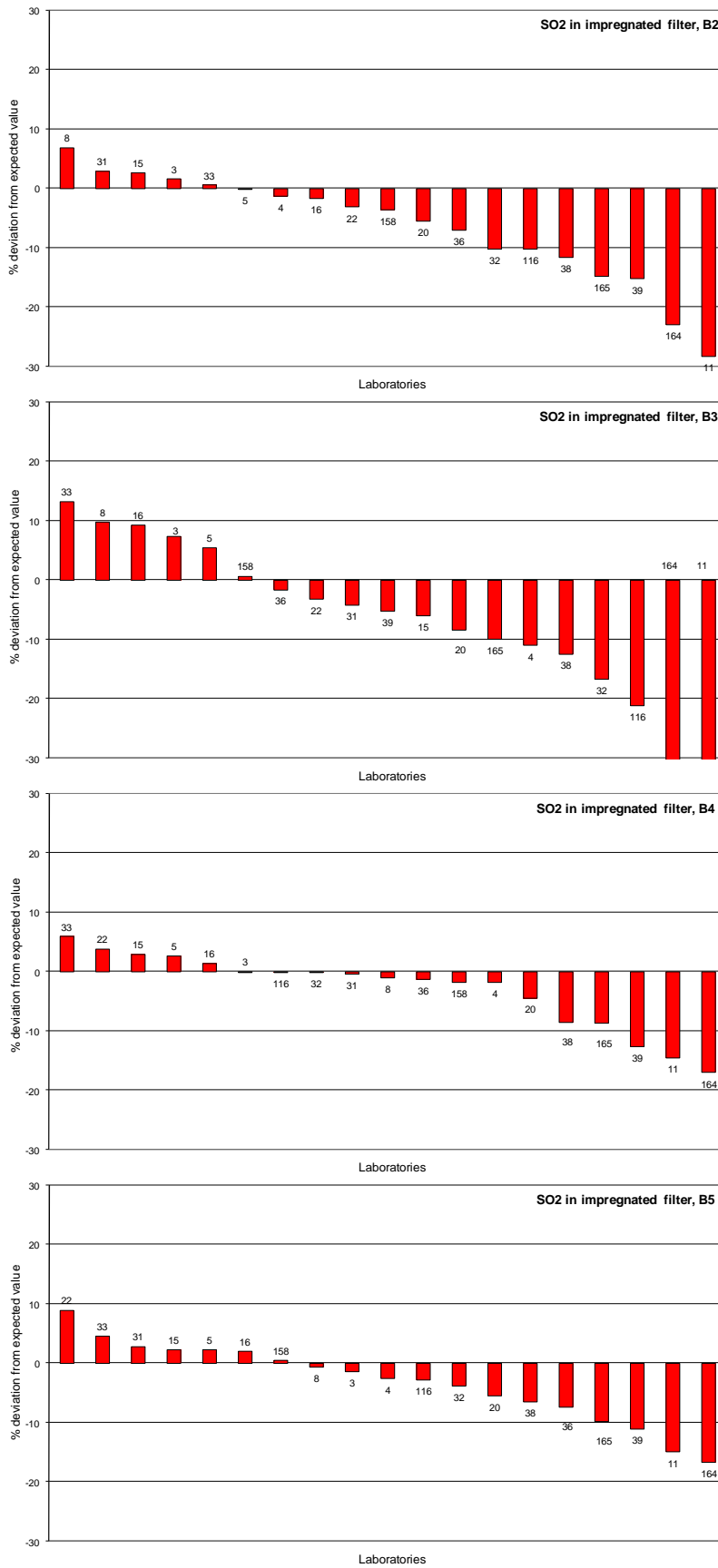
Figure 33: SO₂ in impregnated filter.
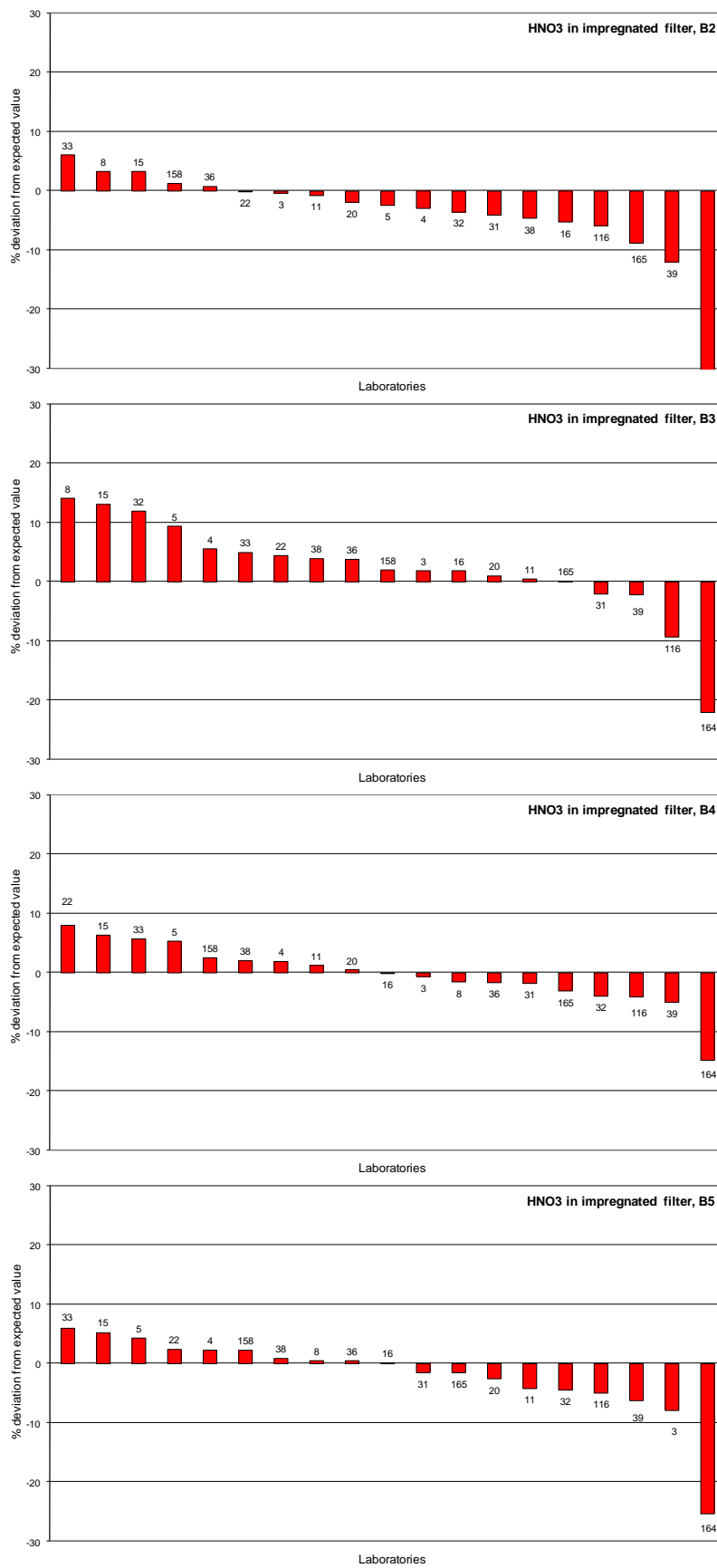
Figure 34: HNO₃ in impregnated filter.
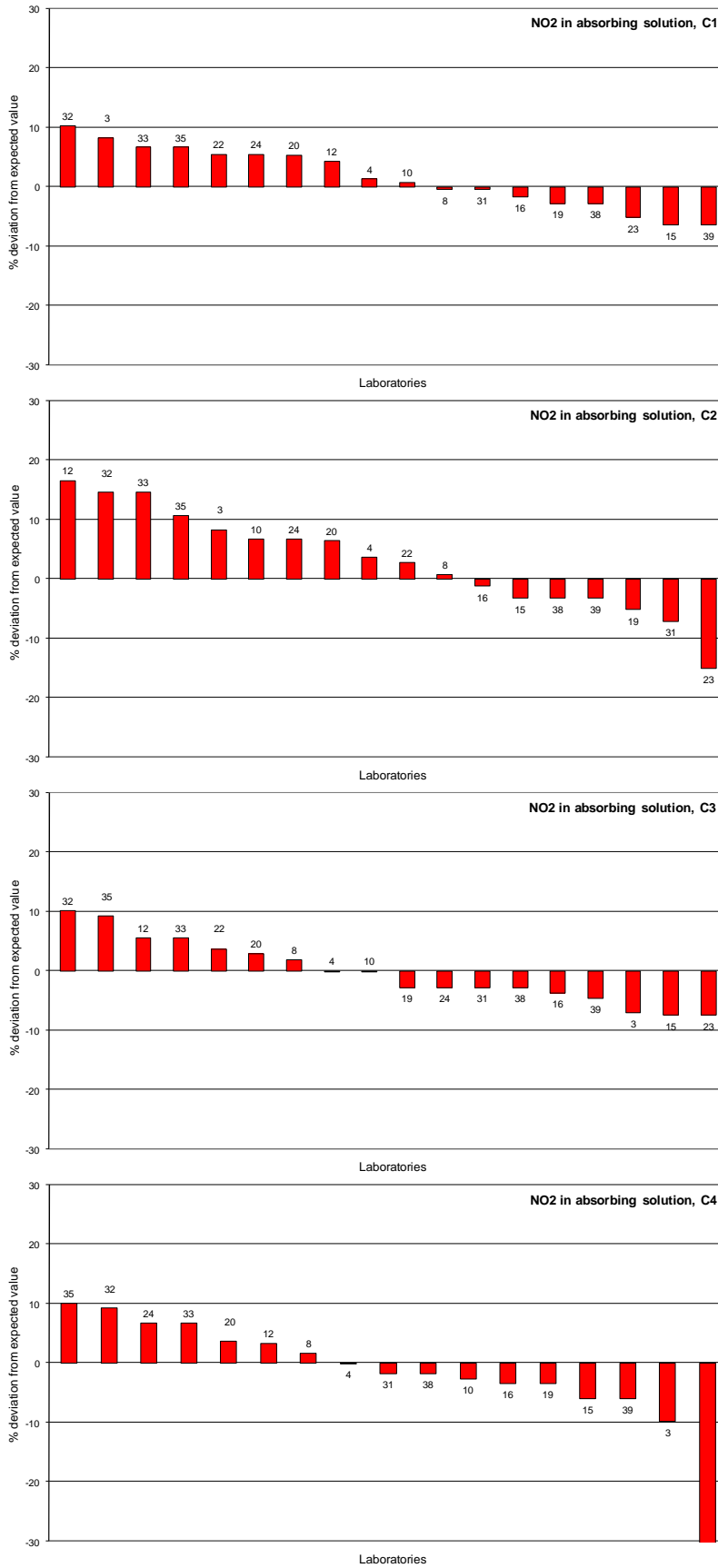
Figure 35: NO₂ in absorbing solution.
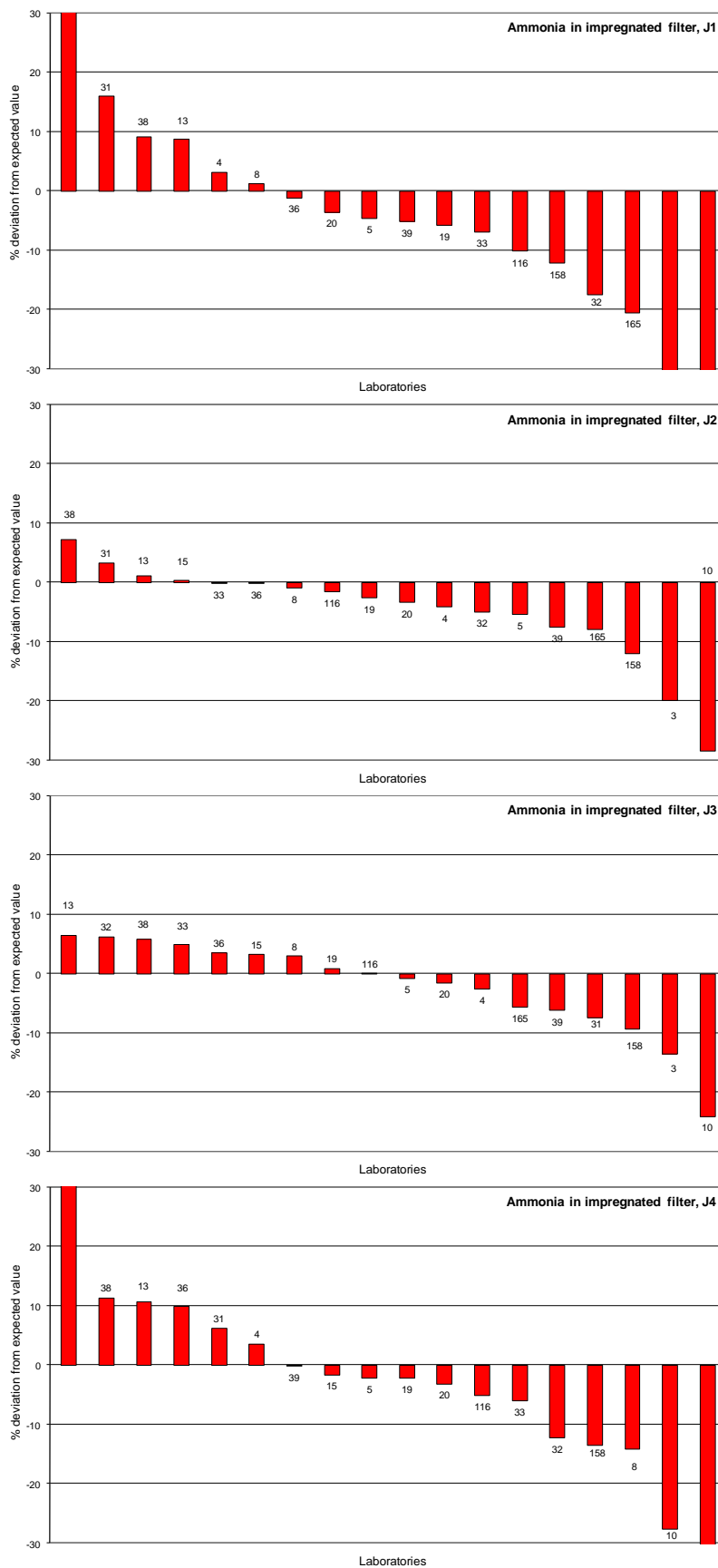
Figure 36: NH₃ in impregnated filter.
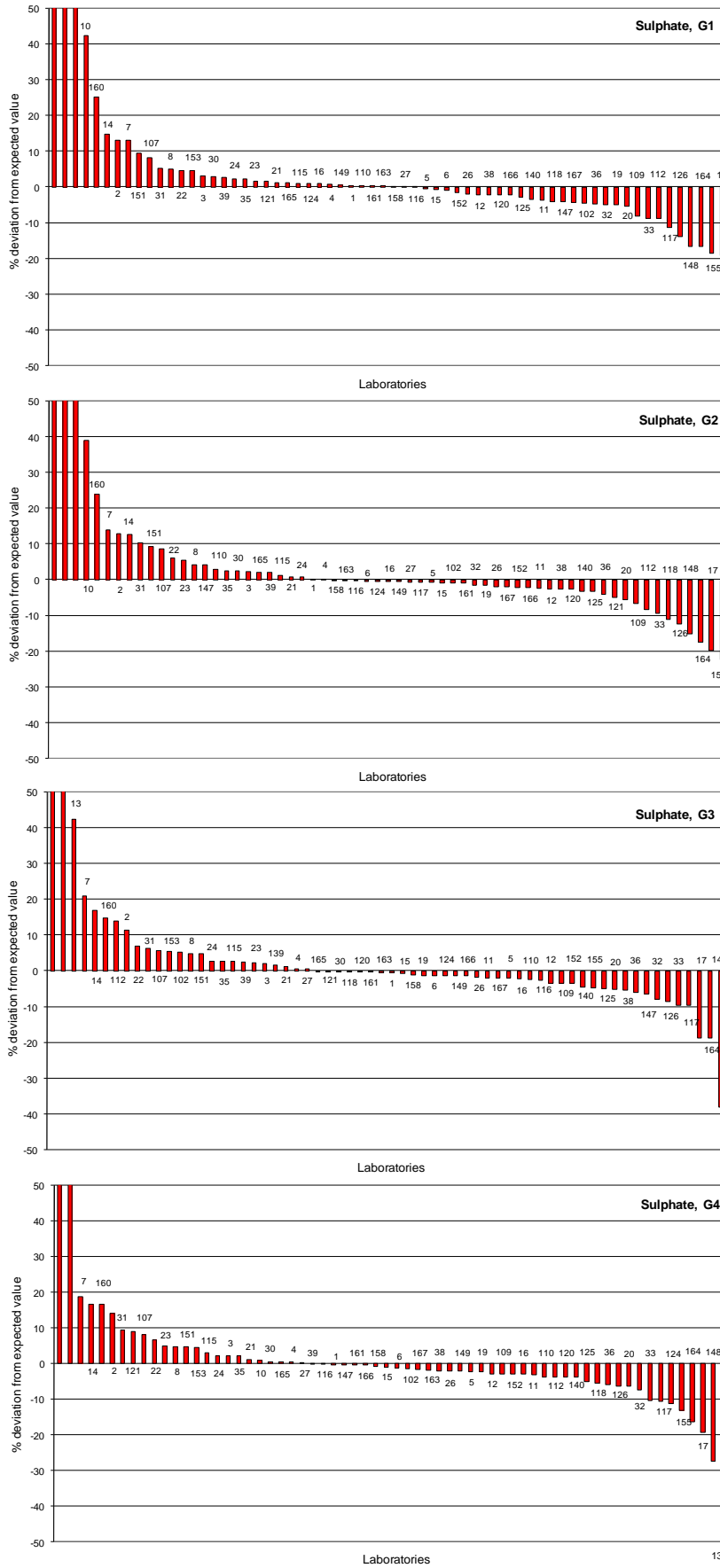
Figure 37: Percent deviation from theoretical value for sulphate.
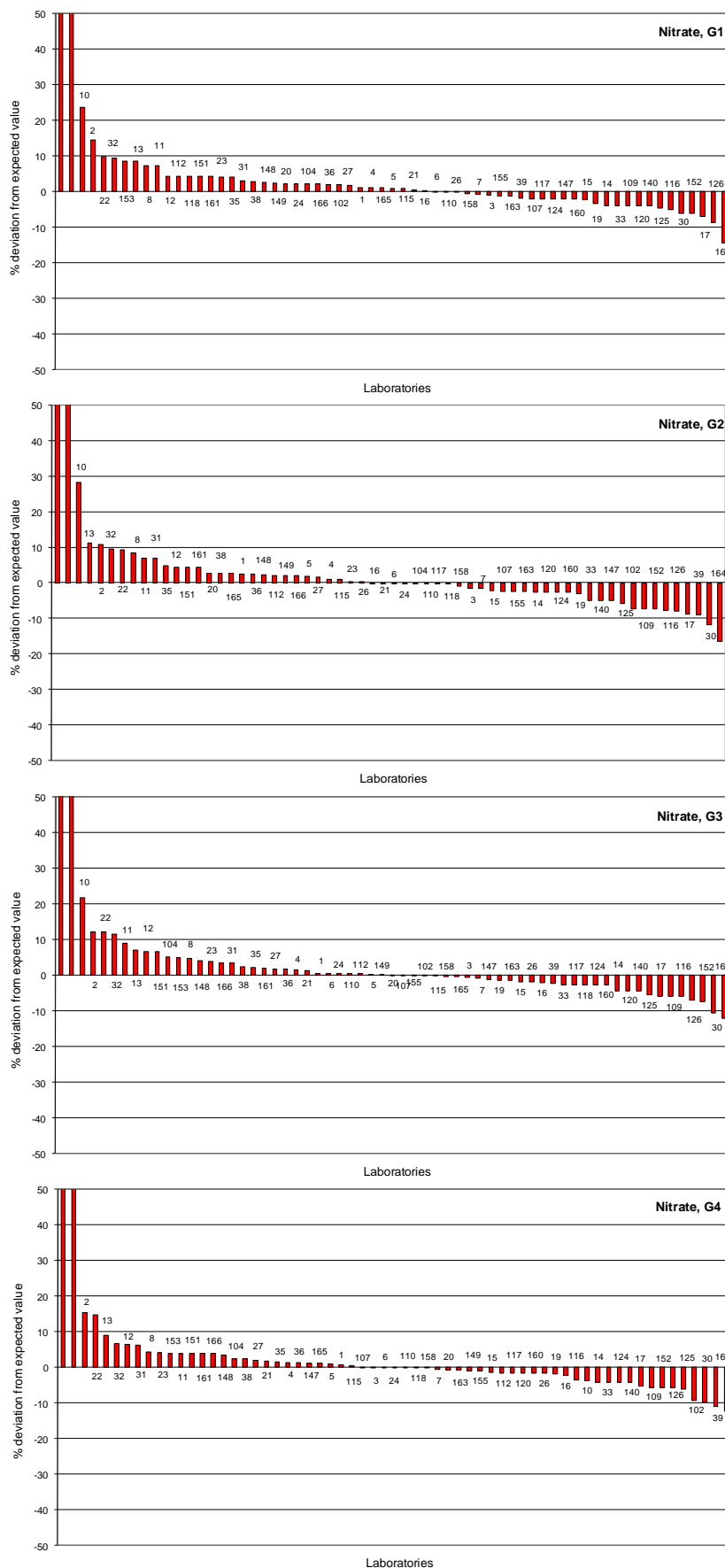
Figure 38: Percent deviation from theoretical value for nitrate.
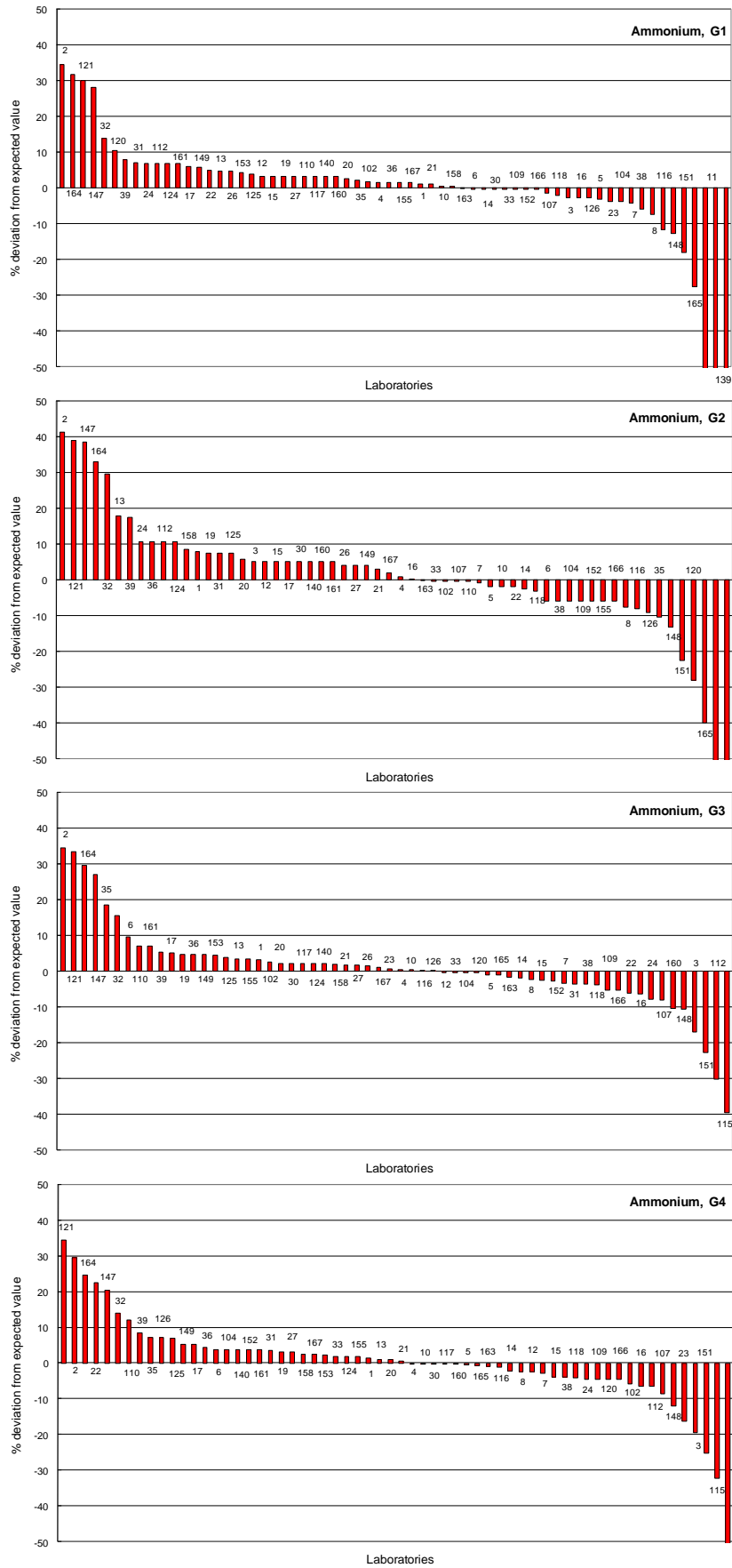
Figure 39: Percent deviation from theoretical value for ammonium.
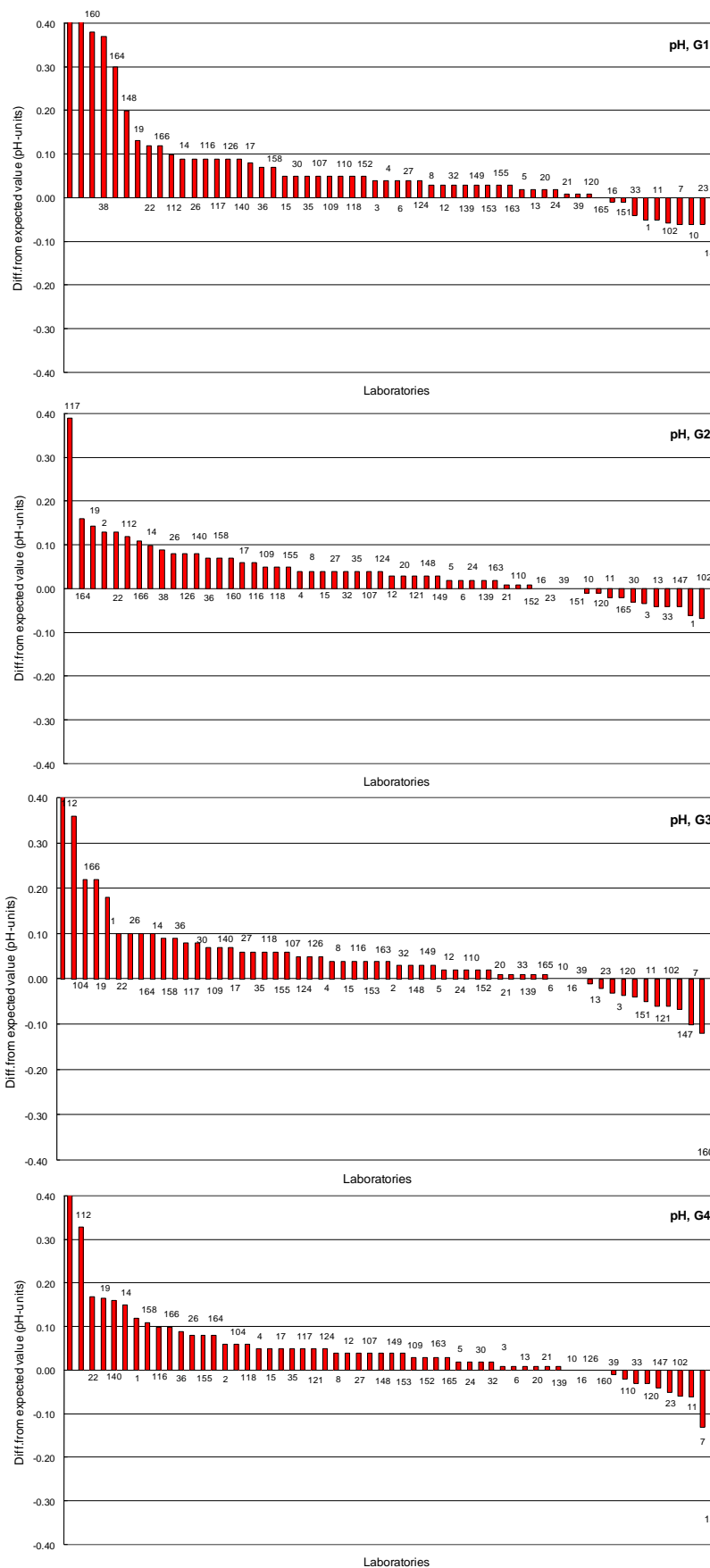
Figure 40: Percent deviation from theoretical value for pH.
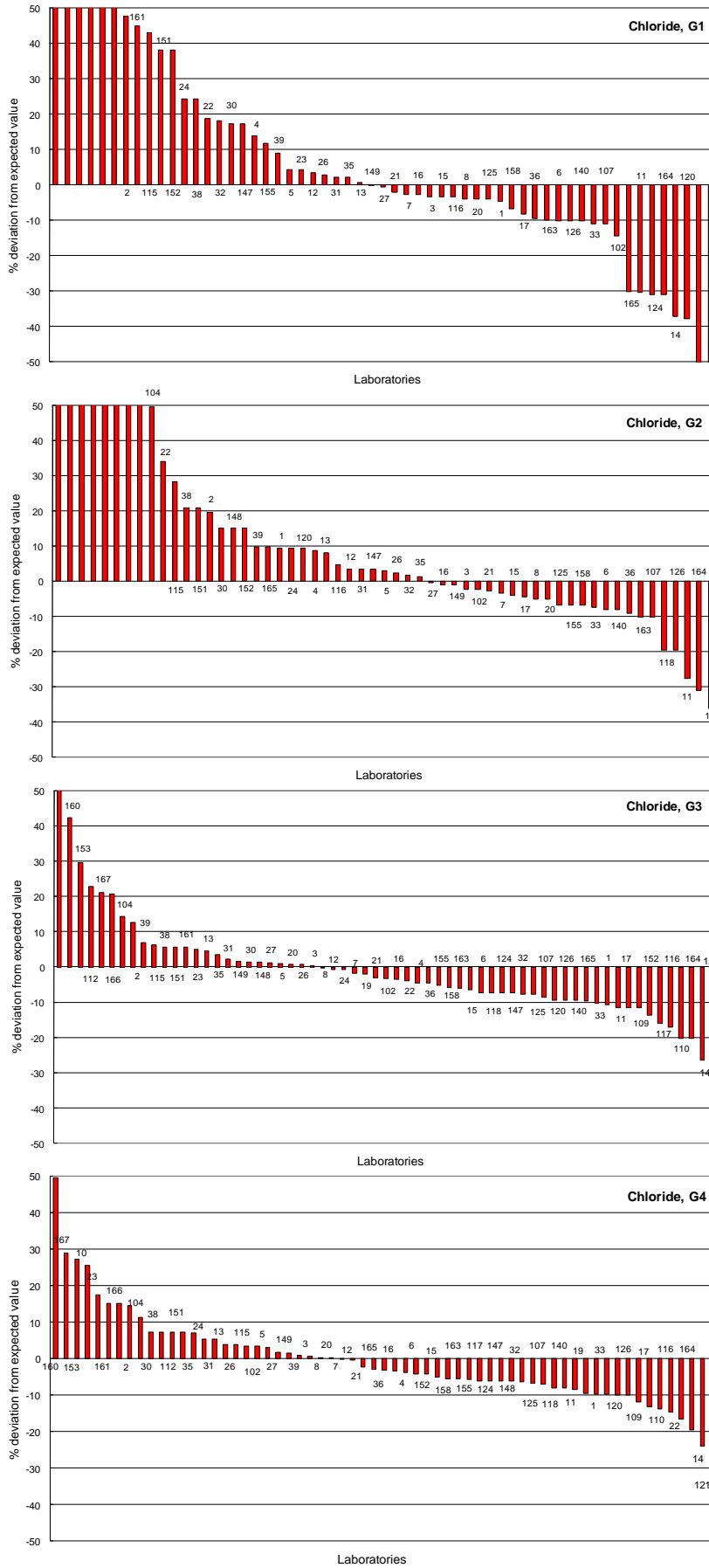
Figure 41: Percent deviation from theoretical value for chloride.
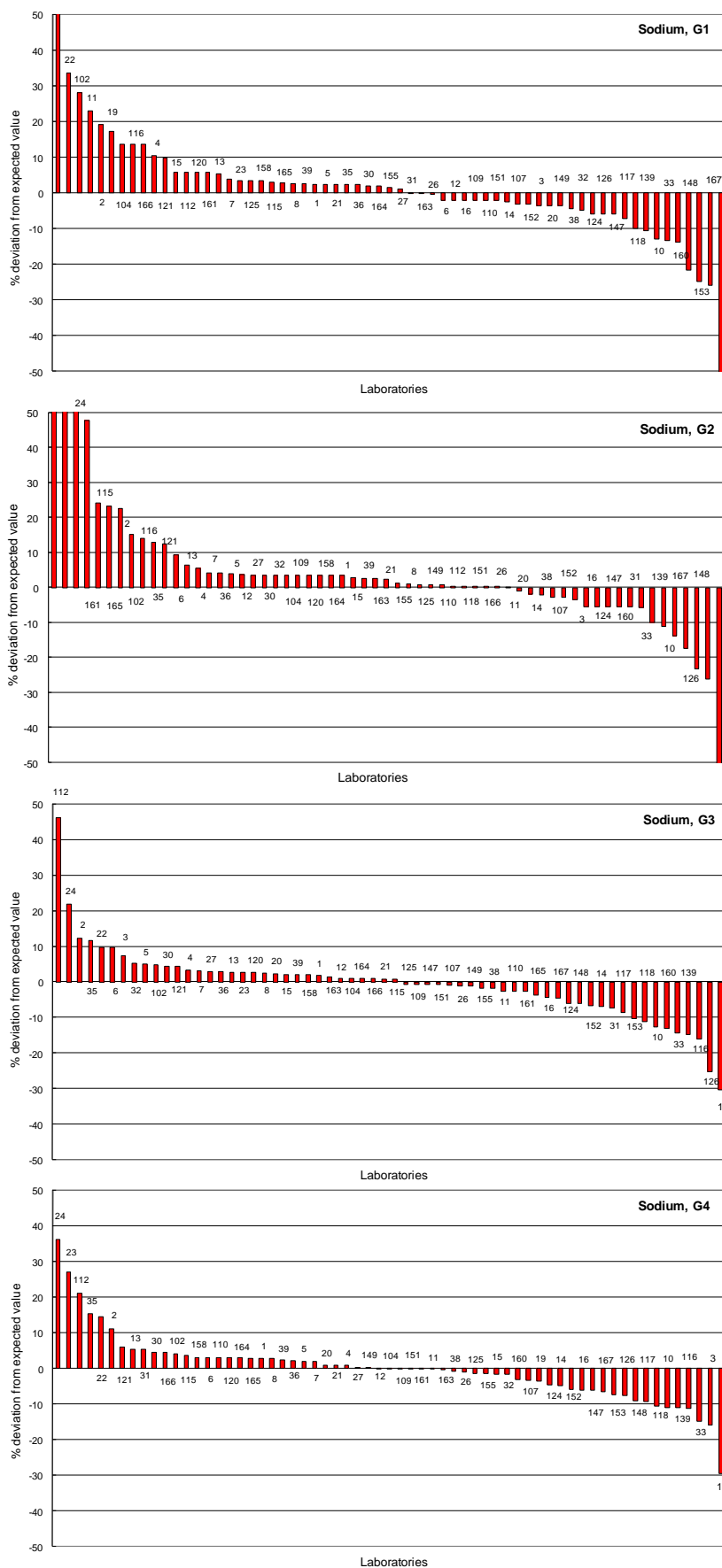
Figure 42: Percent deviation from theoretical value for sodium.
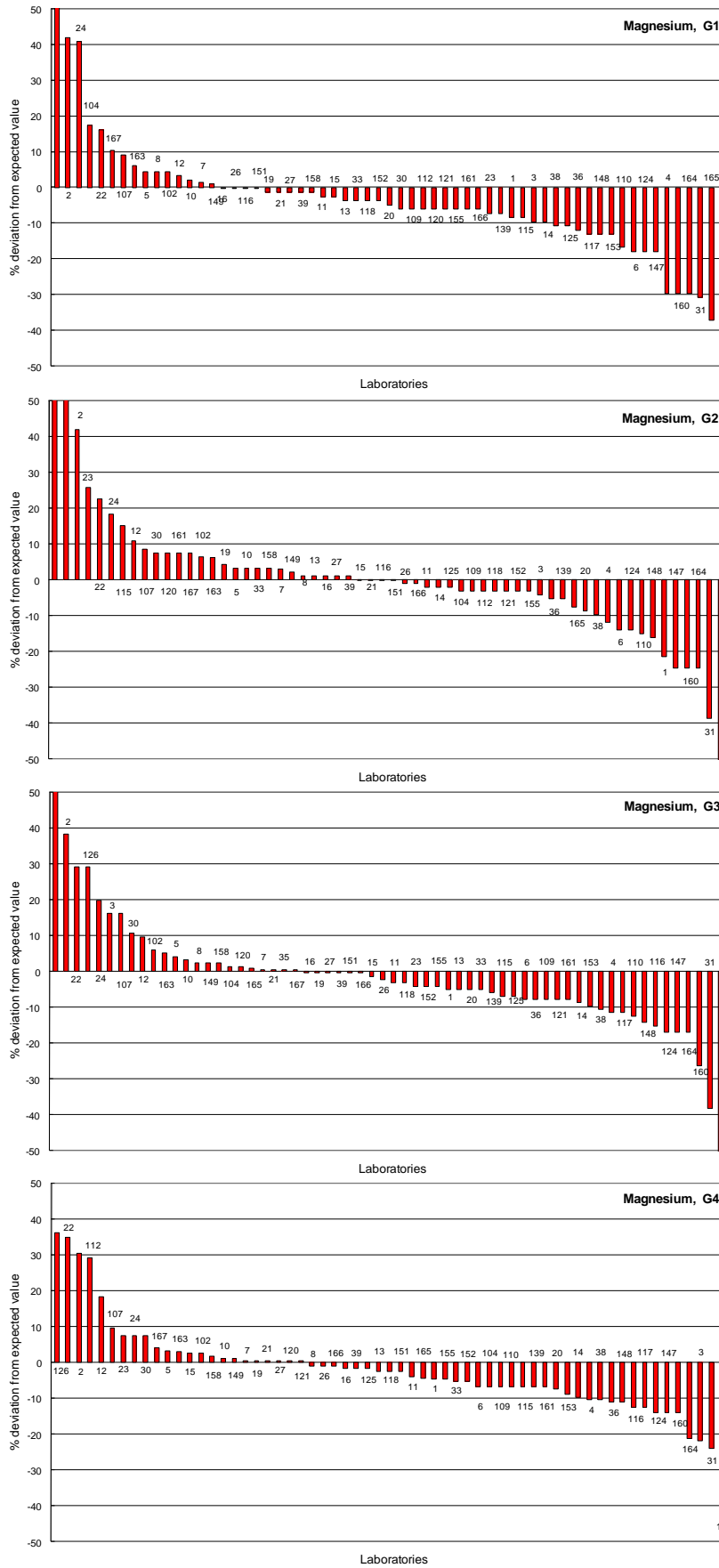
Figure 43: Percent deviation from theoretical value for magnesium.
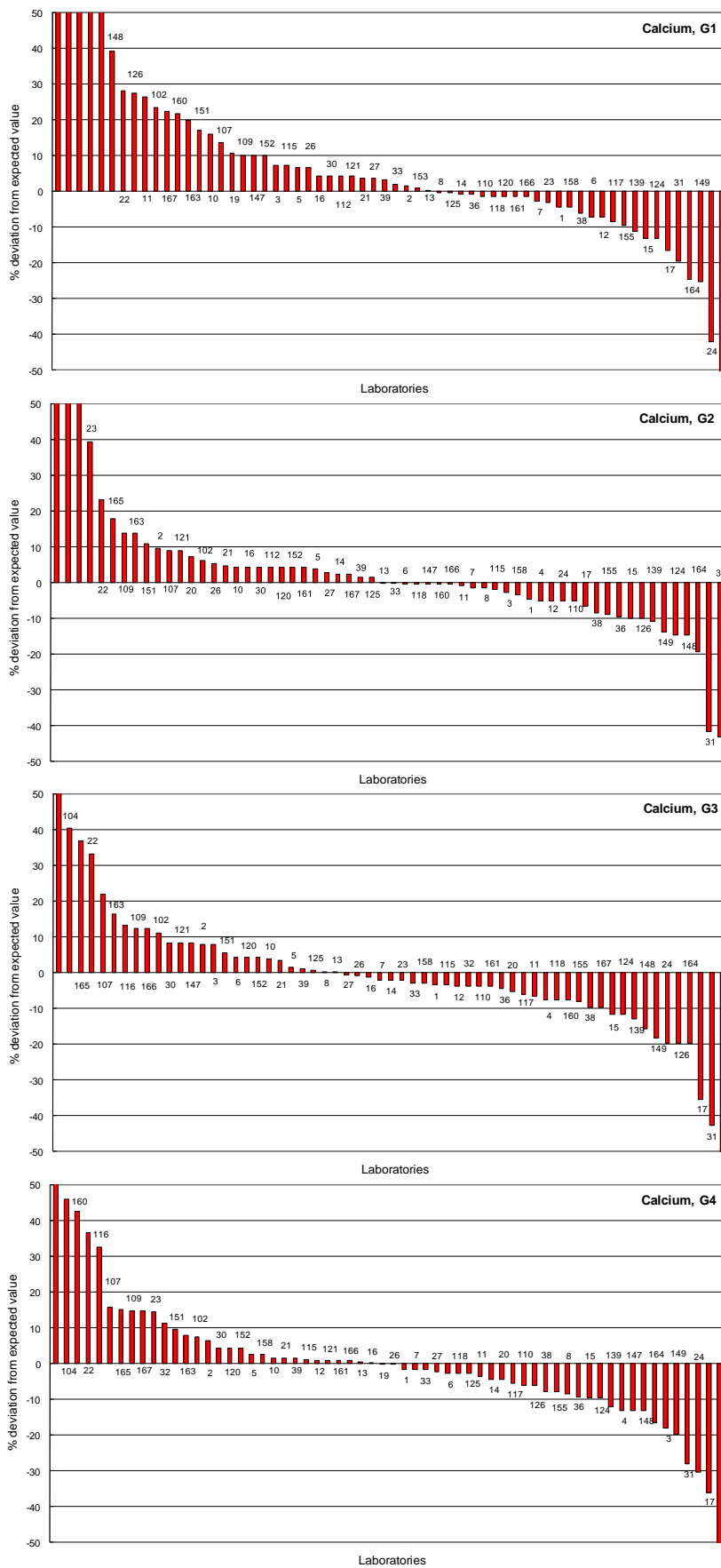
Figure 44: Percent deviation from theoretical value for calcium.
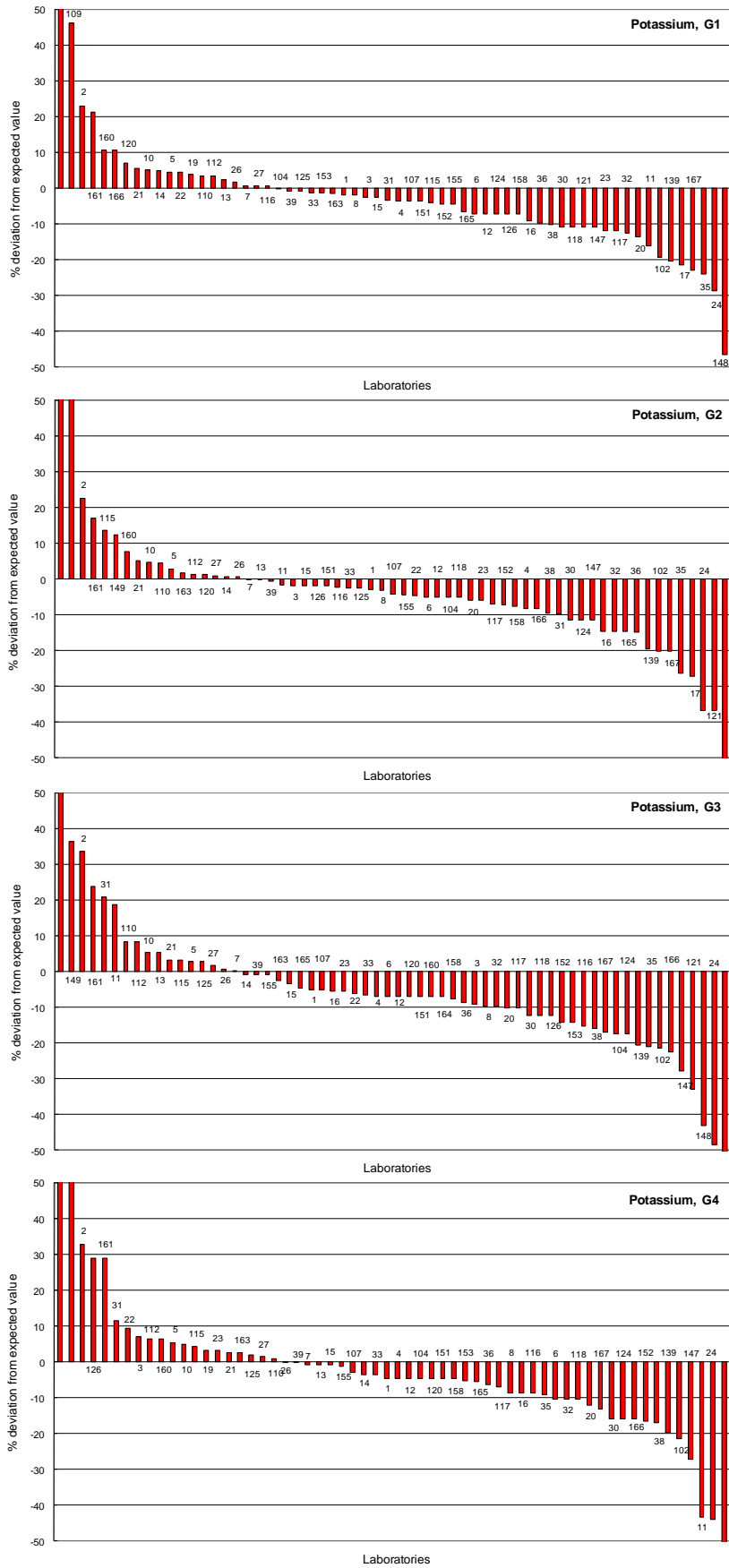
Figure 45: Percent deviation from theoretical value for potassium.
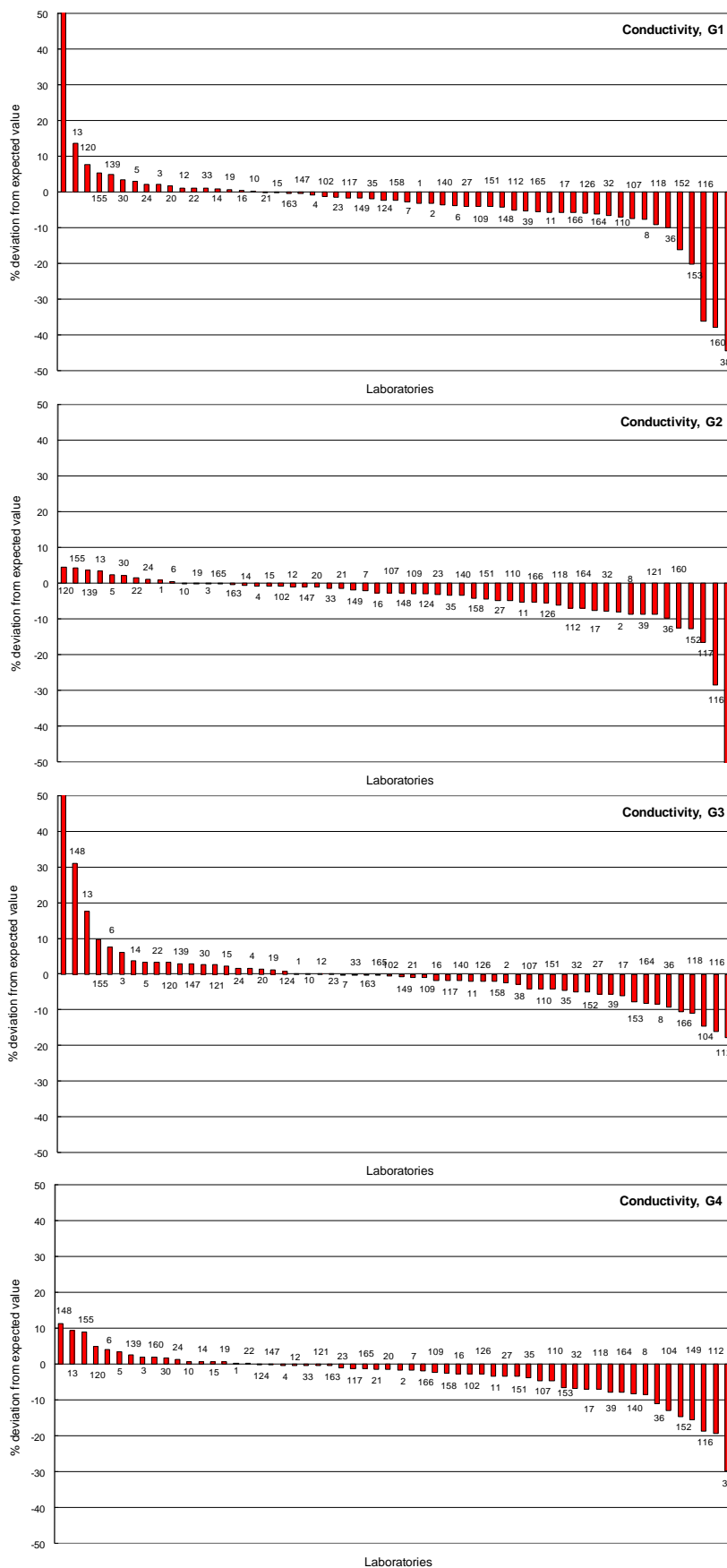
Figure 46: Percent deviation from theoretical value for conductivity.

**Median compared with expected value
(low concentration samples)**

**Median compared with expected value
(high concentration samples)**
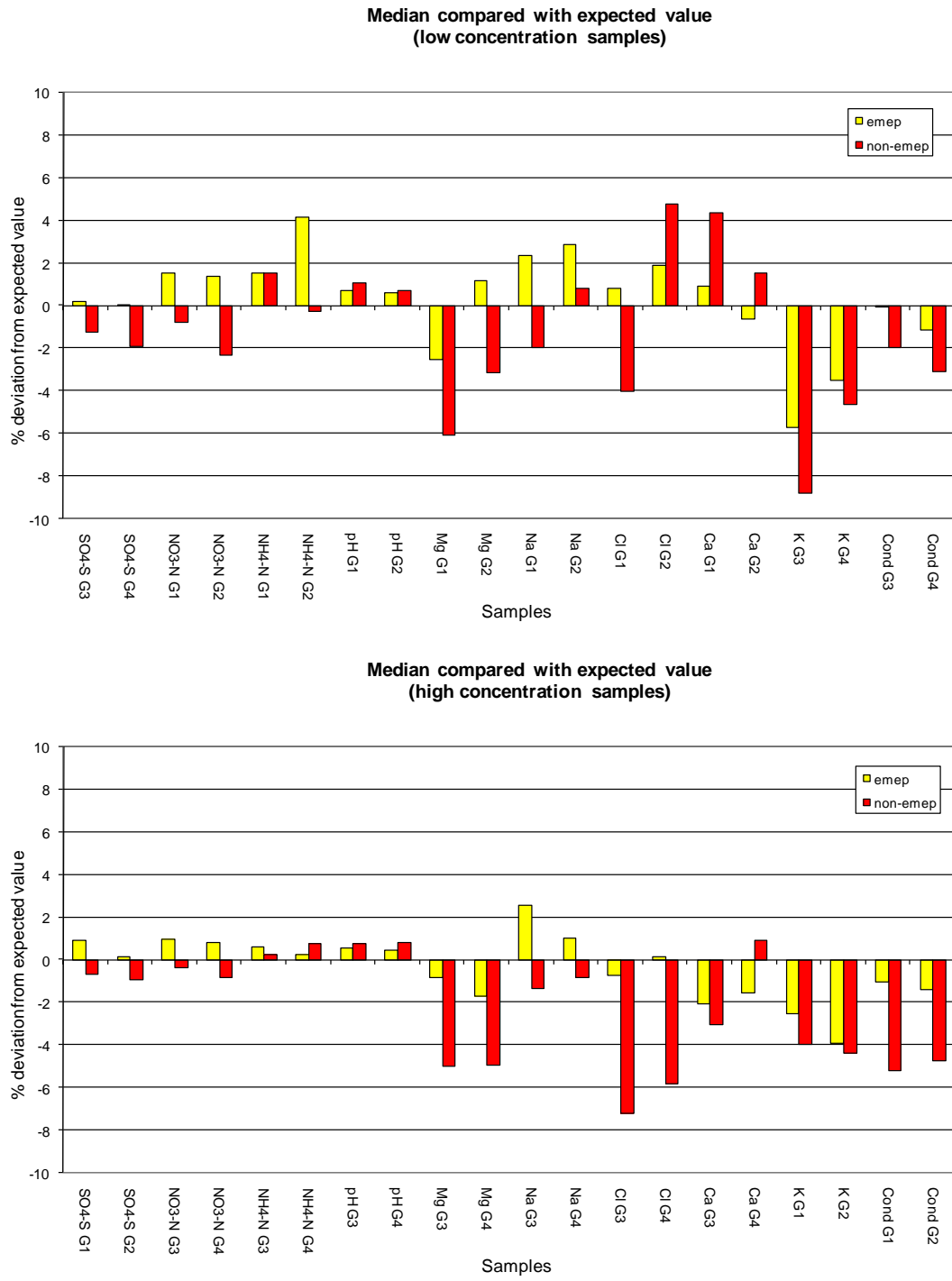
Figure 47: The median compared to theoretical value.
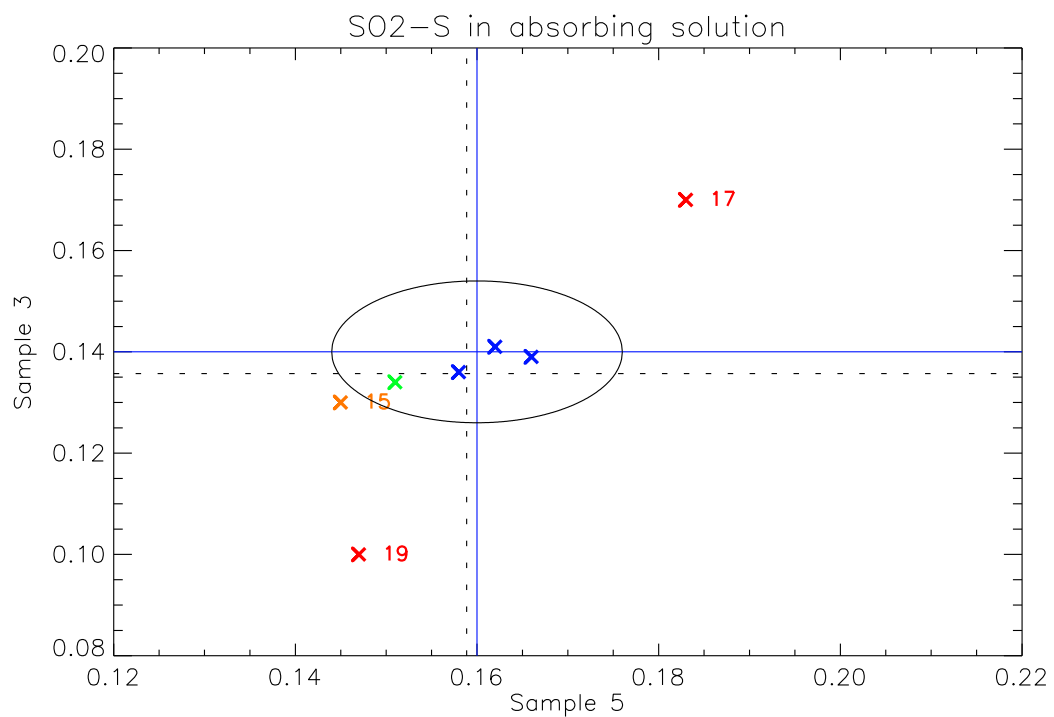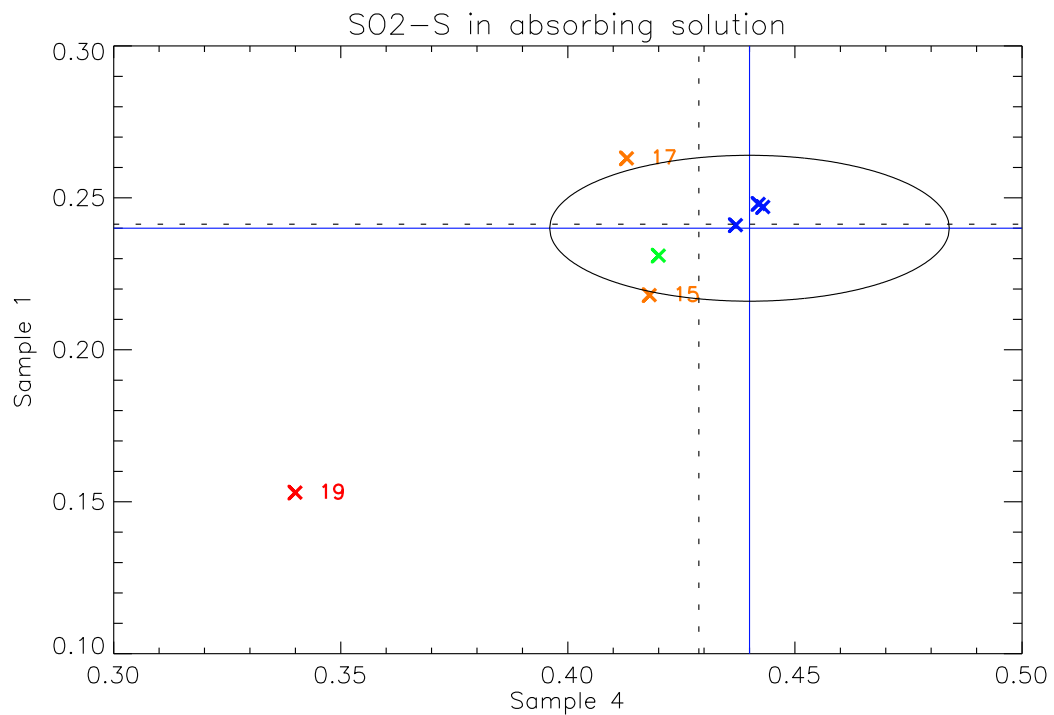
Figure 48: Youden plot of SO$_2$-S in absorbing solution.
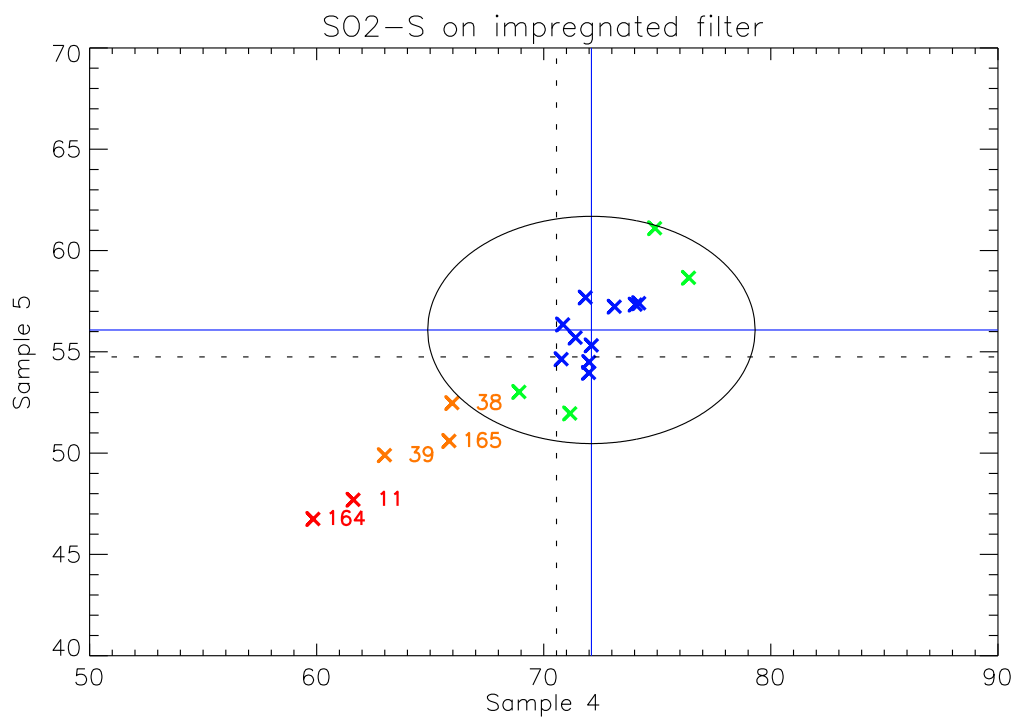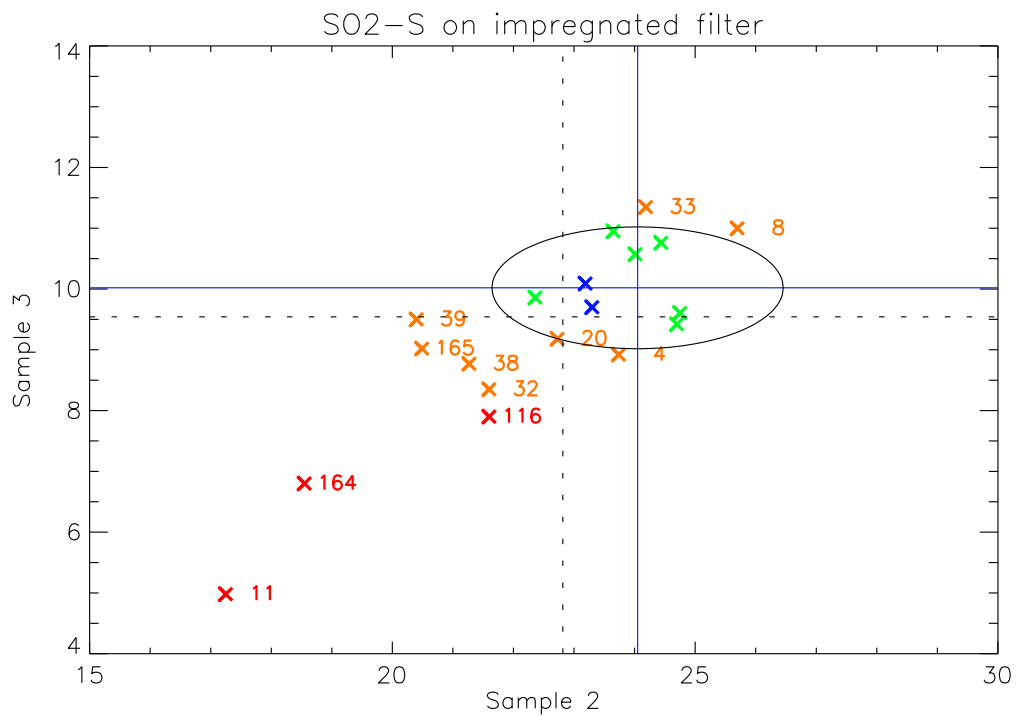
Figure 49: Youden plot of SO₂-S on impregnated filter.
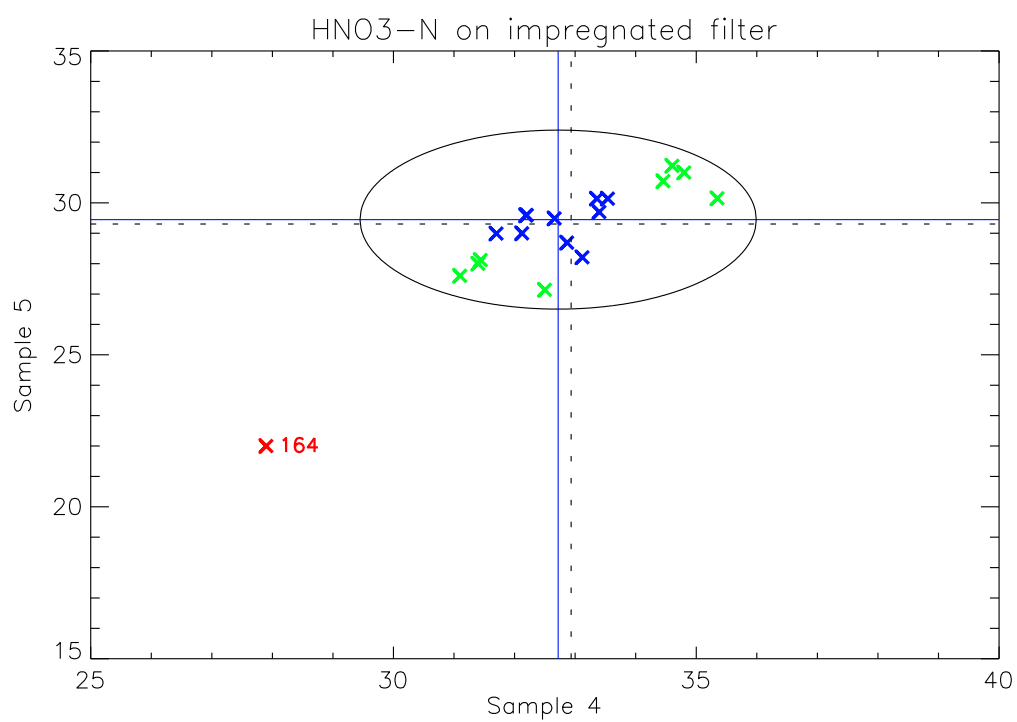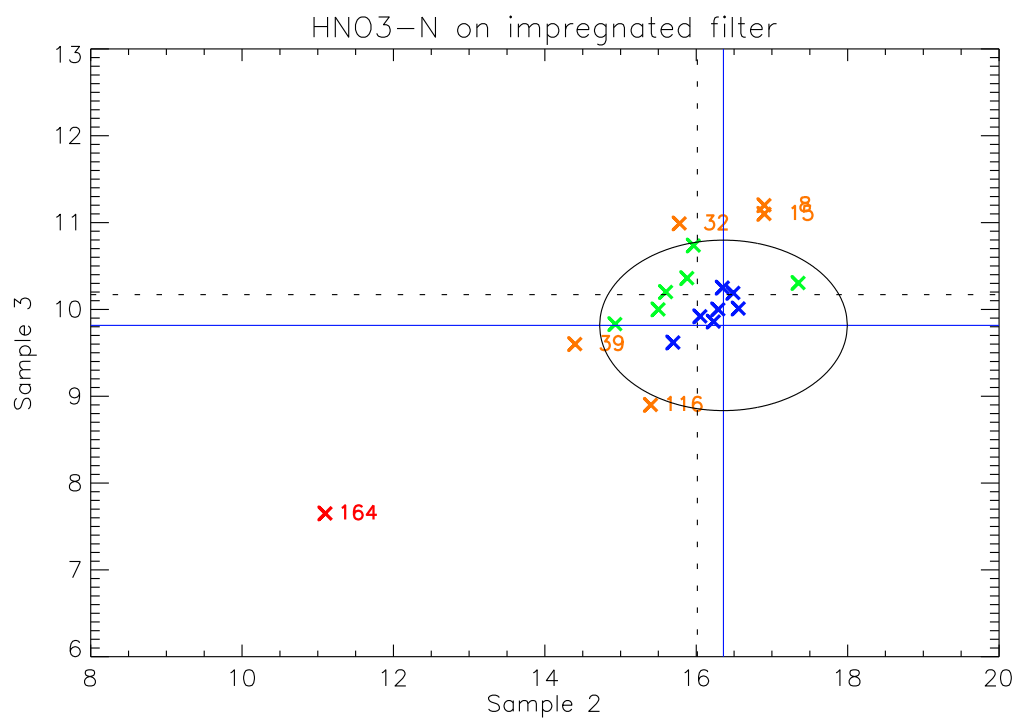
Figure 50: Youden plot of HNO₃-N on impregnated filter.
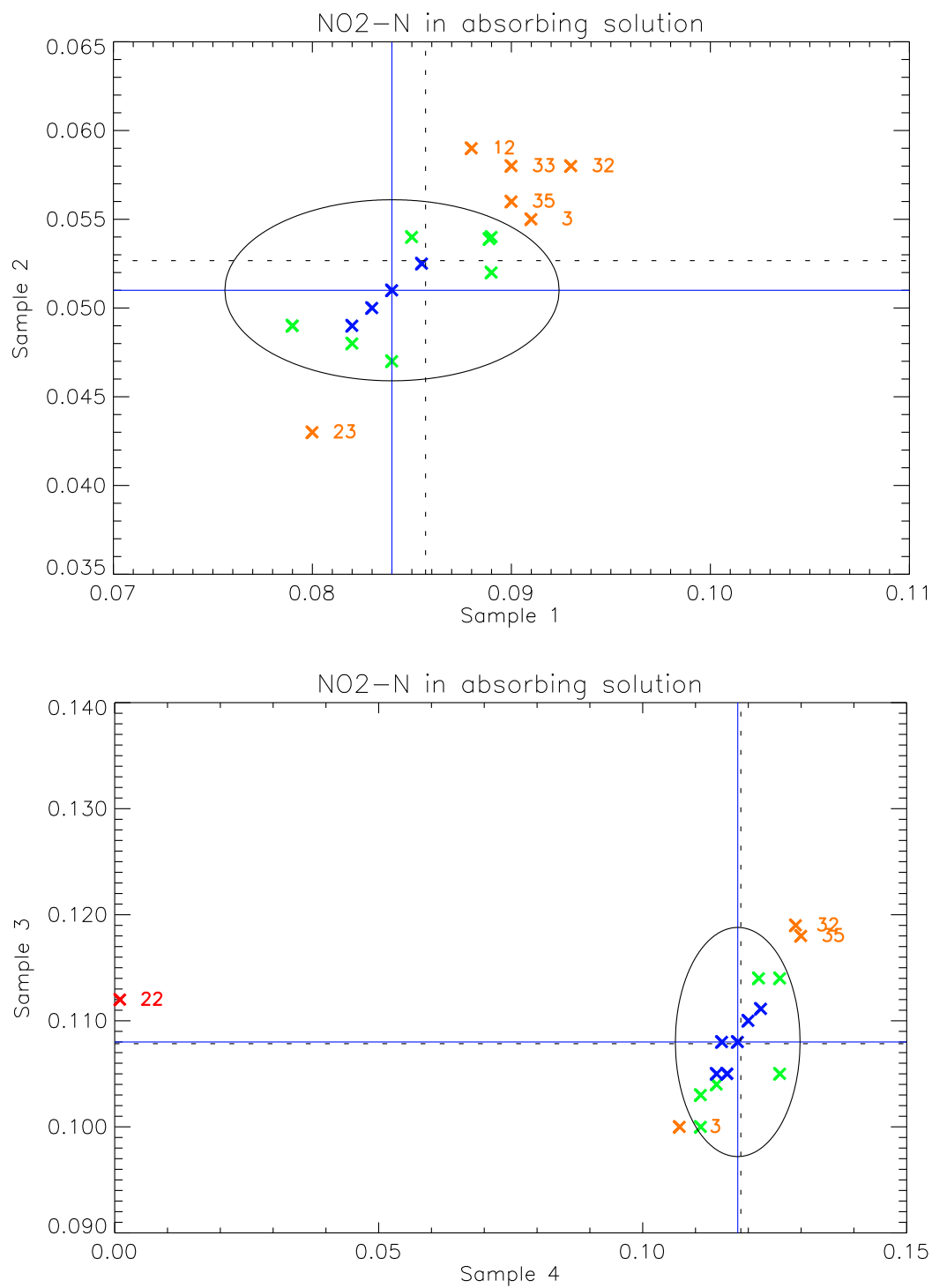
Figure 51: Youden plot of NO$_2$-N in absorbing solution.
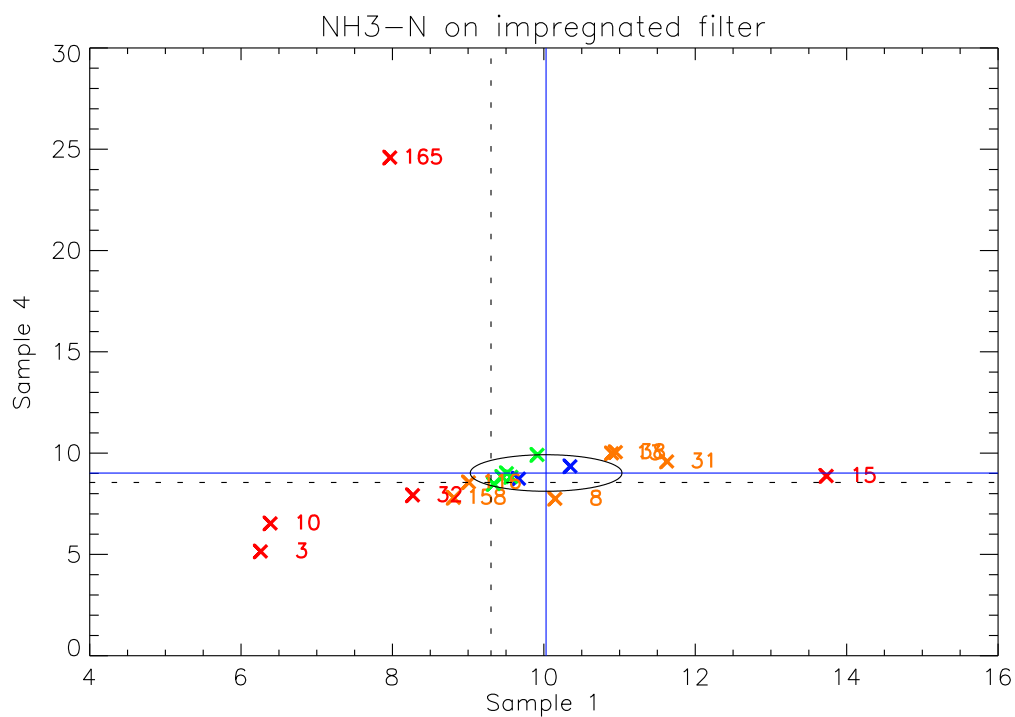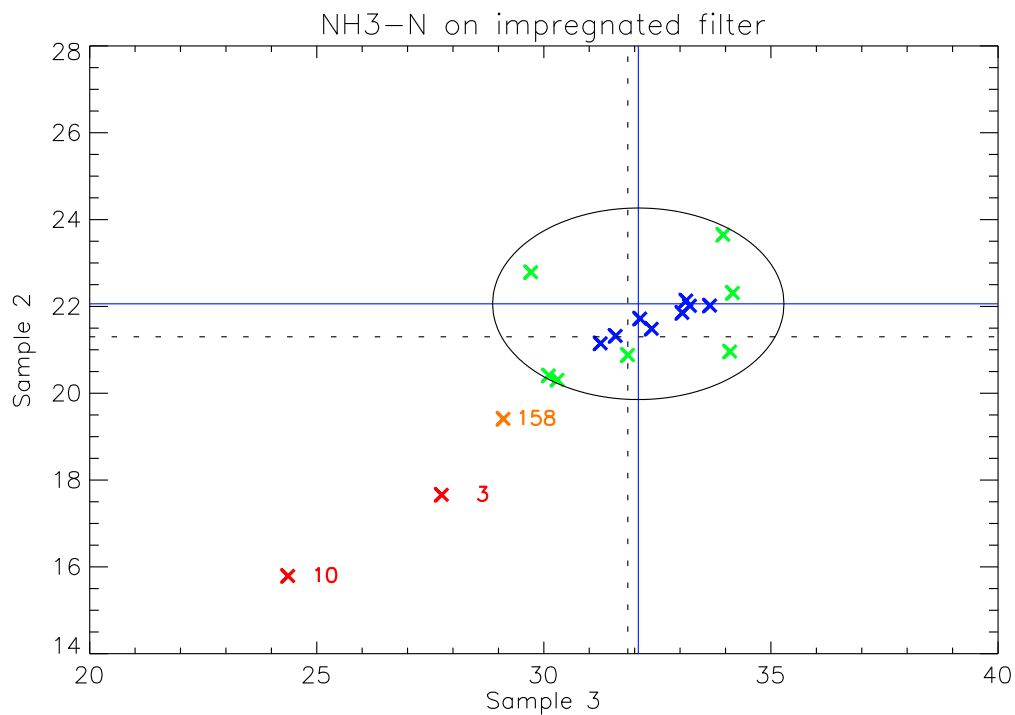
Figure 52: Youden plot of NH₃-N on impregnated filter.
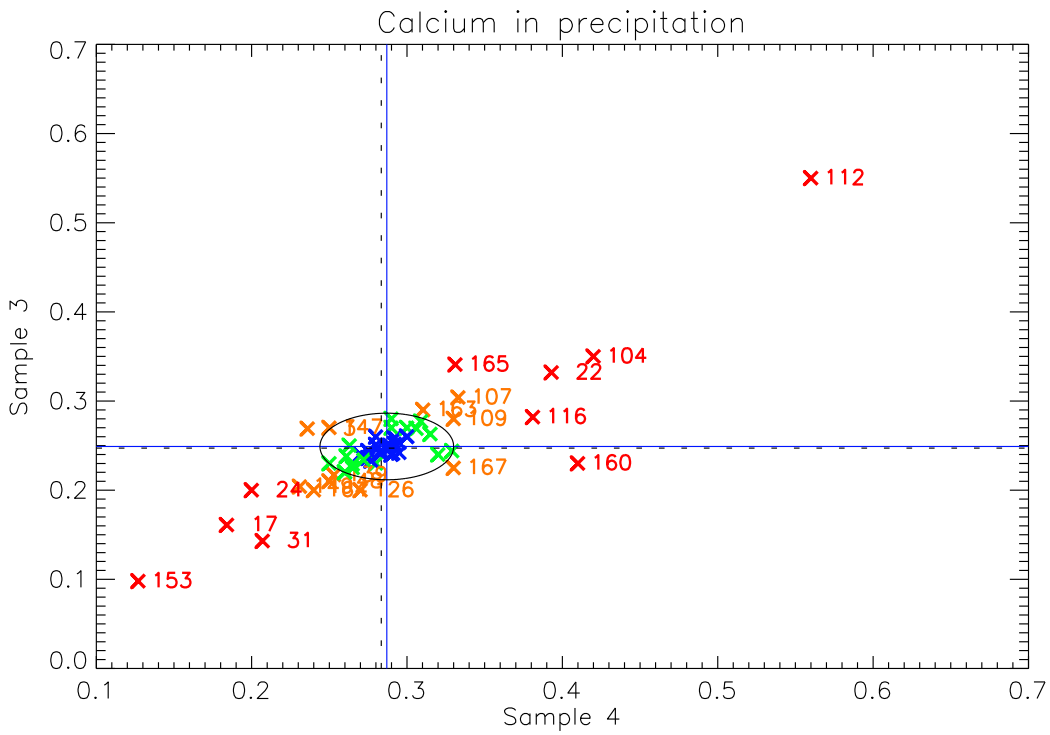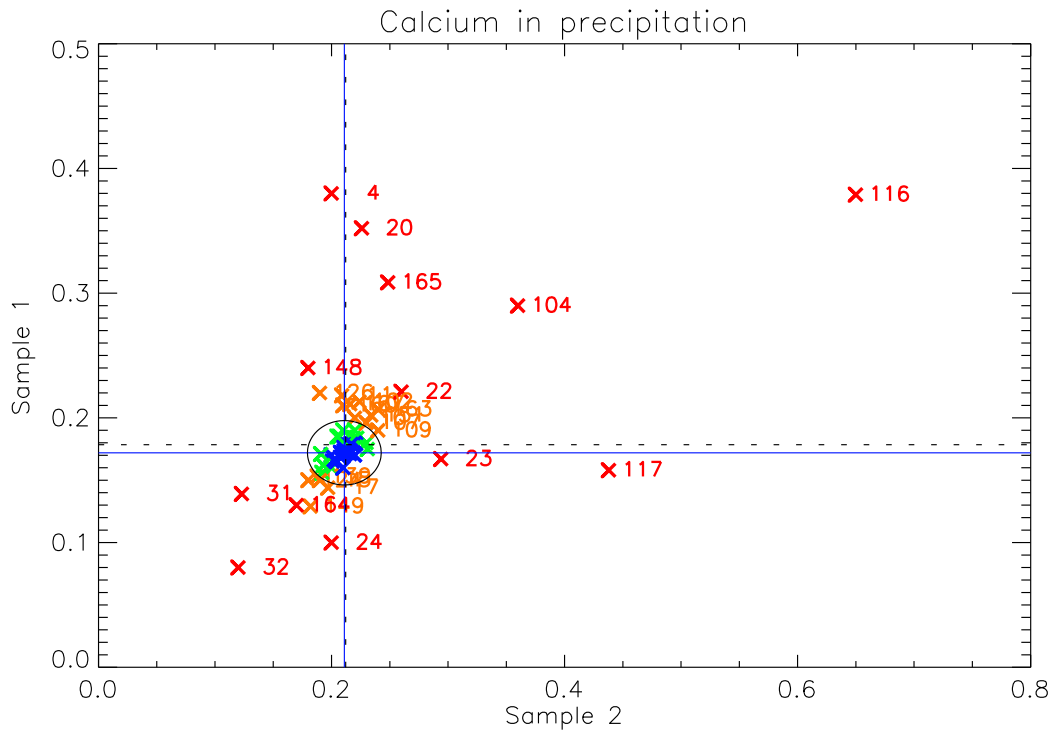
Figure 53: Youden plot of Ca in precipitation.
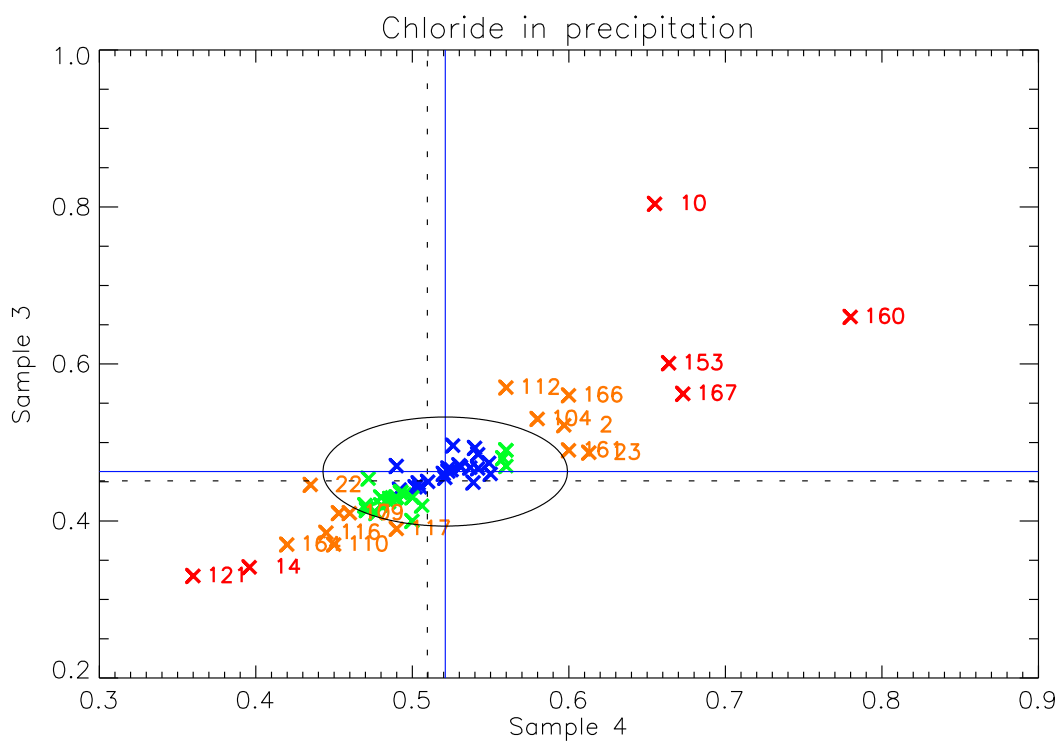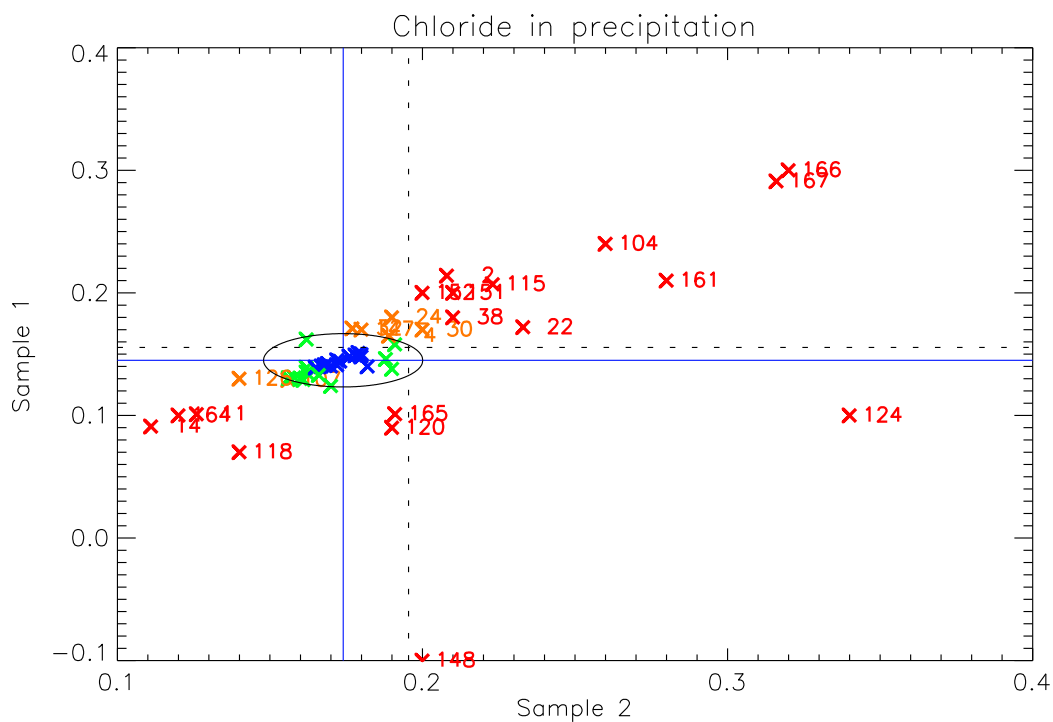
Figure 54: Youden plot of Cl in precipitation.
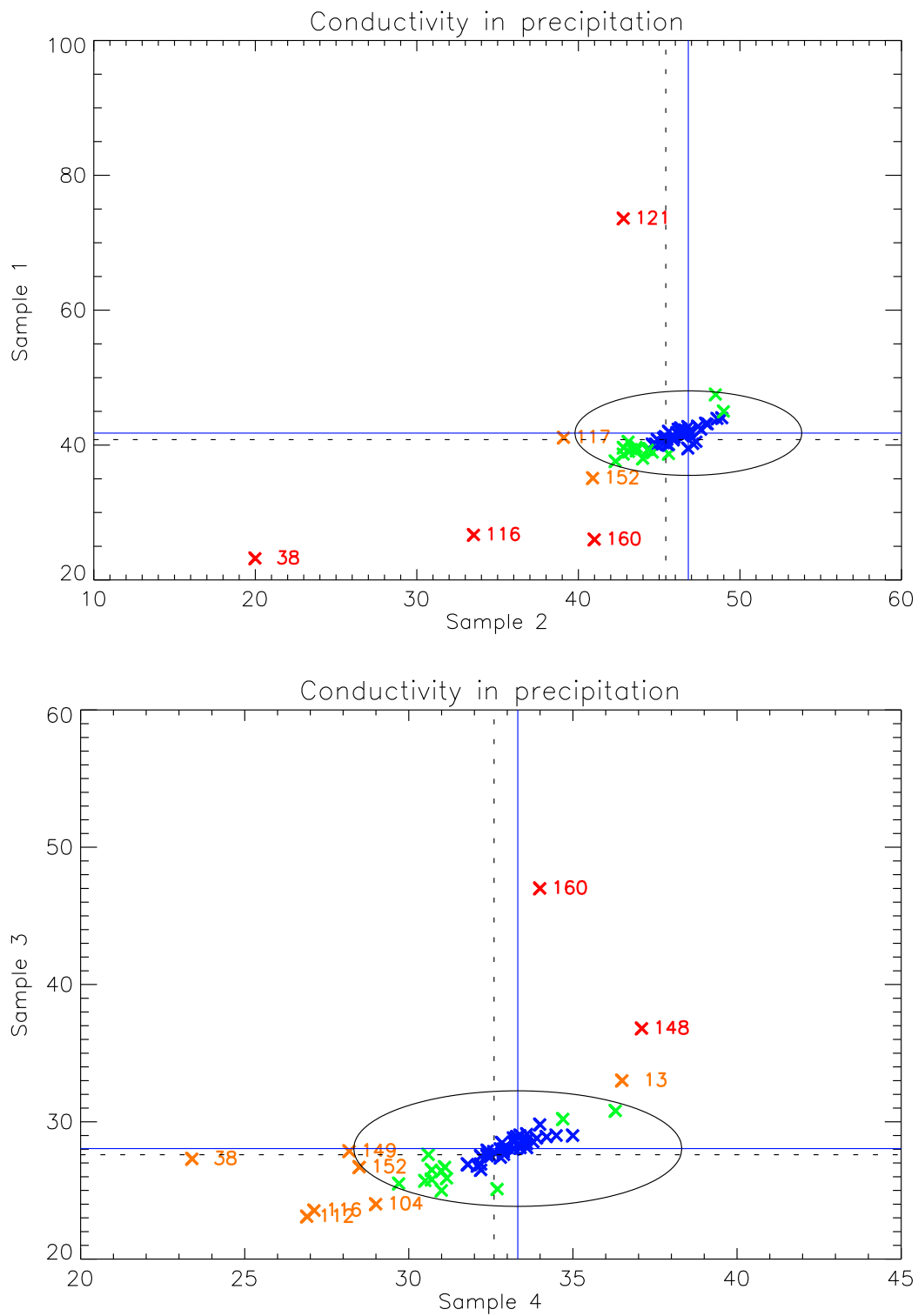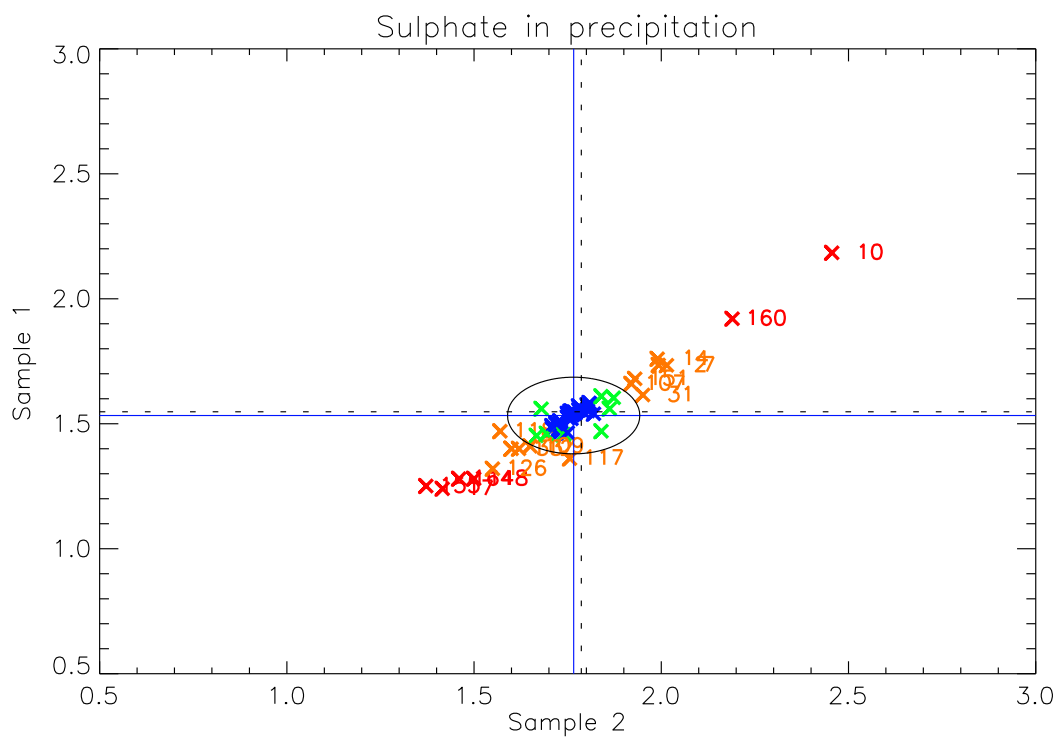
Figure 55: Youden plot of conductivity in precipitation.
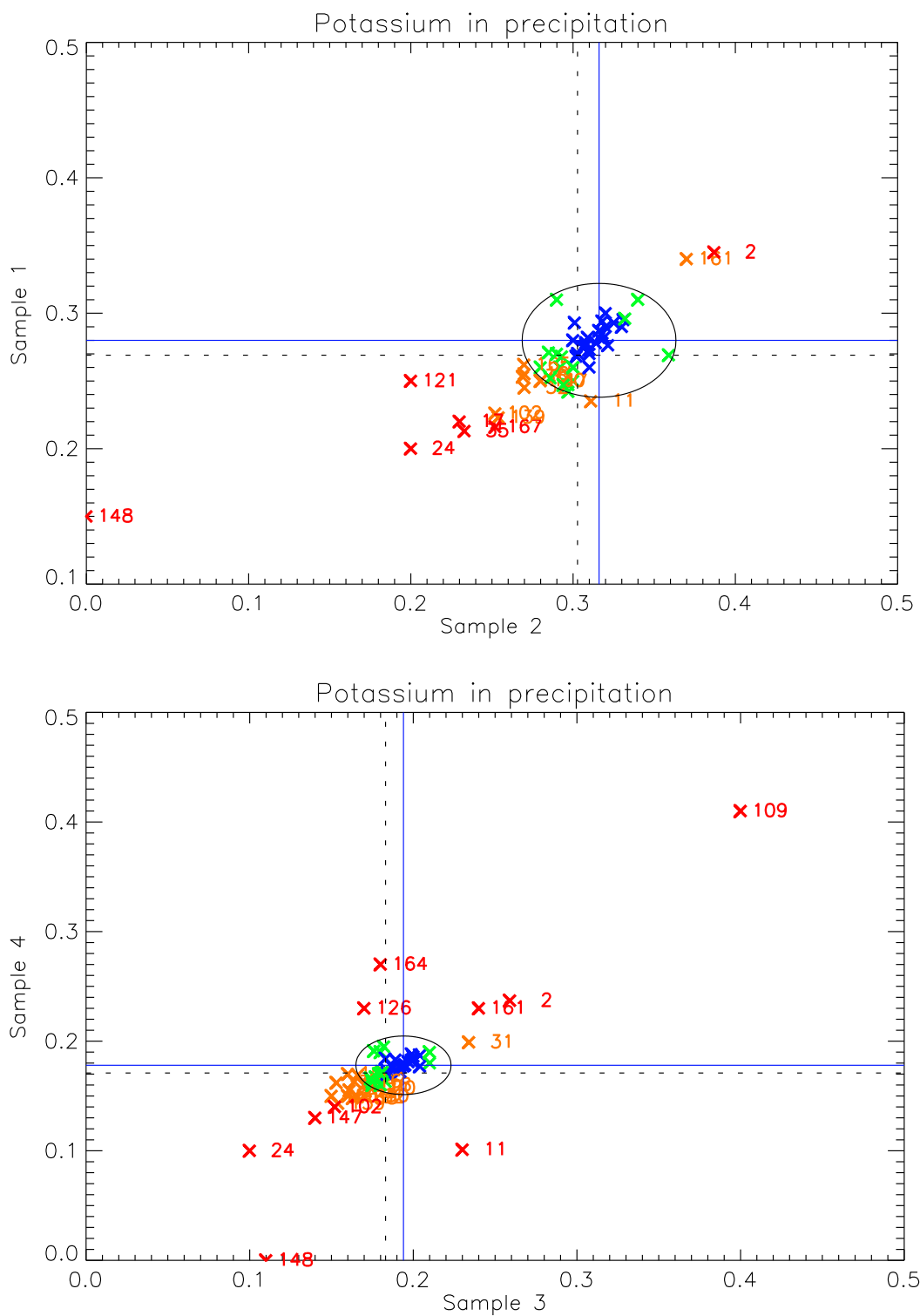
Figure 56: Youden plot of K in precipitation.
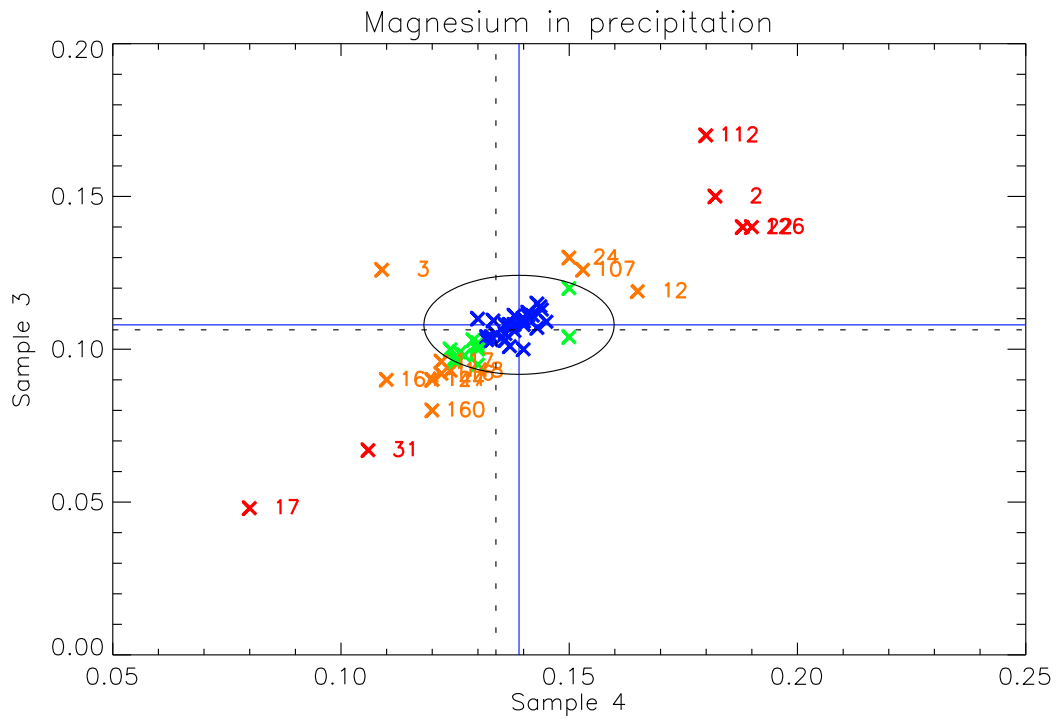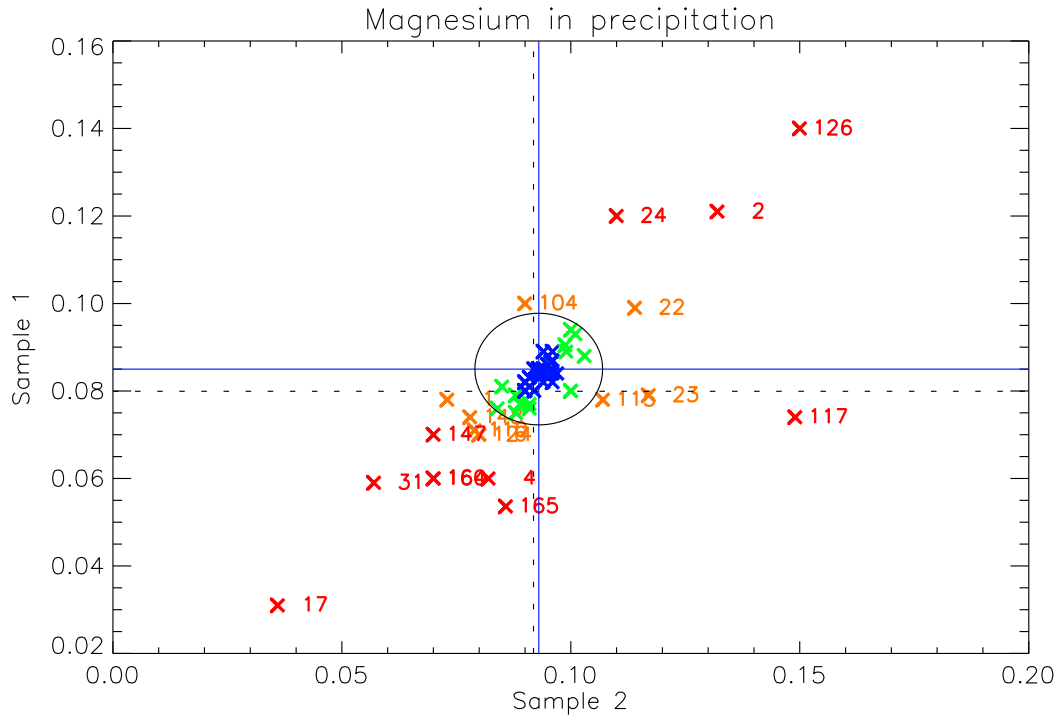
Figure 57: Youden plot of Mg in precipitation.
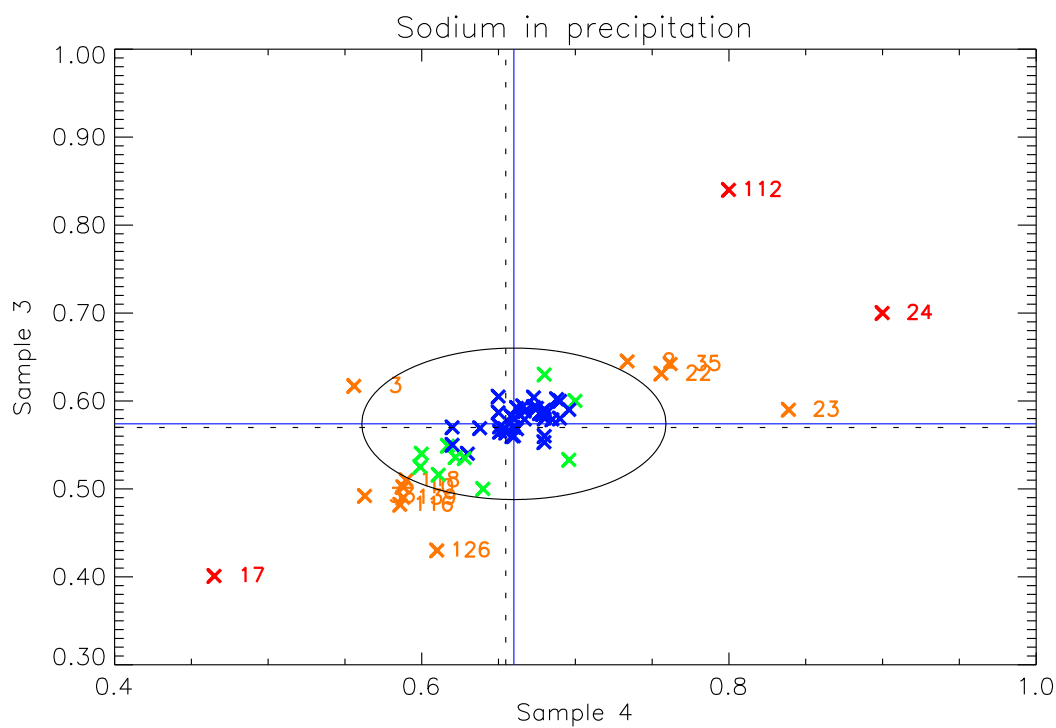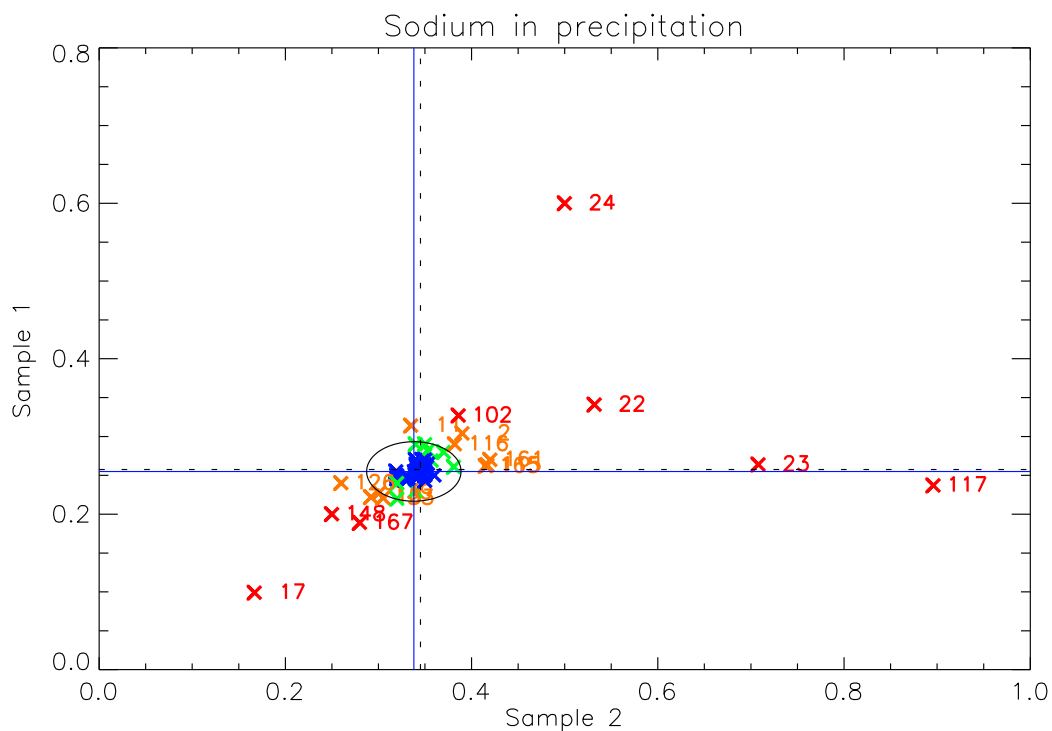
Figure 58: Youden plot of Na in precipitation.
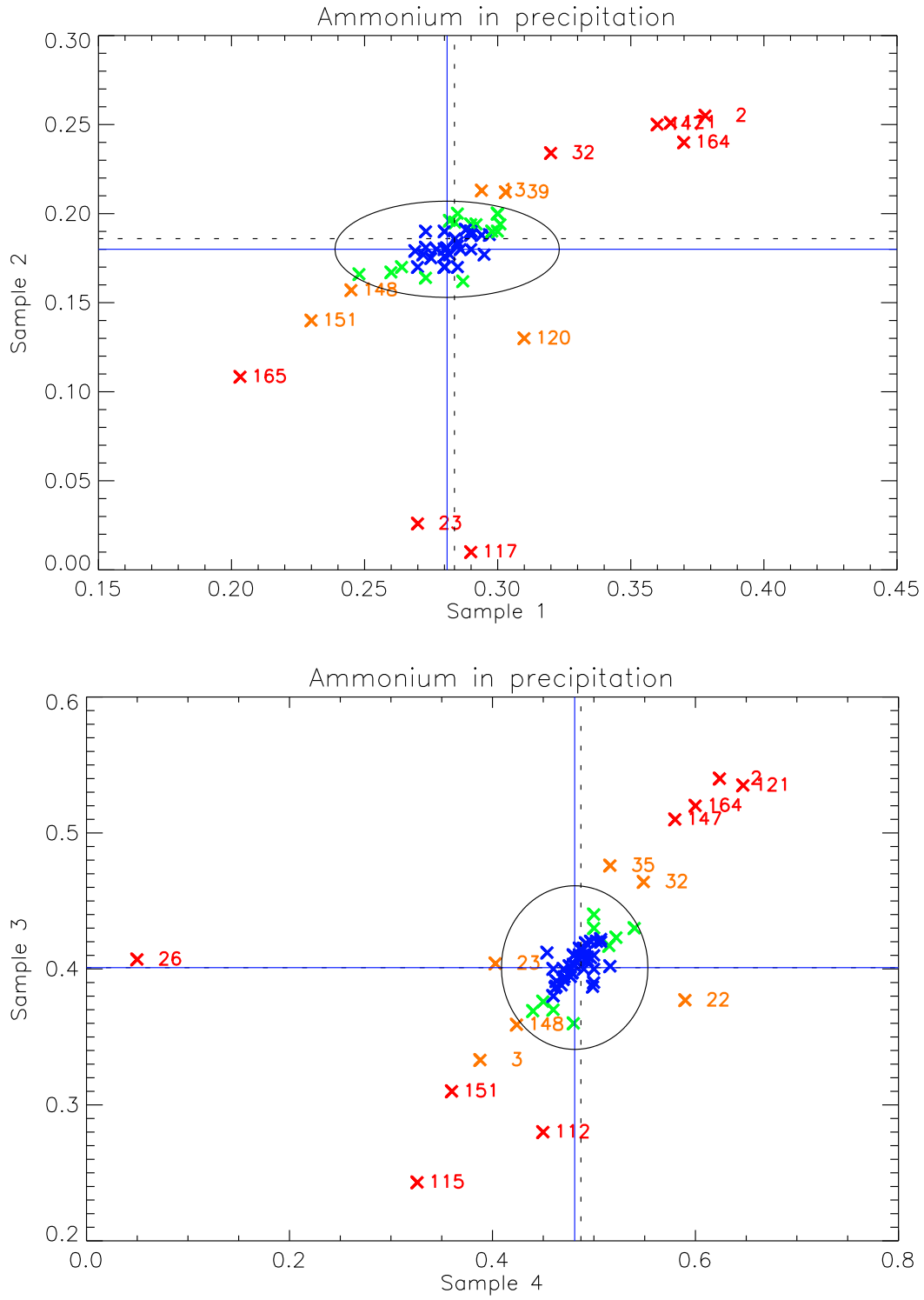
Figure 59: Youden plot of NH₄-N in precipitation.
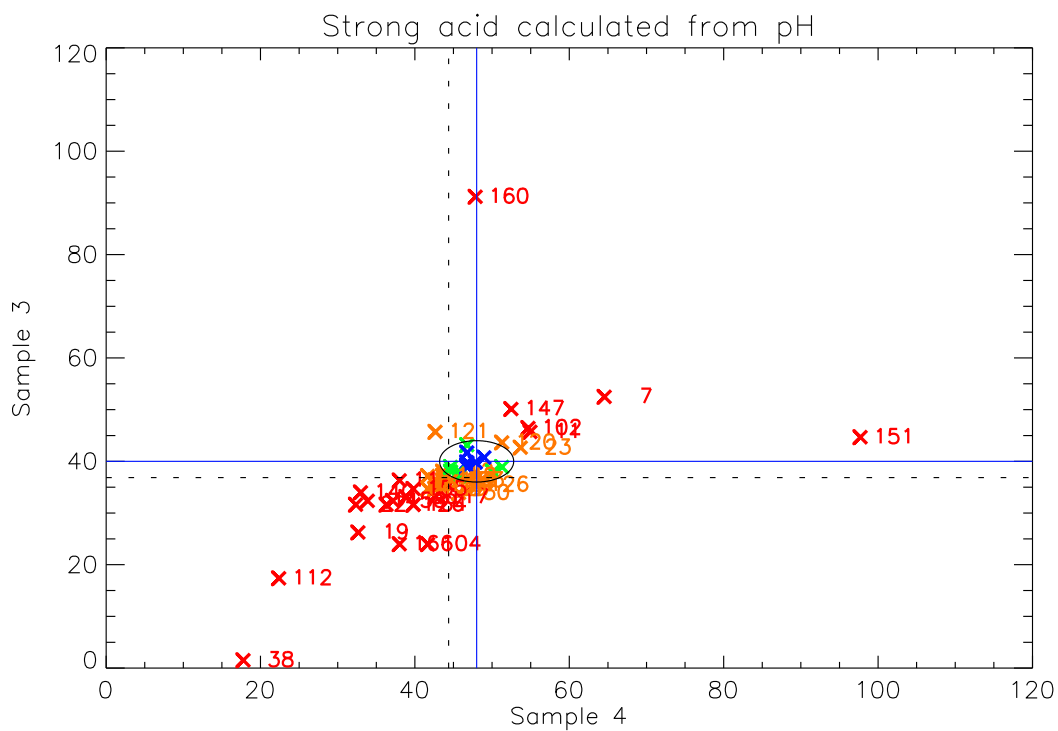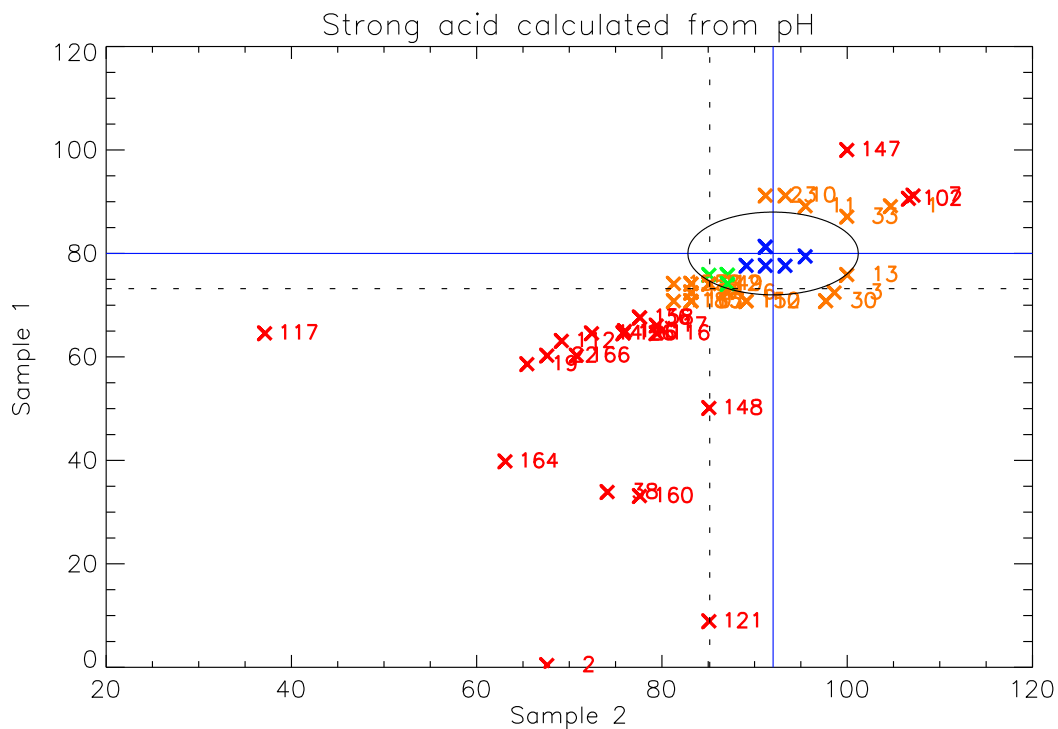
Figure 60: Youden plot of strong acid calculated from pH.
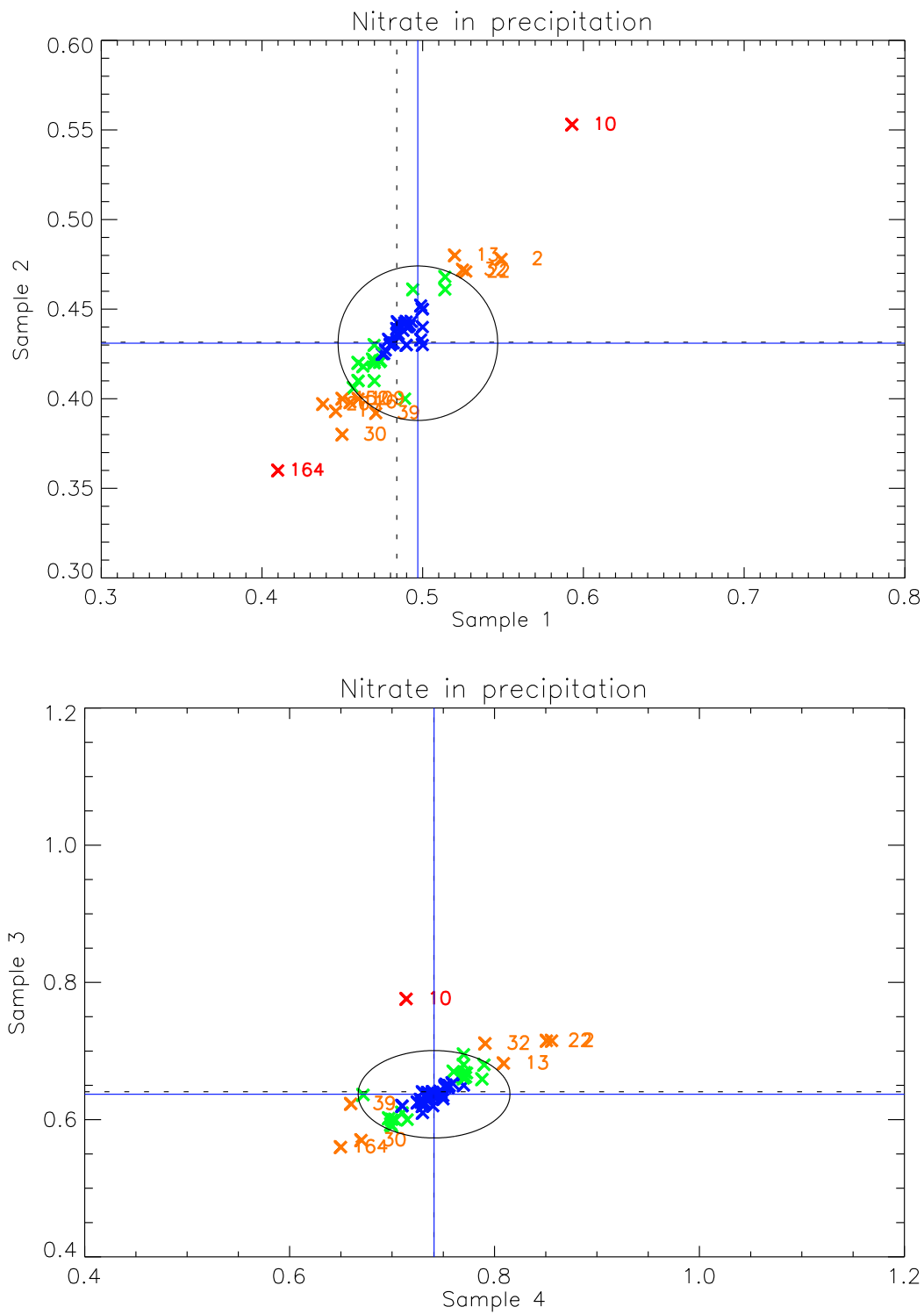
Figure 61: Youden plot of NO₃-N in precipitation.
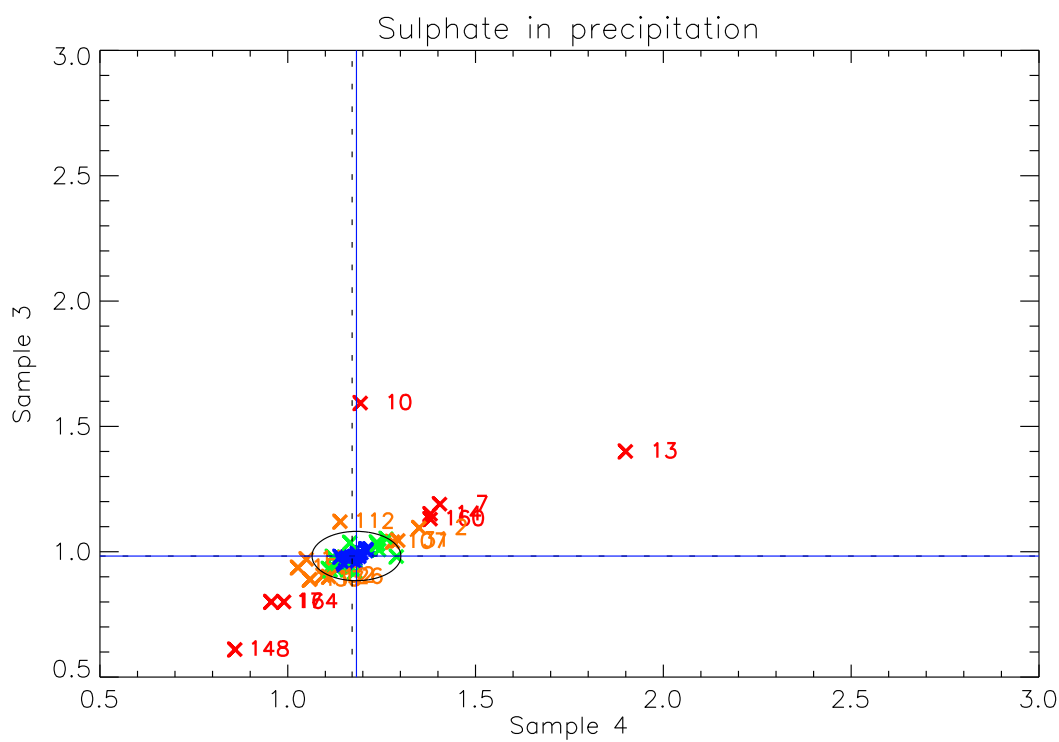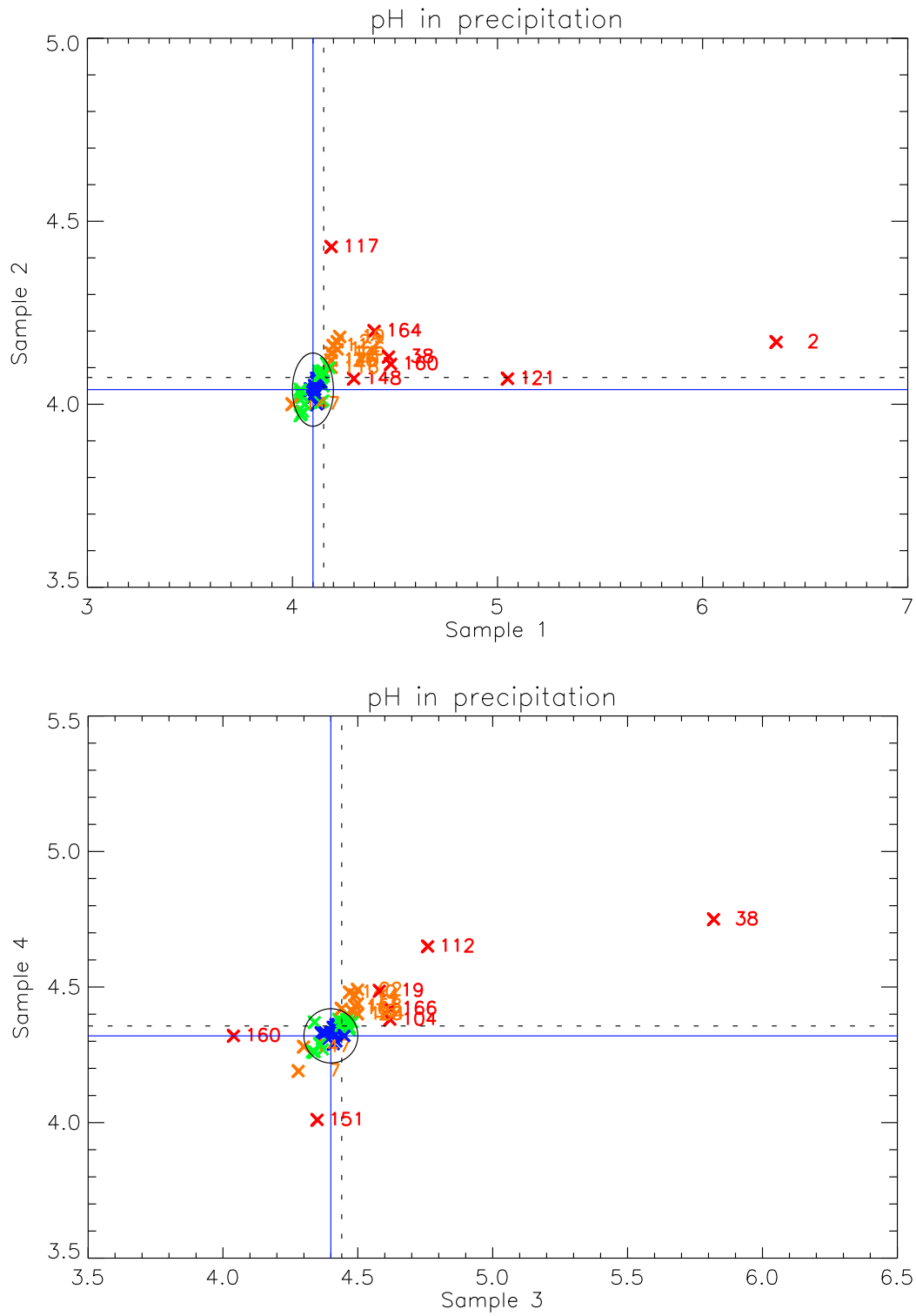
Figure 62: Youden plot of SO₄-S in precipitation.

Figure 63: Youden plot of pH in precipitation.