EMEP/CCC-Report 8/2003

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

The twentieth intercomparison of analytical methods within EMEP

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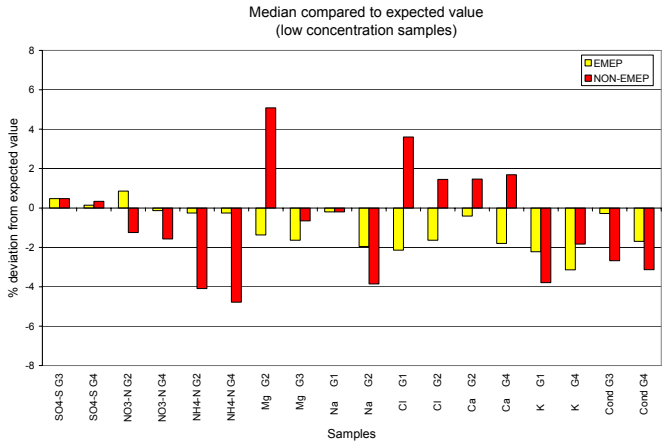

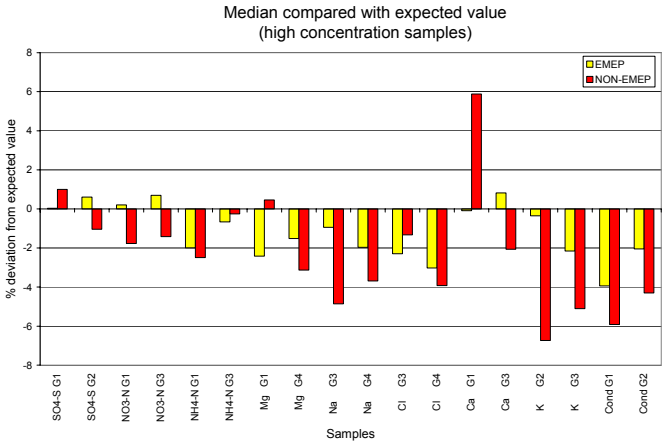

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NILU : EMEP/CCC-Report 8/2003
REFERENCE : O-7729
DATE : JULY 2003

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Contents

Page

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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 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).

This report gives the results of the twentieth interlaboratory test.

2. Organisation of the intercomparison

The samples for the twentieth intercomparison (see Table 1) were prepared and distributed to 71 laboratories in July 2002. In addition to the European participants, two laboratories in North America received samples as a part of the co-operation between EMEP and the North American networks for acid deposition. Also 19 laboratories within the measurement programme ICP-Forest and 16 laboratories participating in various other measurement programmes were invited to participate in the nineteenth intercomparison.

Most of the laboratories had returned their results to the CCC within one month after the deadline given as 15 September 2002. A total of 59 laboratories have returned their results. This includes 34 EMEP-laboratories, 14 ICP-Forest laboratories and 11 other laboratories.

The participating laboratories received the theoretical (expected) values shortly after CCC had received the results. The laboratories were then asked 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 2a and 2b 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 3-7.

3. Data handling

The data reported from the participants are presented in Tables 8, 10, 12, 14, 16 and 18-29.

The methods of data analysis are the same as in earlier intercomparisons. The results for the samples 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.

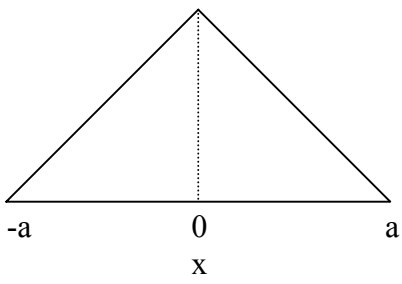
Bar-plots are used for the graphical presentation of the data. Figure 1–Figure 15 are showing the relative deviation from expected value for the different laboratories. There is one plot for each single sample.

Figure 16 gives medians compared to expected value for the results reported by EMEP-laboratories and the other participating laboratories, respectively.

Table 34 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 3.1 and chapter 3.

3.1 Estimating random errors from laboratory comparisons

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, 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

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

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

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

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

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

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).

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

3.2 Estimating systematic errors from laboratory comparisons

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.

$$B = \text{median}[D_i] \tag{6}$$

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

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

4. Results

4.1 Sulphur dioxide in absorbing solution

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 and Figure 1. 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 2.70–6.79 μg S m^{-3}, when 70 ml absorbing solution and 3.6 m^3 sampling volume is used.

Six laboratories use hydrogen peroxide absorption solution method for determination of SO_2 in air. Five of these laboratories reported intercomparison results. In addition, laboratory 15 analysed the absorption solution samples. No outlying results were reported. Two laboratories reported values that deviated more than 20% from expected value, while the rest of the laboratories reported values that deviated less than 10%. The relative standard deviation is 8.1-24.2%. The average ratio is presented in Table 9. Four out of six laboratories have a ratio between 0.90 and 1.10. This is the same as last year.

4.2 Sulphur dioxide and nitric acid on impregnated filter

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 results are presented in Table 10 and Figure 2.

The amount of sulphur on the distributed filters corresponds to air concentrations between 0.80-2.56 μg S m^{-3} when 25 m^3 is sampled.

Laboratories 22 and 138 reported two and four outlying results, respectively. The relative standard deviation is 7.6-23.2 when outliers are excluded. Eight laboratories reported values that deviated between 10-20% from expected value, while nine laboratories reported values that deviated more than 20%.

44 values out of a total of 76 had an error less than 10% when compared to expected value. 17 (22.4%) of the reported values had an error greater than 20%. The average ratios are presented in Table 11. Nine out of 19 laboratories had a ratio between 0.9 and 1.10. This is not as good as last year's result.

In addition to sulphur dioxide, nitric acid 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}–1.37 μg N m^{-3} when 25 m^3 sampling volume is used.

19 laboratories reported results for determination of HNO_3-N on impregnated filters. The results are presented in Table 12 and Figure 3. Laboratory 11 reported four outlying results, while laboratories 22 and 5 reported two and one outlying result, respectively. The relative standard deviation is between 3.9-8.0%, when outliers are excluded. Four laboratories reported values that deviated between 10-20% from expected value and three laboratories reported values that deviated more than 20%.

64 values (82.4%) out of a total of 76 deviated less than 10% from expected value. Seven values (9.2%) had an error greater than 20% when compared to expected value. The average ratios are presented in Table 13. 15 out of a total of 19 laboratories had average ratio between 0.9-1.10. This is slightly better than the results obtained last year.

4.3 Nitrogen dioxide in absorbing solution

The four samples distributed were made to represent both absorption solutions and extracts from iodide-impregnated glass filters. The samples contain known amounts 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 3.4-6.75 µg NO_2-N m^{-3}, when 70 ml absorbing solution and 1.4 m^3 are used. If 4 ml extraction solution and 0.7 m^3 sampling volume are used, the samples correspond to air concentrations between 0.39-0.77 µg NO_2-N m^{-3}.

The results are presented in Table 14 and Figure 4. Laboratory 31 reported three outlying results. Two laboratories reported values between 10-20% away from expected value, while only one laboratory reported values that deviated more than 20%. The relative standard deviation is between 4.1-7.2%, when outliers are excluded. This is about the same as obtained last year.

The average ratio is presented in Table 15. 18 out of a total of 19 laboratories had a ratio between 0.90-1.10, which is a satisfactory result.

4.4 Ammonia on impregnated filters

For the second time impregnated filters for determination of ammonia were distributed. Six impregnated filters inclusive two unidentified blank filters were sent to 21 laboratories. 19 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 16 and Figure 5.

The amount of nitrogen on the filters correspond to air concentrations between 0.30-1.52 µg N m^{-3}, if 25 m^3 sampling volume is used.

Laboratory 32 reported three outlying results, while laboratories 4, 10 and 32 reported one outlying result each. 12 laboratories reported values that deviated between 10-20% from expected value, while nine laboratories reported values that deviated more than 20%.

39 values (51.3%) had an error less than 10% when compared to expected value. Average ratios are given in Table 17. 18 out of 19 laboratories had an average ratio between 0.90-1.10. This is better than in the last intercomparison.

4.5 Precipitation

Four precipitation samples were distributed and 2437 single results from 59 laboratories were reported. 32 of the reporting laboratories are within EMEP. Most of these laboratories now perform the full precipitation programme in EMEP.

4.5.1 Sulphate

A total of 56 laboratories reported results from determination of sulphate. The results are given sin Table 18 and Figure 6. Outlying results were reported from laboratories 130 and 138, which reported outlying results for all four samples. The relative standard deviation is in the region of 8.1-9.2% when outliers are excluded. This is slightly higher than last year. Seven laboratories reported values between 10-20% and five laboratories reported values more than 20% away from expected value.

4.5.2 Nitrate

A total of 57 laboratories reported values of nitrate. The results are presented in Table 19 and Figure 7. Laboratory 116 reported one outlying result, while laboratory 138 reported outlying results for all four samples. The relative standard deviation is in the region of 9.3-13.7% when outliers are excluded. This is slightly higher compared to last year. Four laboratories reported values between 10-20% from expected value and four laboratories reported values that deviated more than 20%.

4.5.3 Ammonium

56 laboratories reported results from determination of ammonium. The results are presented in Table 20 and Figure 8. Laboratory 40 reported three, laboratory 166 reported two and laboratories 136, 120, 112, 18 and 3 reported one outlying result each. The relative standard deviation is in the region of 6.3-19.5%. This is not as good as obtained last year. 15 laboratories reported values between 10-20% from expected value and 10 laboratories reported values that deviated more than 20%.

4.5.4 pH and strong acid

Table 21, Table 22 and Figure 9 present the results from pH measurements and determination of strong acid. 57 laboratories reported results from pH measurements.

Laboratory 137 reported three outlying results, while laboratories 133, 17 and 3 reported one outlier each. Five laboratories reported values that deviated more than 0.2 pH units from the expected value. Compared to the obtained median value, four laboratories reported values deviating more than 0.2 pH-units.

In order to obtain more realistic standard deviation values, the pH-data are recalculated to H+. The results are presented in Table 22. The relative standard deviation varies between 7.4% and 11.1%.

15 laboratories have determined strong acid by titration. The results are presented in Table 23. Laboratory 140 reported one outlying result.

4.5.5 Chloride

58 laboratories reported results from determination of chloride. The results are presented in Table 24 and Figure 10. Laboratory 137 reported outlying results for 3 samples, laboratory 107 and 17 reported outlying results for 2 samples, while laboratories 133, 131, 116, 109, 40 and 22 reported one outlying result each. The relative standard deviation is between 5.24-28.5%, when outliers are excluded.

19 laboratories reported values between 10% and 20% from expected value. 15 laboratories reported values that deviated more than 20% from expected value.

4.5.6 Sodium

A total of 55 laboratories reported results from determination of sodium. Table 25 and Figure 11 presents the results. Laboratory 136 reported outlying results for all four samples, while laboratories 135, 121, 116, 22 and 17 reported one outlying

result each. The relative standard deviation is between 8.15% and 10.3% when outliers are excluded.

22 laboratories reported values between 10% and 20% from expected value. 15 laboratories reported values that deviate more than 20% from expected value.

4.5.7 Magnesium

A total of 54 laboratories reported values from determination of magnesium. The results are presented in Table 26 and Figure 12. Laboratory 136 reported outlying results for all four samples. The relative standard deviation is between 13.1-18.6% when outliers are excluded. 16 laboratories reported results that deviated between 10-20% from expected value. 11 laboratories reported values that deviated more than 20%.

4.5.8 Calcium

A total of 55 laboratories reported values from determination of calcium. The results are presented in Table 27 and Figure 13. Laboratory 136 reported outlying results for all four samples. The relative standard deviation is between 17.39-37.4% when outliers are excluded. 24 laboratories reported values between 10% and 20% from expected value. 16 laboratories reported values that deviated more than 20% from expected value.

4.5.9 Potassium

55 laboratories reported values from determination of potassium. The results are given in Table 28 and Figure 14. Laboratory 136 reported three outlying results, laboratories 115 and 4 reported two, while laboratory 11 reported one outlying result. 17 laboratories reported values between 10% and 20% from expected value. 18 laboratories reported values that deviated more than 20%.

4.5.10 Conductivity and ion balance

The results from the conductivity measurements are given in Table 29 and Figure 15. Laboratories 40 and 24 reported outlying results for all four samples, while laboratories 20, 23 and 115 reported two outliers each.

The standard deviation is in the range 4.5-6.3% when outliers are excluded. This is the same as in earlier intercomparisons. 20 values (9%) are reported between 10-20% from expected value and 16 (7%) of the reported values deviates more than 20%. These results are similar to what was reported last year.

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 30 gives the ratios of the measured to the calculated values. As can be seen from inspecting these values, the laboratories 37, 116, 130, 135 and 136 have one or more ratios that are far away from 1.

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 31. Laboratories 11, 35, 112, 115,116, 130, 133 and 136 have ratios that are far from 1.

5. Conclusions

A total of 59 laboratories participated in the twentieth intercomparison. 32 of these laboratories are within the EMEP network.

For all the samples analysed, the deviations from theoretical values are calculated. Figure 16 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 4%. This is an improvement compared to earlier intercomparisons. The median deviations for the other participating laboratories are less than 7% for the high concentration samples and less than 5% for the low concentration samples. This is about the same as obtained in 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 2437 single results, 100 are defined as outliers. This is 4.1% of the reported data, which is comparable to the results obtained last year. 26 laboratories reported outlying results, but four laboratories only are responsible for 47% of the total amount of outliers.

In Table 32 the ratio of the median values to the theoretical values for all the parameters is presented. As can be seen from this table, all parameters have median values that are in good agreement with the theoretical values.

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Appendix 1

Tables

Table 1: Samples distributed for the nineteenth 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.	6 KOH-impregnated Whatman 40 filters, comprising 1 blank and 8 filters to which different amounts of sulphuric acid 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 2a: EMEP laboratories participating in the nineteenth laboratory intercomparison. The numbers in front of the names are used in tables and figures.

Austria	(1)	Umweltbundesamt Zweigstelle Sud, Klagenfurt
Canada	(26)	Meteorological Service of Canada, Toronto
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)	Laboratories Wolff
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
Ireland	(37)	Environmental Protection Agency, Dublin
Italy	(13)	C.N.R. Istituto Inquinamento Atmosferico
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)	Direccao Regional do Ambiente e Recursos Naturais do Alentejo, Sines
Romania	(18)	Research and Engineering Institute for Environment
Russian Federation	(22)	Institute of Global Climate and Ecology
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
Serbia and Montenegro	(24)	Rep. Hydrometeorological Institute of Serbia

Table 2b: Participating laboratories outside the EMEP network.

Germany	(104)	Hessige Landwirtschafliche
Germany	(105)	Universität des Saarlandes
Sweden	(106)	IVL Svenska Miljöinstitutet AB, Aneboda
Finland	(107)	The Finnish Forest Institute
Germany	(109)	Institut für Bondenkunde und Waldernährung der Universität, Göttingen
Germany	(110)	Thüringer Landesanstalt für Landwirtschaft (TTL), Jena
Finland	(111)	Finnish Forest Research Institute, Vantaa Research Centre
Germany	(112)	Niedersächsische Forstliche Versuchsanstalt (NVF)
Germany	(113)	Landesforstanstalt Eberswalde, abt. Waldökologie
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	(118)	Forstliche Versuchs-und Forschungsanstalt
Germany	(119)	Landesumweltamt (LUA)
Germany	(120)	Landwirtschaftliche Untersuchungs- und Forschungsanstalt (LUFA)
Germany	(121)	Landesamt für Natur und Umwelt
Italy	(126)	APPA Laboratorio Biologico Provinciale
Italy	(130)	Universita degli Studi Siena
China	(131)	Chongqing Institute of Environmental Science and Monitoring
Belarus	(133)	Institute for Problems of Natural Resources Use and Ecology
China	(135)	Hunan Research Institute of Environmental Protection Science
China	(136)	Guangzhou Research Institute of Environmental Protection
Germany	(137)	UST Umwelt-Systemtechnik GmbH, Gera
China	(138)	Guizhou Research Institute of Environmental Protection Science, Guiyang
Italy	(140)	C.N.R. Istituto di Ricerca sulle Acque

Table 3: Analytical methods used at the participating laboratories for the determination of sulphur dioxide in absorbing solution.

Method	Laboratory
1. Ion chromatography	6, 15, 17, 19, 21, 23

Table 4: Analytical methods used at the participating laboratories for the determination of sulphur dioxide on impregnated filters.

Method	Laboratory
1. Thorin method	16
2. Ion chromatography	3, 4, 5, 8, 11, 12, 13, 15, 19, 20, 22, 23, 31,33, 34, 36, 38, 131, 135, 138
3. Capillary Ion Analysis	39

Table 5: Analytical methods used at the participating laboratories for determination of nitric acid on impregnated filters

Method	Laboratory
1. Reduction to nitrite	16
2. Ion chromatography	3, 4, 5, 8, 11, 13, 15, 19, 20, 22, 31,33, 34, 36, 131, 135, 138
3. Capillary Ion Analysis	39

Table 6: Analytical method for determination of ammonia on impregnated filters.

Method	Laboratory
1. Spectroscopy	4, 39
2. Chloramine T	16
3. Indophenole	10, 19, 33
4 Ion chromatography	5, 36,131, 135, 138

Table 7: Analytical method used for NO_2 in absorbing solution.

Method	Laboratory
1. NEDA/Sulphanilamide	3, 4, 10, 15, 16, 19, 20, 22, 23, 31, 33, 34, 35, 39
2. NEDA/Sulphanilic acid	
3. Ion chromatography	36

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

SULPHUR DIOXIDE IN ABSORBING SOL.
SAMPLE NO.: A1
THEORETICAL VALUE 0.140
UNIT: µg S/ml

RUN 1:
NUMBER OF LABORATORIES: 6
ARITHMETIC MEAN VALUE: 0.137
MEDIAN: 0.139
STANDARD DEVIATON: 0.033
REL. ST. DEVIATION (%): 24.291

RUN 2:
NUMBER OF LABORATORIES: 6
ARITHMETIC MEAN VALUE: 0.137
MEDIAN: 0.139
STANDARD DEVIATON: 0.033
REL. ST. DEVIATION (%): 24.291

RESULTS IN DECREASING ORDER:

17	0.180	6	0.139
23	0.154	15	0.131
21	0.140	19	0.079

"UNUSED": DATA UNUSED IN RUN 2

SULPHUR DIOXIDE IN ABSORBING SOL.
SAMPLE NO.: A2
THEORETICAL VALUE 0.349
UNIT: µg S/ml

RUN 1:
NUMBER OF LABORATORIES: 6
ARITHMETIC MEAN VALUE: 0.346
MEDIAN: 0.350
STANDARD DEVIATON: 0.028
REL. ST. DEVIATION (%): 8.108

RUN 2:
NUMBER OF LABORATORIES: 6
ARITHMETIC MEAN VALUE: 0.346
MEDIAN: 0.350
STANDARD DEVIATON: 0.028
REL. ST. DEVIATION (%): 8.108

RESULTS IN DECREASING ORDER:

17	0.380	6	0.343
23	0.368	15	0.321
21	0.358	19	0.307

"UNUSED": DATA UNUSED IN RUN 2

SULPHUR DIOXIDE IN ABSORBING SOL.
SAMPLE NO.: A4
THEORETICAL VALUE 0.297
UNIT: µg S/ml

RUN 1:
NUMBER OF LABORATORIES: 6
ARITHMETIC MEAN VALUE: 0.316
MEDIAN: 0.298
STANDARD DEVIATON: 0.052
REL. ST. DEVIATION (%): 16.538

RUN 2:
NUMBER OF LABORATORIES: 6
ARITHMETIC MEAN VALUE: 0.316
MEDIAN: 0.298
STANDARD DEVIATON: 0.052
REL. ST. DEVIATION (%): 16.538

RESULTS IN DECREASING ORDER:

17	0.420	6	0.292
23	0.311	19	0.288
21	0.304	15	0.280

"UNUSED": DATA UNUSED IN RUN 2

SULPHUR DIOXIDE IN ABSORBING SOL.
SAMPLE NO.: A5
THEORETICAL VALUE 0.184
UNIT: µg S/ml

RUN 1:
NUMBER OF LABORATORIES: 6
ARITHMETIC MEAN VALUE: 0.200
MEDIAN: 0.195
STANDARD DEVIATON: 0.022
REL. ST. DEVIATION (%): 10.866

RUN 2:
NUMBER OF LABORATORIES: 6
ARITHMETIC MEAN VALUE: 0.200
MEDIAN: 0.195
STANDARD DEVIATON: 0.022
REL. ST. DEVIATION (%): 10.866

RESULTS IN DECREASING ORDER:

15	0.241	21	0.192
19	0.205	6	0.186
23	0.198	17	0.180

"UNUSED": DATA UNUSED IN RUN 2

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 value / Expected value				Average
	Sample No.				
	A1	A2	A4	A5	
6	0.99	0.98	0.98	1.01	0.99
15	0.93	0.92	0.94	1.31	1.03
17	1.28	1.09	1.42	0.98	1.19
19	0.56	0.88	0.97	1.11	0.88
21	1.00	1.03	1.03	1.04	1.02
23	1.10	1.06	1.05	1.07	1.07

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

SULPHUR DIOXIDE ON IMPREGNATED FILTER
SAMPLE NO.: B1
THEORETICAL VALUE 52.100
UNIT: µg S/FIL

RUN 1:
NUMBER OF LABORATORIES: 19
ARITHMETIC MEAN VALUE: 50.226
MEDIAN: 52.300
STANDARD DEVIATON: 5.882
REL. ST. DEVIATION (%): 11.711

RUN 2:
NUMBER OF LABORATORIES: 17
ARITHMETIC MEAN VALUE: 51.739
MEDIAN: 52.570
STANDARD DEVIATON: 3.972
REL. ST. DEVIATION (%): 7.677

RESULTS IN DECREASING ORDER:

36	56.600	38	51.700	
20	55.850	3	50.200	
33	55.350	4	50.000	
16	54.750	34	49.700	
135	54.630	39	49.700	
8	54.400	131	43.280	
32	53.400	11	42.540	
15	52.600	138	37.720	UNUSED
31	52.570	22	37.000	UNUSED
5	52.300			

"UNUSED": DATA UNUSED IN RUN 2

SULPHUR DIOXIDE ON IMPREGNATED FILTER
SAMPLE NO.: B2
THEORETICAL VALUE 22.040
UNIT: µg S/FIL

RUN 1:
NUMBER OF LABORATORIES: 19
ARITHMETIC MEAN VALUE: 20.945
MEDIAN: 21.500
STANDARD DEVIATON: 4.771
REL. ST. DEVIATION (%): 22.779

RUN 2:
NUMBER OF LABORATORIES: 17
ARITHMETIC MEAN VALUE: 22.229
MEDIAN: 21.500
STANDARD DEVIATON: 2.963
REL. ST. DEVIATION (%): 13.329

RESULTS IN DECREASING ORDER:

20	26.850	38	21.000	
36	26.500	31	20.780	
33	26.370	4	20.300	
16	24.850	3	20.240	
32	24.200	34	18.680	
135	23.460	11	17.820	
5	23.300	131	17.250	
8	23.290	22	11.300	UNUSED
15	21.500	138	8.770	UNUSED
39	21.500			

"UNUSED": DATA UNUSED IN RUN 2

SULPHUR DIOXIDE ON IMPREGNATED FILTER
SAMPLE NO.: B4
THEORETICAL VALUE 20.040
UNIT: µg S/FIL

RUN 1:
NUMBER OF LABORATORIES: 19
ARITHMETIC MEAN VALUE: 19.414
MEDIAN: 19.520
STANDARD DEVIATON: 5.550
REL. ST. DEVIATION (%): 28.586

RUN 2:
NUMBER OF LABORATORIES: 18
ARITHMETIC MEAN VALUE: 20.148
MEDIAN: 19.960
STANDARD DEVIATON: 4.667
REL. ST. DEVIATION (%): 23.166

RESULTS IN DECREASING ORDER:

36	27.000	31	19.360	
20	25.850	4	19.200	
33	25.150	39	19.100	
16	24.610	34	18.460	
8	23.560	131	16.650	
32	22.800	11	15.250	
5	22.700	38	10.800	
135	21.550	22	10.700	
15	20.400	138	6.210	UNUSED
3	19.520			

"UNUSED": DATA UNUSED IN RUN 2

SULPHUR DIOXIDE ON IMPREGNATED FILTER
SAMPLE NO.: B5
THEORETICAL VALUE 64.120
UNIT: µg S/FIL

RUN 1:
NUMBER OF LABORATORIES: 19
ARITHMETIC MEAN VALUE: 63.066
MEDIAN: 64.820
STANDARD DEVIATON: 7.614
REL. ST. DEVIATION (%): 12.073

RUN 2:
NUMBER OF LABORATORIES: 18
ARITHMETIC MEAN VALUE: 63.954
MEDIAN: 65.335
STANDARD DEVIATON: 6.746
REL. ST. DEVIATION (%): 10.549

RESULTS IN DECREASING ORDER:

32	76.000	39	64.200	
36	73.900	34	63.220	
33	69.080	3	62.440	
5	68.100	4	61.800	
8	67.100	11	56.830	
31	66.940	131	55.920	
16	66.580	22	51.800	
15	66.100	38	50.500	
20	65.850	138	47.080	UNUSED
135	64.820			

"UNUSED": DATA UNUSED IN RUN 2

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 (B1).

Lab. No	Measured value / Expected value				Average
	Sample No.				
	B1	B2	B4	B5	
3	0.96	0.92	0.97	0.97	0.96
4	0.96	0.92	0.96	0.96	0.95
5	1.00	1.06	1.13	1.06	1.06
8	1.04	1.06	1.18	1.05	1.08
11	0.82	0.81	0.76	0.89	0.82
15	1.01	0.98	1.02	1.03	1.01
16	1.05	1.13	1.23	1.04	1.11
20	1.07	1.22	1.29	1.03	1.15
22	0.71	0.51	0.53	0.81	0.64
31	1.01	0.94	0.97	1.04	0.99
32	1.02	1.10	1.14	1.19	1.11
33	1.06	1.20	1.26	1.08	1.15
34	0.95	0.85	0.92	0.99	0.93
36	1.09	1.20	1.35	1.15	1.20
39	0.99	0.95	0.54	0.79	0.82
116	0.95	0.98	0.95	1.00	0.97
131	0.83	0.78	0.83	0.87	0.83
135	1.05	1.06	1.08	1.01	1.05
138	0.72	0.40	0.31	0.73	0.54

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

NITRIC ACID ON IMPREGNATED FILTER
SAMPLE NO.: B1
THEORETICAL VALUE 13.090
UNIT: µg N/FIL.

RUN 1:

NUMBER OF LABORATORIES:	19
ARITHMETIC MEAN VALUE:	11.844
MEDIAN:	13.400
STANDARD DEVIATON:	3.723
REL. ST. DEVIATION (%):	31.433

RUN 2:

NUMBER OF LABORATORIES:	17
ARITHMETIC MEAN VALUE:	13.037
MEDIAN:	13.500
STANDARD DEVIATON:	1.055
REL. ST. DEVIATION (%):	8.095

RESULTS IN DECREASING ORDER:

20	14.000	3	13.230
39	13.900	36	13.000
15	13.800	31	12.480
32	13.800	131	12.310
138	13.780	34	11.580
33	13.776	116	11.100
135	13.690	22	10.600
8	13.685	11	2.610 UNUSED
4	13.500	5	0.790 UNUSED
16	13.400		

"UNUSED": DATA UNUSED IN RUN 2

NITRIC ACID ON IMPREGNATED FILTER
SAMPLE NO.: B2
THEORETICAL VALUE 31.084
UNIT: µg N/FIL.

RUN 1:

NUMBER OF LABORATORIES:	19
ARITHMETIC MEAN VALUE:	29.468
MEDIAN:	30.221
STANDARD DEVIATON:	2.573
REL. ST. DEVIATION (%):	8.731

RUN 2:

NUMBER OF LABORATORIES:	17
ARITHMETIC MEAN VALUE:	30.170
MEDIAN:	30.400
STANDARD DEVIATON:	1.555
REL. ST. DEVIATION (%):	5.154

RESULTS IN DECREASING ORDER:

138	32.760	3	29.890
135	31.820	33	29.558
15	31.500	16	29.400
31	31.350	34	29.040
5	31.200	131	28.250
39	31.200	116	28.100
20	31.000	32	26.600
4	30.600	11	24.210 UNUSED
36	30.400	22	22.800 UNUSED
8	30.221		

"UNUSED": DATA UNUSED IN RUN 2

NITRIC ACID ON IMPREGNATED FILTER
SAMPLE NO.: B4
THEORETICAL VALUE 34.356
UNIT: µg N/FIL.

RUN 1:

NUMBER OF LABORATORIES:	19
ARITHMETIC MEAN VALUE:	33.173
MEDIAN:	33.800
STANDARD DEVIATON:	3.291
REL. ST. DEVIATION (%):	9.922

RUN 2:

NUMBER OF LABORATORIES:	17
ARITHMETIC MEAN VALUE:	34.186
MEDIAN:	34.000
STANDARD DEVIATON:	1.340
REL. ST. DEVIATION (%):	3.920

RESULTS IN DECREASING ORDER:

138	36.350	3	33.790
32	36.300	39	33.700
15	35.900	34	33.180
5	35.200	33	33.009
4	35.100	131	32.670
135	35.030	16	32.280
31	34.790	116	32.000
8	34.061	11	25.130 UNUSED
20	34.000	22	24.000 UNUSED
36	33.800		

"UNUSED": DATA UNUSED IN RUN 2

NITRIC ACID ON IMPREGNATED FILTER
SAMPLE NO.: B5
THEORETICAL VALUE 9.816
UNIT: µg N/FIL.

RUN 1:

NUMBER OF LABORATORIES:	19
ARITHMETIC MEAN VALUE:	9.412
MEDIAN:	9.880
STANDARD DEVIATON:	1.399
REL. ST. DEVIATION (%):	14.865

RUN 2:

NUMBER OF LABORATORIES:	18
ARITHMETIC MEAN VALUE:	9.686
MEDIAN:	9.890
STANDARD DEVIATON:	0.750
REL. ST. DEVIATION (%):	7.742

RESULTS IN DECREASING ORDER:

15	10.600	36	9.540
5	10.500	131	9.530
16	10.420	39	9.500
8	10.342	32	9.400
138	10.320	34	9.260
135	10.060	31	9.010
4	10.000	22	8.300
33	9.987	116	7.800
20	9.900	11	4.480 UNUSED
3	9.880		

"UNUSED": DATA UNUSED IN RUN 2

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 (B1).

Lab. No.	Measured / Expected				Average
	Sample No.				
	B1	B2	B4	B5	
3	1.01	0.96	0.98	1.01	0.99
4	1.03	0.98	1.02	1.02	1.01
5	0.06	1.00	1.02	1.07	0.79
8	1.05	0.97	0.99	1.05	1.02
11	0.20	0.78	0.73	0.46	0.54
15	1.05	1.01	1.04	1.08	1.05
16	1.02	0.95	0.94	1.06	0.99
20	1.07	1.00	0.99	1.01	1.02
22	0.81	0.73	0.70	0.85	0.77
31	0.95	1.01	1.01	0.92	0.97
32	1.05	0.86	1.06	0.96	0.98
33	1.05	0.95	0.96	1.02	1.00
34	0.88	0.93	0.97	0.94	0.93
36	0.99	0.98	0.98	0.97	0.98
38	1.06	1.00	0.98	0.97	1.00
39	0.85	0.90	0.93	0.79	0.87
131	0.94	0.91	0.95	0.97	0.94
135	1.05	1.02	1.02	1.02	1.03
138	1.05	1.05	1.06	1.05	1.05

Table 14: Analytical results for nitrogen dioxide in absorbing solution.

NITROGEN DIOXIDE IN ABSORBING SOL.
SAMPLE NO.: C1
THEORETICAL VALUE 0.068
UNIT: µg N/ml

RUN 1:
NUMBER OF LABORATORIES: 19
ARITHMETIC MEAN VALUE: 0.066
MEDIAN: 0.067
STANDARD DEVIATON: 0.004
REL. ST. DEVIATION (%): 6.368

RUN 2:
NUMBER OF LABORATORIES: 18
ARITHMETIC MEAN VALUE: 0.067
MEDIAN: 0.067
STANDARD DEVIATON: 0.003
REL. ST. DEVIATION (%): 4.492

RESULTS IN DECREASING ORDER:

39	0.072	12	0.066
22	0.071	20	0.066
32	0.069	10	0.065
33	0.069	16	0.065
35	0.069	8	0.064
34	0.068	19	0.064
4	0.067	23	0.064
36	0.067	15	0.059
38	0.067	31	0.053 UNUSED
3	0.067		

"UNUSED": DATA UNUSED IN RUN 2

NITROGEN DIOXIDE IN ABSORBING SOL.
SAMPLE NO.: C2
THEORETICAL VALUE 0.118
UNIT: µg N/ml

RUN 1:
NUMBER OF LABORATORIES: 19
ARITHMETIC MEAN VALUE: 0.117
MEDIAN: 0.119
STANDARD DEVIATON: 0.007
REL. ST. DEVIATION (%): 6.279

RUN 2:
NUMBER OF LABORATORIES: 18
ARITHMETIC MEAN VALUE: 0.118
MEDIAN: 0.119
STANDARD DEVIATON: 0.005
REL. ST. DEVIATION (%): 4.075

RESULTS IN DECREASING ORDER:

22	0.126	12	0.118
3	0.125	16	0.118
39	0.124	23	0.117
33	0.122	10	0.114
35	0.121	34	0.113
4	0.120	8	0.112
20	0.119	19	0.111
32	0.119	15	0.109
36	0.119	31	0.094 UNUSED
38	0.119		

"UNUSED": DATA UNUSED IN RUN 2

NITROGEN DIOXIDE IN ABSORBING SOL.
SAMPLE NO.: C3
THEORETICAL VALUE 0.085
UNIT: µg N/ml

RUN 1:
NUMBER OF LABORATORIES: 19
ARITHMETIC MEAN VALUE: 0.083
MEDIAN: 0.084
STANDARD DEVIATON: 0.005
REL. ST. DEVIATION (%): 6.533

RUN 2:
NUMBER OF LABORATORIES: 18
ARITHMETIC MEAN VALUE: 0.084
MEDIAN: 0.084
STANDARD DEVIATON: 0.004
REL. ST. DEVIATION (%): 4.436

RESULTS IN DECREASING ORDER:

22	0.090	38	0.084
3	0.089	10	0.083
39	0.089	23	0.082
33	0.088	16	0.081
35	0.088	19	0.081
4	0.086	34	0.081
32	0.086	8	0.080
36	0.085	15	0.076
12	0.084	31	0.067 UNUSED
20	0.084		

"UNUSED": DATA UNUSED IN RUN 2

NITROGEN DIOXIDE IN ABSORBING SOL.
SAMPLE NO.: C4
THEORETICAL VALUE 0.135
UNIT: µg N/ml

RUN 1:
NUMBER OF LABORATORIES: 19
ARITHMETIC MEAN VALUE: 4.343
MEDIAN: 0.135
STANDARD DEVIATON: 18.356
REL. ST. DEVIATION (%): 422.671

RUN 2:
NUMBER OF LABORATORIES: 18
ARITHMETIC MEAN VALUE: 0.132
MEDIAN: 0.135
STANDARD DEVIATON: 0.010
REL. ST. DEVIATION (%): 7.279

RESULTS IN DECREASING ORDER:

3	80.145 UNUSED	38	0.135
22	0.145	20	0.134
35	0.140	23	0.133
33	0.139	10	0.130
4	0.138	8	0.129
32	0.137	15	0.126
12	0.136	39	0.122
34	0.136	19	0.113
36	0.136	31	0.107
16	0.135		

"UNUSED": DATA UNUSED IN RUN 2

Table 15: 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				Average
	Sample No.				
	C1	C2	C3	C4	
3	0.98	1.06	1.06	1.07	1.04
4	0.99	1.01	1.02	1.02	1.01
8	0.94	0.95	0.95	0.96	0.95
10	0.96	0.96	0.98	0.96	0.97
12	0.98	1.00	0.99	1.00	0.99
15	0.87	0.92	0.90	0.93	0.91
16	0.96	1.00	0.96	1.00	0.98
19	0.95	0.94	0.95	0.83	0.92
20	0.98	1.00	0.99	0.99	0.99
22	1.05	1.06	1.06	1.07	1.06
23	0.95	0.99	0.97	0.98	0.97
31	0.79	0.79	0.78	0.79	0.79
32	1.02	1.00	1.02	1.01	1.01
33	1.02	1.03	1.04	1.03	1.03
34	1.00	0.95	0.96	1.00	0.98
35	1.02	1.02	1.04	1.03	1.03
36	0.99	1.00	1.00	1.00	1.00
38	0.99	1.00	0.99	1.00	1.00
39	1.06	1.05	1.05	0.90	1.02

Table 16: Analytical results for ammonia on impregnated filter.

AMMONIA ON IMPREGNATED FILTER
SAMPLE NO.: J1
THEORETICAL VALUE 38.100
UNIT: µg N/FIL

RUN 1:
NUMBER OF LABORATORIES: 18
ARITHMETIC MEAN VALUE: 37.853
MEDIAN: 36.923
STANDARD DEVIATON: 4.978
REL. ST. DEVIATION (%): 13.152

RUN 2:
NUMBER OF LABORATORIES: 17
ARITHMETIC MEAN VALUE: 37.132
MEDIAN: 36.915
STANDARD DEVIATON: 4.051
REL. ST. DEVIATION (%): 10.909

RESULTS IN DECREASING ORDER:

116	50.100 UNUSED	131	36.915
33	44.800	5	36.750
32	42.545	135	36.620
19	42.055	20	36.310
15	41.730	39	34.555
11	38.950	16	34.385
8	37.497	138	33.855
4	37.155	34	30.610
36	36.930	10	29.584

"UNUSED": DATA UNUSED IN RUN 2

AMMONIA ON IMPREGNATED FILTER
SAMPLE NO.: J3
THEORETICAL VALUE 7.520
UNIT: µg N/FIL

RUN 1:
NUMBER OF LABORATORIES: 18
ARITHMETIC MEAN VALUE: 6.934
MEDIAN: 7.002
STANDARD DEVIATON: 1.718
REL. ST. DEVIATION (%): 24.776

RUN 2:
NUMBER OF LABORATORIES: 16
ARITHMETIC MEAN VALUE: 6.873
MEDIAN: 7.002
STANDARD DEVIATON: 1.118
REL. ST. DEVIATION (%): 16.267

RESULTS IN DECREASING ORDER:

4	11.355 UNUSED	39	6.999
116	8.800	20	6.810
19	8.507	138	6.665
33	8.120	16	6.305
36	7.669	34	6.015
8	7.214	135	5.820
5	7.150	11	5.250
15	7.020	10	4.619
131	7.005	32	3.495 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

AMMONIA ON IMPREGNATED FILTER
SAMPLE NO.: J5
THEORETICAL VALUE 34.090
UNIT: µg N/FIL

RUN 1:
NUMBER OF LABORATORIES: 18
ARITHMETIC MEAN VALUE: 31.989
MEDIAN: 32.775
STANDARD DEVIATON: 6.155
REL. ST. DEVIATION (%): 19.240

RUN 2:
NUMBER OF LABORATORIES: 16
ARITHMETIC MEAN VALUE: 33.802
MEDIAN: 33.010
STANDARD DEVIATON: 3.292
REL. ST. DEVIATION (%): 9.739

RESULTS IN DECREASING ORDER:

116	42.400	36	32.700
4	36.955	5	32.650
19	36.686	131	32.415
33	36.310	20	32.310
15	35.830	39	30.605
8	34.081	34	29.528
138	33.355	16	28.985
135	33.170	10	19.482 UNUSED
11	32.850	32	15.485 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

AMMONIA ON IMPREGNATED FILTER
SAMPLE NO.: J6
THEORETICAL VALUE 10.030
UNIT: µg N/FIL

RUN 1:
NUMBER OF LABORATORIES: 18
ARITHMETIC MEAN VALUE: 9.378
MEDIAN: 9.377
STANDARD DEVIATON: 1.850
REL. ST. DEVIATION (%): 19.727

RUN 2:
NUMBER OF LABORATORIES: 17
ARITHMETIC MEAN VALUE: 9.627
MEDIAN: 9.400
STANDARD DEVIATON: 1.564
REL. ST. DEVIATION (%): 16.242

RESULTS IN DECREASING ORDER:

116	12.700	4	9.355
8	11.562	20	9.310
19	10.930	34	8.990
131	10.685	135	8.700
36	10.600	11	8.550
138	10.395	39	8.351
15	10.330	16	7.955
5	9.950	10	5.898
33	9.400	32	5.135 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

Table 17: 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 (J1 and J6).

Lab. No.	Measured / Expected				Average
	Sample No.				
	J1	J3	J5	J6	
4	0.98	1.51	1.08	0.93	1.13
5	0.96	0.95	0.96	0.99	0.97
8	0.98	0.96	1.00	1.15	1.02
10	0.78	0.61	0.57	0.59	0.64
11	1.02	0.70	0.96	0.85	0.88
15	1.10	0.93	1.05	1.03	1.03
16	0.90	0.84	0.85	0.79	0.85
19	1.10	1.13	1.08	1.09	1.10
20	0.95	0.91	0.95	0.93	0.93
32	1.12	0.46	0.45	0.51	0.64
33	1.18	1.08	1.07	0.94	1.06
34	0.80	0.80	0.87	0.90	0.84
36	0.97	1.02	0.96	1.06	1.00
39	0.91	0.93	0.90	0.83	0.89
116	1.32	1.17	1.24	1.27	1.25
131	0.97	0.93	0.95	1.07	0.98
135	0.96	0.77	0.97	0.87	0.89
138	0.89	0.89	0.98	1.04	0.95

Table 18: Analytical results for sulphate in precipitations samples.

SULPHATE
SAMPLE NO.: G1
THEORETICAL VALUE 1.574
UNIT: µg S/ml

RUN 1:
NUMBER OF LABORATORIES: 56
ARITHMETIC MEAN VALUE: 1.691
MEDIAN: 1.581
STANDARD DEVIATON: 0.598
REL. ST. DEVIATION (%): 35.361

RUN 2:
NUMBER OF LABORATORIES: 54
ARITHMETIC MEAN VALUE: 1.579
MEDIAN: 1.580
STANDARD DEVIATON: 0.128
REL. ST. DEVIATION (%): 8.084

RESULTS IN DECREASING ORDER:

130	4.780 UNUSED	8	1.580
138	4.620 UNUSED	24	1.580
116	2.067	5	1.574
133	1.841	19	1.573
14	1.741	12	1.570
107	1.694	23	1.570
17	1.680	140	1.570
118	1.670	34	1.565
39	1.661	10	1.564
7	1.658	15	1.560
35	1.646	26	1.556
114	1.640	104	1.540
135	1.635	113	1.540
1	1.630	6	1.539
21	1.625	105	1.537
4	1.621	16	1.536
33	1.620	36	1.532
137	1.620	111	1.530
126	1.610	11	1.526
13	1.600	37	1.510
27	1.600	110	1.500
115	1.600	109	1.490
31	1.596	121	1.480
3	1.591	32	1.456
112	1.590	38	1.440
119	1.590	120	1.440
131	1.586	22	1.434
20	1.581	136	0.995

"UNUSED": DATA UNUSED IN RUN 2

SULPHATE
SAMPLE NO.: G2
THEORETICAL VALUE 1.586
UNIT: µg S/ml

RUN 1:
NUMBER OF LABORATORIES: 56
ARITHMETIC MEAN VALUE: 1.708
MEDIAN: 1.590
STANDARD DEVIATON: 0.604
REL. ST. DEVIATION (%): 35.383

RUN 2:
NUMBER OF LABORATORIES: 54
ARITHMETIC MEAN VALUE: 1.595
MEDIAN: 1.590
STANDARD DEVIATON: 0.130
REL. ST. DEVIATION (%): 8.159

RESULTS IN DECREASING ORDER:

130	4.770 UNUSED	8	1.590
138	4.730 UNUSED	12	1.590
133	2.166	15	1.590
116	1.779	34	1.586
137	1.756	11	1.576
14	1.728	112	1.570
107	1.715	140	1.570
39	1.706	19	1.568
118	1.690	26	1.567
7	1.669	5	1.561
135	1.669	104	1.560
4	1.663	16	1.554
35	1.661	6	1.551
17	1.660	37	1.550
1	1.650	105	1.548
10	1.641	36	1.544
33	1.640	111	1.540
21	1.637	126	1.540
13	1.630	121	1.530
24	1.620	113	1.520
27	1.617	109	1.510
31	1.614	110	1.500
119	1.610	115	1.500
3	1.604	32	1.491
131	1.603	120	1.470
114	1.600	38	1.460
23	1.598	22	1.456
20	1.591	136	1.046

"UNUSED": DATA UNUSED IN RUN 2

SULPHATE
SAMPLE NO.: G3
THEORETICAL VALUE 1.025
UNIT: µg S/ml

RUN 1:
NUMBER OF LABORATORIES: 56
ARITHMETIC MEAN VALUE: 1.110
MEDIAN: 1.030
STANDARD DEVIATON: 0.409
REL. ST. DEVIATION (%): 36.847

RUN 2:
NUMBER OF LABORATORIES: 54
ARITHMETIC MEAN VALUE: 1.034
MEDIAN: 1.030
STANDARD DEVIATON: 0.091
REL. ST. DEVIATION (%): 8.812

RESULTS IN DECREASING ORDER:

138	3.180 UNUSED	20	1.030
130	3.150 UNUSED	112	1.030
133	1.378	119	1.030
116	1.352	31	1.029
14	1.161	34	1.023
39	1.087	105	1.023
24	1.080	13	1.020
21	1.076	23	1.020
1	1.070	111	1.020
17	1.070	19	1.018
114	1.070	26	1.018
118	1.070	11	1.017
7	1.067	37	1.012
10	1.067	104	1.010
107	1.066	16	1.007
4	1.064	109	1.000
5	1.063	115	1.000
35	1.063	6	0.997
33	1.060	36	0.996
15	1.050	137	0.982
126	1.050	113	0.980
27	1.049	110	0.970
131	1.046	120	0.960
140	1.040	121	0.955
3	1.036	32	0.936
135	1.035	38	0.920
8	1.030	22	0.897
12	1.030	136	0.697

"UNUSED": DATA UNUSED IN RUN 2

SULPHATE
SAMPLE NO.: G4
THEORETICAL VALUE 1.012
UNIT: µg S/ml

RUN 1:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 1.093
MEDIAN: 1.015
STANDARD DEVIATON: 0.395
REL. ST. DEVIATION (%): 36.122

RUN 2:
NUMBER OF LABORATORIES: 53
ARITHMETIC MEAN VALUE: 1.019
MEDIAN: 1.013
STANDARD DEVIATON: 0.094
REL. ST. DEVIATION (%): 9.222

RESULTS IN DECREASING ORDER:

130	3.090 UNUSED	20	1.013
138	3.010 UNUSED	8	1.010
116	1.418	12	1.010
133	1.241	119	1.010
137	1.184	23	1.007
14	1.126	36	1.002
17	1.100	34	1.001
114	1.070	115	1.000
7	1.062	37	0.999
118	1.060	26	0.998
21	1.057	5	0.997
126	1.050	11	0.996
35	1.047	131	0.993
107	1.047	104	0.990
39	1.046	105	0.988
4	1.045	111	0.981
10	1.042	109	0.980
1	1.040	19	0.978
135	1.034	6	0.975
27	1.031	113	0.970
13	1.030	110	0.960
15	1.030	120	0.960
140	1.030	121	0.931
33	1.020	38	0.910
112	1.020	32	0.906
31	1.017	22	0.886
3	1.015	136	0.672
16	1.015		

"UNUSED": DATA UNUSED IN RUN 2

Table 19: Analytical results for nitrate in precipitations samples.

NITRATE
SAMPLE NO.: G1
THEORETICAL VALUE 0.607
UNIT: µg N/ml

RUN 1:
NUMBER OF LABORATORIES: 57
ARITHMETIC MEAN VALUE: 0.650
MEDIAN: 0.603
STANDARD DEVIATON: 0.295
REL. ST. DEVIATION (%): 45.436

RUN 2:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 0.601
MEDIAN: 0.601
STANDARD DEVIATON: 0.068
REL. ST. DEVIATION (%): 11.362

RESULTS IN DECREASING ORDER:

138	2.670 UNUSED	35	0.601
116	1.300 UNUSED	12	0.600
40	0.972	104	0.600
133	0.655	113	0.600
24	0.640	115	0.600
39	0.635	36	0.598
130	0.630	26	0.596
135	0.628	19	0.595
23	0.626	15	0.593
4	0.622	111	0.592
1	0.620	3	0.591
33	0.620	8	0.591
114	0.620	118	0.590
5	0.616	140	0.590
7	0.614	16	0.588
37	0.614	137	0.587
20	0.612	34	0.585
27	0.612	6	0.584
32	0.612	119	0.580
131	0.611	22	0.572
13	0.610	105	0.570
17	0.610	110	0.570
126	0.610	112	0.570
10	0.608	121	0.565
11	0.608	38	0.560
14	0.608	109	0.540
107	0.608	120	0.540
31	0.604	136	0.305
21	0.603		

"UNUSED": DATA UNUSED IN RUN 2

NITRATE
SAMPLE NO.: G2
THEORETICAL VALUE 0.546
UNIT: µg N/ml

RUN 1:
NUMBER OF LABORATORIES: 57
ARITHMETIC MEAN VALUE: 0.581
MEDIAN: 0.546
STANDARD DEVIATON: 0.253
REL. ST. DEVIATION (%): 43.549

RUN 2:
NUMBER OF LABORATORIES: 56
ARITHMETIC MEAN VALUE: 0.548
MEDIAN: 0.545
STANDARD DEVIATON: 0.062
REL. ST. DEVIATION (%): 11.365

RESULTS IN DECREASING ORDER:

138	2.400 UNUSED	10	0.544
40	0.947	21	0.544
115	0.600	15	0.540
24	0.590	19	0.540
133	0.587	104	0.540
4	0.578	113	0.540
11	0.575	26	0.539
37	0.575	36	0.539
39	0.565	121	0.539
23	0.563	8	0.534
1	0.560	111	0.534
33	0.560	140	0.531
114	0.560	31	0.530
118	0.560	126	0.530
130	0.560	3	0.529
5	0.559	16	0.529
137	0.557	6	0.526
135	0.554	34	0.523
13	0.553	105	0.519
14	0.553	136	0.517
32	0.553	22	0.515
7	0.552	110	0.510
27	0.552	112	0.510
20	0.551	119	0.510
35	0.551	38	0.500
12	0.550	109	0.500
17	0.550	120	0.500
107	0.546	116	0.385
131	0.546		

"UNUSED": DATA UNUSED IN RUN 2

NITRATE
SAMPLE NO.: G3
THEORETICAL VALUE 0.738
UNIT: µg N/ml

RUN 1:
NUMBER OF LABORATORIES: 57
ARITHMETIC MEAN VALUE: 0.788
MEDIAN: 0.740
STANDARD DEVIATON: 0.342
REL. ST. DEVIATION (%): 43.341

RUN 2:
NUMBER OF LABORATORIES: 56
ARITHMETIC MEAN VALUE: 0.744
MEDIAN: 0.740
STANDARD DEVIATON: 0.070
REL. ST. DEVIATION (%): 9.368

RESULTS IN DECREASING ORDER:

138	3.270 UNUSED	113	0.740
40	1.157	126	0.740
136	0.924	36	0.736
24	0.830	131	0.736
118	0.810	15	0.733
11	0.774	13	0.730
23	0.766	104	0.730
1	0.760	3	0.727
130	0.760	19	0.726
39	0.759	26	0.725
4	0.758	140	0.725
135	0.758	8	0.723
133	0.756	34	0.721
5	0.755	22	0.720
107	0.754	111	0.719
7	0.752	105	0.712
27	0.752	6	0.711
17	0.750	16	0.701
20	0.750	38	0.700
33	0.750	115	0.700
114	0.750	119	0.700
32	0.745	121	0.698
14	0.744	110	0.690
31	0.743	112	0.690
35	0.742	120	0.690
37	0.742	137	0.689
10	0.740	109	0.670
12	0.740	116	0.618
21	0.740		

"UNUSED": DATA UNUSED IN RUN 2

NITRATE
SAMPLE NO.: G4
THEORETICAL VALUE 0.521
UNIT: µg N/ml

RUN 1:
NUMBER OF LABORATORIES: 57
ARITHMETIC MEAN VALUE: 0.544
MEDIAN: 0.518
STANDARD DEVIATON: 0.245
REL. ST. DEVIATION (%): 45.108

RUN 2:
NUMBER OF LABORATORIES: 56
ARITHMETIC MEAN VALUE: 0.513
MEDIAN: 0.518
STANDARD DEVIATON: 0.070
REL. ST. DEVIATION (%): 13.717

RESULTS IN DECREASING ORDER:

138	2.290 UNUSED	15	0.517
136	0.753	131	0.517
40	0.678	10	0.516
135	0.541	16	0.516
130	0.540	121	0.516
133	0.537	140	0.515
23	0.536	19	0.514
39	0.531	26	0.514
11	0.530	104	0.510
113	0.530	118	0.510
114	0.530	8	0.508
126	0.530	31	0.508
4	0.529	111	0.508
5	0.529	3	0.504
7	0.528	34	0.503
32	0.528	116	0.502
14	0.525	6	0.500
20	0.525	115	0.500
27	0.525	105	0.495
21	0.523	38	0.490
13	0.522	22	0.481
1	0.520	110	0.480
12	0.520	112	0.480
17	0.520	119	0.480
33	0.520	137	0.478
35	0.520	109	0.470
36	0.520	120	0.470
37	0.520	24	0.100
107	0.518		

"UNUSED": DATA UNUSED IN RUN 2

Table 20: Analytical results for ammonium in precipitations sample.

AMMONIUM
SAMPLE NO.: G1
THEORETICAL VALUE 0.401
UNIT: µg N/ml

RUN 1:
NUMBER OF LABORATORIES: 56
ARITHMETIC MEAN VALUE: 0.402
MEDIAN: 0.392
STANDARD DEVIATON: 0.045
REL. ST. DEVIATION (%): 11.119

RUN 2:
NUMBER OF LABORATORIES: 53
ARITHMETIC MEAN VALUE: 0.398
MEDIAN: 0.392
STANDARD DEVIATON: 0.027
REL. ST. DEVIATION (%): 6.734

RESULTS IN DECREASING ORDER:

40	0.609 UNUSED	26	0.392	
116	0.545 UNUSED	36	0.392	
136	0.489	131	0.391	
19	0.486	112	0.390	
17	0.454	7	0.389	
37	0.441	20	0.389	
18	0.431	21	0.388	
1	0.420	15	0.387	
33	0.420	22	0.386	
39	0.420	23	0.386	
109	0.420	111	0.386	
113	0.420	121	0.384	
11	0.410	5	0.382	
104	0.410	133	0.381	
114	0.410	12	0.380	
140	0.408	38	0.380	
13	0.404	10	0.379	
105	0.404	31	0.378	
8	0.401	27	0.377	
32	0.401	34	0.374	
6	0.400	126	0.371	
115	0.400	110	0.370	
130	0.400	119	0.370	
16	0.395	118	0.369	
35	0.395	137	0.369	
4	0.394	107	0.358	
14	0.394	3	0.350	
135	0.393	120	0.310 UNUSED	

"UNUSED": DATA UNUSED IN RUN 2

AMMONIUM
SAMPLE NO.: G2
THEORETICAL VALUE 0.261
UNIT: µg N/ml

RUN 1:
NUMBER OF LABORATORIES: 56
ARITHMETIC MEAN VALUE: 0.446
MEDIAN: 0.260
STANDARD DEVIATON: 1.327
REL. ST. DEVIATION (%): 297.263

RUN 2:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 0.269
MEDIAN: 0.260
STANDARD DEVIATON: 0.053
REL. ST. DEVIATION (%): 19.543

RESULTS IN DECREASING ORDER:

3	10.192 UNUSED	130	0.260
40	0.515	5	0.257
136	0.496	21	0.257
116	0.354	7	0.255
19	0.316	20	0.255
39	0.315	26	0.255
17	0.307	13	0.253
37	0.300	35	0.253
115	0.300	12	0.250
133	0.287	38	0.250
33	0.282	111	0.250
32	0.279	135	0.248
104	0.270	4	0.246
109	0.270	10	0.246
114	0.270	27	0.245
8	0.269	126	0.245
18	0.267	22	0.243
31	0.264	23	0.243
34	0.264	131	0.243
36	0.264	112	0.240
105	0.264	118	0.240
11	0.263	137	0.237
14	0.263	16	0.235
140	0.262	121	0.232
1	0.260	119	0.230
6	0.260	110	0.220
15	0.260	120	0.220
113	0.260	107	0.218

"UNUSED": DATA UNUSED IN RUN 2

AMMONIUM
SAMPLE NO.: G3
THEORETICAL VALUE 0.481
UNIT: µg N/ml

RUN 1:
NUMBER OF LABORATORIES: 56
ARITHMETIC MEAN VALUE: 0.490
MEDIAN: 0.477
STANDARD DEVIATON: 0.051
REL. ST. DEVIATION (%): 10.489

RUN 2:
NUMBER OF LABORATORIES: 53
ARITHMETIC MEAN VALUE: 0.480
MEDIAN: 0.476
STANDARD DEVIATON: 0.030
REL. ST. DEVIATION (%): 6.313

RESULTS IN DECREASING ORDER:

40	0.721 UNUSED	5	0.476	
116	0.650 UNUSED	26	0.476	
18	0.605 UNUSED	34	0.474	
19	0.570	135	0.474	
136	0.570	23	0.473	
17	0.544	22	0.472	
33	0.524	14	0.471	
39	0.520	20	0.471	
37	0.508	35	0.471	
1	0.507	21	0.470	
133	0.505	31	0.468	
104	0.500	10	0.465	
113	0.500	4	0.464	
114	0.500	111	0.462	
115	0.500	38	0.460	
32	0.498	137	0.460	
105	0.497	27	0.454	
11	0.496	121	0.454	
8	0.492	12	0.450	
13	0.492	110	0.450	
140	0.492	112	0.450	
130	0.490	118	0.450	
131	0.490	119	0.450	
15	0.488	16	0.445	
36	0.486	126	0.444	
6	0.480	107	0.430	
109	0.480	120	0.430	
7	0.478	3	0.426	

"UNUSED": DATA UNUSED IN RUN 2

AMMONIUM
SAMPLE NO.: G4
THEORETICAL VALUE 0.221
UNIT: µg N/ml

RUN 1:
NUMBER OF LABORATORIES: 56
ARITHMETIC MEAN VALUE: 0.228
MEDIAN: 0.220
STANDARD DEVIATON: 0.056
REL. ST. DEVIATION (%): 24.330

RUN 2:
NUMBER OF LABORATORIES: 53
ARITHMETIC MEAN VALUE: 0.221
MEDIAN: 0.220
STANDARD DEVIATON: 0.025
REL. ST. DEVIATION (%): 11.287

RESULTS IN DECREASING ORDER:

40	0.480 UNUSED	113	0.220	
136	0.462 UNUSED	130	0.220	
116	0.304	14	0.216	
18	0.274	35	0.216	
133	0.272	13	0.215	
19	0.260	26	0.215	
39	0.254	4	0.214	
17	0.253	20	0.214	
37	0.253	34	0.214	
33	0.245	1	0.210	
32	0.241	111	0.210	
109	0.240	118	0.210	
36	0.239	119	0.210	
8	0.238	126	0.209	
15	0.235	27	0.208	
5	0.234	10	0.207	
31	0.230	23	0.207	
104	0.230	22	0.201	
114	0.230	115	0.200	
105	0.225	121	0.200	
140	0.225	137	0.198	
7	0.224	135	0.193	
6	0.220	131	0.191	
11	0.220	120	0.190	
12	0.220	110	0.180	
16	0.220	3	0.172	
21	0.220	107	0.167	
38	0.220	112	0.100 UNUSED	

"UNUSED": DATA UNUSED IN RUN 2

Table 21: Analytical results for pH in precipitations samples.

PH
SAMPLE NO.: G1
THEORETICAL VALUE 4.155
UNIT: PH units

RUN 1:
NUMBER OF LABORATORIES: 57
ARITHMETIC MEAN VALUE: 4.224
MEDIAN: 4.210
STANDARD DEVIATON: 0.167
REL. ST. DEVIATION (%): 3.945

RUN 2:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 4.197
MEDIAN: 4.200
STANDARD DEVIATON: 0.054
REL. ST. DEVIATION (%): 1.285

RESULTS IN DECREASING ORDER:

137	5.330 UNUSED	7	4.200
17	4.590 UNUSED	21	4.200
113	4.320	120	4.200
115	4.310	121	4.200
14	4.260	1	4.190
38	4.260	13	4.190
11	4.250	131	4.190
20	4.250	4	4.180
112	4.250	5	4.180
119	4.250	23	4.180
19	4.240	105	4.180
22	4.240	106	4.180
39	4.240	3	4.170
104	4.240	6	4.170
24	4.230	12	4.170
36	4.230	109	4.170
111	4.230	118	4.170
133	4.230	135	4.170
27	4.220	31	4.165
32	4.220	130	4.150
35	4.220	136	4.140
107	4.220	16	4.130
110	4.220	126	4.130
114	4.220	10	4.120
8	4.211	116	4.120
34	4.211	140	4.110
15	4.210	18	4.050
26	4.210	37	4.020
33	4.210		

"UNUSED": DATA UNUSED IN RUN 2

PH
SAMPLE NO.: G2
THEORETICAL VALUE 4.097
UNIT: PH UNITS

RUN 1:
NUMBER OF LABORATORIES: 57
ARITHMETIC MEAN VALUE: 4.316
MEDIAN: 4.130
STANDARD DEVIATON: 1.326
REL. ST. DEVIATION (%): 30.714

RUN 2:
NUMBER OF LABORATORIES: 56
ARITHMETIC MEAN VALUE: 4.141
MEDIAN: 4.130
STANDARD DEVIATON: 0.120
REL. ST. DEVIATION (%): 2.905

RESULTS IN DECREASING ORDER:

3	14.108 UNUSED	17	4.130
137	4.950	21	4.130
115	4.210	36	4.130
112	4.200	113	4.130
11	4.190	121	4.130
14	4.190	135	4.130
20	4.180	1	4.120
22	4.180	7	4.120
19	4.170	104	4.120
24	4.170	106	4.120
26	4.160	119	4.120
32	4.160	131	4.120
35	4.160	31	4.118
39	4.160	12	4.110
111	4.160	23	4.110
15	4.150	105	4.110
27	4.150	6	4.100
33	4.150	109	4.100
38	4.150	130	4.100
114	4.150	118	4.090
120	4.150	140	4.090
133	4.150	16	4.080
8	4.148	116	4.080
107	4.140	126	4.080
110	4.140	10	4.060
34	4.134	18	3.990
4	4.130	136	3.990
5	4.130	37	3.940
13	4.130		

"UNUSED": DATA UNUSED IN RUN 2

PH
SAMPLE NO.: G3
THEORETICAL VALUE 4.426
UNIT: PH units

RUN 1:
NUMBER OF LABORATORIES: 57
ARITHMETIC MEAN VALUE: 4.460
MEDIAN: 4.460
STANDARD DEVIATON: 0.106
REL. ST. DEVIATION (%): 2.373

RUN 2:
NUMBER OF LABORATORIES: 56
ARITHMETIC MEAN VALUE: 4.448
MEDIAN: 4.460
STANDARD DEVIATON: 0.053
REL. ST. DEVIATION (%): 1.200

RESULTS IN DECREASING ORDER:

137	5.140 UNUSED	120	4.460
130	4.630	13	4.450
19	4.540	17	4.450
112	4.530	131	4.450
14	4.510	1	4.440
20	4.510	7	4.440
35	4.510	104	4.440
11	4.490	106	4.440
24	4.480	119	4.440
36	4.480	121	4.440
38	4.480	12	4.430
39	4.480	105	4.430
107	4.480	3	4.422
110	4.480	31	4.422
111	4.480	6	4.420
4	4.470	16	4.420
15	4.470	113	4.420
27	4.470	109	4.410
32	4.470	140	4.410
33	4.470	23	4.400
34	4.467	135	4.400
8	4.464	10	4.380
5	4.460	37	4.380
21	4.460	118	4.380
22	4.460	133	4.370
26	4.460	126	4.360
114	4.460	18	4.310
115	4.460	136	4.290
116	4.460		

"UNUSED": DATA UNUSED IN RUN 2

PH
SAMPLE NO.: G4
THEORETICAL VALUE 4.398
UNIT: PH units

RUN 1:
NUMBER OF LABORATORIES: 57
ARITHMETIC MEAN VALUE: 4.439
MEDIAN: 4.420
STANDARD DEVIATON: 0.132
REL. ST. DEVIATION (%): 2.976

RUN 2:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 4.417
MEDIAN: 4.420
STANDARD DEVIATON: 0.061
REL. ST. DEVIATION (%): 1.380

RESULTS IN DECREASING ORDER:

137	5.130 UNUSED	7	4.420
133	4.960 UNUSED	17	4.420
19	4.510	23	4.420
14	4.500	105	4.420
111	4.500	115	4.420
112	4.500	121	4.420
20	4.490	131	4.420
107	4.490	6	4.410
35	4.480	12	4.410
11	4.470	106	4.410
110	4.470	119	4.410
24	4.460	31	4.404
38	4.460	3	4.401
39	4.460	113	4.400
27	4.450	114	4.400
33	4.450	130	4.400
120	4.450	16	4.390
8	4.446	109	4.390
15	4.440	118	4.390
22	4.440	116	4.380
26	4.440	10	4.360
32	4.440	135	4.360
34	4.439	1	4.350
4	4.430	126	4.350
13	4.430	140	4.310
21	4.430	18	4.280
36	4.430	136	4.240
104	4.430	37	4.180
5	4.420		

"UNUSED": DATA UNUSED IN RUN 2

Table 22: Analytical results for strong acid calculated from pH.

STRONG ACID CALCULATED FROM PH
SAMPLE NO.: G1
THEORETICAL VALUE 70.000
UNIT: µeq/l

RUN 1:
NUMBER OF LABORATORIES: 56
ARITHMETIC MEAN VALUE: 62.576
MEDIAN: 62.380
STANDARD DEVIATON: 12.673
REL. ST. DEVIATION (%): 20.252

RUN 2:
NUMBER OF LABORATORIES: 52
ARITHMETIC MEAN VALUE: 63.255
MEDIAN: 62.380
STANDARD DEVIATON: 6.727
REL. ST. DEVIATION (%): 10.635

RESULTS IN DECREASING ORDER:

37	95.500	UNUSED	15	61.660
18	89.130	UNUSED	26	61.660
130	79.430		33	61.660
140	77.620		8	61.590
10	75.860		34	61.520
116	75.860		27	60.260
16	74.130		32	60.260
126	74.130		35	60.260
136	72.440		107	60.260
31	68.390		110	60.260
6	67.610		114	60.260
12	67.610		24	58.880
109	67.610		36	58.880
118	67.610		111	58.880
135	67.610		133	58.880
3	67.450		19	57.540
4	66.070		22	57.540
5	66.070		104	57.540
23	66.070		11	56.230
105	66.070		20	56.230
106	66.070		112	56.230
1	64.570		119	56.230
13	64.570		14	54.950
131	64.570		38	54.950
7	63.100		115	48.980
21	63.100		113	47.860
120	63.100		17	25.700 UNUSED
121	63.100		137	4.680 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

STRONG ACID CALCULATED FROM PH
SAMPLE NO.: G2
THEORETICAL VALUE 80.000
UNIT: µeq/l

RUN 1:
NUMBER OF LABORATORIES: 57
ARITHMETIC MEAN VALUE: 73.223
MEDIAN: 74.130
STANDARD DEVIATON: 14.182
REL. ST. DEVIATION (%): 19.368

RUN 2:
NUMBER OF LABORATORIES: 52
ARITHMETIC MEAN VALUE: 73.453
MEDIAN: 74.130
STANDARD DEVIATON: 5.446
REL. ST. DEVIATION (%): 7.415

RESULTS IN DECREASING ORDER:

37	114.820	UNUSED	121	74.130
18	102.330	UNUSED	135	74.130
136	102.330	UNUSED	34	73.450
10	87.100		107	72.440
16	83.180		110	72.440
116	83.180		8	71.120
126	83.180		15	70.790
118	81.280		27	70.790
140	81.280		33	70.790
6	79.430		38	70.790
109	79.430		114	70.790
3	77.980		120	70.790
12	77.620		133	70.790
23	77.620		26	69.180
105	77.620		32	69.180
31	76.210		35	69.180
1	75.860		39	69.180
7	75.860		111	69.180
104	75.860		19	67.610
106	75.860		24	67.610
119	75.860		20	66.070
131	75.860		22	66.070
4	74.130		11	64.570
5	74.130		14	64.570
13	74.130		112	63.100
17	74.130		115	61.660
21	74.130		130	23.440 UNUSED
36	74.130		137	11.220 UNUSED
113	74.130			

"UNUSED": DATA UNUSED IN RUN 2

STRONG ACID CALCULATED FROM PH
SAMPLE NO.: G3
THEORETICAL VALUE 37.500
UNIT: µeq/l

RUN 1:
NUMBER OF LABORATORIES: 57
ARITHMETIC MEAN VALUE: 35.700
MEDIAN: 34.670
STANDARD DEVIATON: 5.659
REL. ST. DEVIATION (%): 15.853

RUN 2:
NUMBER OF LABORATORIES: 54
ARITHMETIC MEAN VALUE: 35.692
MEDIAN: 34.670
STANDARD DEVIATON: 3.263
REL. ST. DEVIATION (%): 9.142

RESULTS IN DECREASING ORDER:

136	51.290	UNUSED	21	34.670
18	48.980	UNUSED	22	34.670
126	43.650		26	34.670
133	42.660		114	34.670
10	41.690		115	34.670
37	41.690		116	34.670
118	41.690		120	34.670
23	39.810		8	34.360
130	39.810		34	34.120
135	39.810		4	33.880
109	38.900		15	33.880
140	38.900		27	33.880
6	38.020		32	33.880
16	38.020		33	33.880
113	38.020		24	33.110
3	37.840		36	33.110
31	37.840		38	33.110
12	37.150		39	33.110
105	37.150		107	33.110
1	36.310		110	33.110
7	36.310		111	33.110
104	36.310		11	32.360
106	36.310		14	30.900
119	36.310		20	30.900
121	36.310		35	30.900
13	35.480		112	29.510
17	35.480		19	28.840
131	35.480		137	7.240 UNUSED
5	34.670			

"UNUSED": DATA UNUSED IN RUN 2

STRONG ACID CALCULATED FROM PH
SAMPLE NO.: G4
THEORETICAL VALUE 40.000
UNIT: µeq/l

RUN 1:
NUMBER OF LABORATORIES: 56
ARITHMETIC MEAN VALUE: 37.634
MEDIAN: 37.585
STANDARD DEVIATON: 8.237
REL. ST. DEVIATION (%): 21.888

RUN 2:
NUMBER OF LABORATORIES: 52
ARITHMETIC MEAN VALUE: 37.799
MEDIAN: 37.585
STANDARD DEVIATON: 4.202
REL. ST. DEVIATION (%): 11.118

RESULTS IN DECREASING ORDER:

37	66.070	UNUSED	4	37.150
136	57.540	UNUSED	13	37.150
18	52.480		21	37.150
140	48.980		36	37.150
1	44.670		104	37.150
126	44.670		34	36.390
10	43.650		15	36.310
135	43.650		22	36.310
116	41.690		26	36.310
16	40.740		32	36.310
109	40.740		8	35.810
118	40.740		27	35.480
113	39.810		33	35.480
114	39.810		120	35.480
3	39.720		24	34.670
31	39.450		38	34.670
6	38.900		39	34.670
12	38.900		11	33.880
106	38.900		110	33.880
119	38.900		35	33.110
5	38.020		20	32.360
7	38.020		107	32.360
17	38.020		14	31.620
23	38.020		111	31.620
105	38.020		112	31.620
115	38.020		19	30.900
121	38.020		133	10.960 UNUSED
131	38.020		137	7.410 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

Table 23: Analytical results for strong acid in precipitations samples.

STRONG ACIDS
SAMPLE NO.: G1
THEORETICAL VALUE: 70
UNIT: µeq

RUN 1:
NUMBER OF LABORATORIES: 15
ARITHMETIC MEAN VALUE: 65.395
MEDIAN: 66.000
STANDARD DEVIATON: 5.669
REL. ST. DEVIATION (%): 8.668

RUN 2:
NUMBER OF LABORATORIES: 14
ARITHMETIC MEAN VALUE: 64.495
MEDIAN: 64.800
STANDARD DEVIATON: 4.638
REL. ST. DEVIATION (%): 7.191

RESULTS IN DECREASING ORDER:

140	78.000 UNUSED	14	63.600
126	74.000	34	62.000
109	68.140	27	60.720
6	68.000	32	60.256
118	68.000	35	60.250
135	67.610	36	58.900
3	67.450	104	58.000
105	66.000		

"UNUSED": DATA UNUSED IN RUN 2

STRONG ACIDS
SAMPLE NO.: G2
THEORETICAL VALUE: 80
UNIT: µeq

RUN 1:
NUMBER OF LABORATORIES: 15
ARITHMETIC MEAN VALUE: 75.410
MEDIAN: 76.000
STANDARD DEVIATON: 4.761
REL. ST. DEVIATION (%): 6.313

RUN 2:
NUMBER OF LABORATORIES: 15
ARITHMETIC MEAN VALUE: 75.410
MEDIAN: 76.000
STANDARD DEVIATON: 4.761
REL. ST. DEVIATION (%): 6.313

RESULTS IN DECREASING ORDER:

126	83.000	135	74.130
118	81.000	36	74.100
140	81.000	34	73.000
109	78.860	27	70.310
105	78.000	32	69.183
3	77.983	35	69.180
14	77.400	6	68.000
104	76.000		

"UNUSED": DATA UNUSED IN RUN 2

STRONG ACIDS
SAMPLE NO.: G3
THEORETICAL VALUE: 38
UNIT: µeg

RUN 1:
NUMBER OF LABORATORIES: 15
ARITHMETIC MEAN VALUE: 37.157
MEDIAN: 36.300
STANDARD DEVIATON: 4.368
REL. ST. DEVIATION (%): 11.757

RUN 2:
NUMBER OF LABORATORIES: 14
ARITHMETIC MEAN VALUE: 36.311
MEDIAN: 36.150
STANDARD DEVIATON: 2.998
REL. ST. DEVIATION (%): 8.258

RESULTS IN DECREASING ORDER:

126	49.000 UNUSED	6	36.000
118	42.000	104	36.000
135	39.810	34	34.000
140	39.000	27	33.890
109	38.620	32	33.884
3	37.844	36	33.100
105	37.000	35	30.900
14	36.300		

"UNUSED": DATA UNUSED IN RUN 2

STRONG ACIDS
SAMPLE NO.: G4
THEORETICAL VALUE: 40
UNIT: µeq

RUN 1:
NUMBER OF LABORATORIES: 15
ARITHMETIC MEAN VALUE: 39.297
MEDIAN: 38.000
STANDARD DEVIATON: 4.105
REL. ST. DEVIATION (%): 10.445

RUN 2:
NUMBER OF LABORATORIES: 14
ARITHMETIC MEAN VALUE: 38.604
MEDIAN: 38.000
STANDARD DEVIATON: 3.223
REL. ST. DEVIATION (%): 8.348

RESULTS IN DECREASING ORDER:

140	49.000 UNUSED	105	38.000
135	44.670	36	37.200
126	44.000	104	37.000
118	41.000	32	36.308
109	40.750	34	36.000
3	39.719	27	35.500
14	39.200	35	33.110
6	38.000		

"UNUSED": DATA UNUSED IN RUN 2

Table 24: Analytical results for chloride in precipitations samples.

CHLORIDE
SAMPLE NO.: G1
THEORETICAL VALUE 0.174
UNIT: µg Cl/ml

RUN 1:
NUMBER OF LABORATORIES: 57
ARITHMETIC MEAN VALUE: 0.206
MEDIAN: 0.171
STANDARD DEVIATON: 0.112
REL. ST. DEVIATION (%): 54.333

RUN 2:
NUMBER OF LABORATORIES: 47
ARITHMETIC MEAN VALUE: 0.182
MEDIAN: 0.171
STANDARD DEVIATON: 0.052
REL. ST. DEVIATION (%): 28.568

RESULTS IN DECREASING ORDER:

109 < LOD			
116	0.724 UNUSED	8	0.171
113 < 0.5			
137	0.548 UNUSED	27	0.171
17	0.480 UNUSED	4	0.170
40	0.424	7	0.170
112 < 0.37			
133	0.335	14	0.170
10	0.316	33	0.170
19 < 0.31			
105 < 0.277			
120	0.210	34	0.170
11	0.206	36	0.170
131	0.206	38	0.170
111 < 0.2			
115	0.200	23	0.165
130	0.200	20	0.164
104	0.190	3	0.161
31	0.187	1	0.160
6	0.183	39	0.160
15	0.183	119	0.160
12	0.180	126	0.160
114	0.180	140	0.160
138	0.180	37	0.153
135	0.179	24	0.150
5	0.176	18	0.149
13	0.176	32	0.142
35	0.174	110	0.140
26	0.173	22	0.131
16	0.172	136	0.125
21	0.172	118	0.120
		107 < 0.07	

"UNUSED": DATA UNUSED IN RUN 2
"LOD": LIMIT OF DETECTION

CHLORIDE
SAMPLE NO.: G2
THEORETICAL VALUE 0.232
UNIT: µg Cl/ml

RUN 1:
NUMBER OF LABORATORIES: 57
ARITHMETIC MEAN VALUE: 0.240
MEDIAN: 0.228
STANDARD DEVIATON: 0.064
REL. ST. DEVIATION (%): 26.674

RUN 2:
NUMBER OF LABORATORIES: 47
ARITHMETIC MEAN VALUE: 0.230
MEDIAN: 0.228
STANDARD DEVIATON: 0.034
REL. ST. DEVIATION (%): 14.667

RESULTS IN DECREASING ORDER:

109 < LOD			
113 < 0.5			
137	0.483 UNUSED	27	0.228
40	0.430 UNUSED	36	0.224
133	0.413 UNUSED	4	0.223
112 < 0.37			
11	0.357	14	0.223
131	0.329	23	0.221
19 < 0.31			
115	0.300	6	0.220
105 < 0.277			
116	0.275	7	0.220
110	0.270	119	0.220
130	0.260	16	0.219
138	0.250	34	0.218
18	0.249	20	0.215
17	0.240	32	0.215
31	0.240	135	0.214
104	0.240	3	0.213
21	0.234	1	0.210
13	0.233	38	0.210
15	0.233	126	0.210
10	0.232	140	0.210
12	0.230	37	0.206
33	0.230	24	0.200
114	0.230	111 < 0.2	
		39	0.190
120	0.230	118	0.190
5	0.229	136	0.186
35	0.229	22	0.153
8	0.228	107	0.090 UNUSED
26	0.228		

"UNUSED": DATA UNUSED IN RUN 2
"LOD": LIMIT OF DETECTION

CHLORIDE
SAMPLE NO.: G3
THEORETICAL VALUE 0.608
UNIT: µg Cl/ml

RUN 1:
NUMBER OF LABORATORIES: 58
ARITHMETIC MEAN VALUE: 0.592
MEDIAN: 0.597
STANDARD DEVIATON: 0.056
REL. ST. DEVIATION (%): 9.473

RUN 2:
NUMBER OF LABORATORIES: 53
ARITHMETIC MEAN VALUE: 0.596
MEDIAN: 0.598
STANDARD DEVIATON: 0.031
REL. ST. DEVIATION (%): 5.244

RESULTS IN DECREASING ORDER:

137	0.771 UNUSED	17	0.596
131	0.721 UNUSED	23	0.595
135	0.659	8	0.593
11	0.655	15	0.593
113	0.650	20	0.592
136	0.644	32	0.591
133	0.638	119	0.590
40	0.632	140	0.590
110	0.630	35	0.586
112	0.630	7	0.585
138	0.630	105	0.585
31	0.623	4	0.582
121	0.622	10	0.582
16	0.617	3	0.579
116	0.614	6	0.574
21	0.613	39	0.572
26	0.611	130	0.570
24	0.610	111	0.566
13	0.607	34	0.561
27	0.607	1	0.560
19	0.601	38	0.560
12	0.600	126	0.560
33	0.600	118	0.550
104	0.600	18	0.542
114	0.600	37	0.540
115	0.600	120	0.490
14	0.599	109	0.463 UNUSED
36	0.599	22	0.420 UNUSED
5	0.598	107	0.410 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

CHLORIDE
SAMPLE NO.: G4
THEORETICAL VALUE 0.724
UNIT: µg Cl/ml

RUN 1:
NUMBER OF LABORATORIES: 57
ARITHMETIC MEAN VALUE: 0.703
MEDIAN: 0.700
STANDARD DEVIATON: 0.108
REL. ST. DEVIATION (%): 15.386

RUN 2:
NUMBER OF LABORATORIES: 56
ARITHMETIC MEAN VALUE: 0.690
MEDIAN: 0.699
STANDARD DEVIATON: 0.051
REL. ST. DEVIATION (%): 7.445

RESULTS IN DECREASING ORDER:

17	1.410 UNUSED	3	0.697
137	0.819	15	0.697
113	0.770	14	0.695
11	0.764	6	0.694
133	0.752	4	0.692
136	0.746	105	0.691
135	0.735	1	0.690
13	0.732	130	0.690
27	0.725	32	0.689
116	0.722	111	0.688
12	0.720	131	0.685
112	0.720	34	0.680
26	0.717	37	0.679
36	0.717	31	0.675
23	0.716	110	0.670
21	0.715	33	0.660
5	0.714	120	0.660
20	0.711	39	0.655
19	0.710	10	0.653
114	0.710	38	0.650
8	0.708	118	0.650
40	0.706	140	0.650
35	0.705	18	0.649
16	0.703	121	0.641
7	0.702	126	0.630
104	0.700	109	0.560
115	0.700	22	0.518
119	0.700	107	0.513
138	0.700		

"UNUSED": DATA UNUSED IN RUN 2

Table 25: Analytical results for sodium in precipitations samples.

SODIUM
SAMPLE NO.: G1
THEORETICAL VALUE 0.301
UNIT: µg Na/ml

RUN 1:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 0.297
MEDIAN: 0.300
STANDARD DEVIATON: 0.047
REL. ST. DEVIATION (%): 15.957

RUN 2:
NUMBER OF LABORATORIES: 52
ARITHMETIC MEAN VALUE: 0.292
MEDIAN: 0.300
STANDARD DEVIATON: 0.030
REL. ST. DEVIATION (%): 10.304

RESULTS IN DECREASING ORDER:

136	0.515 UNUSED	130	0.300
116	0.413 UNUSED	133	0.300
34	0.360	21	0.297
118	0.350	31	0.297
32	0.340	3	0.296
4	0.338	20	0.296
40	0.334	39	0.290
110	0.330	112	0.290
135	0.327	11	0.284
105	0.310	19	0.283
114	0.310	38	0.276
27	0.309	131	0.273
8	0.308	14	0.271
15	0.308	1	0.270
36	0.307	119	0.270
13	0.306	126	0.270
5	0.304	140	0.270
6	0.304	35	0.266
7	0.304	109	0.261
26	0.303	113	0.260
33	0.303	138	0.260
37	0.303	10	0.250
16	0.302	23	0.244
12	0.300	120	0.230
24	0.300	107	0.225
104	0.300	22	0.209
115	0.300	17	0.185 UNUSED
121	0.300		

"UNUSED": DATA UNUSED IN RUN 2

SODIUM
SAMPLE NO.: G2
THEORETICAL VALUE 0.499
UNIT: µg Na/ml

RUN 1:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 0.483
MEDIAN: 0.489
STANDARD DEVIATON: 0.067
REL. ST. DEVIATION (%): 13.872

RUN 2:
NUMBER OF LABORATORIES: 54
ARITHMETIC MEAN VALUE: 0.476
MEDIAN: 0.485
STANDARD DEVIATON: 0.042
REL. ST. DEVIATION (%): 8.746

RESULTS IN DECREASING ORDER:

136	0.868 UNUSED	3	0.481
32	0.580	4	0.481
116	0.560	31	0.481
40	0.541	24	0.480
135	0.534	112	0.480
110	0.520	114	0.480
118	0.520	130	0.480
34	0.517	19	0.476
36	0.508	20	0.472
5	0.505	14	0.464
27	0.503	1	0.460
7	0.500	119	0.460
39	0.500	140	0.450
115	0.500	35	0.447
6	0.498	23	0.440
13	0.498	109	0.440
121	0.498	131	0.438
8	0.496	11	0.432
26	0.496	113	0.430
37	0.495	38	0.426
21	0.493	10	0.420
33	0.492	126	0.420
12	0.490	138	0.420
16	0.490	17	0.410
104	0.490	107	0.386
105	0.490	22	0.385
133	0.490	120	0.380
15	0.489		

"UNUSED": DATA UNUSED IN RUN 2

SODIUM
SAMPLE NO.: G3
THEORETICAL VALUE 0.636
UNIT: µg Na/ml

RUN 1:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 0.606
MEDIAN: 0.616
STANDARD DEVIATON: 0.080
REL. ST. DEVIATION (%): 13.120

RUN 2:
NUMBER OF LABORATORIES: 53
ARITHMETIC MEAN VALUE: 0.606
MEDIAN: 0.616
STANDARD DEVIATON: 0.049
REL. ST. DEVIATION (%): 8.152

RESULTS IN DECREASING ORDER:

136	0.949 UNUSED	31	0.615
4	0.731	112	0.610
40	0.702	119	0.610
110	0.660	130	0.610
34	0.657	3	0.607
114	0.650	24	0.606
20	0.649	19	0.604
36	0.642	1	0.600
13	0.640	115	0.600
32	0.640	140	0.590
118	0.640	14	0.586
5	0.638	23	0.580
15	0.638	126	0.580
27	0.638	131	0.579
7	0.636	38	0.578
33	0.632	104	0.570
39	0.632	109	0.568
121	0.632	35	0.565
26	0.631	11	0.556
6	0.630	113	0.550
8	0.630	138	0.540
12	0.630	10	0.510
105	0.630	120	0.510
37	0.627	17	0.505
21	0.624	107	0.498
16	0.620	22	0.467
133	0.620	135	0.294 UNUSED
116	0.616		

"UNUSED": DATA UNUSED IN RUN 2

SODIUM
SAMPLE NO.: G4
THEORETICAL VALUE 0.872
UNIT: µg Na/ml

RUN 1:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 0.845
MEDIAN: 0.850
STANDARD DEVIATON: 0.089
REL. ST. DEVIATION (%): 10.483

RUN 2:
NUMBER OF LABORATORIES: 52
ARITHMETIC MEAN VALUE: 0.837
MEDIAN: 0.847
STANDARD DEVIATON: 0.058
REL. ST. DEVIATION (%): 6.957

RESULTS IN DECREASING ORDER:

121	1.210 UNUSED	19	0.843
136	1.106 UNUSED	3	0.842
32	1.000	4	0.841
135	0.981	112	0.840
37	0.921	119	0.840
115	0.900	130	0.840
36	0.888	24	0.838
13	0.883	31	0.838
5	0.880	23	0.822
110	0.880	104	0.820
7	0.873	109	0.817
26	0.871	140	0.810
27	0.870	14	0.807
33	0.870	1	0.800
8	0.869	38	0.800
15	0.868	133	0.800
39	0.865	35	0.799
6	0.862	126	0.790
12	0.860	113	0.780
34	0.860	11	0.775
105	0.860	131	0.750
114	0.860	17	0.744
20	0.857	10	0.740
21	0.853	138	0.730
116	0.853	107	0.701
16	0.850	120	0.690
40	0.850	22	0.630 UNUSED
118	0.850		

"UNUSED": DATA UNUSED IN RUN 2

Table 26: Analytical results for magnesium in precipitations samples.

MAGNESIUM
SAMPLE NO.: G1
THEORETICAL VALUE 0.139
UNIT: µg Mg/ml

RUN 1:
NUMBER OF LABORATORIES: 54
ARITHMETIC MEAN VALUE: 0.147
MEDIAN: 0.136
STANDARD DEVIATON: 0.099
REL. ST. DEVIATION (%): 67.037

RUN 2:
NUMBER OF LABORATORIES: 52
ARITHMETIC MEAN VALUE: 0.134
MEDIAN: 0.136
STANDARD DEVIATON: 0.018
REL. ST. DEVIATION (%): 13.100

RESULTS IN DECREASING ORDER:

136	0.840 UNUSED	23	0.136
133	0.191	27	0.136
113	0.160	107	0.135
20	0.155	131	0.135
116	0.155	36	0.134
138	0.150	11	0.133
119 <	0.15		
15	0.146	109	0.133
13	0.144	40	0.132
5	0.142	14	0.131
10	0.140	16	0.131
39	0.140	1	0.130
104	0.140	6	0.130
112	0.140	130	0.130
114	0.140	135	0.130
118	0.140	140	0.130
120	0.140	7	0.129
126	0.140	22	0.128
8	0.139	121	0.126
17	0.139	4	0.125
21	0.139	105	0.120
26	0.139	110	0.120
31	0.139	38	0.111
33	0.139	37	0.101
34	0.139	115	0.100
12	0.138	24	0.090
19	0.138	35	0.068
3	0.136		

"UNUSED": DATA UNUSED IN RUN 2

MAGNESIUM
SAMPLE NO.: G2
THEORETICAL VALUE 0.085
UNIT: µg Mg/ml

RUN 1:
NUMBER OF LABORATORIES: 54
ARITHMETIC MEAN VALUE: 0.099
MEDIAN: 0.084
STANDARD DEVIATON: 0.111
REL. ST. DEVIATION (%): 111.684

RUN 2:
NUMBER OF LABORATORIES: 51
ARITHMETIC MEAN VALUE: 0.084
MEDIAN: 0.084
STANDARD DEVIATON: 0.016
REL. ST. DEVIATION (%): 18.684

RESULTS IN DECREASING ORDER:

136	0.875 UNUSED	12	0.084
119 <	0.15		
133	0.139	16	0.084
116	0.135	27	0.084
20	0.102	17	0.083
115 <	0.1		
126	0.100	11	0.082
135	0.100	23	0.082
40	0.096	109	0.082
107	0.091	36	0.081
10	0.090	131	0.081
15	0.090	1	0.080
104	0.090	112	0.080
113	0.090	114	0.080
120	0.090	130	0.080
138	0.090	140	0.080
118	0.089	14	0.078
5	0.088	22	0.078
13	0.088	4	0.076
26	0.087	6	0.075
39	0.087	105	0.070
8	0.086	121	0.069
21	0.086	38	0.068
34	0.086	24	0.066
3	0.085	37	0.066
19	0.085	7	0.061
31	0.085	110	0.060
33	0.085	35	0.033

"UNUSED": DATA UNUSED IN RUN 2

MAGNESIUM
SAMPLE NO.: G3
THEORETICAL VALUE 0.101
UNIT: µg Mg/ml

RUN 1:
NUMBER OF LABORATORIES: 54
ARITHMETIC MEAN VALUE: 0.109
MEDIAN: 0.100
STANDARD DEVIATON: 0.093
REL. ST. DEVIATION (%): 85.531

RUN 2:
NUMBER OF LABORATORIES: 51
ARITHMETIC MEAN VALUE: 0.096
MEDIAN: 0.099
STANDARD DEVIATON: 0.014
REL. ST. DEVIATION (%): 14.384

RESULTS IN DECREASING ORDER:

136	0.762 UNUSED	3	0.099
119 <	0.15		
133	0.142	12	0.099
20	0.116	27	0.098
113	0.110	36	0.098
126	0.110	11	0.096
138	0.110	23	0.096
115 <	0.1		
40	0.109	109	0.096
15	0.108	131	0.096
13	0.105	17	0.095
34	0.105	16	0.094
107	0.104	22	0.093
5	0.103	14	0.092
8	0.102	6	0.091
33	0.102	135	0.091
39	0.102	1	0.090
118	0.102	7	0.090
19	0.101	130	0.090
26	0.101	4	0.089
31	0.101	121	0.085
10	0.100	38	0.080
21	0.100	105	0.080
104	0.100	110	0.080
112	0.100	37	0.075
114	0.100	116	0.075
120	0.100	24	0.067
140	0.100	35	0.044

"UNUSED": DATA UNUSED IN RUN 2

MAGNESIUM
SAMPLE NO.: G4
THEORETICAL VALUE 0.124
UNIT: µg Mg/ml

RUN 1:
NUMBER OF LABORATORIES: 54
ARITHMETIC MEAN VALUE: 0.128
MEDIAN: 0.121
STANDARD DEVIATON: 0.070
REL. ST. DEVIATION (%): 54.813

RUN 2:
NUMBER OF LABORATORIES: 52
ARITHMETIC MEAN VALUE: 0.119
MEDIAN: 0.120
STANDARD DEVIATON: 0.016
REL. ST. DEVIATION (%): 13.862

RESULTS IN DECREASING ORDER:

136	0.616 UNUSED	10	0.120
133	0.186	104	0.120
119 <	0.15		
138	0.140	112	0.120
135	0.136	113	0.120
20	0.132	114	0.120
13	0.131	120	0.120
15	0.130	130	0.120
126	0.130	140	0.120
31	0.127	11	0.118
5	0.126	22	0.118
8	0.126	109	0.118
34	0.126	7	0.117
118	0.125	14	0.117
19	0.124	16	0.117
21	0.124	6	0.115
26	0.124	40	0.112
39	0.124	1	0.110
107	0.124	4	0.110
12	0.123	38	0.100
3	0.122	105	0.100
17	0.122	110	0.100
33	0.122	115	0.100
36	0.122	116	0.097
121	0.122	37	0.090
23	0.121	24	0.081
27	0.121	35	0.063
131	0.121		

"UNUSED": DATA UNUSED IN RUN 2

Table 27: Analytical results for calcium in precipitations samples.

CALCIUM
SAMPLE NO.: G1
THEORETICAL VALUE 0.335
UNIT: µg Ca/ml

RUN 1:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 0.371
MEDIAN: 0.338
STANDARD DEVIATON: 0.244
REL. ST. DEVIATION (%): 65.887

RUN 2:
NUMBER OF LABORATORIES: 54
ARITHMETIC MEAN VALUE: 0.340
MEDIAN: 0.338
STANDARD DEVIATON: 0.085
REL. ST. DEVIATION (%): 25.073

RESULTS IN DECREASING ORDER:

136	2.039 UNUSED	36	0.338
116	0.794	19	0.337
133	0.498	16	0.334
121	0.437	6	0.333
118	0.430	4	0.330
10	0.400	38	0.325
104	0.400	27	0.324
105	0.400	8	0.320
114	0.400	12	0.320
140	0.400	11	0.316
113	0.380	7	0.313
34	0.364	107	0.312
5	0.361	1	0.310
40	0.360	126	0.310
138	0.360	14	0.305
20	0.356	115	0.300
112	0.350	120	0.300
15	0.347	130	0.300
31	0.347	22	0.280
13	0.346	17	0.279
23	0.343	37	0.276
33	0.342	119	0.260
3	0.341	135	0.256
21	0.341	131	0.238
109	0.341	24	0.211
110	0.340	32	0.188
39	0.339	35	0.174
26	0.338		

"UNUSED": DATA UNUSED IN RUN 2

CALCIUM
SAMPLE NO.: G2
THEORETICAL VALUE 0.239
UNIT: µg Ca/ml

RUN 1:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 0.285
MEDIAN: 0.240
STANDARD DEVIATON: 0.305
REL. ST. DEVIATION (%): 107.171

RUN 2:
NUMBER OF LABORATORIES: 54
ARITHMETIC MEAN VALUE: 0.245
MEDIAN: 0.240
STANDARD DEVIATON: 0.092
REL. ST. DEVIATION (%): 37.445

RESULTS IN DECREASING ORDER:

136	2.404 UNUSED	112	0.240
116	0.800	140	0.240
133	0.431	23	0.237
105	0.330	34	0.237
121	0.327	8	0.235
104	0.320	12	0.230
118	0.280	27	0.230
10	0.270	38	0.230
138	0.270	11	0.226
40	0.265	14	0.220
110	0.260	113	0.220
5	0.259	120	0.220
20	0.259	107	0.219
31	0.256	7	0.214
15	0.255	1	0.210
21	0.251	126	0.210
114	0.250	130	0.210
6	0.249	22	0.202
19	0.248	115	0.200
4	0.247	119	0.190
109	0.246	17	0.184
16	0.245	37	0.176
13	0.243	24	0.165
36	0.243	131	0.151
3	0.241	135	0.141
33	0.241	32	0.140
39	0.241	35	0.103
26	0.240		

"UNUSED": DATA UNUSED IN RUN 2

CALCIUM
SAMPLE NO.: G3
THEORETICAL VALUE 0.364
UNIT: µg Ca/ml

RUN 1:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 0.392
MEDIAN: 0.360
STANDARD DEVIATON: 0.235
REL. ST. DEVIATION (%): 60.024

RUN 2:
NUMBER OF LABORATORIES: 54
ARITHMETIC MEAN VALUE: 0.361
MEDIAN: 0.360
STANDARD DEVIATON: 0.063
REL. ST. DEVIATION (%): 17.395

RESULTS IN DECREASING ORDER:

136	2.043 UNUSED	112	0.360
116	0.559	33	0.359
133	0.545	4	0.357
105	0.500	7	0.357
121	0.465	27	0.353
138	0.430	107	0.353
5	0.404	1	0.350
34	0.394	11	0.350
10	0.390	104	0.350
40	0.390	23	0.349
15	0.388	14	0.341
13	0.382	12	0.340
110	0.380	120	0.340
114	0.380	126	0.340
118	0.380	38	0.331
37	0.379	113	0.330
3	0.378	130	0.330
39	0.376	140	0.330
109	0.376	22	0.323
6	0.373	119	0.320
31	0.373	17	0.303
21	0.372	115	0.300
8	0.370	135	0.299
20	0.370	131	0.285
26	0.370	35	0.225
19	0.367	24	0.212
36	0.367	32	0.200
16	0.360		

"UNUSED": DATA UNUSED IN RUN 2

CALCIUM
SAMPLE NO.: G4
THEORETICAL VALUE 0.259
UNIT: µg Ca/ml

RUN 1:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 0.285
MEDIAN: 0.260
STANDARD DEVIATON: 0.197
REL. ST. DEVIATION (%): 69.038

RUN 2:
NUMBER OF LABORATORIES: 54
ARITHMETIC MEAN VALUE: 0.260
MEDIAN: 0.258
STANDARD DEVIATON: 0.061
REL. ST. DEVIATION (%): 23.605

RESULTS IN DECREASING ORDER:

136	1.646 UNUSED	4	0.257
116	0.518	16	0.255
133	0.473	33	0.255
105	0.350	8	0.253
121	0.350	31	0.253
138	0.310	27	0.250
118	0.300	23	0.249
13	0.296	107	0.249
40	0.286	11	0.242
15	0.282	7	0.241
34	0.282	12	0.240
104	0.280	14	0.240
6	0.278	126	0.240
5	0.275	38	0.237
21	0.271	120	0.230
10	0.270	130	0.230
114	0.270	1	0.220
140	0.270	119	0.220
109	0.266	37	0.218
20	0.263	22	0.213
19	0.262	115	0.200
39	0.262	131	0.199
3	0.260	17	0.196
26	0.260	32	0.180
36	0.260	135	0.171
110	0.260	24	0.169
112	0.260	35	0.132
113	0.260		

"UNUSED": DATA UNUSED IN RUN 2

Table 28: Analytical results for potassium in precipitations samples.

POTASSIUM
SAMPLE NO.: G1
THEORETICAL VALUE 0.255
UNIT: µg K/ml

RUN 1:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 0.254
MEDIAN: 0.249
STANDARD DEVIATON: 0.108
REL. ST. DEVIATION (%): 42.657

RUN 2:
NUMBER OF LABORATORIES: 53
ARITHMETIC MEAN VALUE: 0.239
MEDIAN: 0.249
STANDARD DEVIATON: 0.028
REL. ST. DEVIATION (%): 11.806

RESULTS IN DECREASING ORDER:

136	1.007 UNUSED	24	0.249
115	0.300	36	0.248
118	0.300	33	0.247
20	0.291	35	0.243
114	0.270	12	0.240
109	0.262	110	0.240
32	0.260	130	0.240
3	0.258	133	0.240
14	0.258	138	0.240
31	0.257	21	0.236
5	0.256	23	0.234
8	0.256	4	0.233
15	0.256	10	0.230
26	0.256	104	0.230
13	0.255	113	0.230
121	0.253	38	0.222
39	0.252	140	0.220
7	0.251	131	0.209
27	0.251	34	0.208
135	0.251	22	0.204
16	0.250	1	0.200
19	0.250	37	0.196
105	0.250	40	0.191
112	0.250	119	0.190
116	0.250	107	0.182
126	0.250	120	0.180
6	0.249	11	0.160
		17 <	0.077

"UNUSED": DATA UNUSED IN RUN 2

POTASSIUM
SAMPLE NO.: G2
THEORETICAL VALUE 0.204
UNIT: µg K/ml

RUN 1:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 0.196
MEDIAN: 0.200
STANDARD DEVIATON: 0.035
REL. ST. DEVIATION (%): 17.992

RUN 2:
NUMBER OF LABORATORIES: 51
ARITHMETIC MEAN VALUE: 0.193
MEDIAN: 0.200
STANDARD DEVIATON: 0.023
REL. ST. DEVIATION (%): 11.918

RESULTS IN DECREASING ORDER:

136	0.342 UNUSED	138	0.200
115	0.300 UNUSED	121	0.199
114	0.240	135	0.197
118	0.230	35	0.196
22	0.226	16	0.195
14	0.223	21	0.194
20	0.222	6	0.191
31	0.215	10	0.190
26	0.213	126	0.190
3	0.211	130	0.190
19	0.210	23	0.188
15	0.208	116	0.188
5	0.207	105	0.180
8	0.207	140	0.180
109	0.207	131	0.176
13	0.206	34	0.175
24	0.206	38	0.174
27	0.206	104	0.170
4	0.203	119	0.170
7	0.203	113	0.160
39	0.203	37	0.157
36	0.201	1	0.150
12	0.200	40	0.149
32	0.200	107	0.146
33	0.200	110	0.140
112	0.200	120	0.140
133	0.200	11	0.113 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

POTASSIUM
SAMPLE NO.: G3
THEORETICAL VALUE 0.306
UNIT: µg K/ml

RUN 1:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 0.286
MEDIAN: 0.295
STANDARD DEVIATON: 0.049
REL. ST. DEVIATION (%): 17.224

RUN 2:
NUMBER OF LABORATORIES: 52
ARITHMETIC MEAN VALUE: 0.288
MEDIAN: 0.295
STANDARD DEVIATON: 0.030
REL. ST. DEVIATION (%): 10.262

RESULTS IN DECREASING ORDER:

115	0.400 UNUSED	38	0.295
20	0.346	35	0.294
32	0.332	16	0.292
131	0.321	10	0.290
114	0.320	12	0.290
118	0.320	104	0.290
135	0.319	105	0.290
27	0.317	130	0.290
15	0.315	138	0.290
13	0.309	109	0.285
5	0.308	6	0.284
8	0.308	21	0.284
19	0.306	23	0.283
14	0.305	116	0.281
26	0.305	126	0.280
7	0.304	22	0.275
3	0.303	136	0.262
31	0.303	37	0.254
33	0.300	1	0.250
110	0.300	34	0.245
112	0.300	40	0.243
133	0.300	119	0.240
140	0.300	120	0.240
36	0.299	11	0.225
39	0.299	107	0.225
121	0.297	113	0.190
24	0.296	4	0.021 UNUSED
		17 <	0.077

"UNUSED": DATA UNUSED IN RUN 2

POTASSIUM
SAMPLE NO.: G4
THEORETICAL VALUE 0.153
UNIT: µg K/ml

RUN 1:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 0.144
MEDIAN: 0.149
STANDARD DEVIATON: 0.030
REL. ST. DEVIATION (%): 20.702

RUN 2:
NUMBER OF LABORATORIES: 51
ARITHMETIC MEAN VALUE: 0.144
MEDIAN: 0.149
STANDARD DEVIATON: 0.023
REL. ST. DEVIATION (%): 16.020

RESULTS IN DECREASING ORDER:

136	0.220 UNUSED	7	0.148
115	0.200	36	0.147
114	0.190	116	0.145
22	0.188	33	0.144
20	0.174	21	0.143
121	0.174	35	0.143
118	0.170	16	0.142
109	0.165	6	0.140
14	0.160	10	0.140
26	0.160	12	0.140
32	0.160	140	0.140
138	0.160	23	0.139
8	0.158	135	0.131
13	0.158	105	0.130
15	0.157	34	0.125
3	0.156	38	0.122
27	0.155	104	0.120
19	0.154	1	0.110
24	0.154	37	0.110
31	0.150	11	0.108
39	0.150	40	0.107
112	0.150	107	0.102
113	0.150	131	0.101
119 <	0.15		
126	0.150	110	0.100
130	0.150	120	0.100
133	0.150	17 <	0.077
5	0.149	4	0.028 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

Table 29: Analytical results for conductivity in precipitations samples.

CONDUCTIVITY
SAMPLE NO.: G1
THEORETICAL VALUE 40.600
UNIT: µS/cm

RUN 1:
NUMBER OF LABORATORIES: 56
ARITHMETIC MEAN VALUE: 37.616
MEDIAN: 38.650
STANDARD DEVIATON: 4.055
REL. ST. DEVIATION (%): 10.781

RUN 2:
NUMBER OF LABORATORIES: 51
ARITHMETIC MEAN VALUE: 38.325
MEDIAN: 38.800
STANDARD DEVIATON: 2.431
REL. ST. DEVIATION (%): 6.342

RESULTS IN DECREASING ORDER:

23	46.000 UNUSED	140	38.600	
12	42.200	4	38.500	
20	41.700	14	38.400	
13	41.500	15	38.400	
130	41.000	107	38.300	
27	40.700	114	38.200	
5	40.400	131	38.200	
109	40.400	106	38.000	
16	40.200	118	38.000	
19	40.200	22	37.900	
10	40.170	36	37.900	
121	40.000	11	37.800	
31	39.920	116	37.790	
33	39.800	37	37.500	
21	39.600	110	37.400	
112	39.600	136	37.000	
3	39.400	34	36.900	
35	39.400	39	36.000	
126	39.300	38	35.200	
8	39.200	104	35.000	
111	39.200	135	33.200	
18	39.100	119	31.900	
1	39.000	7	31.700	
17	39.000	113	30.300	
105	39.000	40	28.000 UNUSED	
120	39.000	137	27.900 UNUSED	
32	38.800	115	27.000 UNUSED	
6	38.700	24	23.000 UNUSED	

"UNUSED": DATA UNUSED IN RUN 2

CONDUCTIVITY
SAMPLE NO.: G2
THEORETICAL VALUE 43.100
UNIT: µS/cm

RUN 1:
NUMBER OF LABORATORIES: 56
ARITHMETIC MEAN VALUE: 40.961
MEDIAN: 41.900
STANDARD DEVIATON: 3.868
REL. ST. DEVIATION (%): 9.443

RUN 2:
NUMBER OF LABORATORIES: 53
ARITHMETIC MEAN VALUE: 41.700
MEDIAN: 42.000
STANDARD DEVIATON: 2.291
REL. ST. DEVIATION (%): 5.493

RESULTS IN DECREASING ORDER:

23	48.000	105	41.800	
20	45.400	35	41.700	
12	45.200	34	41.500	
18	44.900	3	41.430	
17	44.500	8	41.400	
13	43.600	11	41.300	
27	43.500	6	41.200	
121	43.400	15	41.200	
19	43.100	131	41.200	
38	43.100	14	41.000	
5	43.000	106	41.000	
10	43.000	118	41.000	
104	43.000	22	40.700	
130	43.000	36	40.300	
1	42.900	110	40.300	
109	42.900	136	40.300	
32	42.800	4	40.200	
116	42.750	107	40.100	
140	42.600	39	39.900	
16	42.300	115	39.000	
33	42.300	120	39.000	
31	42.240	113	37.500	
126	42.200	119	36.600	
21	42.170	7	35.700	
112	42.100	135	34.700	
114	42.100	40	30.000 UNUSED	
37	42.000	24	28.000 UNUSED	
111	42.000	137	25.700 UNUSED	

"UNUSED": DATA UNUSED IN RUN 2

CONDUCTIVITY
SAMPLE NO.: G3
THEORETICAL VALUE 29.300
UNIT: µS/cm

RUN 1:
NUMBER OF LABORATORIES: 55
ARITHMETIC MEAN VALUE: 28.504
MEDIAN: 28.930
STANDARD DEVIATON: 2.562
REL. ST. DEVIATION (%): 8.988

RUN 2:
NUMBER OF LABORATORIES: 51
ARITHMETIC MEAN VALUE: 28.622
MEDIAN: 28.930
STANDARD DEVIATON: 1.541
REL. ST. DEVIATION (%): 5.383

RESULTS IN DECREASING ORDER:

20	35.000 UNUSED	15	28.900	
23	34.000 UNUSED	21	28.830	
18	31.290	17	28.800	
121	30.700	105	28.800	
12	30.600	37	28.700	
130	30.500	6	28.500	
32	30.200	112	28.500	
13	30.100	14	28.400	
104	30.000	131	28.400	
1	29.900	4	28.300	
27	29.900	11	28.300	
116	29.800	35	28.300	
111	29.700	140	28.300	
10	29.600	106	28.000	
5	29.500	110	28.000	
19	29.500	22	27.900	
7	29.400	36	27.500	
31	29.380	39	27.400	
8	29.300	113	27.100	
34	29.300	107	26.900	
109	29.200	136	26.300	
16	29.100	119	25.800	
33	29.100	135	24.400	
114	29.100	137	24.300	
118	29.000	115	24.000	
120	29.000	24	20.000 UNUSED	
126	29.000	40	19.000 UNUSED	
3	28.930			

"UNUSED": DATA UNUSED IN RUN 2

CONDUCTIVITY
SAMPLE NO.: G4
THEORETICAL VALUE 27.900
UNIT: µS/cm

RUN 1:
NUMBER OF LABORATORIES: 54
ARITHMETIC MEAN VALUE: 26.864
MEDIAN: 27.210
STANDARD DEVIATON: 2.340
REL. ST. DEVIATION (%): 8.712

RUN 2:
NUMBER OF LABORATORIES: 49
ARITHMETIC MEAN VALUE: 27.277
MEDIAN: 27.290
STANDARD DEVIATON: 1.251
REL. ST. DEVIATION (%): 4.586

RESULTS IN DECREASING ORDER:

20	32.500 UNUSED	16	27.200	
23	31.000	15	27.100	
18	29.550	131	27.100	
12	29.000	4	27.000	
13	29.000	8	27.000	
121	28.800	37	27.000	
27	28.500	106	27.000	
32	28.500	112	27.000	
130	28.500	120	27.000	
116	28.220	6	26.800	
5	28.000	11	26.800	
118	28.000	14	26.700	
10	27.900	105	26.600	
111	27.900	22	26.400	
31	27.870	36	26.200	
19	27.800	7	26.000	
34	27.700	136	26.000	
109	27.700	39	25.800	
1	27.600	107	25.600	
35	27.600	113	25.600	
126	27.600	110	25.400	
140	27.600	135	24.100	
17	27.500	119	24.000	
114	27.500	115	22.000 UNUSED	
33	27.300	137	21.600 UNUSED	
3	27.290	24	19.000 UNUSED	
21	27.220	40	19.000 UNUSED	

"UNUSED": DATA UNUSED IN RUN 2

Table 30: Ratio of the measured to the calculated conductivity in synthetic precipitation samples (G1-G4).

Lab. No.	Measured value / calculated value				Remarks
	G1	G2	G3	G4	
1	1.00	1.03	1.03	0.95	
3	1.00	0.99	1.00	1.00	
4	0.98	0.97	1.02	1.01	
5	1.03	1.05	1.03	1.03	
6	0.98	0.97	0.98	0.99	
7	0.82	0.85	1.01	0.95	
8	1.04	1.04	1.04	1.02	
10	0.94	0.94	0.97	0.97	
11	1.07	1.10	1.03	1.05	
12	1.07	1.07	1.06	1.06	
13	1.03	1.06	1.05	1.07	
14	1.07	1.07	1.04	1.06	
15	1.02	1.03	1.02	1.01	
16	0.96	0.97	1.01	0.97	
17	1.52	1.09	1.03	0.97	K^+ is missing
18					Reports only NH_4^+, Cl^-, pH and cond.
19	1.11	1.12	1.11	1.13	
20	1.16	1.19	1.29	1.29	
21	1.03	1.02	1.01	1.01	
22	1.09	1.11	1.05	1.07	
23	1.18	1.14	1.14	1.15	
24					NH_4^+, SO_4^{2-} G4 and NO_3^- G4 are missing
26					Cond. missing
27	1.09	1.09	1.07	1.08	
31	1.00	1.01	1.00	1.01	
32	1.09	1.11	1.13	1.11	Mg^{2+} is missing
33	1.05	1.05	1.02	1.04	
34	0.99	1.02	1.05	1.05	
35	1.08	1.07	1.08	1.12	
36	1.04	0.99	1.00	0.97	
37	0.77	0.76	0.94	0.73	
38	1.03	1.12	0.00	0.00	
39	0.98	0.99	0.97	0.98	
40					SO_4^{2-} is missing
104	0.97	1.03	1.05	0.00	
105	1.01	1.01	0.98	0.99	
106					Reports only NH_4^+
107	1.04	1.00	1.00	1.06	
109	1.05	1.03	1.01	1.01	
110	1.03	1.02	1.03	1.03	
111					Mg^{2+}, Na^+, Ca^{2+} and K^+ are missing
112	1.12	1.16	1.09	1.15	Cl^- values >LOD for G1 and G2 and NH_4^+ G4 are missing
113	0.93	0.94	0.94	0.93	
114	1.01	1.05	1.01	0.97	
115	0.81	1.07	0.87	0.82	Mg^{2+} values < LOD for G2 and G3
116	0.72	0.91	0.97	0.90	
118	0.94	0.93	0.93	0.99	
119	0.92	0.90	0.93	0.92	Mg^{2+} values < LOD
120	1.07	1.02	1.09	1.09	
121	1.07	1.08	1.08	1.05	
126	0.94	0.97	0.93	0.94	
130	0.69	1.10	0.75	0.75	
131	1.00	1.00	0.99	1.03	
133					Cond. is missing
135	0.83	0.84	0.83	0.82	
136	0.78	0.67	0.62	0.62	
137					Mg^{2+}, Na^+, Ca^{2+} and K^+ are missing
138					Cond. is missing
140	0.89	0.99	0.96	0.90	

Table 31: Ratio of equivalent concentration of anions to the equivalent concentration of cation measured in synthetic precipitation samples.

Lab. No.	Anions / Cations					Remarks
	G1	G2	G3	G4	Average	
1	1.10	1.10	1.05	1.04	1.07	
3	1.04	1.05	1.03	1.03	1.04	
4	1.06	1.11	1.10	1.10	1.09	
5	1.03	1.03	1.03	0.99	1.02	
6	1.00	0.98	0.97	0.98	0.98	
7	1.11	1.10	1.04	1.06	1.08	
8	1.06	1.06	1.01	1.02	1.03	
10	0.99	1.00	1.03	1.02	1.01	
11	1.12	1.22	1.12	1.13	1.15	
12	1.03	1.03	1.04	1.02	1.03	
13	0.89	1.07	0.99	1.01	0.99	
14	1.23	1.21	1.16	1.18	1.20	
15	1.05	1.06	1.01	1.01	1.03	
16	0.96	0.97	1.00	1.01	0.98	
17	1.77	1.15	1.15	1.35	1.36	K^+ values < LOD
18						Reports only NH_4^+, Cl^-, pH and cond.
19	1.01	1.01	1.02	1.04	1.02	
20	1.09	1.10	1.04	1.07	1.07	
21	1.08	1.07	1.06	1.05	1.07	
22	1.08	1.08	1.00	1.01	1.04	
23	1.06	1.06	1.03	1.06	1.05	
24						$NH4^+$, SO_4^{2-} G4 and NO_3^- G4 are missing
26	1.05	1.07	1.01	1.02	1.04	
27	1.11	1.10	1.07	1.07	1.08	
31	1.03	1.03	1.02	1.00	1.02	
32	1.16	1.10	1.11	1.03	1.10	
33	1.08	1.09	1.03	1.02	1.05	
34	1.04	1.03	1.00	1.01	1.02	
35	1.25	1.25	1.22	1.24	1.24	
36	1.07	1.02	1.01	1.00	1.02	
37	0.85	0.82	0.96	0.82	0.86	
38	1.08	1.03	1.01	1.02	1.03	
39	1.14	1.11	1.04	1.04	1.08	
40						SO_4^{2-} is missing
104	1.05	0.99	1.02	1.02	1.02	
105	0.95	0.93	0.94	0.97	0.95	
106						Reports only NH_4^+
107	1.18	1.17	1.12	1.17	1.16	
109	0.92	0.92	0.94	0.92	0.92	
110	1.03	1.04	1.00	1.04	1.03	
111						Mg^{2+}, Na^+, Ca^{2+} and K^+ are missing
112	1.06	1.08	1.08	1.25	1.12	
113	1.09	1.00	1.03	1.03	1.04	
114	1.07	1.08	1.02	1.02	1.05	
115	1.22	1.18	1.06	1.03	1.12	
116	1.27	0.78	0.98	1.05	1.02	
118	1.00	1.02	1.02	0.99	1.01	
119	1.29	1.14	1.12	1.15	1.18	Mg^{2+} values < LOD
120	1.06	1.07	1.04	1.09	1.07	
121	0.93	0.96	0.95	0.83	0.92	
126	1.02	0.98	1.00	1.01	1.00	
130	2.29	4.07	2.01	2.14	2.63	
131	1.12	1.13	1.10	1.11	1.11	
133	1.17	1.25	1.04	1.27	1.18	
135	1.09	1.11	1.17	1.01	1.09	
136	0.27	0.29	0.42	0.42	0.35	
137						Mg^{2+}, Na^+, Ca^{2+} and K^+ are missing
138						NH_4^+ and pH are missing
140	0.94	0.99	1.01	0.94	0.97	

Table 32: 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	1.00
	G3	1.00
	G4	1.00
NO_3-N	G1	1.00
	G2	1.00
	G3	1.00
	G4	1.00
NH_4-N	G1	0.98
	G2	1.00
	G3	1.00
	G4	1.00
pH (calc.from H^+)	G1	0.90
	G2	0.93
	G3	0.95
	G4	0.95
H	G1	0.94
	G2	0.95
	G3	0.97
	G4	0.95
Mg	G1	0.98
	G2	1.00
	G3	0.99
	G4	0.98
Na	G1	1.00
	G2	0.97
	G3	0.97
	G4	0.97
Cl	G1	0.99
	G2	0.98
	G3	0.98
	G4	0.97
Ca	G1	1.01
	G2	1.00
	G3	1.00
	G4	1.01
K	G1	0.98
	G2	0.98
	G3	0.97
	G4	0.98
Cond.	G1	0.95
	G2	0.97
	G3	0.99
	G4	0.97

Table 33: Analytical methods used for the determination of chemical constituents in precipitation samples.

Constituents	Methods	Laboratory
SO_4	1. Thorin	18
	2. Ion chromatography	1, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 26, 27, 31,32, 33, 34, 35, 36, 38, 104, 105, 107,110, 111, 114, 115, 116, 118, 119, 121, 124, 130, 131, 133, 134, 135, 136, 137, 138, 140
	3. Capillary electrophoresis	39
	4. ICP-AES	109, 112, 117
	5. FIA	
	6. Turbidimetry	24
NO_3	1 Griess after Cd-red.	24, 112
	2 Ion chromatography	1, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 26, 27, 31,32, 33, 34, 35, 36, 38, 105, 107,110, 114, 115, 116, 118, 119, 121, 124,130, 131, 133, 134, 135, 136, 137, 138, 140
	3 UV-method/Photometric	40, 104,
	4 Capillary electrophoresis	39
	5 FIA	109, 111, 113,
NH_4	1 Indophenol	10, 17, 18, 19, 20, 24,32, 34, 35, 39, 40, 112, 114,140
	2 Berthelot reaction, salycilate	26,
	3 Ion chromatography	1, 5, 7, 8, 12, 13, 15, 21, 22, 23, 31, 36, 107, 115, 119, 121, 124, 131,135,136
	4 Flow injection analysis (FIA)	6, 11, 14, 27, 106, 109, 111, 113, 134
	5 Chloramin T	16
	6 Nessler method	105
	7 Kjeldahl	
	8 Photometry	3, 4, 33, 104, 110,114, 116, , 118, 133,137
H^+	1 Acidimetric titration	14, 124, 126
	2 Alkali titration to spec. pH	6,
Mg	1 Atomic absorption (AAS)	3, 4, 10, 16, 17, 19, 20, 22, 24, 26, 27, 33, 34, 35, 38, 40, 105,116, 121, 124, 133,137
	2 Ion chromatography	1, 5, 6, 7, 8, 12, 13, 15, 21, 23, 31, 36, 107, 114, 119, 130, 131, 135, 136, 138, 140
	3 ICP-AES	11, 14, 39, 104, 109, 111, 112, 113, 115, 118
Na	1 AES	33, 38, 112, 133
	2 AAS	3, 4, 10, 16, 17, 19, 20, 24, 26, 27,32, 34, 35, 40, 105, 116, 124,137
	3 ICP-AES	11, 14, 39, 104, 109, 110,111, 115, 118,
	4 Ion chromatography	1, 5, 6, 7, 8, 12, 13, 15, 21, 22, 23, 31, 36, 107, 114, 119, 121, 130, 131, 135, 136, 138, 140
Cl	1 Mercury thiocyanate-iron	18, 24, 40
	2 Ion chromatography	1, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 26, 27, 31,32, 33, 34, 35, 36, 38, 104, 105, 107,110, 111, 114, 115, 116, 118, 119, 121, 124,130, 131, 133, 134, 135, 136, 137, 138, 140
	3 Capillary electrophoresis	39
	4 Potensiometric method	109, 112
	5 Photometric method	
Ca	1 AAS	3, 4, 8,10, 16, 17, 19, 22, 24, 26, 27,32, 33, 34, 35, 38, 40, 105, 116, 124, 133,137
	2 ICP-AES	11, 14, 39, 104, 109,110, 111, 112, 113, 115, 118
	3 Ion chromatography	1, 5, 6, 7, 8, 12, 15, 20,21, 23, 31, 36, 107, 114, 119, 121, 130, 131, 135, 136, 138, 140
	4 AES	
K	1 AAS	3, 4, 10, 16, 17, 18, 19, 24, 26, 27,32, 34, 35, 40, 105, 112, 124,137s
	2 Ion chromatography	1, 5, 6, 7, 8, 12, 13, 15, 20, 21, 22, 23, 31, 36, 107, 114, 119, 121, 126,130, 131, 135, 136, 138, 140
	3 AES	33, 39, 116, 133?
	4 ICP-AES	11, 14, 104, 109, 110,111, 113, 115, 118

Table 34: 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-}		NO_3^-		NH_4^+		Mg^{2+}		H calc	
	Random error %	Systematic error %	Random error %	Systematic error %	Random error %	Systematic error %	Random error %	Systematic error %	Random error %	Systematic error %
1	0	4	2	2	4	3	3	-9	7	-5
3	0	1	0	-3	2	-15	1	-2	2	-2
4	0	3	2	3	1	-3	2	-11	2	-7
5	-1	-1	1	2	4	-1	0	2	3	-6
6	0	-3	0	-4	0	0	0	-8	2	0
7	0	5	1	1	2	-1	6	-9	4	-5
8	0	0	0	-2	2	3	1	1	4	-11
10	2	3	0	0	1	-5	3	0	2	9
11	0	-1	2	3	2	2	1	-5	7	-17
12	0	0	1	0	4	-5	0	-1	1	-3
13	-1	2	1	0	2	0	2	4	3	-7
14	2	11	0	1	2	-2	1	-7	6	-21
15	0	1	1	-1	3	1	1	6	4	-11
16	-1	-2	2	-3	4	-5	3	-6	3	3
17	1	6	1	1	4	15	2	-2	30	-7
18					14	12			8	28
19	0	-1	0	-2	6	21	1	0	3	-19
20	0	0	1	1	1	-2	3	14	5	-19
21	0	4	0	0	1	-2	1	0	3	-8
22	0	-10	1	-5	1	-5	2	-7	8	-14
23	1	0	1	3	1	-4	1	-3	4	-4
24			41	6			11	-34	6	-14
26	0	-1	0	-1	0	-2	1	0	6	-11
27	0		1	1	2	-6	1	-2	4	-12
31	1	1	1	-1	4	-1	1	0	3	-2
32	0	-8	0	1	2	5			5	-12
33	1	3	1	2	3	7	1	0	4	-11
34	0	0	0	-3	4	-2	2	1	4	-9
35	0	4	1	0	1	-2	7	-52	3	-15
36	0	-3	1	-1	3	1	1	-3	6	-9
37	0	-2	2	1	2	11	7	-27	22	45
38	0	-9	1	-7	2	-5	4	-20	8	-13
39	1	6	1	3	4	11	1	1	47	-14
40			18	64	6	72	8	0		
104	1	-2	0	-1	1	3	3	0	8	-6
105	1	-2	1	-4	2	1	3	-18	3	-4
106									2	-5
107	3	6	1	0	1	-14	4	2	4	-13
109	2	-4	1	-10	2	4	1	-5	3	0
110	1	-5	1	-6	1	-11	2	-20	4	-12
111	1	-3	0	-2	1	-4			5	-17
112	1	1	1	-6			2	-2	6	-19
113	1	-3	1	0	2	3	9	6	16	-5
114	2	4	0	2	1	3	2	-2	7	-11
115	4	-1	6	-2	7	3			14	-19
116	9	28	58	-11	10	35	28	-4	6	4
118	2	6	6	0	3	-8	1	1	5	2
119	1	1	1	-6	2	-9			9	-5
120	3	-7	1	-8	7	-13	3	0	5	-10
121	1	-6	3	-4	1	-7	5	-13	4	-7
126	3	2	2	0	3	-7	5	7	2	8
130	35	204	1	3	1	0	2	-6	47	2
131	1	1	1	0	5	-4	1	-4	2	-5
133	11	24	2	5	9	7	8	47	25	-18
135	2	3	1	3	2	-3	9	1	7	0
136	8	-34	36	13	18	48	108	607	14	28
137	7	8	4	-5	1	-7			28	-86
138	36	200	52	325			4	9		
140	1	0	1	-2	1	2	3	-4	6	8

Table 34, cont.

Lab. no.	Na^+		Cl^-		Ca^{2+}		K^+		Cond.	
	Random error %	Systematic error %	Random error %	Systematic error %	Random error %	Systematic error %	Random error %	Systematic error %	Random error %	Systematic error %
1	3	-7	3	-6	3	-9	2	-24	3	-1
3	2	-4	2	-5	2	1	2	1	1	-3
4	9	2	3	-4	2	-1	51	-32	2	-4
5	0	1	1	-1	3	8	1	1	0	0
6	1	-1	4	-5	3	3	3	-6	1	-4
7	0	0	2	-4	3	-7	1	-1	10	-13
8	1	-1	1	-2	3	-2	1	1	2	-3
10	6	-18	20	-3	7	9	2	-6	1	0
11	6	-13	9	10	1	-5	9	0	2	-4
12	1	-1	1	-1	2	-6	2	-6	1	4
13	1	1	1	0	5	5	1	1	1	2
14	3	-7	2	-2	2	-7	4	2	2	-5
15	1	0	3	-2	2	6	1	2	2	-4
16	2	-2	3	-2	1	-1	2	-4	1	-2
17	3	-21	66	36	1	-20			4	-1
18			9	-10					4	5
19	1	-5			1	1	2	0	1	0
20	3	-2	1	-3	2	4	4	13	5	10
21	1	-2	1	0	1	3	2	-6	1	-2
22	11	-25	15	-31	2	-14	15	-2	2	-5
23	1	-10	0	-2	3	-2	2	-8	3	14
24	2	-4			11	-36	2	-1	10	-35
26	1	0	1	-1	1	1	2	2		
27	1	1	0	0	0	-3	3	1	1	2
31	2	-3	6	2	3	3	3	0	1	-1
32	9	10	2	-6	12	-41	5	3	3	1
33	1	-1			2	0	1	-3	1	-2
34	5	3	4	-7	4	9	6	-16	4	-2
35	3	0	2	-2	5	-46	1	-5	1	-3
36	1	1	1	-2	0	1	1	-3	1	-6
37	4	0	4	-8	11	-17	3	-21	3	-3
38	3	-11			3	-5	4	-13		
39	1	-1	5	-9	1	1	1	-1	3	
40	6	7	25	26	0	9	3	-26	5	-33
104	5	-5	4	0	13	14	3	-13		
105	2	-1			10	30	3	-8	1	-4
106									2	-5
107	7	-22			2	-5	5	-28	1	-7
109	2	-10			1	2	6	2	0	0
110	2	4	9	-1	3	3	10	-15	2	-7
111									2	-1
112	2	-4			3	0	0	-2	0	-3
113	4	-13			11	-3	20	-15	9	-11
114	2	0	2	-1	7	5	4	11	3	-2
115	5	0	9	2	4	-16	9	31	11	-16
116	9	4	52	6	50	120	4	-5	4	0
118	5	2	3	-13	11	14	6	9	3	-3
119	1	-5	1	-4	5	-16			6	-15
120	8	-21	15	-8	2	-9	4	-28	4	-4
121	24	0			2	32	5	-1	2	2
126	4	-12	8	-8	1	-8	4	-4	1	-2
130	2	-4	6	-1	1	-11	2	-6	1	1
131	7	-10	14	15	5	-28	12	-16	2	-4
133	5	-2	14	22	7	62	2	-2		
135	32	5	6	2	5	-28	6	-2	5	-17
136	11	47	8	-3	106	565	142	45	2	-8
137			26	48					14	-27
138	7	-15	4	3	6	14	4	-4		
140	2	-8	6	-5	13	2	5	-8	2	-2

Appendix 2

Figures

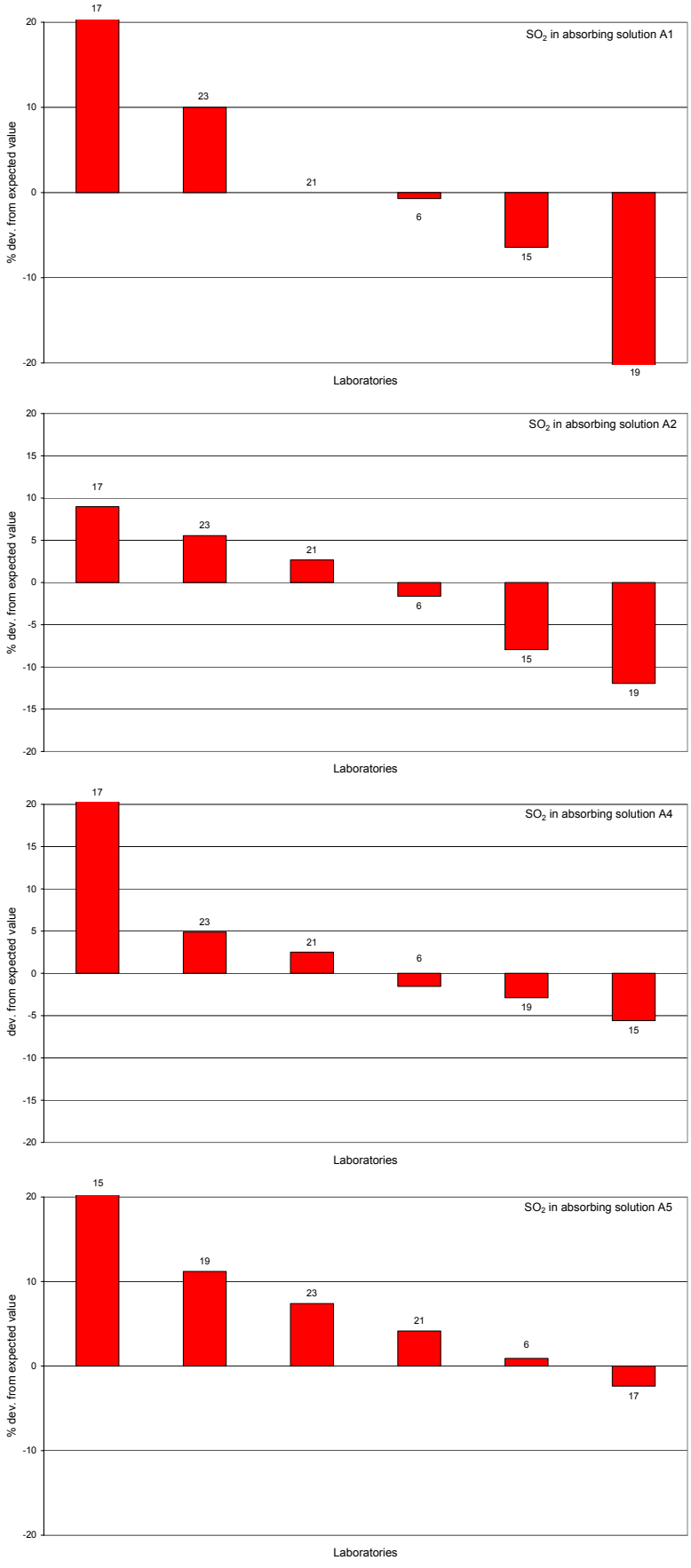

Figure 1: SO_2 in absorbing solution.

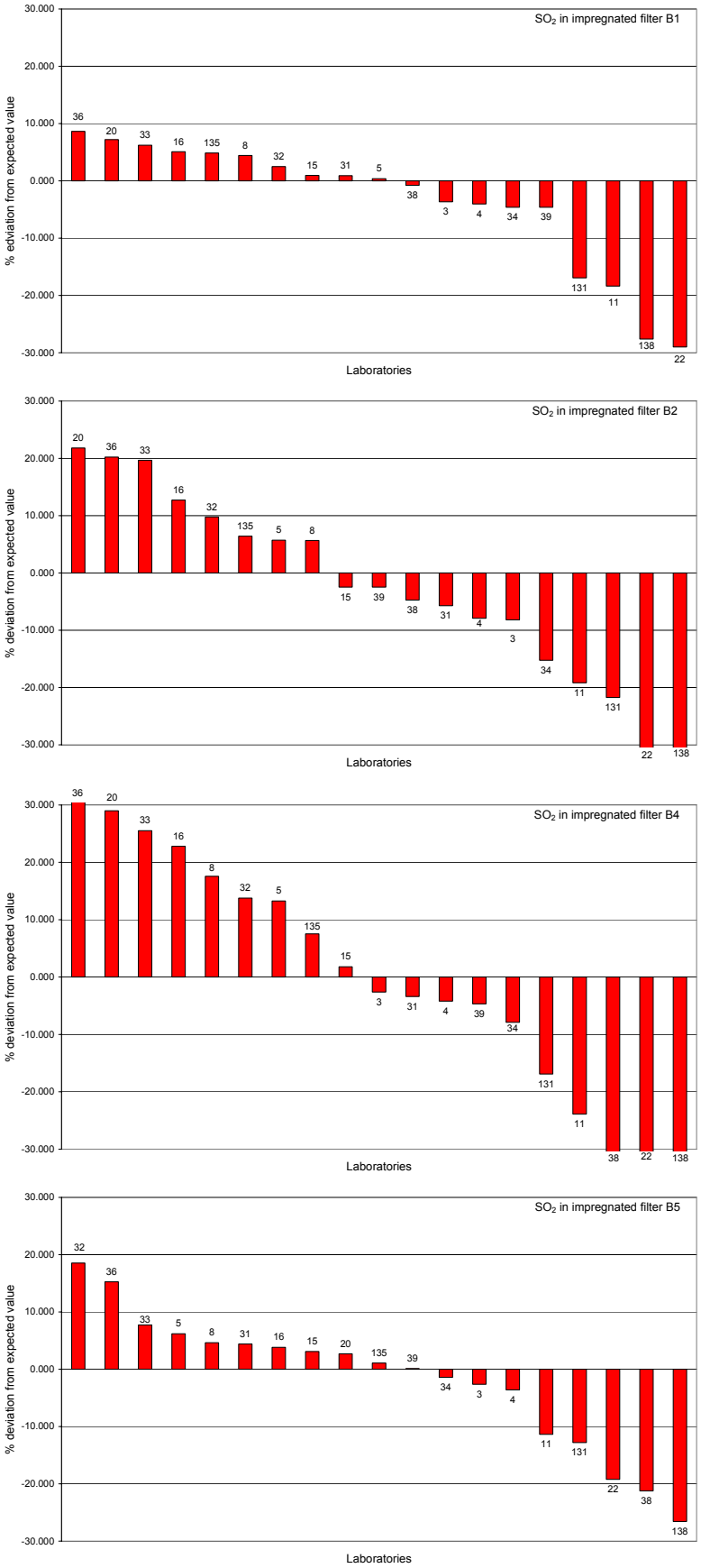

Figure 2: SO_2 in impregnated filter.

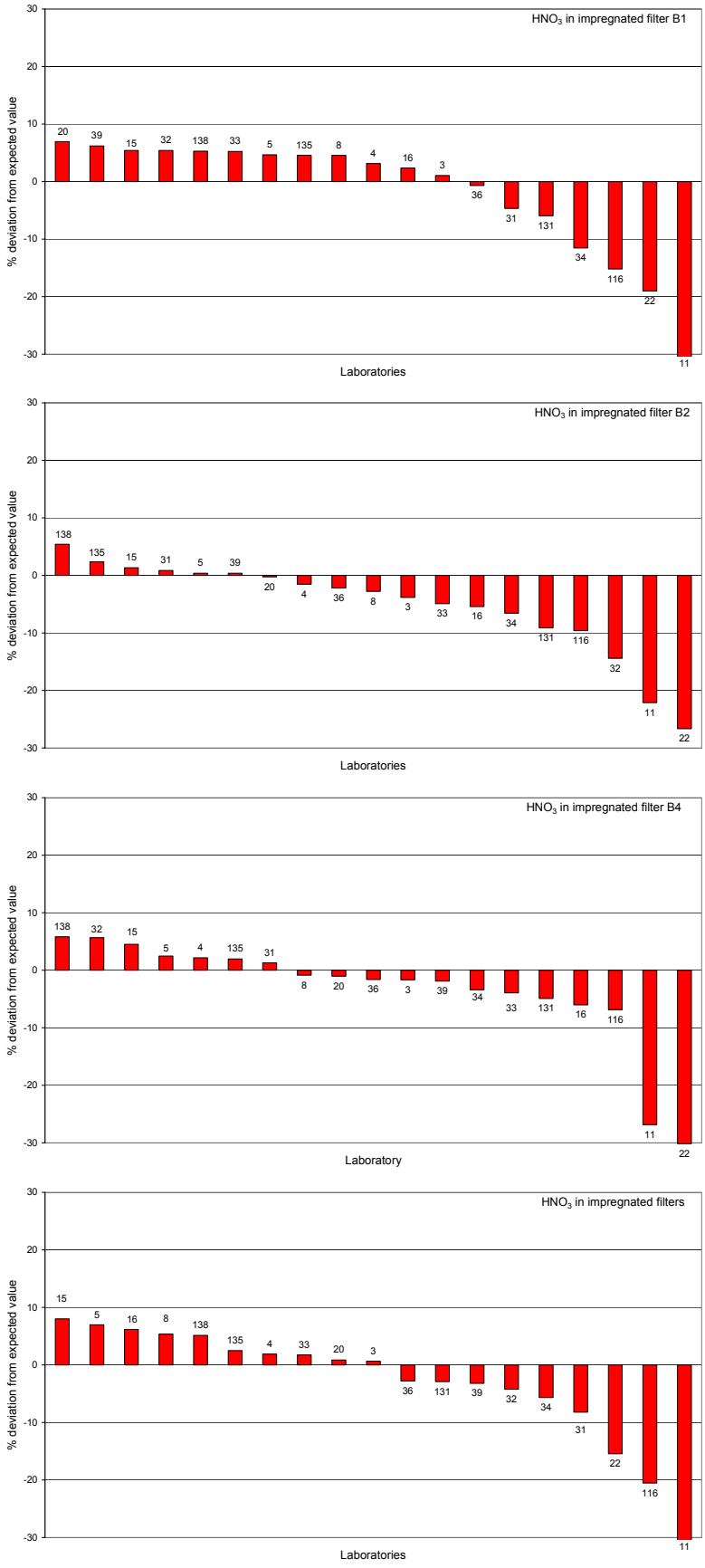

Figure 3: HNO_3 in impregnated filter.

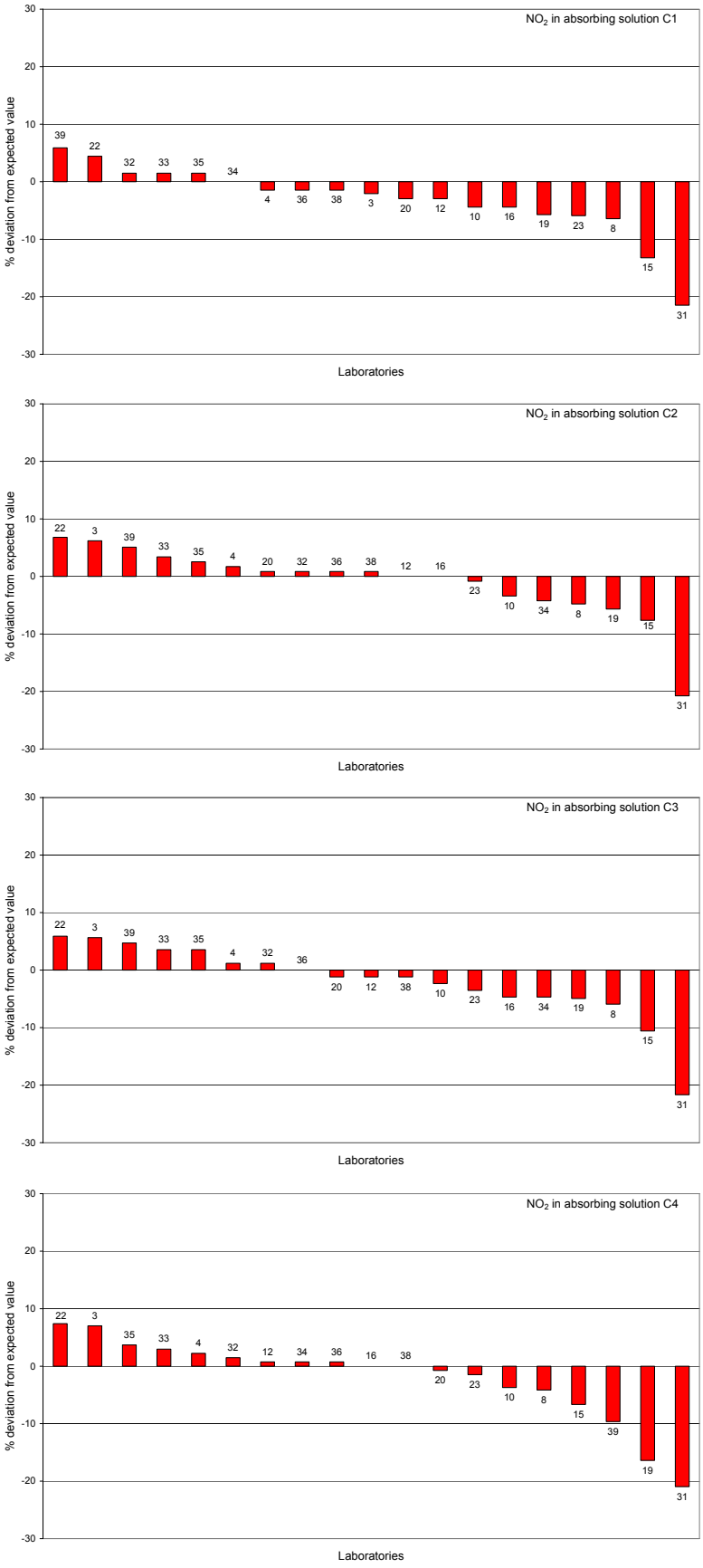

Figure 4: NO_2 in absorbing solution.

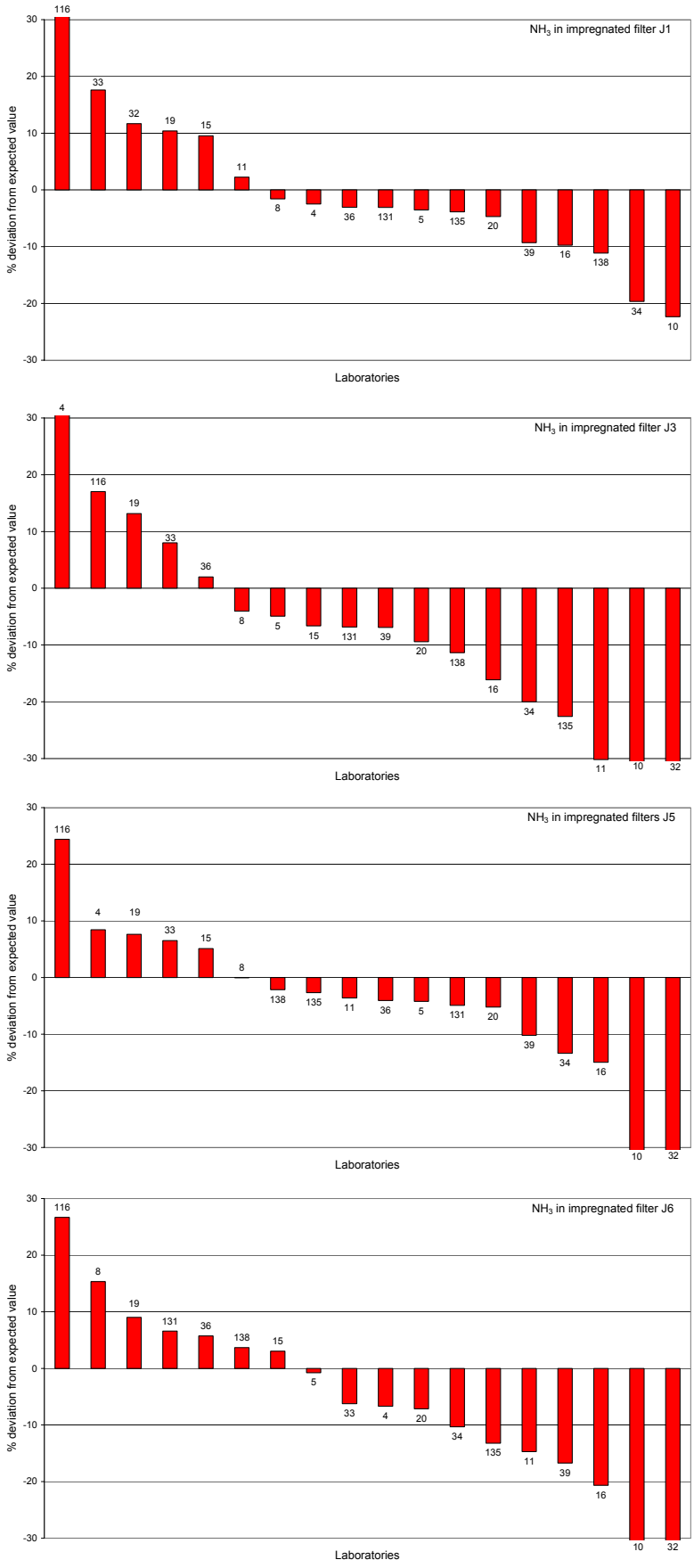

Figure 5: NH_3 in impregnated filter.

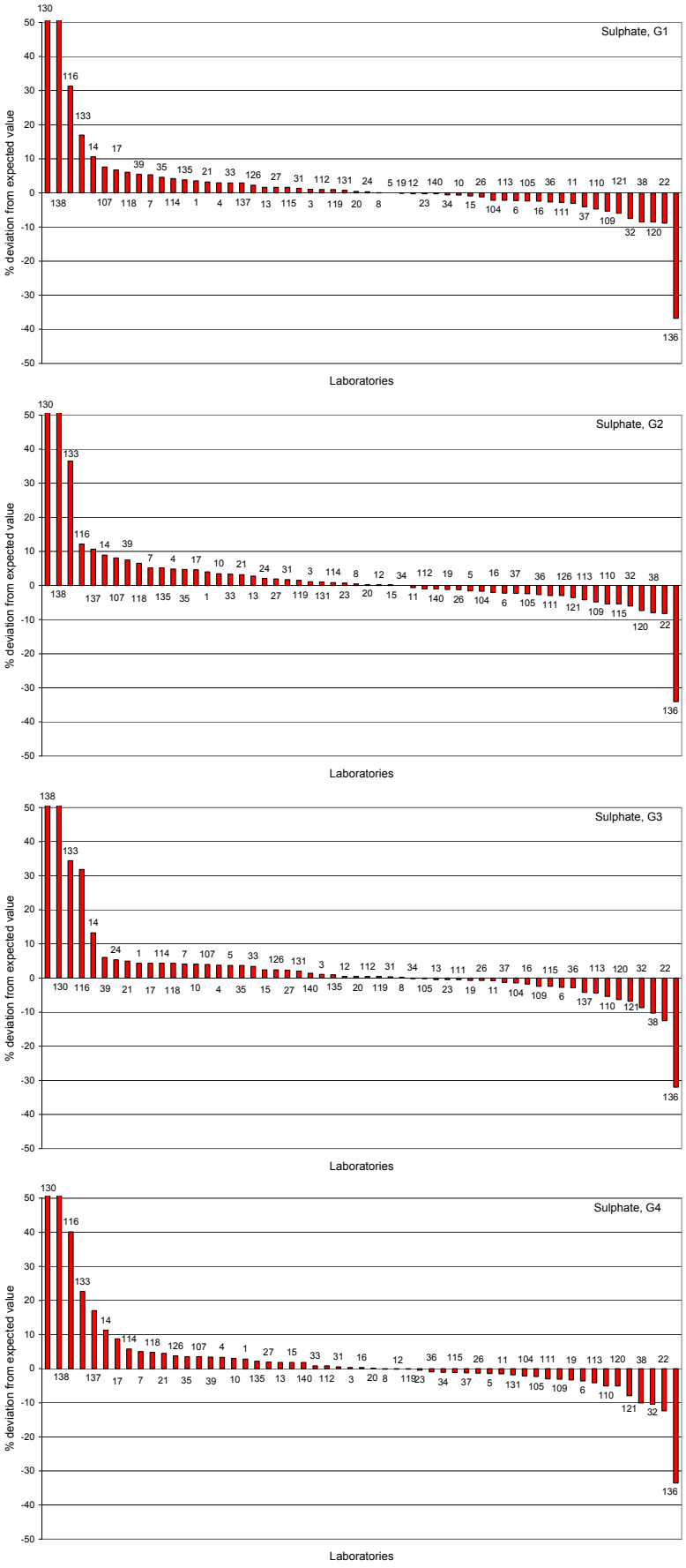

Figure 6: Percent deviation from theoretical value for sulphate.

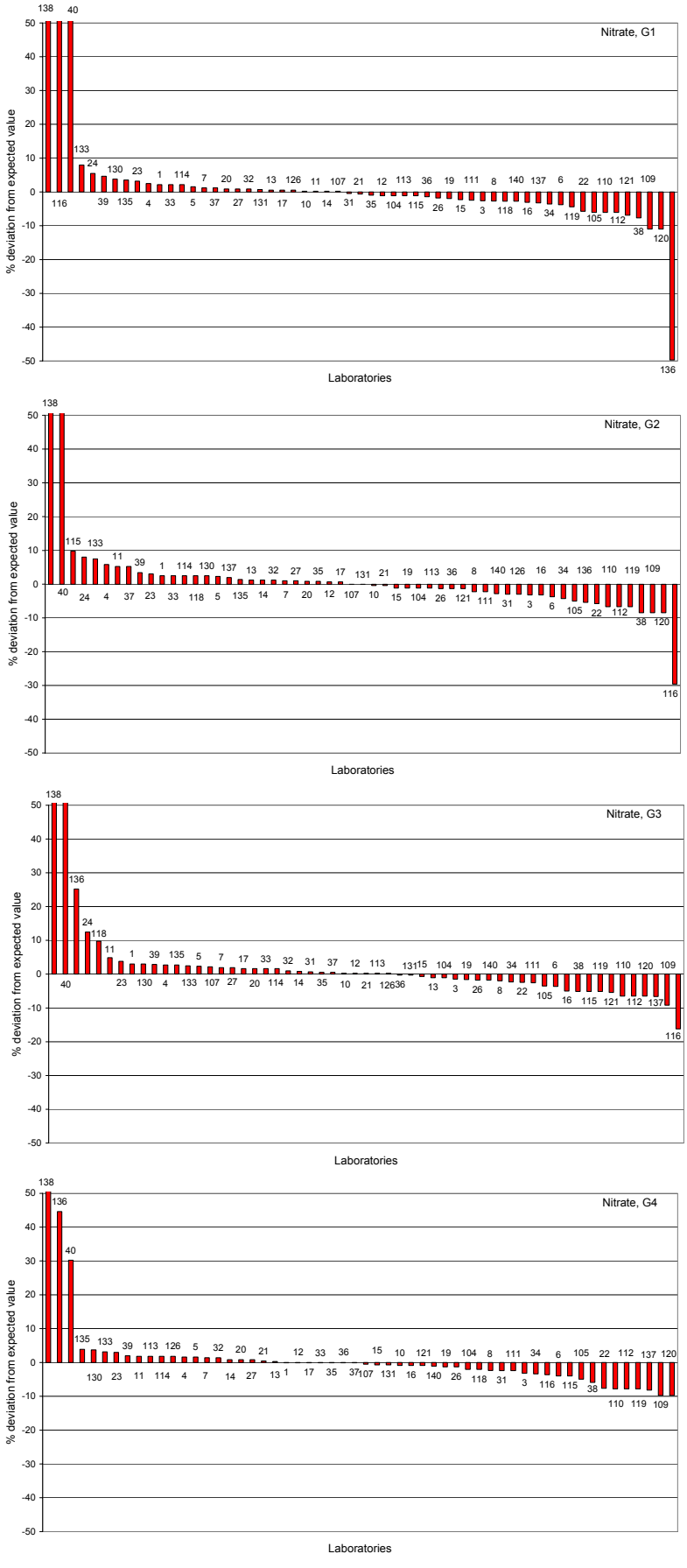

Figure 7: Percent deviation from theoretical value for nitrate.

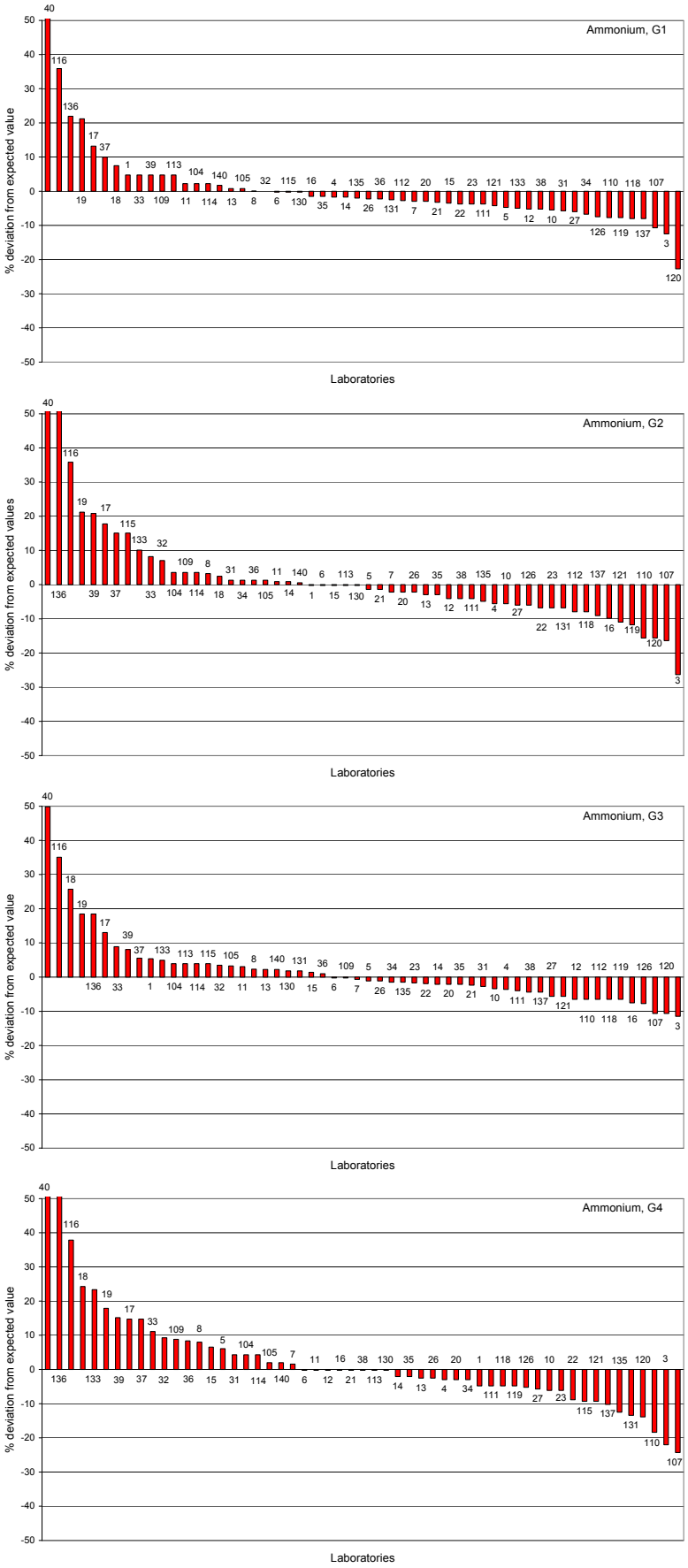

Figure 8: Percent deviation from theoretical value for ammonium.

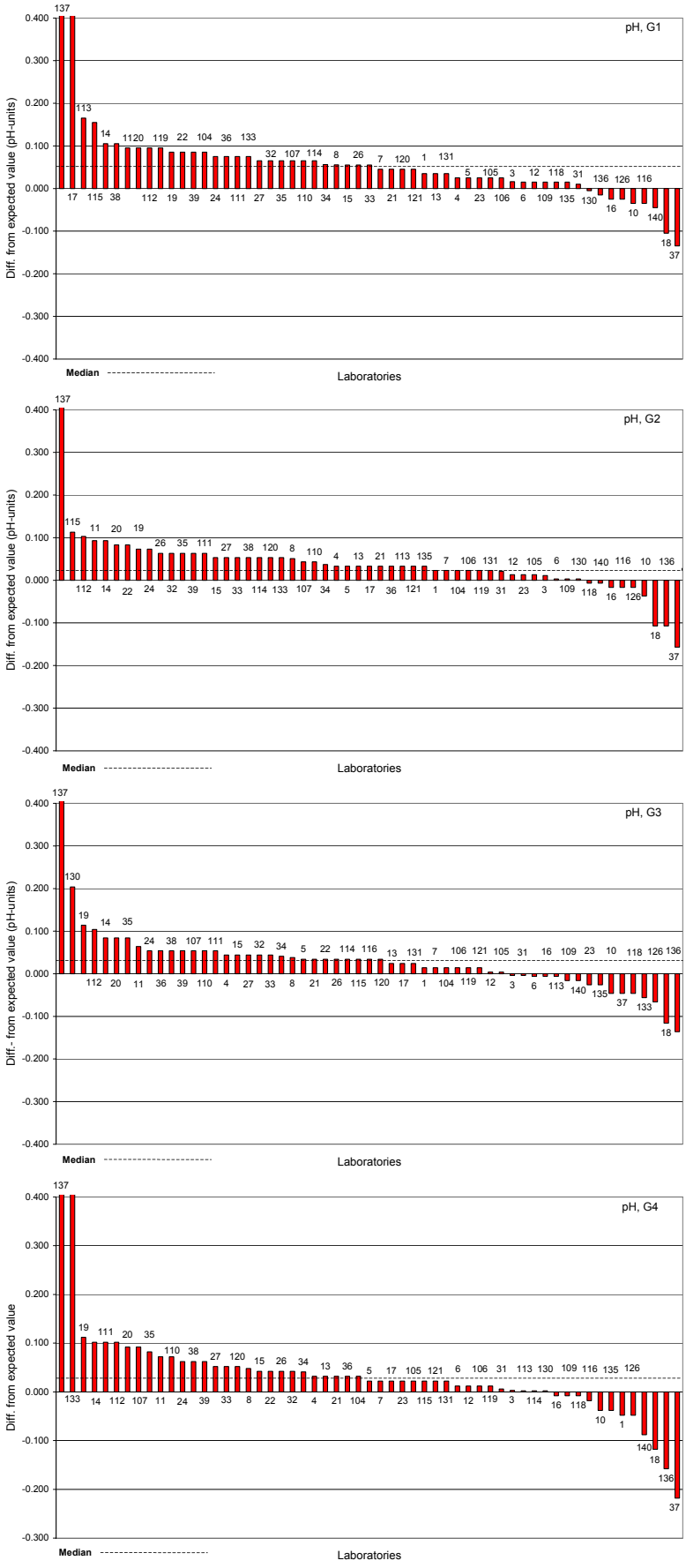

Figure 9: Percent deviation from theoretical value for pH.

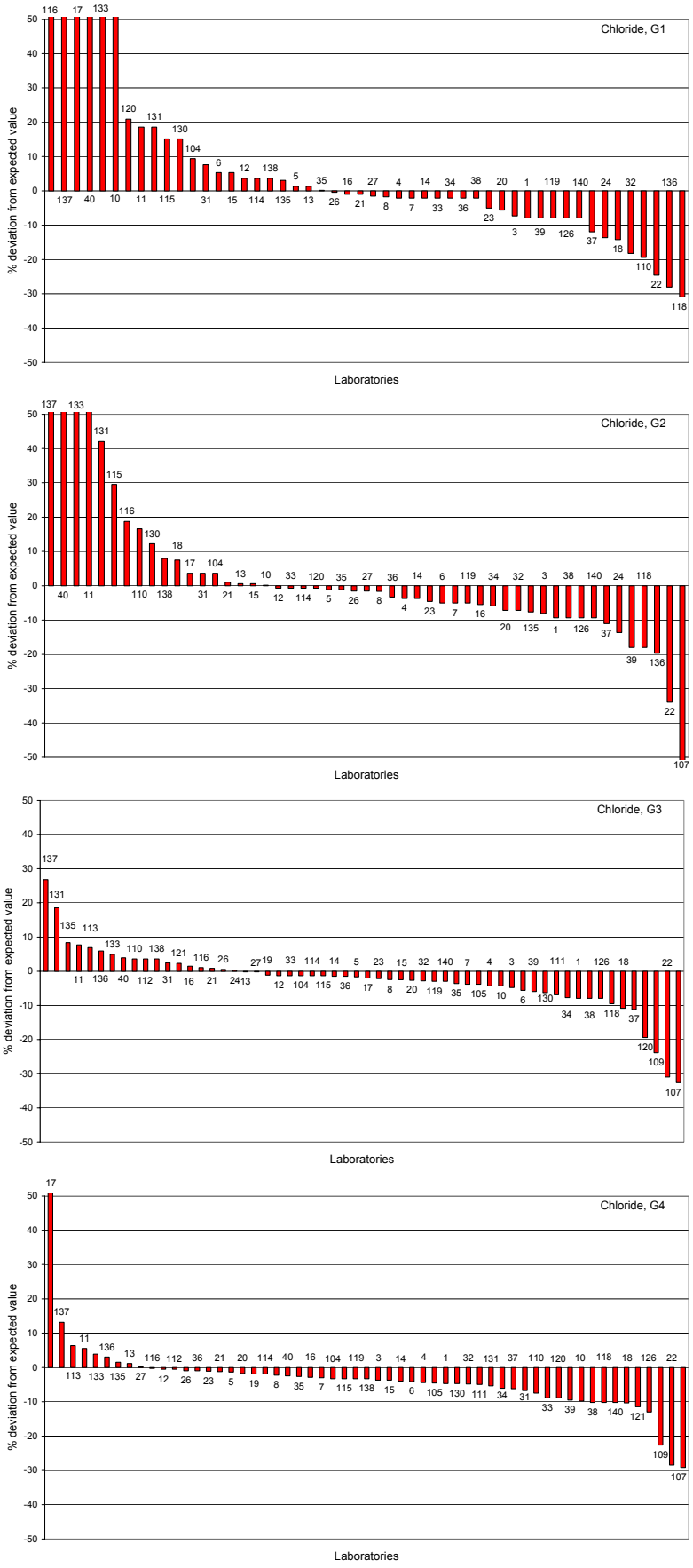

Figure 10: Percent deviation from theoretical value for chloride.

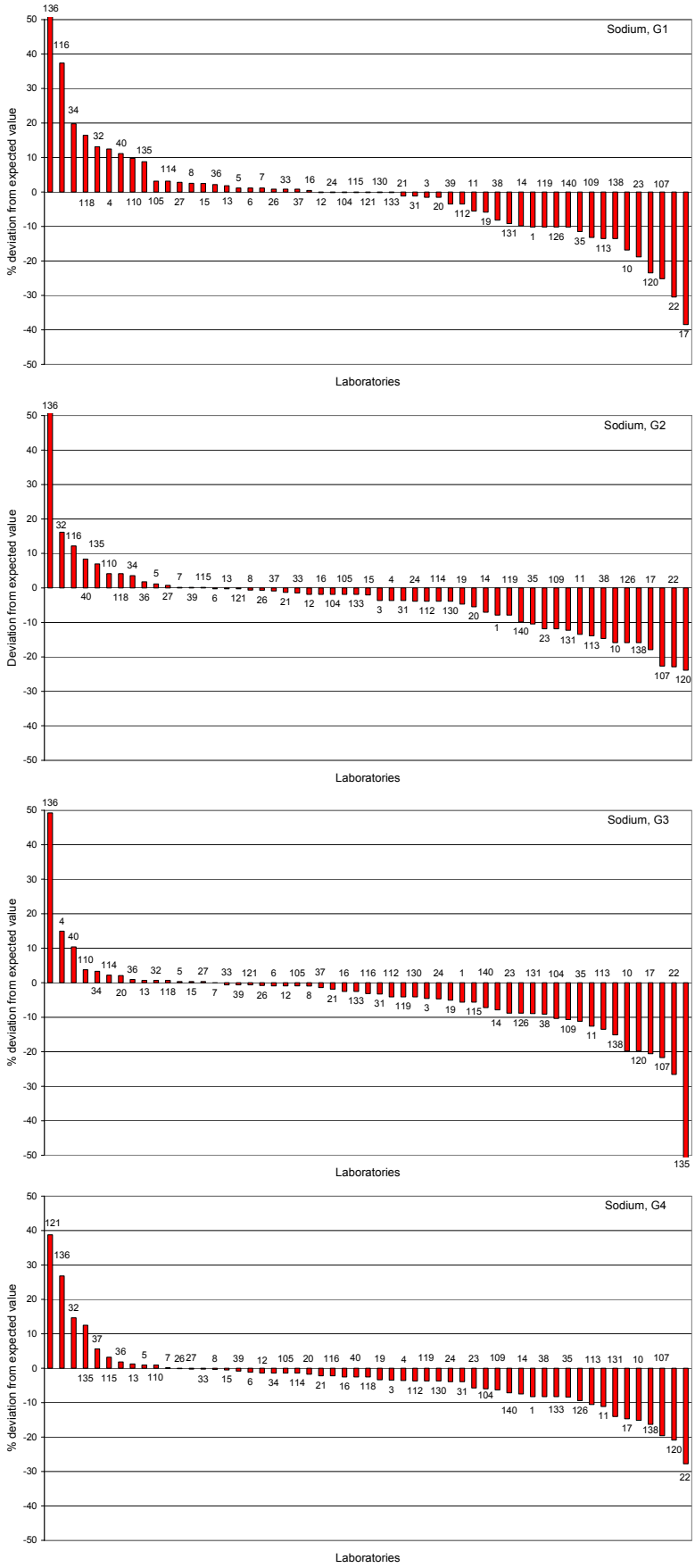

Figure 11: Percent deviation from theoretical value for sodium.

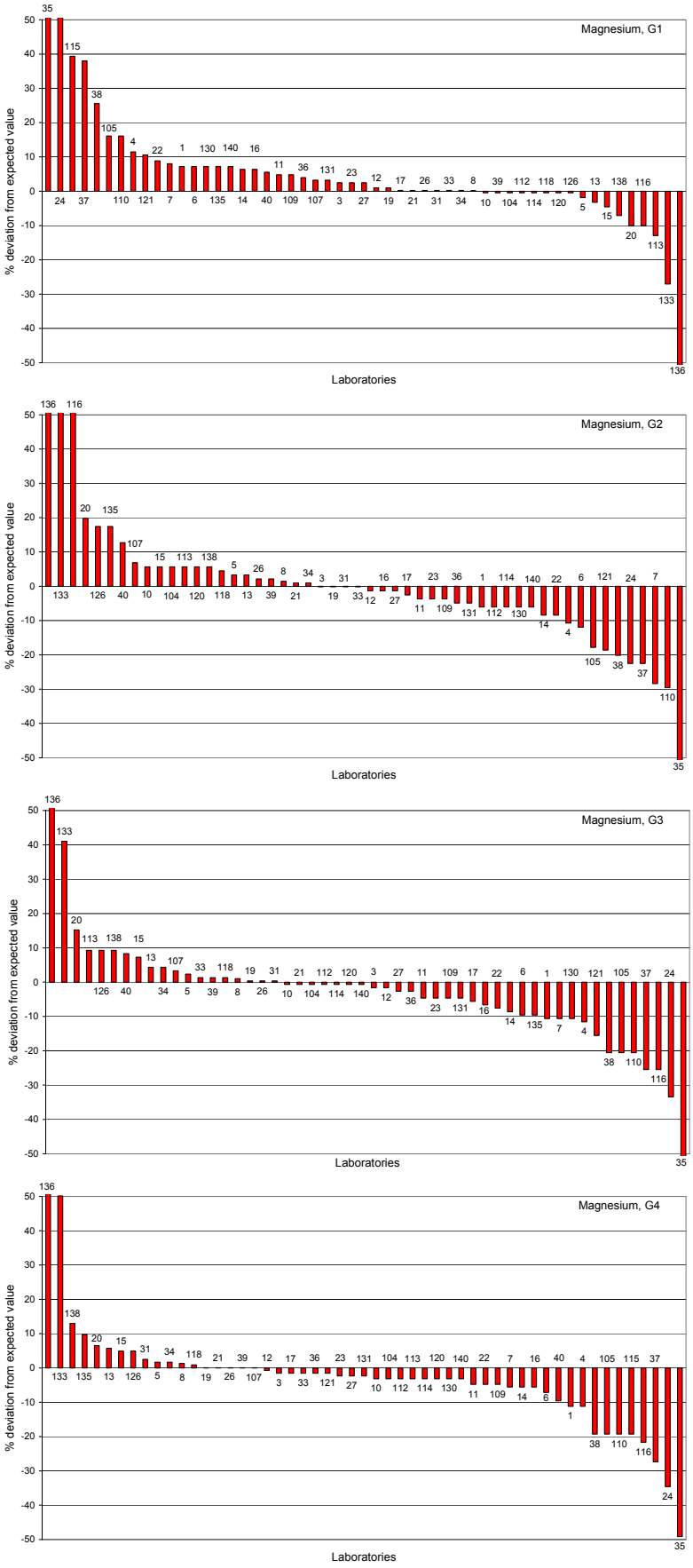

Figure 12: Percent deviation from theoretical value for magnesium.

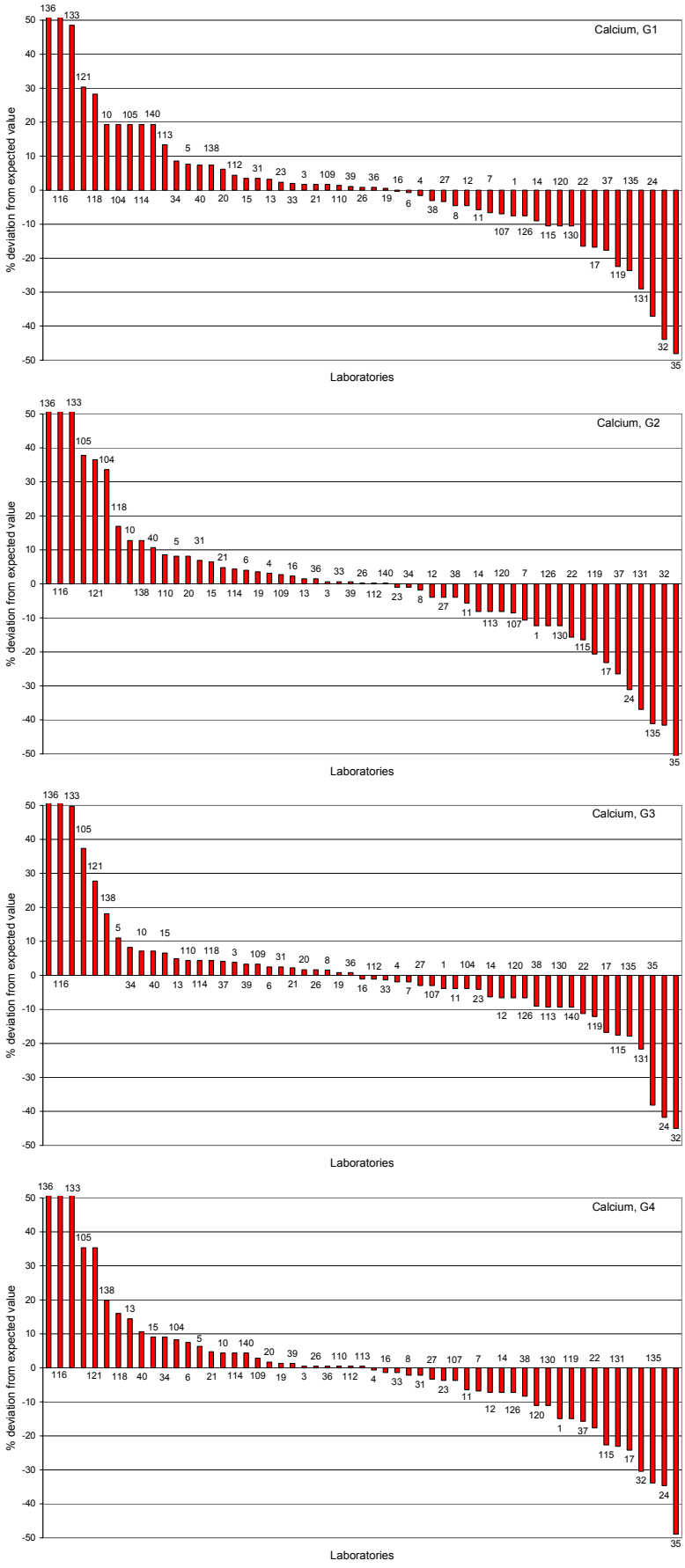

Figure 13: Percent deviation from theoretical value for calcium.

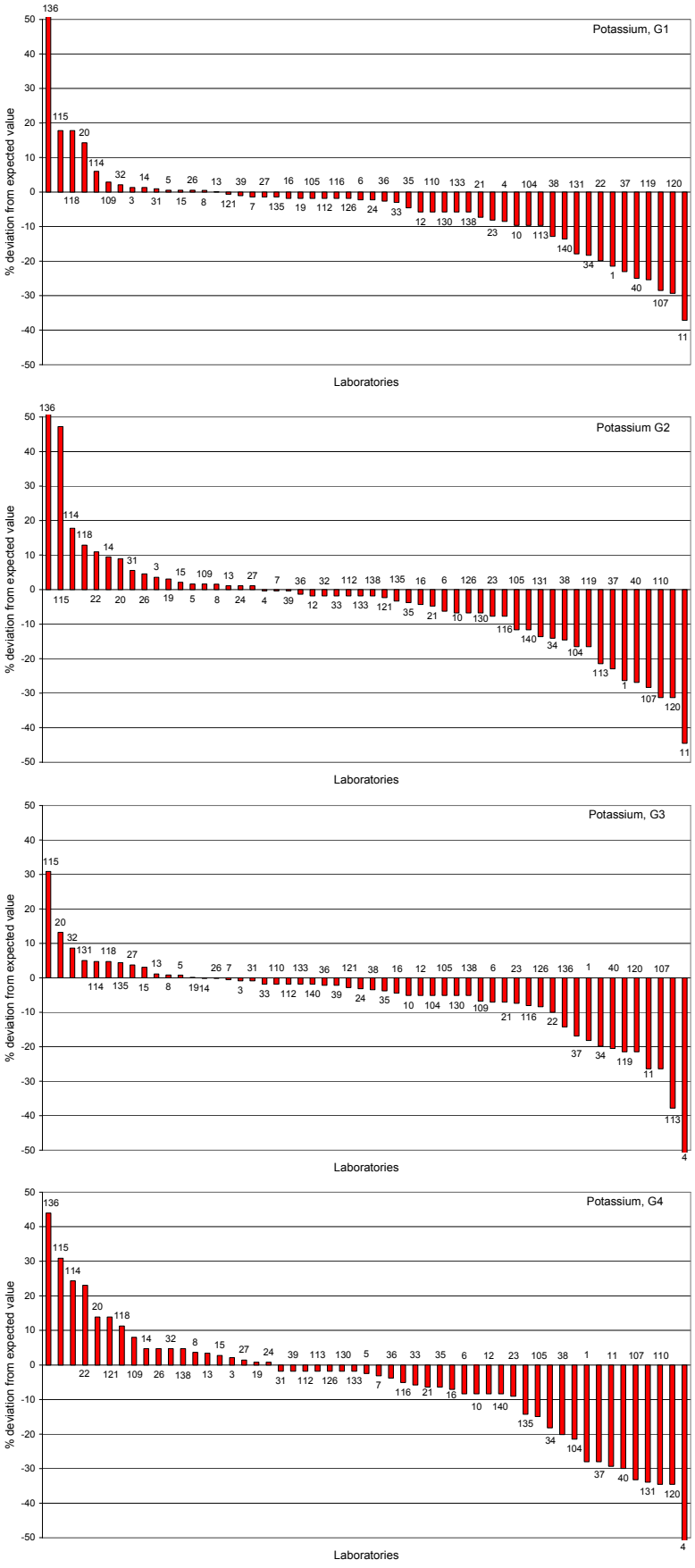

Figure 14: Percent deviation from theoretical value for potassium.

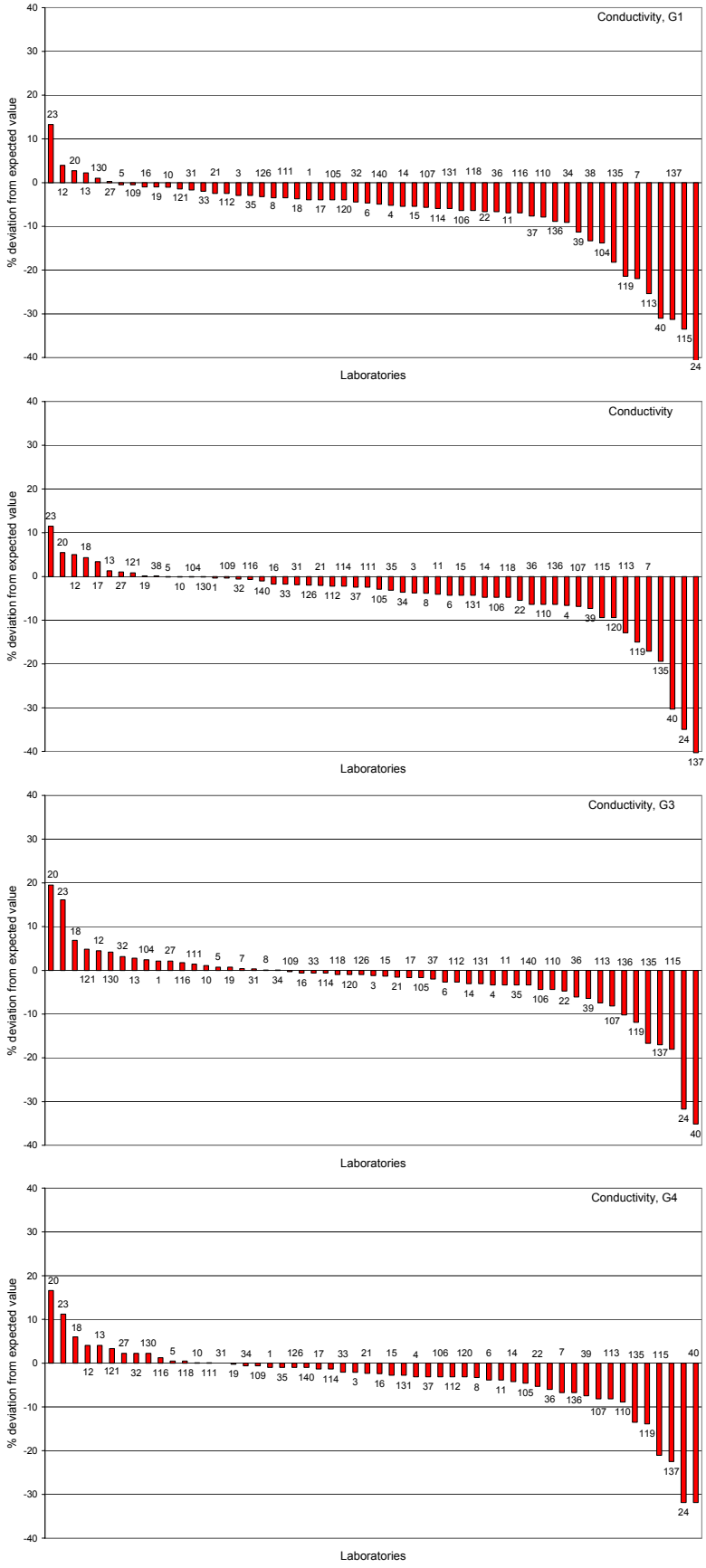

Figure 15: Percent deviation from theoretical value for conductivity.

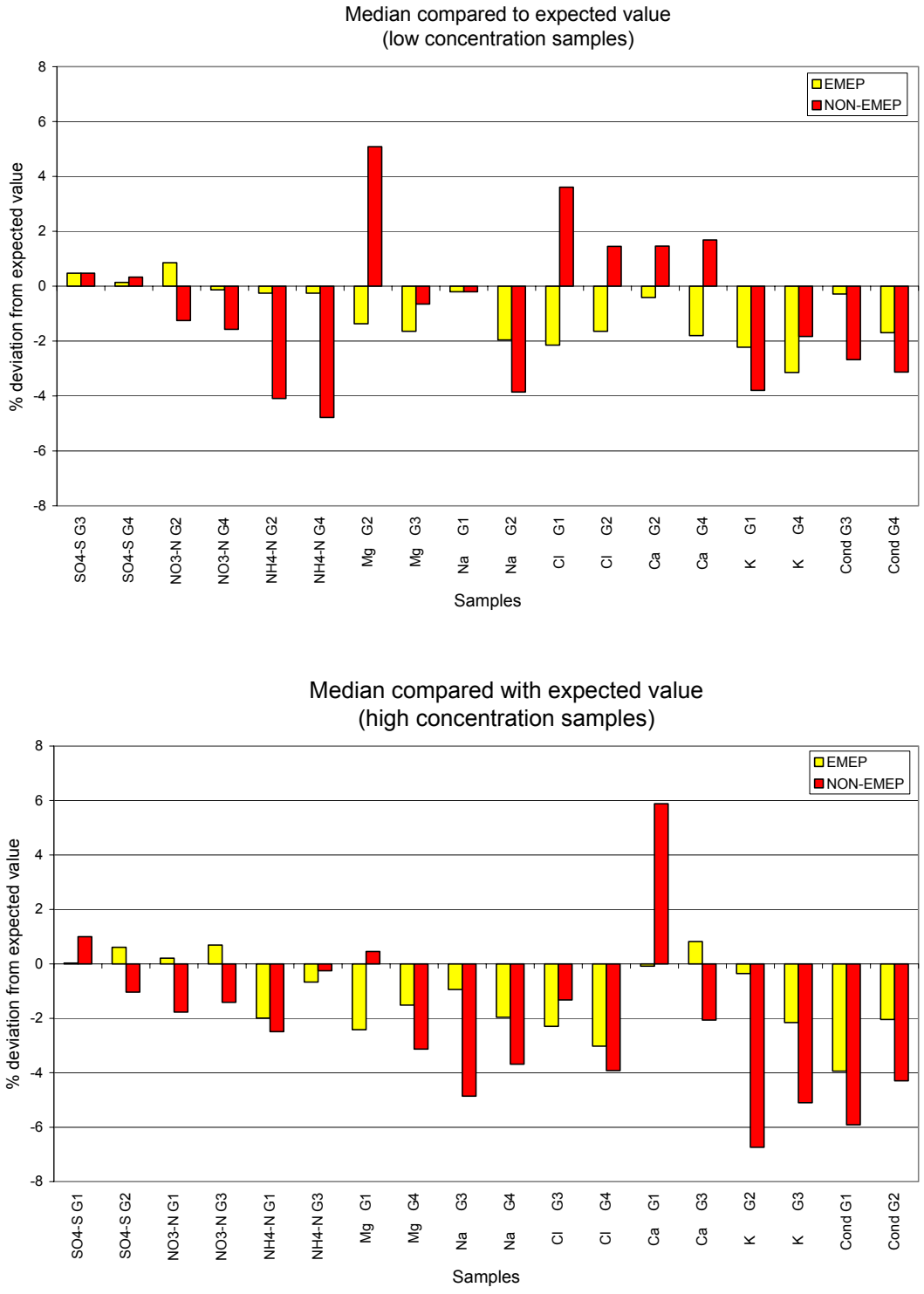

Figure 16: The median compared to theoretical value.