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

The seventeenth intercomparison of analytical methods within EMEP

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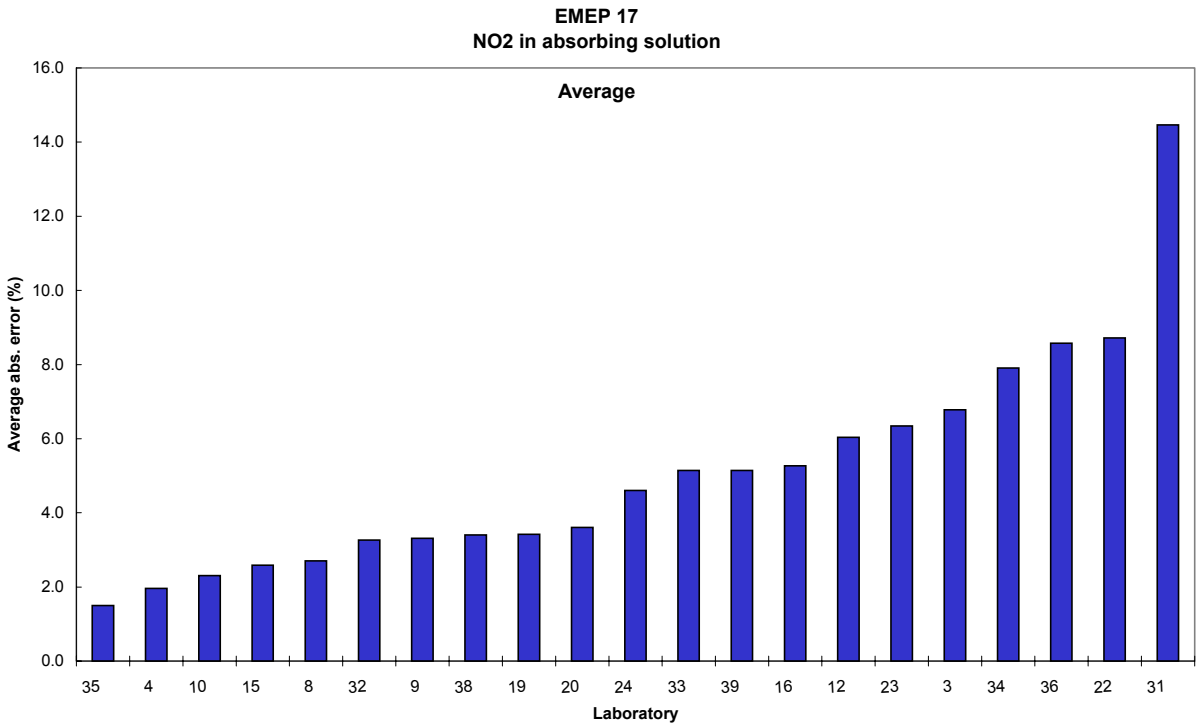

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The seventeenth intercomparison of analytical methods within EMEP

1. Introduction

29 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 1977, EMEP 1996, http://www.nilu.no/projects/ccc/manual/index.html).

In order to improve the data comparability and to get a picture of the different laboratories' performance, interlaboratory comparisons are organized by the Chemical Co-ordinating Centre (CCC) at the Norwegian Institute for Air Research (NILU). So far sixteen 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; Thrane, 1978, 1980a, 1980b, 1981).

This report gives the results of the seventeenth interlaboratory test.

2. Organization of the intercomparison

The samples for the seventeenth intercomparison (see Table 1) were prepared and distributed to 36 laboratories in July 1999. 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. One European laboratory not yet reporting to the CCC also received samples.

All of the laboratories had returned their results to the CCC within 15 days after the deadline given as 1 September 1999. 35 laboratories have returned results.

A preliminary evaluation of the data was given in the EMEP Workshop in Dubrovnik, Croatia in October 1999. The participating laboratories received the theoretical (expected) values 20 November 1999 by e-mail. 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. Particularly the instruction for a new way of reporting the results for NO_2 in absorbing solution had been overlooked by many participants.

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. Table 2 gives

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, 4, 5, 6 and 7.

3. Treatment of the data

The data reported from the participants are presented in Tables 8, 10, 12, 14, 15, and 17-28 and in Figures 1-17.

The method of data analysis is 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 (see Table 2). The expected (theoretical) value, the number of reported values, 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.

Due to changes in NILU's data systems, Youden-plots are not used for the graphical presentations of the data in this report. Instead, the results are plotted to show the deviation in per cent from the expected value or the median value. These plots show the errors in ranked order.

4. Results

4.1 Sulphur dioxide

Six samples and one blank absorbing solution were distributed to the laboratories using the hydrogen peroxide absorption solution method. The reported results for the synthetic samples for sulphur dioxide in hydrogen peroxide absorbing solutions are given in Table 8. The reported value for the blank has been subtracted from all the other reported values. The ratios of the theoretical to the reported values are listed in Table 9. The relative errors based on the expected values are shown in Figure 1.

Only 6 laboratories now use a hydrogen peroxide absorption solution for their SO_2-measurements, but one additional laboratory (No. 15) analysed these samples.

Table 8 shows that the relative standard deviations are quite high, between 54.1 and 7.1% for the six samples when outliers are removed. This is higher than in the previous intercomparisons. The sulphate concentrations in the solutions for these samples correspond to a SO_2-concentration in air of 1.9-8.6 µg S/m^3, when 70 ml absorbing solution and 3.6 m^3 sample volume are used. The lowest concentrations are lower than in the previous comparisons, and the high relative errors shown in Figure 2 is an indication that the absorbing solution method may give variable results in this concentration range, which is quite common in European rural areas.

Laboratory No. 19 reported values that were more than two standard deviations from the mean value for two of the samples.

The average of the ratios of the expected values to values found by the laboratories presented in Table 9 vary from 0.86 to 1.56. In this case the very high ratio for Sample No. 1 for Laboratory No. 19 has been omitted.

Laboratory No. 19 reported a very high value for the blank (0.196 μg S/ml). This may have been a misprint, but no answer was given from the laboratory when they were asked to check these results.

Figure 1 shows that the relative errors often are higher than 30% for some of the laboratories. For the lowest concentration (A1) 4 of 7 laboratories reported values more than 30% from the expected value.

Impregnated filter samples for sulphur dioxide were analysed by sixteen laboratories. Nine samples were distributed including one blank (B2) that was **not** identified as "Blank". The value reported for this sample was subtracted from the other values before using the data.

The results are shown in Table 10 and in Figure 2. The ratios of the theoretical to the reported values are listed in Table 11.

Table 10 shows that the relative standard deviations are between 4.5 and 15.6% when the outliers are excluded. This result is a little worse than in the preceding comparison, but much better than for sulphur dioxide in absorbing solutions. The amount of sulphur in these samples corresponds to air concentrations between 0.32 and 2.4 μg S/m^3 if 25 m^3 of air is sampled.

Laboratories Nos. 20 and 38 reported both two values more than two standard deviations from the mean values. Laboratories Nos. 3 and 33 reported one such value.

Figure 2 shows that most of the reported values are less than 20% from the expected values. Only 11 values out of 128 have an error higher than 20%. The plots show that low values occur more often than high values, indicating insufficient extraction from the filter or a negative matrix effect on the analytical method from the impregnation solution.

The average ratios presented in Table 11 are in the range 0.93 to 1.20. Thirteen laboratories out of sixteen had an average ratio between 0.90 and 1.10. This is a quite satisfactory result.

Since as many as eight samples for sulphur dioxide in impregnated filters were used, x-y plots with reported values plotted against expected values could be used to visualize the results. In Figure 17 such plots are shown for each of the laboratories. In the plots the linear regression line (fully drawn) and the 1:1-line (dotted) are also shown. In addition the equation for the regression line and the corresponding R^2-values are given in the plots.

Most of the plots show good agreement with the expected values, but Laboratories Nos. 20, 33, 38 and 39 obviously have a systematic error since the correlation is quite good but the slope is different from one or the regression line is crossing below the origin. The reason may be wrong calibration solutions or a matrix effect as mentioned above.

4.2 Nitrogen dioxide

The samples corresponding to nitrogen dioxide in absorbing solutions or extracts from iodide-impregnated filters contained known amounts of sodium nitrite diluted in water. In order to have more stable samples and to give the laboratories the opportunity to use their own sample solution matrix, the distributed solutions were to be diluted 1:10. The results should be reported as the diluted concentrations. Twenty-one laboratories reported results.

The results are shown in Table 12 and in Figure 3. The ratios of the theoretical values to the reported values are listed in Table 13.

The relative standard deviations were between 5.0 and 6.4% when outliers were omitted. This was a little better than in the last intercomparison. Laboratory No. 31 reported results more than two standard deviations from the mean values for three of the samples, while Laboratory No. 12 reported one such result.

The average ratios presented in Table 13 are in the range 0.92 to 1.17. Twenty of the twenty-one laboratories have average ratios between 0.90 and 1.10. This is a quite satisfactory result.

The 10 times diluted samples that were analysed correspond to air concentrations from 4.2 to 8.1 µg NO_2-N/m^3 when 70 ml absorbing solution and 1.4 m^3 of air is sampled. This is a little higher than the annual mean concentrations in remote areas of Central Europe, but much higher than the mean values in the northern part of Europe. When the iodide impregnated filter method is used, the given concentrations in the solutions correspond to 0.48 to 0.93 µg NO_2-N/m^3 when 4 ml extraction solution is used and 0.7 m^3 of air is sampled.

4.3 Sulphate on filters

The samples consisted of Whatman 40 filters to which different amounts of a diluted sodium sulphate solution had been added. The amount of sulphur on the filters distributed were divided into two groups called "low" and "high" since some laboratories use low-volume sampling (1-3.5 m^3) and some use medium volume (10-50 m^3).

The results of the analyses are shown in Tables 14 and 15 and in Figures 4 and 5.

Seven of twenty-five sets of filter samples were in the low concentration range. None of the reported values in this range were outliers.

The relative standard deviations were between 1.8 and 6.4%. This is better than in the last intercomparison even though the corresponding air concentrations were a little lower this time. The range was 0.7 to 3.0 µg S/m^3 if 3 m^3 of air is sampled.

Figure 4 show that nearly all reported values are less than 5% from the expected value.

Eighteen sets of filters were distributed in the high concentration range. In this range the relative standard deviations were between 4.9 and 6,7% when one outlier was excluded for three of the samples and two outliers for one of the samples. This is a about the same as in the last intercomparison. The air concentrations corresponding to the amount of sulphur added to the filters are 0.5 to 2 µg S/m^3 when 25 m^3 of air is sampled. Laboratory No. 30 reported too low values for two of the samples and too high value for one of the samples. Laboratories Nos. 33 and 38 reported one too low value each.

Figure 5 shows that most of the reported values are less than 10% from the expected values.

Table 16 shows the ratios of the theoretical to the reported values and the average ratios for the samples. The average ratios vary between 0.97 and 1.06 in the low concentration range and between 0.96 and 1.32 in the high range. Fifteen out of eighteen laboratories had average ratios between 0.9 and 1.10 in the high range. In the low range all of the seven laboratories had an average ratio within this interval.

4.4 Precipitation

Most of the laboratories now perform the full precipitation programme in EMEP. Four precipitation samples were distributed and 1336 single results from 34 laboratories were reported.

4.4.1 Sulphate

The results from the determination of sulphate are given in Table 17 and in Figure 6. Laboratories Nos. 9, 33 and 35 reported two outlying results each, while Laboratories Nos. 18 and 19 each reported one “outlier”. The relative standard deviations after excluding the "outliers" were 3.4-6.2%, which is about the same as in the last intercomparison.

Figure 6 shows that only a few laboratories report values more than 20% from the expected ones. It shows that only a few laboratories now have problems with the important parameter sulphate. The laboratories Nos. 18, and 35 still use other methods than ion chromatography, and this seems to be the reason for deviating results. However, Laboratories Nos. 9, 19 and 33 are using ion chromatography, and still seems to have problems with the precision.

4.4.2 Nitrate

Table 18 and Figure 7 present the results of the nitrate determinations. The standard deviations after excluding the outliers are in the range 3.4-4.6%, which are very low, and lower than in the last intercomparisons. Laboratory No. 40 reported outlying low values for all four samples. Laboratories Nos. 33 and 35 reported one outlying result each.

Figure 7 shows that only a few laboratories have reported values more than 10% from the expected ones. In fact, more than 80% of the reported values are less than 5% from the expected value.

4.4.3 Ammonium

Table 19 and Figure 8 give the results of the ammonium analysis. Laboratories Nos. 3 and 24 both reported two results more than two standard deviations from the expected values. Laboratories Nos. 19, 11 and 31 reported each one outlying result. Relative standard deviations were in the range 3.9-6.3% when outliers were excluded. This is a better than in the last intercomparison.

Figure 8 shows that most laboratories report data less than 10% from the expected values.

4.4.4 pH and strong acid

Tables 20-22 and Figures 9-10 show the results of the pH measurements and the determination of strong acids. Thirty-four laboratories reported pH-values, while only two of these reported titrated concentrations of strong acid.

In Table 21 the pH-data in Table 20 have been recalculated to H^+ concentrations to give realistic standard deviation values.

Laboratory No. 34 reported outlying low pH values for all four samples. Laboratories No. 13 reported low values for three of the samples.

This is the fifth succeeding intercomparison that Laboratory No. 13 reports too low pH-values and shows that the intercomparisons have not been used to improve the results. One reason could be a long storage time in room temperature with evaporation before analysis, but this is not the recommended way to store precipitation samples.

The relative standard deviation for the calculated H^+ concentration, varied between 6.8 and 11.6% when outliers were excluded. This is higher than for the other parameters but a little better than in the last intercomparison.

In Figure 9 and 10 the deviation in pH-units and % from the **median** of the reported values are given instead of from the expected value. This is done since the median for this parameter deviates more from the expected values than for the other parameters.

Only two laboratories reported values for titrated acidity. None of the reported values where outliers.

4.4.5 Chloride

Table 23 and Figure 11 give the results of the chloride determinations. Laboratory No. 19 reported outlying high values for all four samples. Laboratory No. 24 also reported high values, and three of them more than two standard deviations from the mean value. Five other laboratories, Nos. 22, 23, 33, 37 and 39 reported one outlier each.

The relative standard deviations for the reported values when the outliers were removed were between 7.7 and 20.3%, which is higher than for most of the other parameters, but a little better than in the last intercomparison.

Figure 11 shows that relative many reported values more than 20% from the expected values.

4.4.6 Sodium

Table 24 and Figure 12 show the results of the sodium determinations. Laboratory No. 40 reported too low values for all four samples, while Laboratories Nos. 9, 17 and 38 reported outlying vales for one of the samples each.

The relative standard deviations were between 3.3 and 8.3% when the outliers were excluded, which is better than in the last intercomparison.

Only a few reported values were more than 10% from the expected values for the highest sample pair (Sample Nos. 2 and 3), but for the samples with the lowest concentration there were more laboratories with larger errors.

4.4.7 Magnesium

The results of the magnesium determinations are presented in Table 25 and Figure 13. Laboratory No. 40 reported too low values for all four samples while Laboratory No. 38 reported too high values for three of the samples and Laboratory No. 23 too high values for two of the samples.

The relative standard deviations after excluding the outliers were in the range 6-9.5%, which is approximately the same as in the preceding intercomparison.

Relative many values have an error larger than 10% as seen in Figure 13.

4.4.8 Calcium

Table 26 and Figure 14 show the results of the calcium determinations. Laboratories Nos. 23, 32 and 37 reported outlying values for two of the samples, while Laboratories Nos. 30, 35 and 40 reported outliers for one sample each.

The relative standard deviation after omitting the outliers was in the range 7.3-14.1%. This is better than in the last intercomparison.

Figure 14 show that many of the reported values are more than 20% from the expected ones. It should be noted that the Ca concentrations given in the samples are lower than the usual concentration in the precipitation samples in some countries.

4.4.9 Potassium

In Table 27 and Figure 15 the results of the potassium determinations are shown. Laboratory No. 18 reported all four values too high, while Laboratories Nos. 11 and 40 reported two outliers each.

The standard deviations after omitting the outlying results were between 10.1 and 21.5%, which is about the same as in the last intercomparison.

Many reported values are more than 20% from the expected values, as can be seen in Figure 15. The potassium concentrations in the samples are relatively low, but this is usually also the case for the real samples at EMEP sites.

4.4.10 Conductivity and ion balance

The results of the conductivity measurements are given in Table 28 and Figure 16 Laboratory No. 17 reported three of the values too high, while Laboratory No. 40 reported one high and one low value. Laboratories Nos. 20, 22 and 33 reported one low "outlier" each.

The relative standard deviations were in the range 3.9-9.2%, which is a little higher than in the last intercomparison.

Only a few laboratories reported values more than 20% from the expected values. The shape of the plots for Samples G2 and G4 in Figure 16 is a little unusual, with nearly all of the reported values lower than the expected ones. However, many of the reported values are only a few % from the expected values, and the median of the reported values is only 3% lower than the expected values. If the median of the reported pH-values had been used for calculation of the expected values for conductivity, the shape had been more normal.

Conductivity measurements are mainly used in EMEP for quality control reasons by comparing measured with calculated values when all main ions in the precipitation have been measured. In Table 29 the ratio of the measured to the calculated conductivities (from the reported results) are given. By inspecting these values, it is seen that at least Laboratories Nos. 17 and 18 should have looked closer into the reported results, since the ratios between measured and calculated conductivity is far from 1. Also Laboratory No. 38 has two of the ratios deviating much from 1, but as last time it seems that the conductivity measurement for these samples having a low conductivity is the reason. Laboratory No. 23, which in this intercomparison reported more outlying results than earlier, should have got a warning when looking into these ratios.

However, looking only at the ratio between measured and calculated conductivity values, erroneous results may be overlooked if the concentrations are low, and do not count much in the sum of ionic conductivities.

Some obvious mistakes could have been discovered if the laboratories had used the ion balance control. The ratios for anions/cations (equivalents) are seen in Table 30. Laboratories Nos. 9, 32, 33 and 35 have ratios deviating much from 1 for at least two of the samples.

5. Conclusions

In this seventeenth intercomparison of analytical methods within EMEP, 35 laboratories participated. Nearly all laboratories perform the complete programme for the precipitation samples. Totally 1690 single results from synthetic samples with known content were received.

As can be seen from Table 31, the median values of the reported data were generally not more than ±5% away from the theoretical expected value. However, the mean values for H^+ in precipitation calculated from the pH-measurements were between 10 and 14% lower than the expected ones. The reason for this is not obvious.

Like in earlier intercomparisons, "outliers", have been defined as results more than two standard deviations from the mean value. Outliers occur for almost all samples and parameters.

Of the 1690 reported results, 99 were in this way identified as outliers. This is 5.6% of the data, which is a little more than in earlier intercomparisons. When the reported data are normally distributed, the definition of an outlier will result in percentage outliers in this range.

It should be noted that only four laboratories caused about 40% of the outliers. Laboratories Nos. 40, 19, 33 and 38 had seven or more outlying results. These laboratories **must** strengthen the quality control of the laboratory analyses, but also more precise analytical methods have to be used to reach the desired quality. One of these laboratories also had many outliers in the last intercomparison. One laboratory (No. 40) with 17 outliers has not reported data to EMEP yet, but has unofficially participated in the laboratory intercomparisons in the last years.

Twelve of the laboratories had no outliers. That is less than last year. One laboratory had only one outlier.

The relative standard deviations found in this intercomparison are generally in the same range as in the last intercomparison. For some parameters there are less spread in the results than earlier, for some others more.

Some laboratories took part in the intercomparison, even before they have started regular reporting of data. This means that further improvements could be expected when they get more training and experience.

Some laboratories are using methods which today must be characterized as outdated and not suited for analysing the samples and concentrations experienced in EMEP. The main reason for using old methods is lack of funding for modern equipment in some countries.

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Appendix 1

Tables

Table 1: Samples distributed for the seventeenth interlaboratory test.

A.	6 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.	9 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.
E.	5 synthetic filter samples for determination of sulphate by wet chemical methods, comprising 1 Whatman 40 blank and 4 filters to which different amounts of Na_2SO_4 (aq) 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 2: Participating laboratories in the seventeenth laboratory intercomparison. The number in front of the names are used in tables and figures.

Canada	(26)	Atmospheric Environment Service, Toronto
Croatia	(35)	Meteorological and Hydrological Service, Zagreb
Czech Republic	(3)	Czech Hydrometeorological Institute, Praha
Denmark	(4)	National Environmental Research Institute. Air Pollution Laboratory
Estonia	(38)	Estonian Environmental Research Centre, Tallinn
European Commission	(30)	Joint Research Centre, Ispra, Environment Institute
Finland	(5)	Finnish Meteorological Institute. Air Quality Department
France	(6)	Laboratories Wolff Environnement, Evry
FYROM	(40)	Republic Hydrometeorological Institute of Macedonia, Skopje
Germany	(7)	IfE Leipzig GmbH, Umweltlabor
Germany	(8)	Umweltbundesamt, Messtelle Schauinsland
Greece	(9)	Ministry of Environment. Environmental Division, Athens
Hungary	(10)	Institute for Atmospheric Physics
Iceland	(11)	Idntæknistofnun Islands (Technological Inst. of Iceland)
Ireland	(12)	Meteorological Service, Dublin
Italy	(13)	Istituto Inquinamento Atmosferico of C.N.R
Latvia	(33)	Latvian Hydrometeorological Institute, Environmental Quality Testing Laboratory
Lithuania	(32)	Institute of Physics, Vilnius
Netherlands	(14)	National Institute of Public Health and Environmental Protection (RIVM)
Norway	(15)	Norwegian Institute for Air Research |(NILU)
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
Yugoslavia	(24)	Federal Hydrometeorological Institute, Belgrade

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

Method	Laboratory
1. Ion chromatography	6, 9, 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	3, 33
2. Ion chromatography	4, 5, 11, 15, 16, 20, 22, 26, 31, 32, 34, 36, 38
3. Capillary Ion Analysis	39

Table 5: Wet chemical methods used at the participating laboratories for the determination of sulphate on filters.

Method	Laboratory
1. Thorin method	33
2. Ion chromatography	4, 5, 6, 10, 11, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 26, 30, 31, 32, 34, 38
3. Capillary Ion Analysis	39

Table 6: Analytical method used for NO_2 in absorbing solution.

Method	Laboratory
1. ANSA/Sulphanilamide	9, 12, 24
2. NEDA/Sulphanilamide	3, 4, 10, 15, 16, 19, 20, 22, 23, 31, 32, 33, 34, 35, 36, 38, 39
3. NEDA/Sulphanilic acid	8

Table 7: Analytical methods used for the determination of chemical constituents in precipitation samples.

Constituents	Methods	Laboratory
SO_4	1 Thorin	18
	2 Ion chromatography	3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 26, 27, 30, 31, 32, 33, 34, 36, 37, 38
	3 Turbidimetry	24, 35
	4 Capillary Ion Analysis	39
NO_3	1 Griess after Cd-red.	24
	2 Ion chromatography	3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15,16, 17, 19, 20, 21, 22, 23, 26, 27, 30, 31, 32, 33, 34, 36, 37, 38
	3 UV-method	35
	4 Capillary Ion Analysis	39
	5 SQ-Merck ?	40
NH_4	1 Indophenol	3, 4, 10, 11, 17, 19, 24, 27, 32, 33, 34, 35, 38, 39
	2 Berthelot reaction, salycilate	14, 26
	3 Ion chromatography	5, 6, 7, 9, 13, 15, 21, 22, 23, 30, 31, 36
	4 Flow injection analysis (FIA)	8, 20, 37
	5 Chloramin T	16
	6 Nessler	18
	7 SQ-Merck ?	40
H^+	1 Acidimetric titration	14
	2 Alkali titration to spec. pH	6
Mg	1 Atomic absorption (AAS)	3, 4, 8, 10, 11, 16, 17, 18, 19, 20, 22, 24, 26, 27, 33, 34, 35, 36, 38, 39, 40
	2 Ion chromatography	5, 6, 7, 9, 12, 13, 15, 21, 23, 30, 31, 37
	3 ICP-AES	14
Na	1 AES	10, 19, 32, 33, 36, 38, 39
	2 AAS	3, 4, 8, 16, 17, 20, 24, 26, 27, 34, 35, 40
	3 ICP-AES	14
	4 Ion chromatography	5, 6, 7, 9, 13, 15, 21, 22, 23, 30, 31, 37
Cl	1 Mercury thiocyanate-iron	18, 24, 32, 35
	2 Ion chromatography	3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 26, 27, 30, 31, 33, 34, 36, 37, 38
	3 Capillary Ion Analysis	39
Ca	1 AAS	3, 4, 8, 11, 16, 17, 19, 20, 22, 24, 26, 27, 34, 35, 36, 38, 40
	2 ICP-AES	14
	3 Ion chromatography	5, 6, 7, 9, 13, 15, 21, 23, 30, 31, 37
	4 AES	10, 32, 33, 39
K	1 AAS	3, 4, 8, 11, 16, 17, 18, 19, 20, 24, 26, 27, 34, 35, 40
	2 Ion chromatography	5, 6, 7, 9, 13, 15, 21, 22, 23, 30, 31, 37
	3 AES	10, 32, 33, 36, 38, 39
	4 ICP-AES	14

Table 8: Analytical results of the synthetic samples of SO_2 in absorbing solution (A), listed in decreasing order. The theoretical value, arithmetic mean concentration, median, standard deviation, relative standard deviation, the number of laboratories, and the number of "outliers" are included.

SULPHUR DIOXIDE IN ABSORBING SOL. SAMPLE NO.: 1 THEORETICAL VALUE 0.100 UNIT: UG S/ML RUN 1: NUMBER OF LABORATORIES: 7 ARITHMETIC MEAN VALUE: 0.095 MEDIAN: 0.108 STANDARD DEVIATON: 0.052 REL. ST. DEVIATION (%): 54.058 RUN 2: NUMBER OF LABORATORIES: 7 ARITHMETIC MEAN VALUE: 0.095 MEDIAN: 0.108 STANDARD DEVIATON: 0.052 REL. ST. DEVIATION (%): 54.058 RESULTS IN DECREASING ORDER: 6 0.142 21 0.108 17 0.139 9 0.050 23 0.119 19 0.001 15 0.108 "UNUSED": DATA UNUSED IN RUN 2	SULPHUR DIOXIDE IN ABSORBING SOL. SAMPLE NO.: 2 THEORETICAL VALUE 0.321 UNIT: UG S/ML RUN 1: NUMBER OF LABORATORIES: 7 ARITHMETIC MEAN VALUE: 0.307 MEDIAN: 0.323 STANDARD DEVIATON: 0.052 REL. ST. DEVIATION (%): 16.855 RUN 2: NUMBER OF LABORATORIES: 6 ARITHMETIC MEAN VALUE: 0.324 MEDIAN: 0.326 STANDARD DEVIATON: 0.025 REL. ST. DEVIATION (%): 7.828 RESULTS IN DECREASING ORDER: 17 0.352 15 0.313 23 0.347 6 0.282 21 0.329 19 0.202 UNUSED 9 0.323 "UNUSED": DATA UNUSED IN RUN 2
SULPHUR DIOXIDE IN ABSORBING SOL. SAMPLE NO.: 3 THEORETICAL VALUE 0.401 UNIT: UG S/ML RUN 1: NUMBER OF LABORATORIES: 7 ARITHMETIC MEAN VALUE: 0.395 MEDIAN: 0.416 STANDARD DEVIATON: 0.063 REL. ST. DEVIATION (%): 16.053 RUN 2: NUMBER OF LABORATORIES: 6 ARITHMETIC MEAN VALUE: 0.417 MEDIAN: 0.426 STANDARD DEVIATON: 0.030 REL. ST. DEVIATION (%): 7.149 RESULTS IN DECREASING ORDER: 9 0.440 21 0.405 23 0.439 6 0.363 17 0.436 19 0.265 UNUSED 15 0.416 "UNUSED": DATA UNUSED IN RUN 2	SULPHUR DIOXIDE IN ABSORBING SOL. SAMPLE NO.: 4 THEORETICAL VALUE 0.140 UNIT: UG S/ML RUN 1: NUMBER OF LABORATORIES: 7 ARITHMETIC MEAN VALUE: 0.143 MEDIAN: 0.146 STANDARD DEVIATON: 0.036 REL. ST. DEVIATION (%): 24.903 RUN 2: NUMBER OF LABORATORIES: 7 ARITHMETIC MEAN VALUE: 0.143 MEDIAN: 0.146 STANDARD DEVIATON: 0.036 REL. ST. DEVIATION (%): 24.903 RESULTS IN DECREASING ORDER: 17 0.178 15 0.142 9 0.177 6 0.106 23 0.164 19 0.085 21 0.146 "UNUSED": DATA UNUSED IN RUN 2
SULPHUR DIOXIDE IN ABSORBING SOL. SAMPLE NO.: 6 THEORETICAL VALUE 0.441 UNIT: UG S/ML RUN 1: NUMBER OF LABORATORIES: 7 ARITHMETIC MEAN VALUE: 0.444 MEDIAN: 0.448 STANDARD DEVIATON: 0.084 REL. ST. DEVIATION (%): 19.008 RUN 2: NUMBER OF LABORATORIES: 7 ARITHMETIC MEAN VALUE: 0.444 MEDIAN: 0.448 STANDARD DEVIATON: 0.084 REL. ST. DEVIATION (%): 19.008 RESULTS IN DECREASING ORDER: 9 0.577 21 0.442 23 0.483 6 0.400 17 0.459 19 0.298 15 0.448 "UNUSED": DATA UNUSED IN RUN 2	SULPHUR DIOXIDE IN ABSORBING SOL. SAMPLE NO.: 7 THEORETICAL VALUE 0.301 UNIT: UG S/ML RUN 1: NUMBER OF LABORATORIES: 7 ARITHMETIC MEAN VALUE: 0.306 MEDIAN: 0.303 STANDARD DEVIATON: 0.064 REL. ST. DEVIATION (%): 21.007 RUN 2: NUMBER OF LABORATORIES: 7 ARITHMETIC MEAN VALUE: 0.306 MEDIAN: 0.303 STANDARD DEVIATON: 0.064 REL. ST. DEVIATION (%): 21.007 RESULTS IN DECREASING ORDER: 9 0.422 15 0.288 23 0.333 6 0.281 21 0.305 19 0.208 17 0.303 "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 (samples A1-A6).

Lab. No.	Theoretical value / Measured value						Average ratio
	Sample No.						
	A1	A2	A3	A4	A6	A7	
6	0.71	1.14	1.10	1.32	1.10	1.07	1.07
9	2.00	0.99	0.91	0.79	0.76	0.71	1.09
15	0.93	1.02	0.96	0.99	0.98	1.04	0.98
17	0.72	0.91	0.92	0.79	0.96	0.99	0.86
19	(100.2)	1.59	1.51	1.65	1.48	1.45	1.56
21	0.93	0.97	0.99	0.96	1.00	0.99	0.97
23	0.84	0.92	0.91	0.86	0.91	0.90	0.89

Table 10: Analytical results of the synthetic samples of SO_2 on KOH-impregnated filter (B1-4 and B6-9). The results are corrected for the reported value for sample B5 (Blank). For explanation, see Table 8.

SULPHUR DIOXIDE ON IMPREGNATED FILTER
SAMPLE NO.: 1
THEORETICAL VALUE 60.100
UNIT: UG S/FIL

RUN 1:
NUMBER OF LABORATORIES: 16
ARITHMETIC MEAN VALUE: 59.062
MEDIAN: 59.500
STANDARD DEVIATON: 3.400
REL. ST. DEVIATION (%): 5.757

RUN 2:
NUMBER OF LABORATORIES: 16
ARITHMETIC MEAN VALUE: 59.062
MEDIAN: 59.500
STANDARD DEVIATON: 3.400
REL. ST. DEVIATION (%): 5.757

RESULTS IN DECREASING ORDER:

31	64.000	16	59.200
3	62.900	22	59.000
15	62.300	4	58.600
5	62.200	26	58.200
32	61.600	33	55.500
36	60.800	38	54.400
34	60.000	39	53.500
11	59.800	20	53.000

"UNUSED": DATA UNUSED IN RUN 2

SULPHUR DIOXIDE ON IMPREGNATED FILTER
SAMPLE NO.: 3
THEORETICAL VALUE 16.000
UNIT: UG S/FIL

RUN 1:
NUMBER OF LABORATORIES: 16
ARITHMETIC MEAN VALUE: 15.631
MEDIAN: 15.850
STANDARD DEVIATON: 1.575
REL. ST. DEVIATION (%): 10.074

RUN 2:
NUMBER OF LABORATORIES: 15
ARITHMETIC MEAN VALUE: 15.847
MEDIAN: 15.900
STANDARD DEVIATON: 1.364
REL. ST. DEVIATION (%): 8.609

RESULTS IN DECREASING ORDER:

36	18.600	5	15.800
11	17.400	4	15.600
3	17.100	26	15.200
32	16.800	22	14.700
31	16.500	16	14.500
39	16.200	20	14.000
34	16.000	33	13.400
15	15.900	38	12.400 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

SULPHUR DIOXIDE ON IMPREGNATED FILTER
SAMPLE NO.: 4
THEORETICAL VALUE 8.020
UNIT: UG S/FIL

RUN 1:
NUMBER OF LABORATORIES: 16
ARITHMETIC MEAN VALUE: 7.336
MEDIAN: 7.485
STANDARD DEVIATON: 0.982
REL. ST. DEVIATION (%): 13.385

RUN 2:
NUMBER OF LABORATORIES: 14
ARITHMETIC MEAN VALUE: 7.344
MEDIAN: 7.485
STANDARD DEVIATON: 0.693
REL. ST. DEVIATION (%): 9.442

RESULTS IN DECREASING ORDER:

3	9.300 UNUSED	34	7.480
32	8.530	36	7.380
39	8.100	26	7.210
15	7.870	31	7.000
4	7.780	16	6.790
33	7.550	22	6.140
5	7.500	20	6.000
11	7.490	38	5.250 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

SULPHUR DIOXIDE ON IMPREGNATED FILTER
SAMPLE NO.: 5
THEORETICAL VALUE 40.100
UNIT: UG S/FIL

RUN 1:
NUMBER OF LABORATORIES: 16
ARITHMETIC MEAN VALUE: 39.525
MEDIAN: 39.400
STANDARD DEVIATON: 2.275
REL. ST. DEVIATION (%): 5.756

RUN 2:
NUMBER OF LABORATORIES: 15
ARITHMETIC MEAN VALUE: 39.893
MEDIAN: 39.400
STANDARD DEVIATON: 1.795
REL. ST. DEVIATION (%): 4.498

RESULTS IN DECREASING ORDER:

3	43.100	5	39.400
31	42.400	16	39.300
36	42.300	33	39.100
32	41.100	26	38.700
11	40.900	15	38.500
22	39.900	39	38.100
34	39.800	38	36.400
4	39.400	20	34.000 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

Table 10 cont.

SULPHUR DIOXIDE ON IMPREGNATED FILTER
SAMPLE NO.: 6
THEORETICAL VALUE 54.100
UNIT: UG S/FIL.

RUN 1:
NUMBER OF LABORATORIES: 16
ARITHMETIC MEAN VALUE: 53.050
MEDIAN: 53.650
STANDARD DEVIATON: 3.146
REL. ST. DEVIATION (%): 5.929

RUN 2:
NUMBER OF LABORATORIES: 15
ARITHMETIC MEAN VALUE: 53.520
MEDIAN: 53.900
STANDARD DEVIATON: 2.610
REL. ST. DEVIATION (%): 4.877

RESULTS IN DECREASING ORDER:

3	57.100	15	53.400
31	56.300	5	53.000
22	56.100	4	52.600
36	55.300	16	52.500
11	54.900	26	52.300
32	54.800	33	49.200
38	54.100	39	47.300
34	53.900	20	46.000 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

SULPHUR DIOXIDE ON IMPREGNATED FILTER
SAMPLE NO.: 7
THEORETICAL VALUE 9.020
UNIT: UG S/FIL.

RUN 1:
NUMBER OF LABORATORIES: 16
ARITHMETIC MEAN VALUE: 8.764
MEDIAN: 8.645
STANDARD DEVIATON: 1.371
REL. ST. DEVIATION (%): 15.644

RUN 2:
NUMBER OF LABORATORIES: 16
ARITHMETIC MEAN VALUE: 8.764
MEDIAN: 8.645
STANDARD DEVIATON: 1.371
REL. ST. DEVIATION (%): 15.644

RESULTS IN DECREASING ORDER:

38	11.500	16	8.630
36	11.300	5	8.500
3	10.100	26	8.370
32	9.620	31	7.800
15	9.100	39	7.400
4	9.000	22	7.200
11	9.000	33	7.050
34	8.660	20	7.000

"UNUSED": DATA UNUSED IN RUN 2

SULPHUR DIOXIDE ON IMPREGNATED FILTER
SAMPLE NO.: 8
THEORETICAL VALUE 14.000
UNIT: UG S/FIL.

RUN 1:
NUMBER OF LABORATORIES: 16
ARITHMETIC MEAN VALUE: 13.131
MEDIAN: 13.150
STANDARD DEVIATON: 1.345
REL. ST. DEVIATION (%): 10.243

RUN 2:
NUMBER OF LABORATORIES: 16
ARITHMETIC MEAN VALUE: 13.131
MEDIAN: 13.150
STANDARD DEVIATON: 1.345
REL. ST. DEVIATION (%): 10.243

RESULTS IN DECREASING ORDER:

36	15.600	11	13.100
3	14.900	26	13.100
32	14.800	16	12.500
15	14.200	39	12.100
4	13.700	20	12.000
5	13.600	22	11.900
34	13.400	38	11.100
31	13.200	33	10.900

"UNUSED": DATA UNUSED IN RUN 2

SULPHUR DIOXIDE ON IMPREGNATED FILTER
SAMPLE NO.: 9
THEORETICAL VALUE 36.100
UNIT: UG S/FIL.

RUN 1:
NUMBER OF LABORATORIES: 16
ARITHMETIC MEAN VALUE: 34.906
MEDIAN: 35.050
STANDARD DEVIATON: 2.459
REL. ST. DEVIATION (%): 7.044

RUN 2:
NUMBER OF LABORATORIES: 15
ARITHMETIC MEAN VALUE: 35.253
MEDIAN: 35.200
STANDARD DEVIATON: 2.101
REL. ST. DEVIATION (%): 5.958

RESULTS IN DECREASING ORDER:

36	39.000	11	34.900
3	38.100	4	34.600
32	36.700	26	34.600
5	36.600	39	34.400
34	36.100	16	34.100
31	36.000	38	33.300
15	35.200	20	30.000
22	35.200	33	29.700 UNUSED

"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 the value for B2 (Blank).

Lab. No.	Theoretical value / Measured value								Average ratio
	Sample No.								
	B1	B3	B4	B5	B6	B7	B8	B9	
3	0.96	0.94	0.86	0.93	0.95	0.89	0.94	0.95	0.93
4	1.03	1.03	1.03	1.02	1.03	1.00	1.02	1.04	1.02
5	0.97	1.01	1.07	1.02	1.02	1.06	1.03	0.99	1.02
11	1.01	0.92	1.07	0.98	0.99	1.00	1.07	1.03	1.01
15	0.97	1.01	1.02	1.04	1.01	0.99	0.99	1.02	1.01
16	1.01	1.11	1.18	1.02	1.03	1.04	1.13	1.06	1.07
20	1.13	1.15	1.34	1.18	1.18	1.29	1.17	1.20	1.20
22	1.02	1.09	1.31	1.00	0.96	1.25	1.18	1.02	1.10
26	1.03	1.05	1.11	1.03	1.03	1.08	1.07	1.04	1.06
31	0.94	0.97	1.15	0.95	0.96	1.16	1.06	1.00	1.02
32	0.98	0.95	0.94	0.97	0.99	0.94	0.95	0.98	0.96
33	1.08	1.19	1.06	1.03	1.10	1.28	1.29	1.21	1.16
34	1.00	1.00	1.07	1.01	1.00	1.04	1.05	1.00	1.02
36	0.99	0.86	1.09	0.95	0.98	0.80	0.90	0.92	0.94
38	1.11	1.29	1.53	1.10	1.00	0.78	1.26	1.08	1.14
39	1.12	0.99	0.99	1.05	1.14	1.22	1.16	1.05	1.09

Table 12: Analytical results of the synthetic samples of NO_2 in absorbing solution (C1-4). For explanation, see Table 8.

NITROGEN DIOXIDE IN ABSORBING SOL.
SAMPLE NO.: 1
THEORETICAL VALUE 0.162
UNIT: UG N/ML

RUN 1:
NUMBER OF LABORATORIES: 21
ARITHMETIC MEAN VALUE: 0.161
MEDIAN: 0.160
STANDARD DEVIATON: 0.011
REL. ST. DEVIATION (%): 6.935

RUN 2:
NUMBER OF LABORATORIES: 20
ARITHMETIC MEAN VALUE: 0.162
MEDIAN: 0.160
STANDARD DEVIATON: 0.010
REL. ST. DEVIATION (%): 6.133

RESULTS IN DECREASING ORDER:

34	0.181	20	0.160
36	0.181	23	0.160
10	0.174	12	0.158
22	0.173	15	0.155
16	0.172	3	0.153
38	0.170	32	0.152
8	0.166	33	0.150
35	0.163	39	0.150
4	0.161	24	0.149
9	0.160	31	0.137 UNUSED
19	0.160		

"UNUSED": DATA UNUSED IN RUN 2

NITROGEN DIOXIDE IN ABSORBING SOL.
SAMPLE NO.: 2
THEORETICAL VALUE 0.085
UNIT: UG N/ML

RUN 1:
NUMBER OF LABORATORIES: 21
ARITHMETIC MEAN VALUE: 0.084
MEDIAN: 0.082
STANDARD DEVIATON: 0.005
REL. ST. DEVIATION (%): 6.442

RUN 2:
NUMBER OF LABORATORIES: 21
ARITHMETIC MEAN VALUE: 0.084
MEDIAN: 0.082
STANDARD DEVIATON: 0.005
REL. ST. DEVIATION (%): 6.442

RESULTS IN DECREASING ORDER:

36	0.093	4	0.082
22	0.093	9	0.081
34	0.092	19	0.080
12	0.092	20	0.080
38	0.088	23	0.080
8	0.086	33	0.080
10	0.086	39	0.080
32	0.084	16	0.080
15	0.083	3	0.078
35	0.083	31	0.073
24	0.082		

"UNUSED": DATA UNUSED IN RUN 2

NITROGEN DIOXIDE IN ABSORBING SOL.
SAMPLE NO.: 3
THEORETICAL VALUE 0.149
UNIT: UG N/ML

RUN 1:
NUMBER OF LABORATORIES: 21
ARITHMETIC MEAN VALUE: 0.147
MEDIAN: 0.147
STANDARD DEVIATON: 0.008
REL. ST. DEVIATION (%): 5.791

RUN 2:
NUMBER OF LABORATORIES: 20
ARITHMETIC MEAN VALUE: 0.148
MEDIAN: 0.147
STANDARD DEVIATON: 0.007
REL. ST. DEVIATION (%): 5.003

RESULTS IN DECREASING ORDER:

22	0.161	19	0.146
36	0.159	24	0.143
16	0.158	32	0.141
34	0.158	9	0.140
8	0.155	20	0.140
38	0.152	23	0.140
10	0.149	33	0.140
12	0.149	39	0.140
35	0.149	3	0.139
4	0.147	31	0.127 UNUSED
15	0.147		

"UNUSED": DATA UNUSED IN RUN 2

NITROGEN DIOXIDE IN ABSORBING SOL.
SAMPLE NO.: 4
THEORETICAL VALUE 0.091
UNIT: UG N/ML

RUN 1:
NUMBER OF LABORATORIES: 21
ARITHMETIC MEAN VALUE: 0.091
MEDIAN: 0.090
STANDARD DEVIATON: 0.006
REL. ST. DEVIATION (%): 6.538

RUN 2:
NUMBER OF LABORATORIES: 19
ARITHMETIC MEAN VALUE: 0.091
MEDIAN: 0.090
STANDARD DEVIATON: 0.005
REL. ST. DEVIATION (%): 5.204

RESULTS IN DECREASING ORDER:

12	0.103 UNUSED	33	0.090
22	0.101	39	0.090
36	0.097	4	0.089
34	0.096	15	0.089
24	0.094	16	0.088
8	0.094	35	0.088
38	0.094	19	0.087
10	0.091	3	0.085
32	0.091	23	0.080
9	0.090	31	0.078 UNUSED
20	0.090		

"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 nitrogen dioxide in absorbing solutions.

Lab. No.	Theoretical value / Measured value				Average ratio
	Sample No.				
	C1	C2	C3	C4	
3	1.06	1.08	1.07	1.07	1.07
4	1.01	1.03	1.01	1.03	1.02
8	0.98	0.98	0.96	0.97	0.97
9	1.02	1.04	1.06	1.02	1.03
10	0.93	0.98	1.00	1.00	0.98
12	1.03	0.92	1.00	0.89	0.96
15	1.05	1.02	1.01	1.03	1.03
16	0.95	1.06	0.94	1.04	1.00
19	1.02	1.06	1.02	1.05	1.04
20	1.02	1.06	1.06	1.02	1.04
22	0.94	0.91	0.93	0.90	0.92
23	1.02	1.06	1.06	1.14	1.07
24	1.09	1.03	1.04	0.97	1.03
31	1.19	1.15	1.17	1.17	1.17
32	1.07	1.01	1.06	1.01	1.03
33	1.08	1.06	1.06	1.02	1.05
34	0.90	0.92	0.94	0.95	0.93
35	1.00	1.02	1.00	1.04	1.01
36	0.90	0.91	0.94	0.94	0.92
38	0.96	0.96	0.98	0.97	0.97
39	1.08	1.06	1.06	1.02	1.05

Table 14: Analytical results of the wet chemical analysis of sulphate on synthetic filter samples (E1-5). Low concentration range. The results are corrected for the reported value for sample E5. For explanation, see Table 8.

PART. SULPHATE WET CHEMICAL METH.(LOW)
SAMPLE NO.: 1
THEORETICAL VALUE 9.800
UNIT: UG S/FIL.

RUN 1:
NUMBER OF LABORATORIES: 7
ARITHMETIC MEAN VALUE: 9.673
MEDIAN: 9.660
STANDARD DEVIATON: 0.176
REL. ST. DEVIATION (%): 1.823

RUN 2:
NUMBER OF LABORATORIES: 7
ARITHMETIC MEAN VALUE: 9.673
MEDIAN: 9.660
STANDARD DEVIATON: 0.176
REL. ST. DEVIATION (%): 1.823

RESULTS IN DECREASING ORDER:

17	9.980	15	9.630
23	9.770	9	9.530
21	9.710	14	9.430
6	9.660		

"UNUSED": DATA UNUSED IN RUN 2

PART. SULPHATE WET CHEMICAL METH.(LOW)
SAMPLE NO.: 2
THEORETICAL VALUE 2.490
UNIT: UG S/FIL.

RUN 1:
NUMBER OF LABORATORIES: 7
ARITHMETIC MEAN VALUE: 2.459
MEDIAN: 2.480
STANDARD DEVIATON: 0.157
REL. ST. DEVIATION (%): 6.403

RUN 2:
NUMBER OF LABORATORIES: 7
ARITHMETIC MEAN VALUE: 2.459
MEDIAN: 2.480
STANDARD DEVIATON: 0.157
REL. ST. DEVIATION (%): 6.403

RESULTS IN DECREASING ORDER:

17	2.630	21	2.470
23	2.620	15	2.340
14	2.490	9	2.180
6	2.480		

"UNUSED": DATA UNUSED IN RUN 2

PART. SULPHATE WET CHEMICAL METH.(LOW)
SAMPLE NO.: 3
THEORETICAL VALUE 2.180
UNIT: UG S/FIL.

RUN 1:
NUMBER OF LABORATORIES: 7
ARITHMETIC MEAN VALUE: 2.191
MEDIAN: 2.220
STANDARD DEVIATON: 0.100
REL. ST. DEVIATION (%): 4.544

RUN 2:
NUMBER OF LABORATORIES: 7
ARITHMETIC MEAN VALUE: 2.191
MEDIAN: 2.220
STANDARD DEVIATON: 0.100
REL. ST. DEVIATION (%): 4.544

RESULTS IN DECREASING ORDER:

14	2.330	15	2.130
21	2.270	17	2.120
23	2.230	9	2.040
6	2.220		

"UNUSED": DATA UNUSED IN RUN 2

PART. SULPHATE WET CHEMICAL METH.(LOW)
SAMPLE NO.: 4
THEORETICAL VALUE 9.020
UNIT: UG S/FIL.

RUN 1:
NUMBER OF LABORATORIES: 7
ARITHMETIC MEAN VALUE: 9.007
MEDIAN: 8.980
STANDARD DEVIATON: 0.227
REL. ST. DEVIATION (%): 2.525

RUN 2:
NUMBER OF LABORATORIES: 7
ARITHMETIC MEAN VALUE: 9.007
MEDIAN: 8.980
STANDARD DEVIATON: 0.227
REL. ST. DEVIATION (%): 2.525

RESULTS IN DECREASING ORDER:

23	9.430	21	8.900
17	9.150	14	8.790
6	9.020	15	8.780
9	8.980		

"UNUSED": DATA UNUSED IN RUN 2

Table 15: Analytical results of the wet chemical analysis of sulphate on synthetic filter samples (E1-5). High concentration range. The results are corrected for the reported value for sample E5. For explanation, see Table 8.

PART. SULPHATE WET CHEMICAL METH.(HIGH)
SAMPLE NO.: 1
THEORETICAL VALUE 13.100
UNIT: UG S/FIL.

RUN 1:
NUMBER OF LABORATORIES: 18
ARITHMETIC MEAN VALUE: 12.691
MEDIAN: 13.050
STANDARD DEVIATON: 1.822
REL. ST. DEVIATION (%): 14.355

RUN 2:
NUMBER OF LABORATORIES: 17
ARITHMETIC MEAN VALUE: 13.071
MEDIAN: 13.100
STANDARD DEVIATON: 0.879
REL. ST. DEVIATION (%): 6.723

RESULTS IN DECREASING ORDER:

19	14.900	20	13.000	
16	14.700	26	12.800	
5	13.600	31	12.600	
34	13.500	15	12.500	
39	13.500	11	12.300	
4	13.400	10	12.200	
32	13.300	22	12.200	
30	13.200	33	11.400	
13	13.100	38	6.240	UNUSED

"UNUSED": DATA UNUSED IN RUN 2

PART. SULPHATE WET CHEMICAL METH.(HIGH)
SAMPLE NO.: 2
THEORETICAL VALUE 49.800
UNIT: UG S/FIL.

RUN 1:
NUMBER OF LABORATORIES: 18
ARITHMETIC MEAN VALUE: 47.850
MEDIAN: 48.950
STANDARD DEVIATON: 5.464
REL. ST. DEVIATION (%): 11.419

RUN 2:
NUMBER OF LABORATORIES: 17
ARITHMETIC MEAN VALUE: 48.924
MEDIAN: 49.000
STANDARD DEVIATON: 3.111
REL. ST. DEVIATION (%): 6.359

RESULTS IN DECREASING ORDER:

22	55.700	15	48.900	
4	51.800	32	48.600	
10	51.100	11	48.300	
5	51.000	34	48.000	
20	51.000	19	47.300	
13	50.900	38	44.100	
26	49.600	33	43.800	
39	49.100	31	43.500	
16	49.000	30	29.600	UNUSED

"UNUSED": DATA UNUSED IN RUN 2

PART. SULPHATE WET CHEMICAL METH.(HIGH)
SAMPLE NO.: 3
THEORETICAL VALUE 11.800
UNIT: UG S/FIL.

RUN 1:
NUMBER OF LABORATORIES: 18
ARITHMETIC MEAN VALUE: 12.007
MEDIAN: 11.950
STANDARD DEVIATON: 0.917
REL. ST. DEVIATION (%): 7.636

RUN 2:
NUMBER OF LABORATORIES: 16
ARITHMETIC MEAN VALUE: 12.025
MEDIAN: 11.950
STANDARD DEVIATON: 0.585
REL. ST. DEVIATION (%): 4.863

RESULTS IN DECREASING ORDER:

30	14.000	UNUSED10	11.900	
19	13.600	15	11.800	
38	12.800	31	11.800	
39	12.500	13	11.700	
4	12.300	26	11.700	
5	12.100	16	11.500	
32	12.100	22	11.500	
20	12.000	11	11.100	
34	12.000	33	9.730	UNUSED

"UNUSED": DATA UNUSED IN RUN 2

PART. SULPHATE WET CHEMICAL METH.(HIGH)
SAMPLE NO.: 4
THEORETICAL VALUE 43.600
UNIT: UG S/FIL.

RUN 1:
NUMBER OF LABORATORIES: 18
ARITHMETIC MEAN VALUE: 42.450
MEDIAN: 43.000
STANDARD DEVIATON: 4.053
REL. ST. DEVIATION (%): 9.548

RUN 2:
NUMBER OF LABORATORIES: 17
ARITHMETIC MEAN VALUE: 43.182
MEDIAN: 43.100
STANDARD DEVIATON: 2.682
REL. ST. DEVIATION (%): 6.212

RESULTS IN DECREASING ORDER:

22	49.400	15	42.900	
4	46.000	39	42.800	
32	45.100	16	42.200	
20	45.000	11	42.000	
5	44.800	31	41.000	
10	44.600	19	40.800	
13	44.100	33	38.800	
34	43.200	38	38.300	
26	43.100	30	30.000	UNUSED

"UNUSED": DATA UNUSED IN RUN 2

Table 16: The ratios of the theoretical values to the reported values for the determination of sulphate on synthetic filters (E). The low and high concentration range are given with (L) and (H) respectively.

Lab. no. (range)	Theoretical value / Measured value				Average ratio
	Sample no.				
	E1	E2	E3	E4	
4 (H)	0.97	0.96	0.96	0.95	0.96
5 (H)	0.96	0.98	0.98	0.97	0.97
6 (L)	1.01	1.00	0.98	1.00	1.00
9 (L)	1.03	1.14	1.07	1.00	1.06
10 (H)	1.07	0.97	0.99	0.98	1.00
11 (H)	1.07	1.03	1.07	1.04	1.05
13 (H)	1.00	0.98	1.01	0.99	0.99
14 (L)	1.04	1.00	0.93	1.03	1.00
15 (L)	1.02	1.06	1.02	1.03	1.03
15 (H)	1.04	1.02	1.00	1.02	1.02
16 (H)	0.89	1.02	1.03	1.03	0.99
17 (L)	0.98	0.95	1.03	0.99	0.99
19 (H)	0.88	1.05	0.87	1.07	0.97
20 (H)	1.01	0.98	0.99	0.97	0.98
21 (L)	1.01	1.01	0.96	1.01	1.00
22 (H)	1.07	0.89	1.02	0.88	0.97
23 (L)	1.00	0.95	0.98	0.96	0.97
26 (H)	1.02	1.00	1.01	1.01	1.01
30 (H)	0.99	1.68	0.84	1.45	1.24
31 (H)	1.04	1.14	1.01	1.06	1.06
32 (H)	0.98	1.02	0.97	0.97	0.99
33 (H)	1.15	1.14	1.22	1.12	1.16
34 (H)	0.97	1.04	0.99	1.01	1.00
38 (H)	2.09	1.13	0.92	1.14	1.32
39 (H)	0.97	1.01	0.95	1.02	0.99

Table 17: Analytical results for sulphate in synthetic precipitation samples (G). For explanation, see Table 8.

SULPHATE
SAMPLE NO.: 1
THEORETICAL VALUE 0.936
UNIT: UG S/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.935
MEDIAN: 0.931
STANDARD DEVIATON: 0.071
REL. ST. DEVIATION (%): 7.547

RUN 2:
NUMBER OF LABORATORIES: 30
ARITHMETIC MEAN VALUE: 0.930
MEDIAN: 0.931
STANDARD DEVIATON: 0.032
REL. ST. DEVIATION (%): 3.437

RESULTS IN DECREASING ORDER:

9	1.158	UNUSED13	0.930	
33	1.100	UNUSED37	0.930	
32	0.996	3	0.925	
7	0.977	36	0.925	
39	0.971	14	0.922	
38	0.970	19	0.922	
30	0.960	15	0.921	
6	0.950	17	0.919	
21	0.949	26	0.919	
23	0.945	11	0.910	
5	0.941	16	0.908	
27	0.940	35	0.904	
10	0.938	20	0.892	
34	0.937	24	0.865	
4	0.933	22	0.831	
31	0.933	18	0.707	UNUSED
8	0.931			

"UNUSED": DATA UNUSED IN RUN 2

SULPHATE
SAMPLE NO.: 2
THEORETICAL VALUE 1.930
UNIT: UG S/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 1.947
MEDIAN: 1.940
STANDARD DEVIATON: 0.097
REL. ST. DEVIATION (%): 4.998

RUN 2:
NUMBER OF LABORATORIES: 31
ARITHMETIC MEAN VALUE: 1.944
MEDIAN: 1.940
STANDARD DEVIATON: 0.076
REL. ST. DEVIATION (%): 3.886

RESULTS IN DECREASING ORDER:

9	2.244	UNUSED13	1.930	
24	2.114	3	1.928	
38	2.090	4	1.923	
20	2.062	17	1.922	
32	2.042	5	1.914	
7	2.027	8	1.913	
33	2.000	36	1.911	
34	2.000	14	1.909	
21	1.992	26	1.899	
22	1.977	16	1.873	
6	1.970	37	1.870	
35	1.959	10	1.866	
27	1.950	11	1.850	
31	1.950	15	1.830	
39	1.950	18	1.760	
23	1.940	19	1.739	UNUSED
30	1.940			

"UNUSED": DATA UNUSED IN RUN 2

SULPHATE
SAMPLE NO.: 3
THEORETICAL VALUE 1.000
UNIT: UG S/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 1.033
MEDIAN: 1.010
STANDARD DEVIATON: 0.098
REL. ST. DEVIATION (%): 9.514

RUN 2:
NUMBER OF LABORATORIES: 31
ARITHMETIC MEAN VALUE: 1.014
MEDIAN: 1.007
STANDARD DEVIATON: 0.063
REL. ST. DEVIATION (%): 6.205

RESULTS IN DECREASING ORDER:

35	1.334	UNUSED19	1.007	
33	1.330	UNUSED 4	1.004	
9	1.227	8	1.001	
24	1.165	13	1.000	
38	1.070	39	0.995	
32	1.059	26	0.993	
7	1.057	14	0.992	
27	1.030	15	0.989	
31	1.030	16	0.981	
37	1.030	11	0.980	
21	1.024	22	0.978	
5	1.023	36	0.972	
6	1.020	20	0.967	
30	1.020	17	0.965	
10	1.015	3	0.963	
23	1.010	18	0.848	
34	1.010			

"UNUSED": DATA UNUSED IN RUN 2

SULPHATE
SAMPLE NO.: 4
THEORETICAL VALUE 1.730
UNIT: UG S/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 1.774
MEDIAN: 1.740
STANDARD DEVIATON: 0.173
REL. ST. DEVIATION (%): 9.748

RUN 2:
NUMBER OF LABORATORIES: 32
ARITHMETIC MEAN VALUE: 1.749
MEDIAN: 1.740
STANDARD DEVIATON: 0.097
REL. ST. DEVIATION (%): 5.557

RESULTS IN DECREASING ORDER:

35	2.576	UNUSED23	1.739	
9	2.046	3	1.729	
11	1.890	4	1.720	
20	1.876	13	1.720	
24	1.868	8	1.716	
7	1.842	14	1.713	
38	1.840	26	1.707	
32	1.832	22	1.703	
34	1.800	16	1.689	
39	1.800	36	1.685	
21	1.792	17	1.675	
6	1.760	33	1.670	
30	1.760	15	1.640	
27	1.750	10	1.638	
37	1.750	19	1.572	
5	1.741	18	1.550	
31	1.740			

"UNUSED": DATA UNUSED IN RUN 2

Table 18: Analytical results for nitrate in synthetic precipitation samples (G). For explanation, see Table 8.

NITRATE
SAMPLE NO.: 1
THEORETICAL VALUE 0.401
UNIT: UG N/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.393
MEDIAN: 0.398
STANDARD DEVIATON: 0.034
REL. ST. DEVIATION (%): 8.773

RUN 2:
NUMBER OF LABORATORIES: 32
ARITHMETIC MEAN VALUE: 0.398
MEDIAN: 0.398
STANDARD DEVIATON: 0.019
REL. ST. DEVIATION (%): 4.668

RESULTS IN DECREASING ORDER:

37	0.440	14	0.397	
38	0.420	20	0.397	
8	0.416	34	0.397	
15	0.415	17	0.394	
23	0.415	21	0.394	
19	0.414	31	0.393	
39	0.413	9	0.391	
35	0.412	13	0.388	
30	0.410	3	0.387	
32	0.409	16	0.387	
5	0.404	36	0.385	
4	0.402	24	0.384	
6	0.400	22	0.366	
11	0.400	33	0.360	
27	0.400	7	0.341	
26	0.399	40	0.230	UNUSED
10	0.398			

"UNUSED": DATA UNUSED IN RUN 2

NITRATE
SAMPLE NO.: 2
THEORETICAL VALUE 0.858
UNIT: UG N/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.849
MEDIAN: 0.858
STANDARD DEVIATON: 0.059
REL. ST. DEVIATION (%): 7.000

RUN 2:
NUMBER OF LABORATORIES: 31
ARITHMETIC MEAN VALUE: 0.852
MEDIAN: 0.858
STANDARD DEVIATON: 0.029
REL. ST. DEVIATION (%): 3.420

RESULTS IN DECREASING ORDER:

35	1.008	UNUSED	3	0.850
38	0.920	11	0.850	
4	0.886	9	0.849	
23	0.875	26	0.849	
8	0.872	22	0.848	
34	0.872	14	0.847	
6	0.870	13	0.844	
27	0.870	15	0.842	
37	0.870	17	0.839	
21	0.868	7	0.822	
39	0.868	10	0.822	
32	0.867	16	0.816	
20	0.866	19	0.804	
5	0.865	24	0.793	
31	0.865	33	0.770	
30	0.860	40	0.600	UNUSED
36	0.858			

"UNUSED": DATA UNUSED IN RUN 2

NITRATE
SAMPLE NO.: 3
THEORETICAL VALUE 0.747
UNIT: UG N/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.734
MEDIAN: 0.744
STANDARD DEVIATON: 0.048
REL. ST. DEVIATION (%): 6.564

RUN 2:
NUMBER OF LABORATORIES: 31
ARITHMETIC MEAN VALUE: 0.744
MEDIAN: 0.746
STANDARD DEVIATON: 0.026
REL. ST. DEVIATION (%): 3.504

RESULTS IN DECREASING ORDER:

35	0.814	39	0.744	
38	0.790	26	0.738	
22	0.786	14	0.734	
37	0.770	3	0.733	
4	0.765	10	0.733	
27	0.760	9	0.732	
32	0.758	36	0.730	
8	0.757	13	0.729	
23	0.756	15	0.728	
34	0.754	16	0.720	
21	0.751	17	0.719	
6	0.750	19	0.708	
11	0.750	7	0.696	
30	0.750	24	0.685	
20	0.746	33	0.620	UNUSED
31	0.746	40	0.540	UNUSED
5	0.744			

"UNUSED": DATA UNUSED IN RUN 2

NITRATE
SAMPLE NO.: 4
THEORETICAL VALUE 0.441
UNIT: UG N/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.436
MEDIAN: 0.442
STANDARD DEVIATON: 0.038
REL. ST. DEVIATION (%): 8.698

RUN 2:
NUMBER OF LABORATORIES: 32
ARITHMETIC MEAN VALUE: 0.442
MEDIAN: 0.442
STANDARD DEVIATON: 0.018
REL. ST. DEVIATION (%): 4.142

RESULTS IN DECREASING ORDER:

10	0.472	26	0.442	
37	0.470	6	0.440	
38	0.470	7	0.440	
11	0.460	27	0.440	
8	0.456	31	0.438	
20	0.456	21	0.436	
39	0.456	15	0.434	
19	0.451	3	0.432	
22	0.450	9	0.431	
23	0.450	17	0.428	
30	0.450	13	0.427	
4	0.448	36	0.424	
32	0.448	16	0.422	
34	0.445	24	0.406	
35	0.445	33	0.380	
5	0.443	40	0.250	UNUSED
14	0.442			

"UNUSED": DATA UNUSED IN RUN 2

Table 19: Analytical results for ammonium in synthetic precipitation samples (G). For explanation, see Table 8.

AMMONIUM
SAMPLE NO.: 1
THEORETICAL VALUE 0.281
UNIT: UG N/ML

RUN 1:
NUMBER OF LABORATORIES: 34
ARITHMETIC MEAN VALUE: 0.277
MEDIAN: 0.280
STANDARD DEVIATON: 0.022
REL. ST. DEVIATION (%): 8.105

RUN 2:
NUMBER OF LABORATORIES: 31
ARITHMETIC MEAN VALUE: 0.279
MEDIAN: 0.280
STANDARD DEVIATON: 0.015
REL. ST. DEVIATION (%): 5.469

RESULTS IN DECREASING ORDER:

11	0.330	UNUSED 6	0.280	
31	0.319	7	0.276	
32	0.310	8	0.275	
10	0.306	16	0.274	
30	0.290	39	0.274	
38	0.290	4	0.273	
36	0.289	27	0.270	
15	0.288	37	0.270	
17	0.288	20	0.269	
21	0.286	23	0.269	
26	0.284	14	0.268	
19	0.282	9	0.264	
35	0.282	33	0.260	
13	0.281	22	0.259	
18	0.281	40	0.240	
34	0.281	24	0.226	UNUSED
5	0.280	3	0.213	UNUSED

"UNUSED": DATA UNUSED IN RUN 2

AMMONIUM
SAMPLE NO.: 2
THEORETICAL VALUE 0.561
UNIT: UG N/ML

RUN 1:
NUMBER OF LABORATORIES: 34
ARITHMETIC MEAN VALUE: 0.563
MEDIAN: 0.568
STANDARD DEVIATON: 0.027
REL. ST. DEVIATION (%): 4.743

RUN 2:
NUMBER OF LABORATORIES: 32
ARITHMETIC MEAN VALUE: 0.564
MEDIAN: 0.568
STANDARD DEVIATON: 0.022
REL. ST. DEVIATION (%): 3.944

RESULTS IN DECREASING ORDER:

10	0.618	UNUSED 4	0.567	
31	0.609	18	0.566	
32	0.606	13	0.562	
6	0.590	34	0.560	
19	0.583	37	0.560	
24	0.583	8	0.558	
26	0.582	7	0.551	
5	0.580	39	0.549	
30	0.580	23	0.547	
38	0.580	27	0.540	
17	0.579	33	0.540	
16	0.577	14	0.534	
35	0.572	20	0.534	
36	0.572	40	0.530	
11	0.570	22	0.526	
21	0.570	9	0.518	
15	0.569	3	0.491	UNUSED

"UNUSED": DATA UNUSED IN RUN 2

AMMONIUM
SAMPLE NO.: 3
THEORETICAL VALUE 0.481
UNIT: UG N/ML

RUN 1:
NUMBER OF LABORATORIES: 34
ARITHMETIC MEAN VALUE: 0.484
MEDIAN: 0.482
STANDARD DEVIATON: 0.028
REL. ST. DEVIATION (%): 5.810

RUN 2:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.481
MEDIAN: 0.480
STANDARD DEVIATON: 0.022
REL. ST. DEVIATION (%): 4.490

RESULTS IN DECREASING ORDER:

31	0.588	UNUSED13	0.480	
10	0.527	37	0.480	
32	0.521	14	0.479	
24	0.513	8	0.478	
11	0.510	16	0.477	
38	0.500	7	0.473	
5	0.497	23	0.469	
9	0.493	34	0.468	
17	0.493	39	0.468	
21	0.492	20	0.467	
30	0.490	18	0.466	
36	0.490	22	0.466	
19	0.489	27	0.460	
4	0.487	33	0.460	
26	0.487	6	0.450	
15	0.486	3	0.433	
35	0.484	40	0.430	

"UNUSED": DATA UNUSED IN RUN 2

AMMONIUM
SAMPLE NO.: 4
THEORETICAL VALUE 0.241
UNIT: UG N/ML

RUN 1:
NUMBER OF LABORATORIES: 34
ARITHMETIC MEAN VALUE: 0.244
MEDIAN: 0.244
STANDARD DEVIATON: 0.019
REL. ST. DEVIATION (%): 7.641

RUN 2:
NUMBER OF LABORATORIES: 32
ARITHMETIC MEAN VALUE: 0.245
MEDIAN: 0.244
STANDARD DEVIATON: 0.015
REL. ST. DEVIATION (%): 6.252

RESULTS IN DECREASING ORDER:

31	0.287	UNUSED21	0.243	
11	0.270	34	0.243	
18	0.268	22	0.240	
32	0.267	27	0.240	
10	0.264	7	0.239	
19	0.264	9	0.237	
6	0.260	23	0.237	
38	0.260	35	0.237	
17	0.258	4	0.236	
16	0.257	20	0.231	
15	0.254	33	0.230	
30	0.250	39	0.230	
37	0.250	8	0.225	
36	0.248	14	0.221	
5	0.247	40	0.220	
26	0.247	3	0.208	
13	0.245	24	0.195	UNUSED

"UNUSED": DATA UNUSED IN RUN 2

Table 20: Analytical results for pH in synthetic precipitation samples (G). For explanation, see Table 8.

PH
SAMPLE NO.: 1
THEORETICAL VALUE 4.520
UNIT: PH UNITS

RUN 1:
NUMBER OF LABORATORIES: 34
ARITHMETIC MEAN VALUE: 4.589
MEDIAN: 4.590
STANDARD DEVIATON: 0.063
REL. ST. DEVIATION (%): 1.376

RUN 2:
NUMBER OF LABORATORIES: 32
ARITHMETIC MEAN VALUE: 4.590
MEDIAN: 4.590
STANDARD DEVIATON: 0.051
REL. ST. DEVIATION (%): 1.109

RESULTS IN DECREASING ORDER:

19	4.740 UNUSED	30	4.590
13	4.690	18	4.580
36	4.680	23	4.580
22	4.660	27	4.580
8	4.650	35	4.580
40	4.650	15	4.550
10	4.640	3	4.547
26	4.640	7	4.540
14	4.630	17	4.540
24	4.620	38	4.540
32	4.620	9	4.530
37	4.620	31	4.530
33	4.610	16	4.520
39	4.610	20	4.520
4	4.600	5	4.519
6	4.600	21	4.510
11	4.590	34	4.420 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

PH
SAMPLE NO.: 2
THEORETICAL VALUE 4.050
UNIT: PH UNITS

RUN 1:
NUMBER OF LABORATORIES: 34
ARITHMETIC MEAN VALUE: 4.090
MEDIAN: 4.090
STANDARD DEVIATON: 0.045
REL. ST. DEVIATION (%): 1.110

RUN 2:
NUMBER OF LABORATORIES: 32
ARITHMETIC MEAN VALUE: 4.098
MEDIAN: 4.095
STANDARD DEVIATON: 0.031
REL. ST. DEVIATION (%): 0.766

RESULTS IN DECREASING ORDER:

19	4.170	17	4.090
10	4.160	24	4.090
8	4.140	32	4.090
11	4.140	38	4.090
30	4.140	3	4.085
6	4.120	7	4.080
23	4.120	9	4.070
37	4.120	16	4.070
4	4.110	26	4.070
22	4.110	39	4.070
27	4.110	18	4.060
33	4.110	31	4.060
35	4.110	5	4.059
40	4.110	20	4.050
15	4.100	21	4.040
36	4.100	13	3.990 UNUSED
14	4.090	34	3.930 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

PH
SAMPLE NO.: 3
THEORETICAL VALUE 4.590
UNIT: PH UNITS

RUN 1:
NUMBER OF LABORATORIES: 34
ARITHMETIC MEAN VALUE: 4.624
MEDIAN: 4.630
STANDARD DEVIATON: 0.092
REL. ST. DEVIATION (%): 1.985

RUN 2:
NUMBER OF LABORATORIES: 32
ARITHMETIC MEAN VALUE: 4.620
MEDIAN: 4.630
STANDARD DEVIATON: 0.054
REL. ST. DEVIATION (%): 1.160

RESULTS IN DECREASING ORDER:

39	4.990 UNUSED	15	4.630
19	4.730	27	4.630
40	4.710	33	4.620
10	4.690	11	4.610
24	4.690	35	4.610
22	4.680	9	4.600
30	4.660	5	4.590
14	4.650	38	4.590
17	4.650	18	4.570
4	4.640	26	4.570
6	4.640	16	4.560
8	4.640	20	4.560
23	4.640	21	4.560
36	4.640	32	4.560
37	4.640	31	4.550
3	4.630	13	4.470
7	4.630	34	4.390 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

PH
SAMPLE NO.: 4
THEORETICAL VALUE 4.090
UNIT: PH UNITS

RUN 1:
NUMBER OF LABORATORIES: 34
ARITHMETIC MEAN VALUE: 4.122
MEDIAN: 4.125
STANDARD DEVIATON: 0.049
REL. ST. DEVIATION (%): 1.199

RUN 2:
NUMBER OF LABORATORIES: 32
ARITHMETIC MEAN VALUE: 4.132
MEDIAN: 4.130
STANDARD DEVIATON: 0.030
REL. ST. DEVIATION (%): 0.723

RESULTS IN DECREASING ORDER:

19	4.200	7	4.120
24	4.190	9	4.120
10	4.170	11	4.120
36	4.170	17	4.120
8	4.160	40	4.120
22	4.160	3	4.115
23	4.160	14	4.110
4	4.150	18	4.110
27	4.150	32	4.110
30	4.150	16	4.100
37	4.150	5	4.098
38	4.150	20	4.090
6	4.140	26	4.090
33	4.140	31	4.090
15	4.130	21	4.080
35	4.130	13	3.980 UNUSED
39	4.130	34	3.950 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

Table 21: Analytical results for strong acid calculated from pH in synthetic precipitation samples (G). For explanation, see Table 8.

STRONG ACID CALCULATED FROM PH
SAMPLE NO.: 1
THEORETICAL VALUE 30.000
UNIT: UEQ/L

RUN 1:
NUMBER OF LABORATORIES: 34
ARITHMETIC MEAN VALUE: 26.032
MEDIAN: 25.700
STANDARD DEVIATON: 3.866
REL. ST. DEVIATION (%): 14.851

RUN 2:
NUMBER OF LABORATORIES: 32
ARITHMETIC MEAN VALUE: 25.894
MEDIAN: 25.700
STANDARD DEVIATON: 3.010
REL. ST. DEVIATION (%): 11.623

RESULTS IN DECREASING ORDER:

34	38.300	UNUSED	30	25.700
21	30.900		4	25.100
5	30.300		6	25.100
16	30.200		33	24.500
20	30.200		39	24.500
9	29.500		24	24.000
31	29.500		32	24.000
7	28.800		37	24.000
17	28.800		14	23.400
38	28.800		10	22.900
3	28.400		26	22.900
15	28.200		8	22.400
18	26.300		40	22.400
23	26.300		22	21.900
27	26.300		36	20.900
35	26.300		13	20.400
11	25.700		19	18.200 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

STRONG ACID CALCULATED FROM PH
SAMPLE NO.: 2
THEORETICAL VALUE 90.000
UNIT: UEQ/L

RUN 1:
NUMBER OF LABORATORIES: 34
ARITHMETIC MEAN VALUE: 81.771
MEDIAN: 81.300
STANDARD DEVIATON: 9.133
REL. ST. DEVIATION (%): 11.169

RUN 2:
NUMBER OF LABORATORIES: 32
ARITHMETIC MEAN VALUE: 80.031
MEDIAN: 80.350
STANDARD DEVIATON: 5.680
REL. ST. DEVIATION (%): 7.097

RESULTS IN DECREASING ORDER:

34	116.900	UNUSED	38	81.300
13	102.300	UNUSED	15	79.400
21	91.200		36	79.400
20	89.100		4	77.600
5	87.300		22	77.600
18	87.100		27	77.600
31	87.100		33	77.600
9	85.100		35	77.600
16	85.100		40	77.600
26	85.100		6	75.900
39	85.100		23	75.900
7	83.200		37	75.900
3	82.200		8	72.400
14	81.300		11	72.400
17	81.300		30	72.400
24	81.300		10	69.200
32	81.300		19	68.400

"UNUSED": DATA UNUSED IN RUN 2

STRONG ACID CALCULATED FROM PH
SAMPLE NO.: 3
THEORETICAL VALUE 26.000
UNIT: UEQ/L

RUN 1:
NUMBER OF LABORATORIES: 34
ARITHMETIC MEAN VALUE: 24.232
MEDIAN: 23.400
STANDARD DEVIATON: 4.822
REL. ST. DEVIATION (%): 19.901

RUN 2:
NUMBER OF LABORATORIES: 31
ARITHMETIC MEAN VALUE: 23.835
MEDIAN: 23.400
STANDARD DEVIATON: 2.545
REL. ST. DEVIATION (%): 10.679

RESULTS IN DECREASING ORDER:

34	40.900	UNUSED	15	23.400
13	33.900	UNUSED	27	23.400
31	28.200		4	22.900
16	27.500		6	22.900
20	27.500		8	22.900
21	27.500		23	22.900
32	27.500		36	22.900
18	26.900		37	22.900
26	26.900		14	22.400
5	25.700		17	22.400
38	25.700		30	21.900
9	25.100		22	20.900
11	24.500		10	20.400
35	24.500		24	20.400
33	24.000		40	19.500
3	23.400		19	18.500
7	23.400		39	10.200 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

STRONG ACID CALCULATED FROM PH
SAMPLE NO.: 4
THEORETICAL VALUE 82.000
UNIT: UEQ/L

RUN 1:
NUMBER OF LABORATORIES: 34
ARITHMETIC MEAN VALUE: 76.018
MEDIAN: 75.000
STANDARD DEVIATON: 9.663
REL. ST. DEVIATION (%): 12.712

RUN 2:
NUMBER OF LABORATORIES: 32
ARITHMETIC MEAN VALUE: 73.975
MEDIAN: 74.100
STANDARD DEVIATON: 5.015
REL. ST. DEVIATION (%): 6.779

RESULTS IN DECREASING ORDER:

34	112.700	UNUSED	15	74.100
13	104.700	UNUSED	35	74.100
21	83.200		39	74.100
20	81.300		6	72.400
26	81.300		33	72.400
31	81.300		4	70.800
5	79.800		27	70.800
16	79.400		30	70.800
14	77.600		37	70.800
18	77.600		38	70.800
32	77.600		8	69.200
3	76.700		22	69.200
7	75.900		23	69.200
9	75.900		10	67.600
11	75.900		36	67.600
17	75.900		24	64.600
40	75.900		19	63.400

"UNUSED": DATA UNUSED IN RUN 2

Table 22: Analytical results for titerated strong acid in synthetic precipitation samples (G). For explanation, see Table 8.

STRONG ACIDS SAMPLE NO.: 1 THEORETICAL VALUE 30. UNIT: UEQ RUN 1: NUMBER OF LABORATORIES: 2 ARITHMETIC MEAN VALUE: 31.150 MEDIAN: 31.150 STANDARD DEVIATON: 1.202 REL. ST. DEVIATION (%): 3.859 RUN 2: NUMBER OF LABORATORIES: 2 ARITHMETIC MEAN VALUE: 31.150 MEDIAN: 31.150 STANDARD DEVIATON: 1.202 REL. ST. DEVIATION (%): 3.859 RESULTS IN DECREASING ORDER: 6 32.000 14 30.300 "UNUSED": DATA UNUSED IN RUN 2	STRONG ACIDS SAMPLE NO.: 2 THEORETICAL VALUE 90. UNIT: UEQ RUN 1: NUMBER OF LABORATORIES: 2 ARITHMETIC MEAN VALUE: 90.400 MEDIAN: 90.400 STANDARD DEVIATON: 2.263 REL. ST. DEVIATION (%): 2.503 RUN 2: NUMBER OF LABORATORIES: 2 ARITHMETIC MEAN VALUE: 90.400 MEDIAN: 90.400 STANDARD DEVIATON: 2.263 REL. ST. DEVIATION (%): 2.503 RESULTS IN DECREASING ORDER: 6 92.000 14 88.800 "UNUSED": DATA UNUSED IN RUN 2
STRONG ACIDS SAMPLE NO.: 3 THEORETICAL VALUE 26. UNIT: UEQ RUN 1: NUMBER OF LABORATORIES: 2 ARITHMETIC MEAN VALUE: 25.700 MEDIAN: 25.700 STANDARD DEVIATON: 2.404 REL. ST. DEVIATION (%): 9.355 RUN 2: NUMBER OF LABORATORIES: 2 ARITHMETIC MEAN VALUE: 25.700 MEDIAN: 25.700 STANDARD DEVIATON: 2.404 REL. ST. DEVIATION (%): 9.355 RESULTS IN DECREASING ORDER: 14 27.400 6 24.000 "UNUSED": DATA UNUSED IN RUN 2	STRONG ACIDS SAMPLE NO.: 4 THEORETICAL VALUE 82. UNIT: UEQ RUN 1: NUMBER OF LABORATORIES: 2 ARITHMETIC MEAN VALUE: 81.600 MEDIAN: 81.600 STANDARD DEVIATON: 3.394 REL. ST. DEVIATION (%): 4.160 RUN 2: NUMBER OF LABORATORIES: 2 ARITHMETIC MEAN VALUE: 81.600 MEDIAN: 81.600 STANDARD DEVIATON: 3.394 REL. ST. DEVIATION (%): 4.160 RESULTS IN DECREASING ORDER: 6 84.000 14 79.200 "UNUSED": DATA UNUSED IN RUN 2

Table 23: Analytical results for chloride in synthetic precipitation samples (G). For explanation, see Table 8.

CHLORIDE
SAMPLE NO.: 1
THEORETICAL VALUE 0.232
UNIT: UG CL/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.248
MEDIAN: 0.223
STANDARD DEVIATON: 0.083
REL. ST. DEVIATION (%): 33.369

RUN 2:
NUMBER OF LABORATORIES: 31
ARITHMETIC MEAN VALUE: 0.231
MEDIAN: 0.221
STANDARD DEVIATON: 0.047
REL. ST. DEVIATION (%): 20.279

RESULTS IN DECREASING ORDER:

19	0.523	UNUSED 4	0.221	
33	0.510	UNUSED 7	0.221	
23	0.393	8	0.220	
24	0.323	10	0.218	
22	0.313	14	0.217	
35	0.297	15	0.216	
11	0.260	20	0.207	
16	0.259	3	0.206	
31	0.238	6	0.200	
34	0.238	9	0.196	
13	0.236	17	0.194	
32	0.232	39	0.190	
21	0.231	18	0.189	
27	0.230	37	0.180	
5	0.228	38	0.180	
26	0.226	30	0.170	
36	0.223			

"UNUSED": DATA UNUSED IN RUN 2

CHLORIDE
SAMPLE NO.: 2
THEORETICAL VALUE 0.579
UNIT: UG CL/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.579
MEDIAN: 0.564
STANDARD DEVIATON: 0.072
REL. ST. DEVIATION (%): 12.396

RUN 2:
NUMBER OF LABORATORIES: 30
ARITHMETIC MEAN VALUE: 0.574
MEDIAN: 0.564
STANDARD DEVIATON: 0.047
REL. ST. DEVIATION (%): 8.149

RESULTS IN DECREASING ORDER:

19	0.777	UNUSED16	0.564	
24	0.726	UNUSED14	0.562	
33	0.700	22	0.560	
23	0.668	17	0.559	
9	0.650	31	0.556	
34	0.619	4	0.552	
13	0.609	20	0.551	
18	0.603	11	0.550	
36	0.599	3	0.547	
35	0.593	15	0.547	
6	0.590	38	0.540	
27	0.590	8	0.530	
26	0.587	30	0.530	
5	0.574	10	0.523	
32	0.573	37	0.450	
21	0.572	39	0.380	UNUSED
7	0.564			

"UNUSED": DATA UNUSED IN RUN 2

CHLORIDE
SAMPLE NO.: 3
THEORETICAL VALUE 0.695
UNIT: UG CL/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.696
MEDIAN: 0.677
STANDARD DEVIATON: 0.078
REL. ST. DEVIATION (%): 11.180

RUN 2:
NUMBER OF LABORATORIES: 29
ARITHMETIC MEAN VALUE: 0.684
MEDIAN: 0.676
STANDARD DEVIATON: 0.053
REL. ST. DEVIATION (%): 7.715

RESULTS IN DECREASING ORDER:

22	0.871	UNUSED 7	0.676	
24	0.862	UNUSED14	0.674	
19	0.857	UNUSED18	0.674	
33	0.820	36	0.674	
11	0.790	30	0.670	
35	0.776	16	0.666	
23	0.770	31	0.662	
34	0.721	4	0.660	
27	0.700	20	0.657	
13	0.698	6	0.650	
26	0.697	10	0.645	
5	0.695	9	0.640	
15	0.685	17	0.638	
32	0.685	8	0.630	
21	0.684	39	0.550	
38	0.680	37	0.530	UNUSED
3	0.677			

"UNUSED": DATA UNUSED IN RUN 2

CHLORIDE
SAMPLE NO.: 4
THEORETICAL VALUE 0.290
UNIT: UG CL/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.293
MEDIAN: 0.282
STANDARD DEVIATON: 0.066
REL. ST. DEVIATION (%): 22.547

RUN 2:
NUMBER OF LABORATORIES: 30
ARITHMETIC MEAN VALUE: 0.274
MEDIAN: 0.277
STANDARD DEVIATON: 0.023
REL. ST. DEVIATION (%): 8.254

RESULTS IN DECREASING ORDER:

19	0.567	UNUSED 8	0.280	
24	0.436	UNUSED35	0.274	
23	0.430	UNUSED14	0.272	
13	0.315	36	0.268	
38	0.310	31	0.265	
16	0.308	17	0.262	
27	0.300	3	0.261	
33	0.300	6	0.260	
34	0.300	11	0.260	
21	0.290	9	0.259	
32	0.288	15	0.259	
5	0.287	18	0.250	
26	0.286	10	0.247	
7	0.284	37	0.240	
4	0.283	30	0.230	
20	0.282	39	0.230	
22	0.282			

"UNUSED": DATA UNUSED IN RUN 2

Table 24: Analytical results for sodium in synthetic precipitation samples (G). For explanation, see Table 8.

SODIUM
SAMPLE NO.: 1
THEORETICAL VALUE 0.258
UNIT: UG NA/ML

RUN 1:

NUMBER OF LABORATORIES:	32
ARITHMETIC MEAN VALUE:	0.250
MEDIAN:	0.254
STANDARD DEVIATON:	0.029
REL. ST. DEVIATION (%):	11.643

RUN 2:

NUMBER OF LABORATORIES:	30
ARITHMETIC MEAN VALUE:	0.255
MEDIAN:	0.257
STANDARD DEVIATON:	0.021
REL. ST. DEVIATION (%):	8.346

RESULTS IN DECREASING ORDER:

19	0.295	26	0.253
24	0.294	3	0.252
20	0.282	31	0.251
22	0.279	6	0.250
36	0.274	8	0.250
4	0.270	10	0.250
34	0.267	32	0.250
27	0.265	7	0.249
39	0.264	23	0.246
5	0.261	33	0.243
13	0.261	16	0.240
30	0.260	17	0.210
15	0.259	37	0.210
14	0.258	38	0.200
21	0.258	9	0.191 UNUSED
35	0.255	40	0.156 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

SODIUM
SAMPLE NO.: 2
THEORETICAL VALUE 0.698
UNIT: UG NA/ML

RUN 1:

NUMBER OF LABORATORIES:	32
ARITHMETIC MEAN VALUE:	0.693
MEDIAN:	0.696
STANDARD DEVIATON:	0.036
REL. ST. DEVIATION (%):	5.121

RUN 2:

NUMBER OF LABORATORIES:	30
ARITHMETIC MEAN VALUE:	0.700
MEDIAN:	0.696
STANDARD DEVIATON:	0.024
REL. ST. DEVIATION (%):	3.357

RESULTS IN DECREASING ORDER:

19	0.757	13	0.695
30	0.750	7	0.694
32	0.750	15	0.694
34	0.724	24	0.694
36	0.721	26	0.694
6	0.710	20	0.693
35	0.710	27	0.691
31	0.709	3	0.687
5	0.706	23	0.680
14	0.706	38	0.680
39	0.704	22	0.678
10	0.702	37	0.670
4	0.700	9	0.657
8	0.700	33	0.657
16	0.696	17	0.610 UNUSED
21	0.696	40	0.572 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

SODIUM
SAMPLE NO.: 3
THEORETICAL VALUE 0.827
UNIT: UG NA/ML

RUN 1:

NUMBER OF LABORATORIES:	32
ARITHMETIC MEAN VALUE:	0.814
MEDIAN:	0.824
STANDARD DEVIATON:	0.044
REL. ST. DEVIATION (%):	5.420

RUN 2:

NUMBER OF LABORATORIES:	31
ARITHMETIC MEAN VALUE:	0.821
MEDIAN:	0.825
STANDARD DEVIATON:	0.027
REL. ST. DEVIATION (%):	3.313

RESULTS IN DECREASING ORDER:

19	0.866	3	0.824
30	0.860	15	0.822
36	0.856	7	0.821
37	0.850	4	0.820
21	0.845	6	0.820
13	0.840	32	0.820
5	0.839	22	0.817
34	0.835	38	0.810
8	0.830	23	0.805
35	0.830	9	0.804
39	0.829	20	0.791
31	0.828	16	0.789
14	0.826	24	0.783
27	0.826	33	0.778
10	0.825	17	0.727
26	0.825	40	0.622 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

SODIUM
SAMPLE NO.: 4
THEORETICAL VALUE 0.322
UNIT: UG NA/ML

RUN 1:

NUMBER OF LABORATORIES:	32
ARITHMETIC MEAN VALUE:	0.314
MEDIAN:	0.322
STANDARD DEVIATON:	0.027
REL. ST. DEVIATION (%):	8.597

RUN 2:

NUMBER OF LABORATORIES:	30
ARITHMETIC MEAN VALUE:	0.319
MEDIAN:	0.324
STANDARD DEVIATON:	0.020
REL. ST. DEVIATION (%):	6.177

RESULTS IN DECREASING ORDER:

19	0.360	14	0.321
34	0.342	21	0.321
4	0.340	37	0.320
30	0.340	31	0.314
24	0.338	7	0.313
36	0.337	23	0.309
27	0.332	16	0.308
6	0.330	10	0.306
13	0.330	8	0.300
20	0.327	33	0.293
39	0.327	17	0.289
5	0.326	22	0.285
15	0.326	32	0.280
3	0.325	9	0.278
26	0.324	38	0.260 UNUSED
35	0.323	40	0.226 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

Table 25: Analytical results for magnesium in synthetic precipitation samples (G). For explanation, see Table 8.

MAGNESIUM
SAMPLE NO.: 1
THEORETICAL VALUE 0.124
UNIT: UG MG/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.123
MEDIAN: 0.123
STANDARD DEVIATON: 0.015
REL. ST. DEVIATION (%): 12.134

RUN 2:
NUMBER OF LABORATORIES: 31
ARITHMETIC MEAN VALUE: 0.123
MEDIAN: 0.123
STANDARD DEVIATON: 0.012
REL. ST. DEVIATION (%): 9.542

RESULTS IN DECREASING ORDER:

23	0.164	UNUSED	36	0.123
38	0.150		31	0.122
24	0.145		3	0.121
20	0.138		27	0.120
16	0.136		34	0.119
21	0.132		7	0.118
6	0.130		33	0.118
8	0.130		22	0.117
13	0.130		14	0.116
30	0.130		35	0.115
10	0.129		4	0.110
17	0.129		9	0.110
15	0.126		11	0.100
5	0.125		18	0.100
39	0.124		37	0.100
19	0.123		40	0.087 UNUSED
26	0.123			

"UNUSED": DATA UNUSED IN RUN 2

MAGNESIUM
SAMPLE NO.: 2
THEORETICAL VALUE 0.217
UNIT: UG MG/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.218
MEDIAN: 0.218
STANDARD DEVIATON: 0.017
REL. ST. DEVIATION (%): 7.631

RUN 2:
NUMBER OF LABORATORIES: 31
ARITHMETIC MEAN VALUE: 0.218
MEDIAN: 0.218
STANDARD DEVIATON: 0.013
REL. ST. DEVIATION (%): 5.950

RESULTS IN DECREASING ORDER:

38	0.270	UNUSED	22	0.218
24	0.251		39	0.217
18	0.240		10	0.216
23	0.233		16	0.216
9	0.230		19	0.216
30	0.230		3	0.214
31	0.227		26	0.214
34	0.227		36	0.212
17	0.226		7	0.210
20	0.222		27	0.207
21	0.222		35	0.204
5	0.220		4	0.200
6	0.220		11	0.200
8	0.220		33	0.190
14	0.219		37	0.190
13	0.218		40	0.184 UNUSED
15	0.218			

"UNUSED": DATA UNUSED IN RUN 2

MAGNESIUM
SAMPLE NO.: 3
THEORETICAL VALUE 0.201
UNIT: UG MG/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.204
MEDIAN: 0.202
STANDARD DEVIATON: 0.021
REL. ST. DEVIATION (%): 10.355

RUN 2:
NUMBER OF LABORATORIES: 30
ARITHMETIC MEAN VALUE: 0.202
MEDIAN: 0.201
STANDARD DEVIATON: 0.013
REL. ST. DEVIATION (%): 6.611

RESULTS IN DECREASING ORDER:

23	0.272	UNUSED	36	0.201
38	0.250	UNUSED	7	0.200
30	0.230		8	0.200
24	0.223		18	0.200
9	0.221		19	0.199
20	0.218		31	0.199
21	0.218		16	0.197
13	0.214		3	0.196
6	0.210		27	0.194
34	0.208		22	0.192
17	0.206		35	0.189
5	0.205		33	0.183
15	0.205		4	0.180
10	0.203		11	0.180
14	0.202		37	0.170
26	0.202		40	0.157 UNUSED
39	0.202			

"UNUSED": DATA UNUSED IN RUN 2

MAGNESIUM
SAMPLE NO.: 4
THEORETICAL VALUE 0.139
UNIT: UG MG/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.140
MEDIAN: 0.140
STANDARD DEVIATON: 0.011
REL. ST. DEVIATION (%): 8.002

RUN 2:
NUMBER OF LABORATORIES: 31
ARITHMETIC MEAN VALUE: 0.140
MEDIAN: 0.140
STANDARD DEVIATON: 0.009
REL. ST. DEVIATION (%): 6.254

RESULTS IN DECREASING ORDER:

38	0.170	UNUSED	26	0.140
18	0.160		30	0.140
24	0.160		10	0.139
34	0.157		19	0.138
8	0.150		36	0.137
23	0.149		3	0.136
20	0.146		9	0.135
31	0.146		14	0.135
16	0.144		27	0.135
15	0.143		22	0.132
17	0.143		7	0.131
21	0.143		35	0.131
33	0.142		4	0.130
5	0.141		37	0.130
13	0.141		11	0.120
39	0.141		40	0.111 UNUSED
6	0.140			

"UNUSED": DATA UNUSED IN RUN 2

Table 26: Analytical results for calcium in synthetic precipitation samples (G). For explanation, see Table 8.

CALCIUM
SAMPLE NO.: 1
THEORETICAL VALUE 0.364
UNIT: UG CA/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.379
MEDIAN: 0.370
STANDARD DEVIATON: 0.067
REL. ST. DEVIATION (%): 17.641

RUN 2:
NUMBER OF LABORATORIES: 31
ARITHMETIC MEAN VALUE: 0.368
MEDIAN: 0.370
STANDARD DEVIATON: 0.052
REL. ST. DEVIATION (%): 14.105

RESULTS IN DECREASING ORDER:

23	0.560	UNUSED38	0.370	
40	0.538	UNUSED34	0.366	
30	0.510	15	0.365	
20	0.454	24	0.361	
22	0.450	39	0.361	
8	0.430	11	0.360	
13	0.408	17	0.359	
6	0.390	7	0.358	
21	0.387	31	0.353	
36	0.384	26	0.349	
19	0.380	3	0.347	
14	0.374	16	0.328	
5	0.373	35	0.293	
27	0.372	9	0.290	
4	0.370	37	0.260	
10	0.370	33	0.253	
32	0.370			

"UNUSED": DATA UNUSED IN RUN 2

CALCIUM
SAMPLE NO.: 2
THEORETICAL VALUE 0.249
UNIT: UG CA/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.251
MEDIAN: 0.259
STANDARD DEVIATON: 0.028
REL. ST. DEVIATION (%): 11.302

RUN 2:
NUMBER OF LABORATORIES: 30
ARITHMETIC MEAN VALUE: 0.258
MEDIAN: 0.260
STANDARD DEVIATON: 0.019
REL. ST. DEVIATION (%): 7.310

RESULTS IN DECREASING ORDER:

20	0.295	14	0.255	
30	0.290	5	0.253	
40	0.289	8	0.250	
10	0.275	15	0.250	
34	0.275	16	0.249	
19	0.273	27	0.247	
23	0.272	22	0.245	
24	0.270	26	0.241	
31	0.267	38	0.240	
36	0.266	21	0.233	
13	0.264	7	0.228	
3	0.262	33	0.223	
4	0.260	9	0.217	
6	0.260	32	0.190	UNUSED
11	0.260	35	0.189	UNUSED
39	0.260	37	0.170	UNUSED
17	0.259			

"UNUSED": DATA UNUSED IN RUN 2

CALCIUM
SAMPLE NO.: 3
THEORETICAL VALUE 0.402
UNIT: UG CA/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.410
MEDIAN: 0.410
STANDARD DEVIATON: 0.066
REL. ST. DEVIATION (%): 16.100

RUN 2:
NUMBER OF LABORATORIES: 31
ARITHMETIC MEAN VALUE: 0.398
MEDIAN: 0.402
STANDARD DEVIATON: 0.047
REL. ST. DEVIATION (%): 11.888

RESULTS IN DECREASING ORDER:

23	0.623	UNUSED27	0.402	
30	0.560	UNUSED10	0.401	
22	0.490	26	0.401	
20	0.485	8	0.400	
13	0.461	39	0.396	
7	0.451	3	0.393	
21	0.433	4	0.390	
36	0.429	31	0.389	
11	0.420	24	0.388	
17	0.420	16	0.358	
40	0.420	32	0.350	
14	0.419	9	0.345	
15	0.417	38	0.330	
5	0.413	35	0.321	
19	0.413	37	0.310	
6	0.410	33	0.280	
34	0.410			

"UNUSED": DATA UNUSED IN RUN 2

CALCIUM
SAMPLE NO.: 4
THEORETICAL VALUE 0.287
UNIT: UG CA/ML

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.284
MEDIAN: 0.290
STANDARD DEVIATON: 0.036
REL. ST. DEVIATION (%): 12.669

RUN 2:
NUMBER OF LABORATORIES: 31
ARITHMETIC MEAN VALUE: 0.289
MEDIAN: 0.290
STANDARD DEVIATON: 0.030
REL. ST. DEVIATION (%): 10.247

RESULTS IN DECREASING ORDER:

20	0.355	26	0.288	
30	0.330	31	0.288	
23	0.328	15	0.287	
34	0.321	16	0.287	
19	0.312	27	0.286	
38	0.310	10	0.285	
22	0.307	39	0.285	
5	0.305	21	0.273	
36	0.305	24	0.267	
17	0.304	3	0.263	
13	0.303	7	0.263	
8	0.300	35	0.231	
14	0.294	9	0.219	
4	0.290	33	0.218	
6	0.290	32	0.200	UNUSED
11	0.290	37	0.200	UNUSED
40	0.290			

"UNUSED": DATA UNUSED IN RUN 2

Table 27: Analytical results for potassium in synthetic precipitation samples (G). For explanation, see Table 8.

POTASSIUM
SAMPLE NO.: 1
THEORETICAL VALUE 0.153
UNIT: UG K/ML

RUN 1:
NUMBER OF LABORATORIES: 34
ARITHMETIC MEAN VALUE: 0.161
MEDIAN: 0.150
STANDARD DEVIATON: 0.048
REL. ST. DEVIATION (%): 29.511

RUN 2:
NUMBER OF LABORATORIES: 32
ARITHMETIC MEAN VALUE: 0.151
MEDIAN: 0.150
STANDARD DEVIATON: 0.022
REL. ST. DEVIATION (%): 14.435

RESULTS IN DECREASING ORDER:

40	0.350 UNUSED	6	0.150
18	0.306 UNUSED	13	0.150
20	0.227	32	0.150
31	0.210	3	0.148
35	0.168	16	0.146
14	0.164	33	0.144
19	0.164	8	0.140
30	0.160	11	0.140
22	0.159	38	0.140
7	0.158	23	0.139
27	0.155	17	0.137
36	0.155	21	0.137
15	0.154	10	0.132
39	0.153	37	0.130
26	0.152	24	0.128
34	0.152	4	0.120
5	0.150	9	0.115

"UNUSED": DATA UNUSED IN RUN 2

POTASSIUM
SAMPLE NO.: 2
THEORETICAL VALUE 0.280
UNIT: UG K/ML

RUN 1:
NUMBER OF LABORATORIES: 34
ARITHMETIC MEAN VALUE: 0.290
MEDIAN: 0.277
STANDARD DEVIATON: 0.059
REL. ST. DEVIATION (%): 20.471

RUN 2:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 0.281
MEDIAN: 0.277
STANDARD DEVIATON: 0.029
REL. ST. DEVIATION (%): 10.143

RESULTS IN DECREASING ORDER:

18	0.586 UNUSED	34	0.277
31	0.390	36	0.275
40	0.351	3	0.272
20	0.319	7	0.272
35	0.305	11	0.270
22	0.304	23	0.269
19	0.292	33	0.268
30	0.290	9	0.266
32	0.290	5	0.264
37	0.290	16	0.262
14	0.285	24	0.261
6	0.280	8	0.260
27	0.280	17	0.260
15	0.278	38	0.260
39	0.278	10	0.257
13	0.277	21	0.254
26	0.277	4	0.240

"UNUSED": DATA UNUSED IN RUN 2

POTASSIUM
SAMPLE NO.: 3
THEORETICAL VALUE 0.102
UNIT: UG K/ML

RUN 1:
NUMBER OF LABORATORIES: 34
ARITHMETIC MEAN VALUE: 0.106
MEDIAN: 0.101
STANDARD DEVIATON: 0.034
REL. ST. DEVIATION (%): 32.406

RUN 2:
NUMBER OF LABORATORIES: 31
ARITHMETIC MEAN VALUE: 0.104
MEDIAN: 0.100
STANDARD DEVIATON: 0.022
REL. ST. DEVIATION (%): 21.513

RESULTS IN DECREASING ORDER:

40	0.196 UNUSED	24	0.100
18	0.187 UNUSED	32	0.100
20	0.171	33	0.100
31	0.168	38	0.100
22	0.143	36	0.097
35	0.123	5	0.096
19	0.111	21	0.096
30	0.110	9	0.094
37	0.110	7	0.093
16	0.106	23	0.091
26	0.105	6	0.090
13	0.104	17	0.084
15	0.103	4	0.080
27	0.103	8	0.080
34	0.103	10	0.075
39	0.103	14	0.071
3	0.102	11	0.010 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

POTASSIUM
SAMPLE NO.: 4
THEORETICAL VALUE 0.331
UNIT: UG K/ML

RUN 1:
NUMBER OF LABORATORIES: 34
ARITHMETIC MEAN VALUE: 0.328
MEDIAN: 0.321
STANDARD DEVIATON: 0.089
REL. ST. DEVIATION (%): 27.071

RUN 2:
NUMBER OF LABORATORIES: 32
ARITHMETIC MEAN VALUE: 0.326
MEDIAN: 0.321
STANDARD DEVIATON: 0.040
REL. ST. DEVIATION (%): 12.113

RESULTS IN DECREASING ORDER:

18	0.681 UNUSED	34	0.321
40	0.495	6	0.320
31	0.377	33	0.318
20	0.371	5	0.317
35	0.356	17	0.316
19	0.343	3	0.312
36	0.343	4	0.310
30	0.340	32	0.310
37	0.340	16	0.305
27	0.335	22	0.305
15	0.331	9	0.300
39	0.330	38	0.300
13	0.329	10	0.293
26	0.327	24	0.289
14	0.325	21	0.285
23	0.323	8	0.250
7	0.321	11	0.033 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

Table 28: Analytical results for conductivity in synthetic precipitation samples (G). For explanation, see Table 8.

CONDUCTIVITY
SAMPLE NO.: 1
THEORETICAL VALUE 21.600
UNIT: US/CM

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 21.464
MEDIAN: 21.400
STANDARD DEVIATON: 3.636
REL. ST. DEVIATION (%): 16.942

RUN 2:
NUMBER OF LABORATORIES: 32
ARITHMETIC MEAN VALUE: 20.923
MEDIAN: 21.200
STANDARD DEVIATON: 1.926
REL. ST. DEVIATION (%): 9.204

RESULTS IN DECREASING ORDER:

17	38.750	UNUSED	8	21.000	
23	25.000		13	21.000	
39	24.000		16	21.000	
30	23.130		20	21.000	
3	22.510		34	20.900	
15	22.300		35	20.840	
22	22.200		32	20.800	
24	22.000		9	20.700	
27	21.900		19	20.520	
18	21.870		7	20.100	
21	21.790		11	19.200	
5	21.700		36	18.780	
37	21.700		6	17.600	
14	21.500		40	17.300	
10	21.410		33	16.800	
4	21.400		38	16.200	
31	21.400				

"UNUSED": DATA UNUSED IN RUN 2

CONDUCTIVITY
SAMPLE NO.: 2
THEORETICAL VALUE 53.300
UNIT: US/CM

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 50.204
MEDIAN: 51.900
STANDARD DEVIATON: 6.261
REL. ST. DEVIATION (%): 12.472

RUN 2:
NUMBER OF LABORATORIES: 32
ARITHMETIC MEAN VALUE: 51.054
MEDIAN: 51.950
STANDARD DEVIATON: 3.981
REL. ST. DEVIATION (%): 7.798

RESULTS IN DECREASING ORDER:

17	60.000		8	51.800	
23	58.000		35	51.700	
37	53.300		4	51.500	
20	53.200		19	51.500	
21	53.100		38	51.500	
27	53.100		7	51.300	
16	53.000		31	50.800	
15	52.700		32	50.400	
14	52.600		36	48.850	
34	52.500		9	48.100	
18	52.300		24	48.000	
30	52.140		11	47.100	
3	52.050		6	45.800	
5	52.000		33	41.000	
13	52.000		22	38.500	
39	52.000		40	23.000	UNUSED
10	51.900				

"UNUSED": DATA UNUSED IN RUN 2

CONDUCTIVITY
SAMPLE NO.: 3
THEORETICAL VALUE 26.000
UNIT: US/CM

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 26.501
MEDIAN: 26.000
STANDARD DEVIATON: 3.940
REL. ST. DEVIATION (%): 14.867

RUN 2:
NUMBER OF LABORATORIES: 31
ARITHMETIC MEAN VALUE: 25.638
MEDIAN: 26.000
STANDARD DEVIATON: 1.793
REL. ST. DEVIATION (%): 6.992

RESULTS IN DECREASING ORDER:

40	43.000	UNUSED	37	26.000	
17	36.750	UNUSED	31	25.900	
11	30.800		10	25.860	
23	29.000		32	25.700	
30	26.850		4	25.600	
27	26.800		35	25.590	
14	26.400		6	25.400	
15	26.300		22	25.400	
34	26.300		7	25.300	
3	26.230		19	25.260	
21	26.230		36	24.100	
18	26.160		20	23.900	
5	26.000		9	23.800	
8	26.000		39	23.000	
13	26.000		33	22.200	
16	26.000		38	20.700	
24	26.000				

"UNUSED": DATA UNUSED IN RUN 2

CONDUCTIVITY
SAMPLE NO.: 4
THEORETICAL VALUE 44.200
UNIT: US/CM

RUN 1:
NUMBER OF LABORATORIES: 33
ARITHMETIC MEAN VALUE: 42.339
MEDIAN: 43.000
STANDARD DEVIATON: 3.238
REL. ST. DEVIATION (%): 7.648

RUN 2:
NUMBER OF LABORATORIES: 29
ARITHMETIC MEAN VALUE: 42.817
MEDIAN: 43.000
STANDARD DEVIATON: 1.689
REL. ST. DEVIATION (%): 3.944

RESULTS IN DECREASING ORDER:

17	51.000	UNUSED	39	43.000	
23	48.000		34	42.700	
21	44.310		7	42.600	
27	44.300		31	42.600	
3	44.100		38	42.500	
10	44.100		32	42.300	
14	43.900		24	42.000	
15	43.900		30	41.260	
37	43.600		11	41.100	
8	43.500		9	40.500	
18	43.400		36	40.000	
35	43.400		6	39.900	
5	43.300		40	39.300	
19	43.120		20	35.800	UNUSED
4	43.000		22	35.700	UNUSED
13	43.000		33	33.000	UNUSED
16	43.000				

"UNUSED": DATA UNUSED IN RUN 2

Table 29: Ratio of the measured to the calculated conductivity in synthetic precipitation samples (G).

Lab. No.	Measured value / Calculated value				Remark
	Sample No.				
	G1	G2	G3	G4	
3	1.10	1.04	1.07	1.05	
4	1.08	1.05	1.03	1.07	
5	1.00	0.99	1.00	0.99	
6	0.79	0.84	1.01	0.89	Titrated H^+ used
7	0.96	1.00	1.01	1.00	
8	1.10	1.10	1.05	1.10	
9	0.95	0.91	0.90	0.94	
10	1.11	1.13	1.07	1.14	
11	0.98	1.04	1.30	0.99	Missing Na
13	1.14	0.90	0.90	0.82	
14	1.00	1.00	1.00	1.02	Titrated H^+ used
15	1.06	1.07	1.05	1.07	
16	0.98	1.04	1.00	1.00	
17	1.85	1.20	1.52	1.22	
18	-	-	-	-	Missing NO_3, Na and Ca
19	1.12	1.14	1.07	1.14	
20	0.96	0.99	0.90	0.80	
21	0.99	0.98	0.98	0.99	
22	1.20	0.79	1.02	0.90	
23	1.17	1.19	1.12	1.19	
24	1.15	0.93	1.04	1.09	
26	-	-	-	-	Missing conductivity
27	1.08	1.08	1.07	1.10	
30	1.12	1.10	1.06	1.02	
31	0.99	0.96	0.94	0.96	
32	1.07	1.01	0.99	1.00	Missing Mg
33	0.82	0.84	0.86	0.83	
34	0.85	0.83	0.84	0.77	
35	1.03	1.04	0.94	0.96	
36	1.02	0.98	0.97	1.03	
37	1.14	1.12	1.06	1.09	
38	0.76	1.00	0.78	1.03	
39	1.21	1.01	1.15	1.03	
40	-	-	-	-	Missing SO4 and Cl

Table 30: Ratio of equivalent concentration of anions to the equivalent concentration of cations measured in synthetic precipitation samples (G).

Lab. No.	Anions / Cations				Remark
	Sample No.				
	G1	G2	G3	G4	
3	1.07	1.06	1.02	1.06	
4	1.07	1.08	1.05	1.09	
5	1.00	1.00	0.99	1.01	
6	0.97	0.99	1.03	0.98	Titrated H+ used
7	1.01	1.07	1.00	1.11	
8	1.06	1.09	1.02	1.12	
9	1.27	1.17	1.10	1.23	
10	1.06	1.04	1.01	1.08	
11	1.17	1.28	1.41	1.32	Missing Na
13	1.07	0.94	0.91	0.86	
14	0.99	1.00	0.97	1.02	Titrated H+ used
15	1.01	1.01	0.99	1.00	
16	1.00	0.99	0.99	0.99	
17	1.01	1.05	1.00	1.01	
18	-	-	-	-	Missing NO_3, Na and Ca
19	1.21	1.03	1.05	1.10	
20	0.89	1.04	0.93	1.04	
21	0.98	1.02	0.97	1.03	
22	0.98	1.09	1.06	1.10	
23	0.99	1.10	0.94	1.12	
24	1.05	1.08	1.11	1.24	
26	1.08	1.01	0.98	0.99	
27	1.05	1.10	1.06	1.09	
30	0.96	1.06	0.95	1.06	
31	0.97	0.98	0.93	0.97	
32	1.24	1.18	1.16	1.22	Missing Mg
33	1.37	1.12	1.23	1.06	
34	0.92	0.90	0.91	0.84	
35	1.10	1.15	1.26	1.47	
36	1.06	1.04	0.97	1.06	
37	1.23	1.09	1.06	1.13	
38	1.03	1.10	1.05	1.14	
39	1.09	1.01	1.10	1.09	
40	-	-	-	-	Missing Na, K, Mg and Ca

Table 31: The ratio of the median of the reported values to the expected theoretical values for all parameters and samples. The number of reported values are given in parenthesis.

Parameter	Sample No.	Median / Expected
SO_2 in abs. solution	1	1.08 (7)
	2	1.01 (7)
	3	1.04 (7)
	4	1.04 (7)
	5	1.02 (7)
	6	1.01 (7)
SO_2 on imp. filter	1	0.99 (16)
	3	0.99 (16)
	4	0.93 (16)
	5	0.98 (16)
	6	0.99 (16)
	7	0.96 (16)
	8	0.94 (16)
	9	0.97 (16)
NO_2 in abs. solutions	1	0.99 (21)
	2	0.96 (21)
	3	0.99 (21)
	4	0.99 (21)
SO_4 on filters low (synthetic)	1	0.99 (7)
	2	1.00 (7)
	3	1.02 (7)
	4	1.00 (7)
SO_4 on filters high (synthetic)	1	1.00 (18)
	2	0.98 (18)
	3	1.01 (18)
	4	0.99 (18)
SO_4 in precipitation	1	1.00 (33)
	2	1.01 (33)
	3	1.01 (33)
	4	1.01 (33)
NO_3 in precipitation	1	0.99 (33)
	2	1.00 (33)
	3	1.00 (33)
	4	1.00 (33)
NH_4 in precipitation	1	1.00 (34)
	2	1.01 (34)
	3	1.00 (34)
	4	1.01 (34)
pH in prec. (calc. from H^+)	1	0.86 (34)
	2	0.90 (34)
	3	0.90 (34)
	4	0.91 (34)
H^+ in prec. (titrated)	1	1.04 (2)
	2	1.00 (2)
	3	0.99 (2)
	4	1.00 (2)

Table 31 (contd.)

Parameter	Sample No.	Median
		Expected
Cl in precipitation	1	0.96 (33)
	2	0.97 (33)
	3	0.97 (33)
	4	0.97 (33)
Na in precipitation	1	0.99 (32)
	2	1.00 (32)
	3	1.00 (32)
	4	1.00 (32)
Mg in precipitation	1	0.99 (33)
	2	1.01 (33)
	3	1.00 (33)
	4	1.00 (33)
Ca in precipitation	1	1.02 (33)
	2	1.04 (33)
	3	1.02 (33)
	4	1.01 (33)
K in precipitation	1	0.98 (34)
	2	0.99 (34)
	3	0.99 (34)
	4	0.97 (34)
Cond. in precipitation	1	0.99 (33)
	2	0.97 (33)
	3	1.00 (33)
	4	0.97 (33)

Appendix 2

Figures

Figures 1-16: The figures show the relative error for the reported results for the samples of SO_2 in absorbing solution, synthetic samples of SO_2 in KOH-impregnated filters, NO_2 in absorbing solution, synthetic samples of sulphate on filters, and precipitation samples.

The reported values are plotted in a ranked order from the largest negative error to the largest positive error.

Figure 17: Reported values (corrected for blank) for SO_2 in impregnated filters plotted against the expected values. The linear regression lines and R^2-values are also shown.

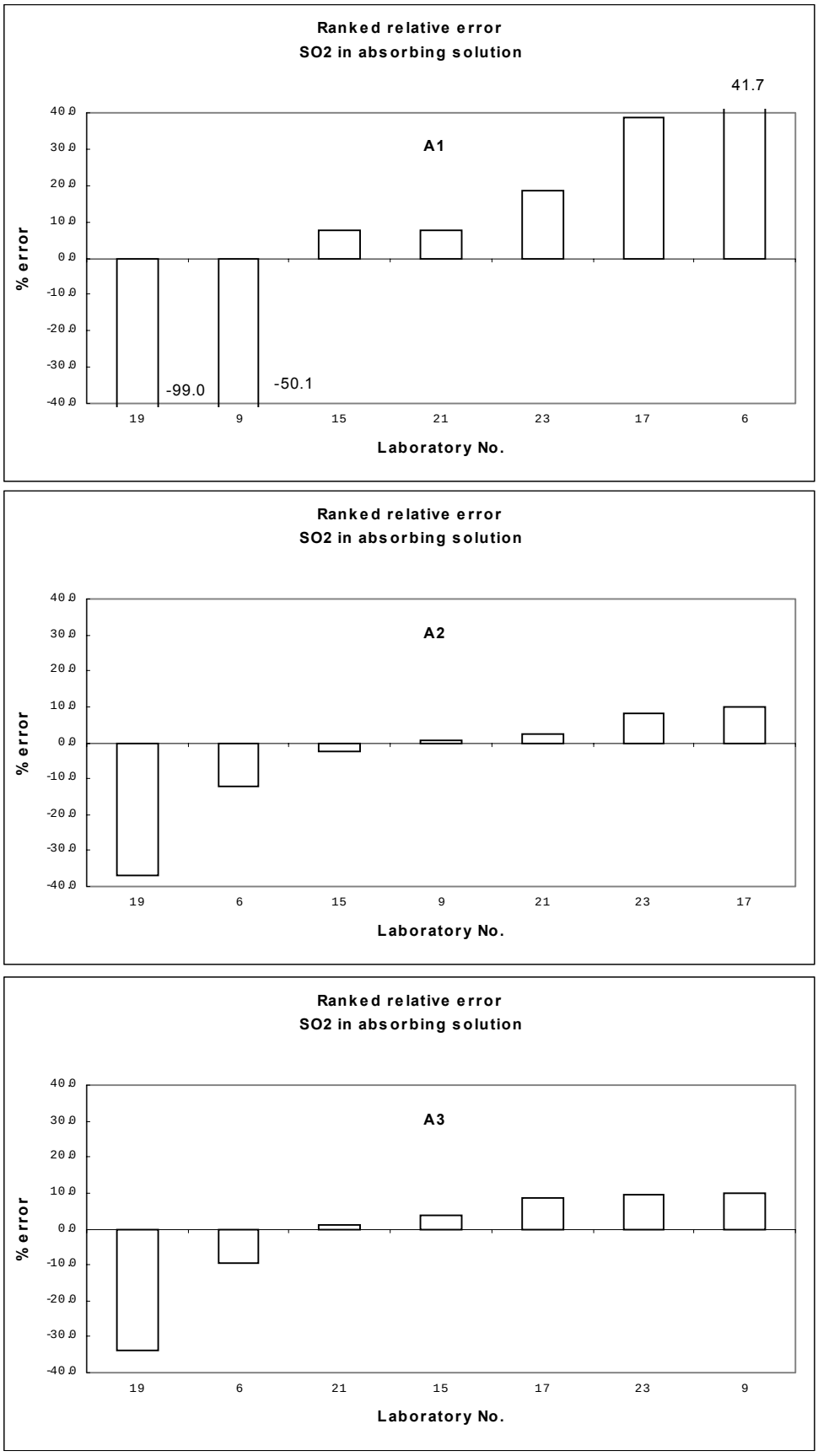
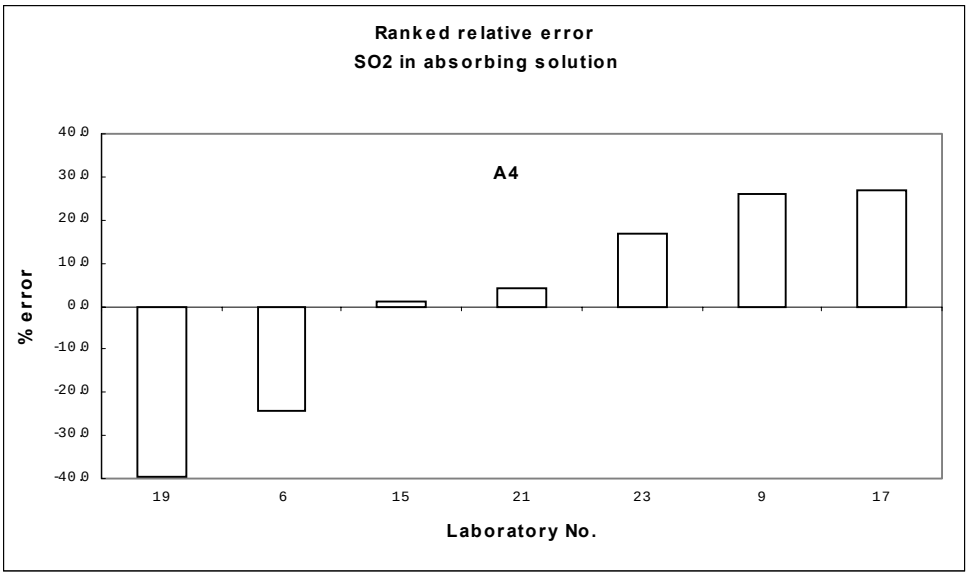
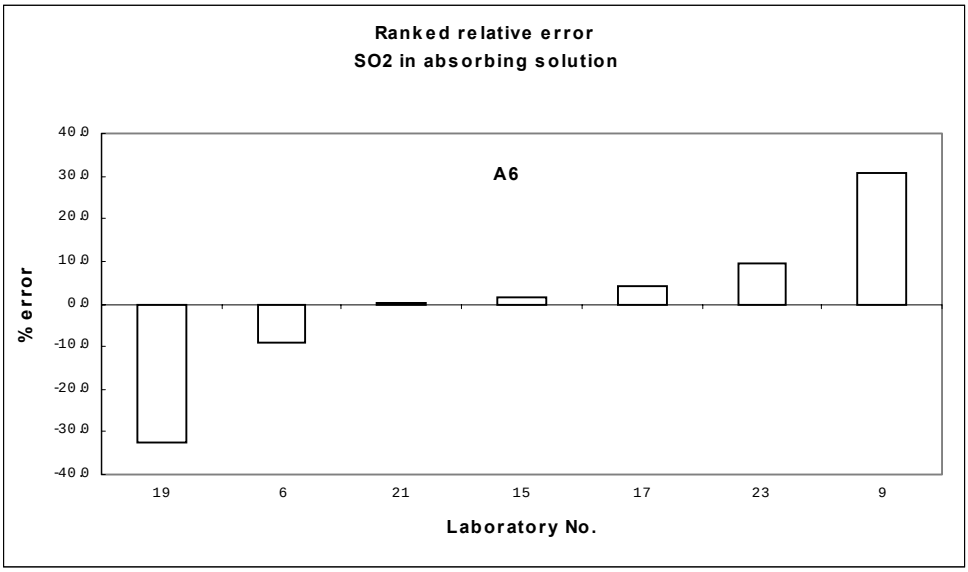

Ranked relative error
SO2 in absorbing solution
A1
41.7
-99.0
-50.1
% error
40.0
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
19
9
15
21
23
17
6
Laboratory No.
Ranked relative error
SO2 in absorbing solution
A2
% error
19
6
15
9
21
23
17
Laboratory No.
Ranked relative error
SO2 in absorbing solution
A3
% error
19
6
21
15
17
23
9
Laboratory No.

Figure 1.





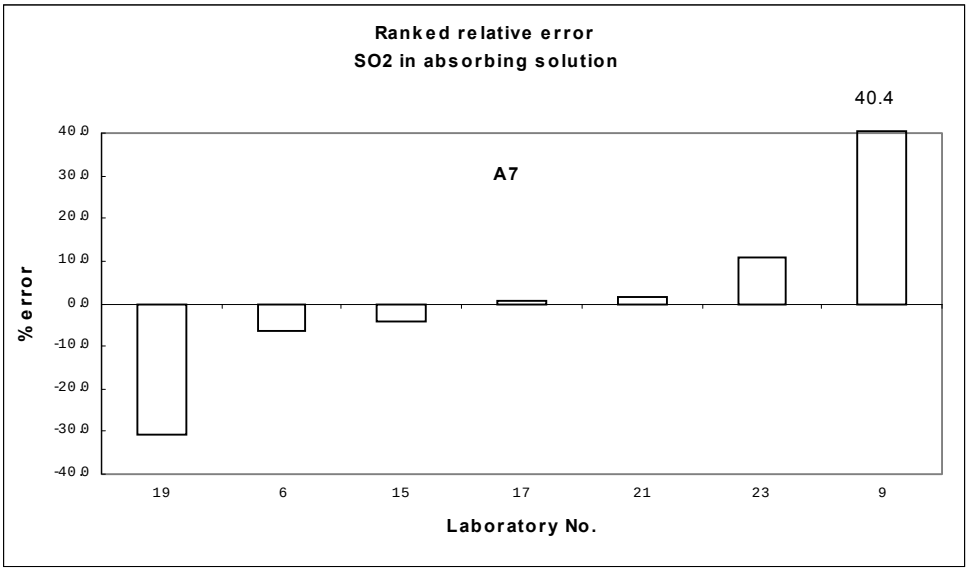


Figure 1, cont.

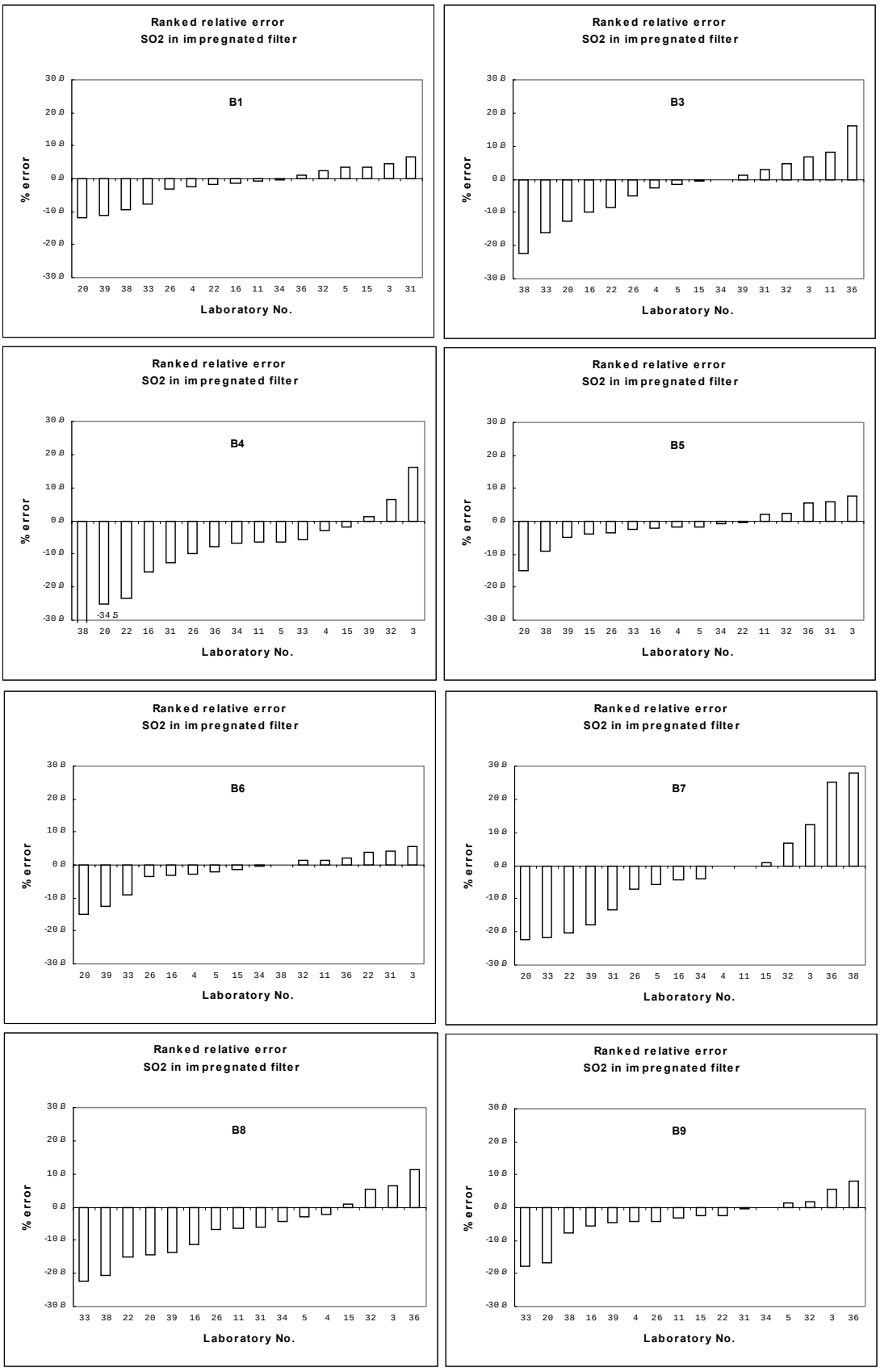

Ranked relative error
SO2 in impregnated filter
B1
% error
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
20 39 38 33 26 4 22 16 11 34 36 32 5 15 3 31
Laboratory No.
Ranked relative error
SO2 in impregnated filter
B3
% error
38 33 20 16 22 26 4 5 15 34 39 31 32 3 11 36
Laboratory No.
Ranked relative error
SO2 in impregnated filter
B4
% error
-34.5
38 20 22 16 31 26 36 34 11 5 33 4 15 39 32 3
Laboratory No.
Ranked relative error
SO2 in impregnated filter
B5
% error
20 38 39 15 26 33 16 4 5 34 22 11 32 36 31 3
Laboratory No.
Ranked relative error
SO2 in impregnated filter
B6
% error
20 39 33 26 16 4 5 15 34 38 32 11 36 22 31 3
Laboratory No.
Ranked relative error
SO2 in impregnated filter
B7
% error
20 33 22 39 31 26 5 16 34 4 11 15 32 3 36 38
Laboratory No.
Ranked relative error
SO2 in impregnated filter
B8
% error
33 38 22 20 39 16 26 11 31 34 5 4 15 32 3 36
Laboratory No.
Ranked relative error
SO2 in impregnated filter
B9
% error
33 20 38 16 39 4 26 11 15 22 31 34 5 32 3 36
Laboratory No.

Figure 2.

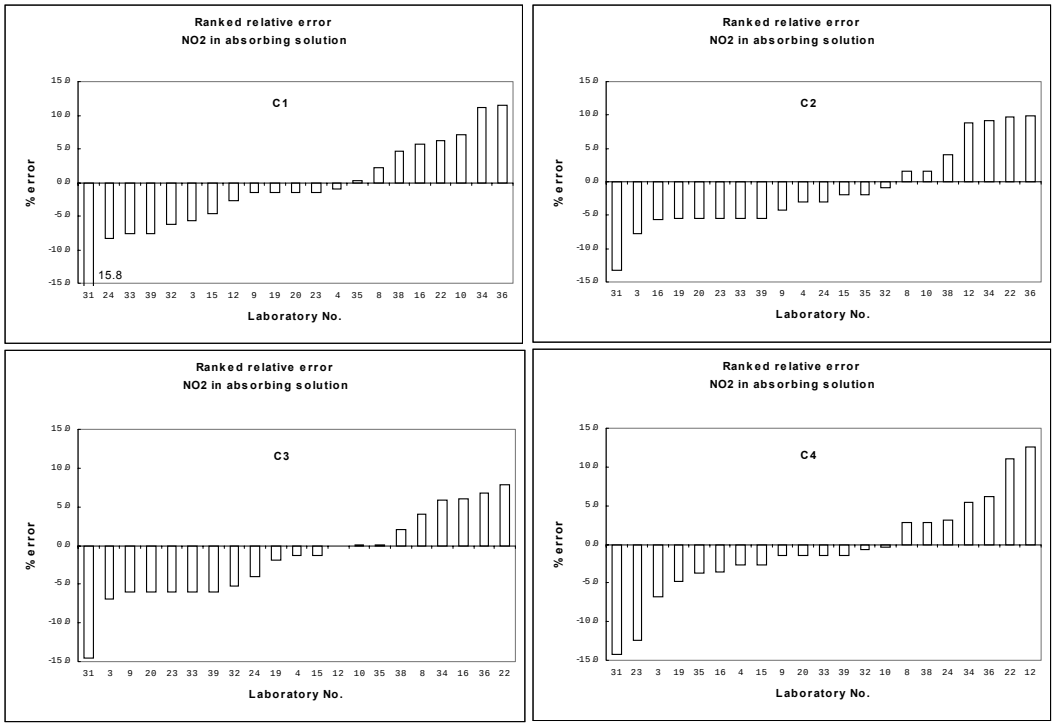


Figure 3.

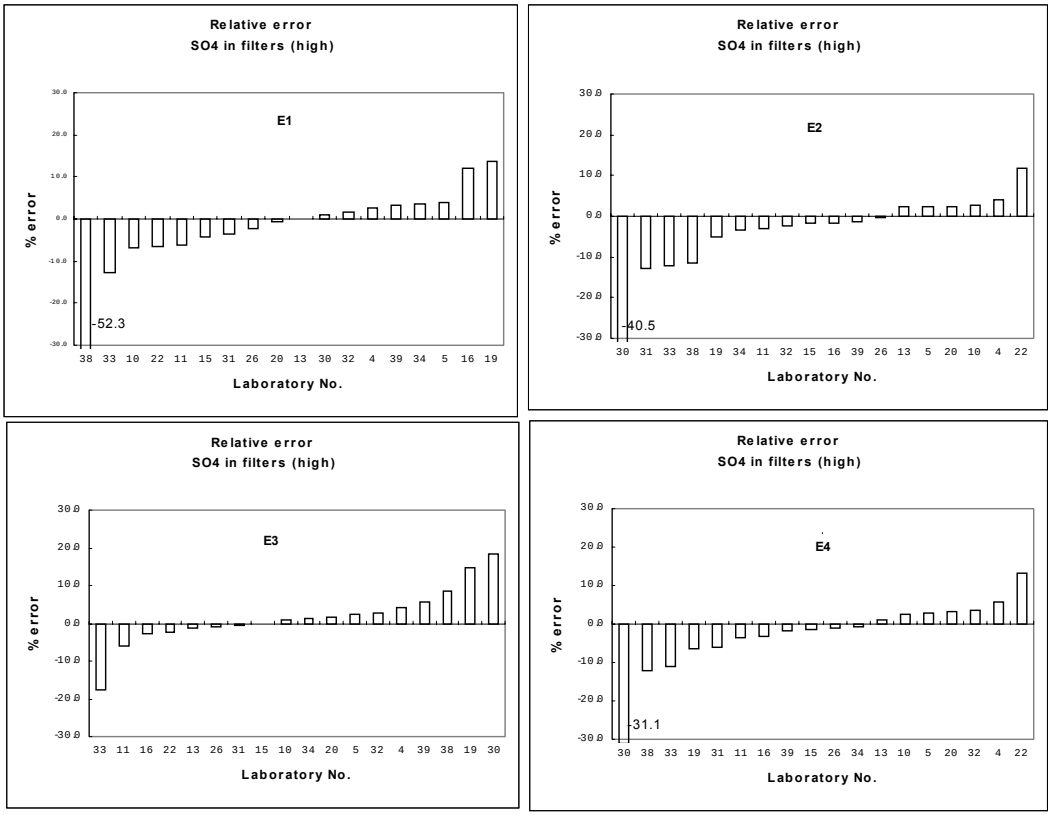


Figure 4.

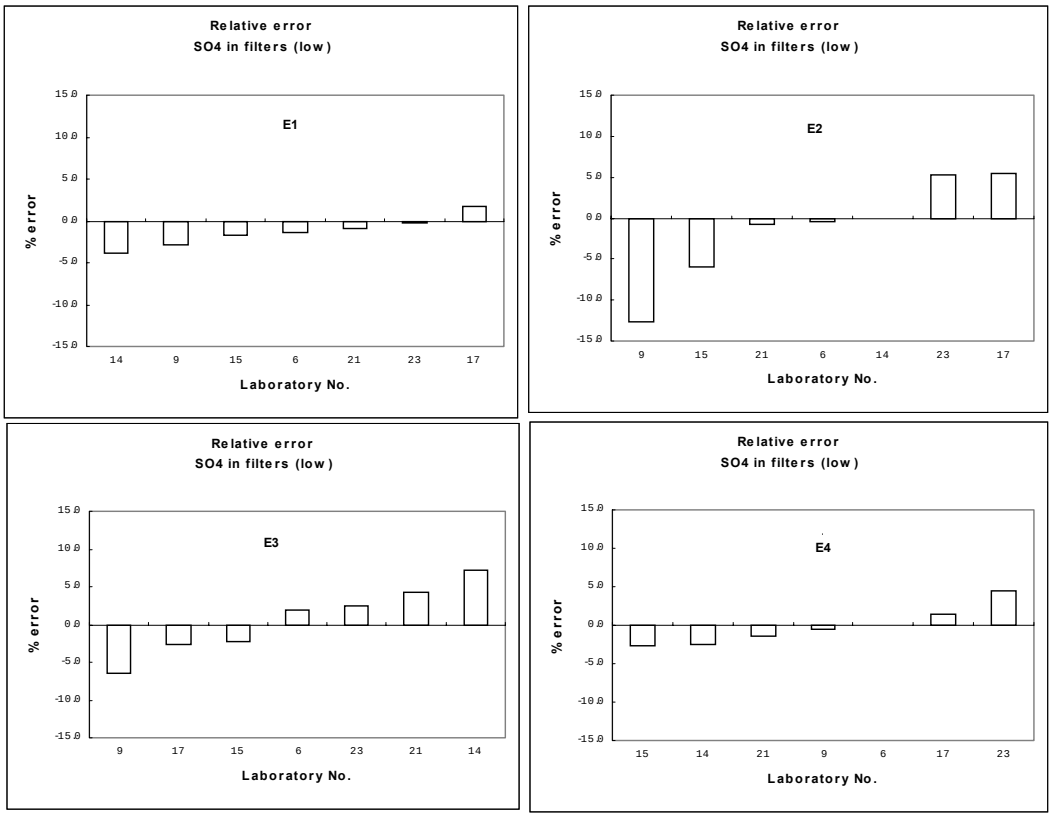


Figure 5.

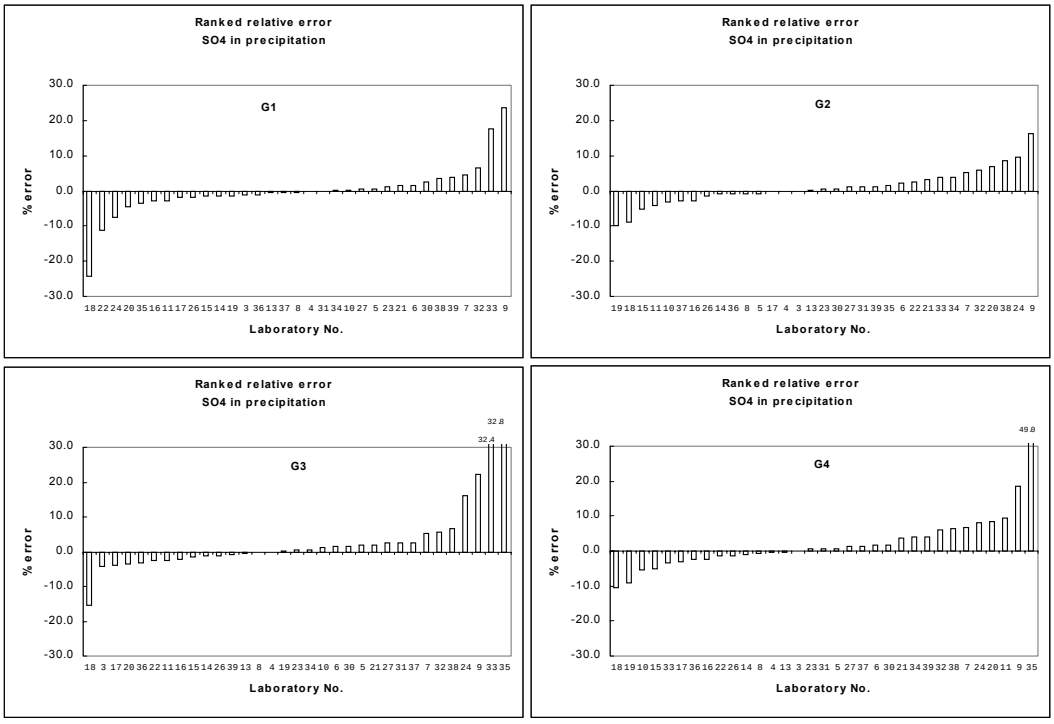


Figure 6.

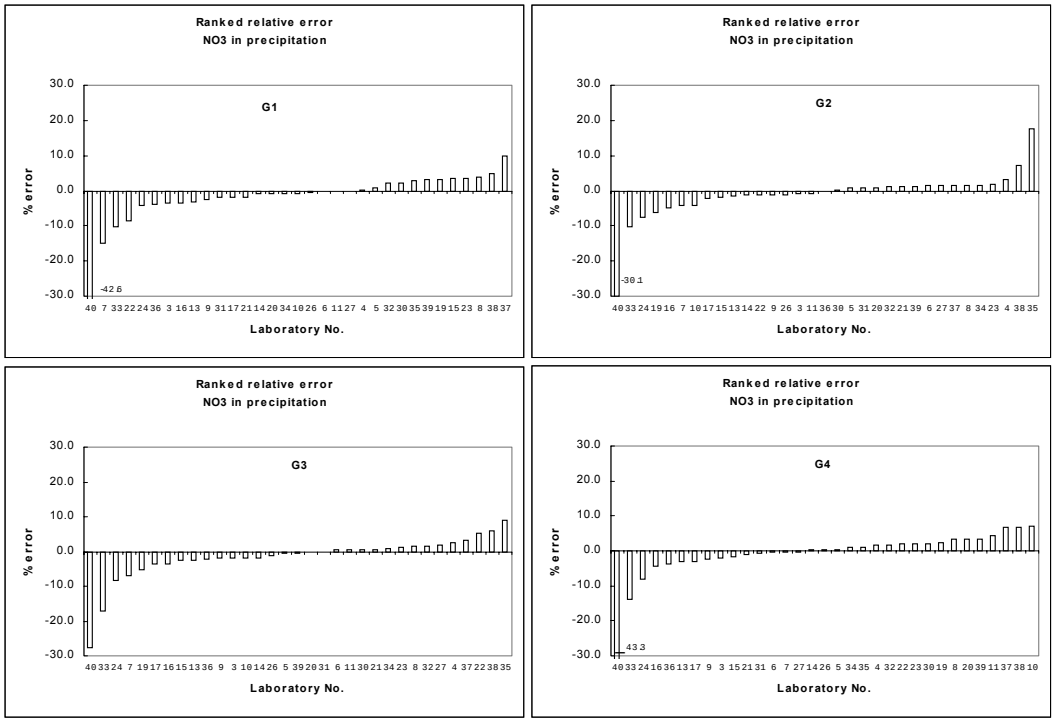


Figure 7.

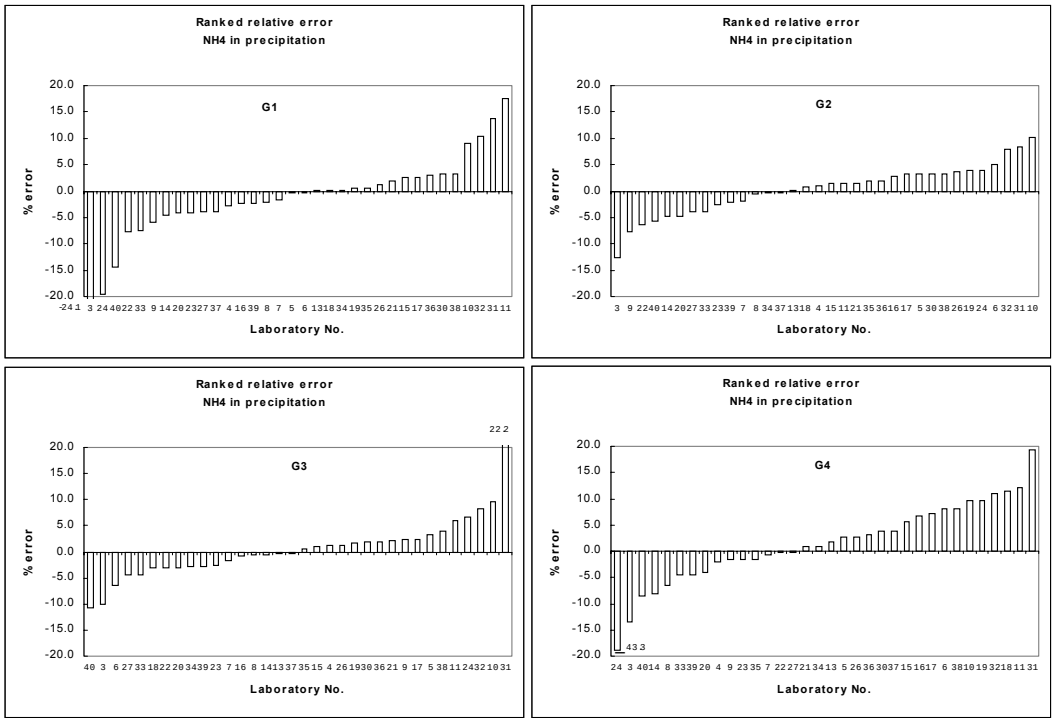


Figure 8.

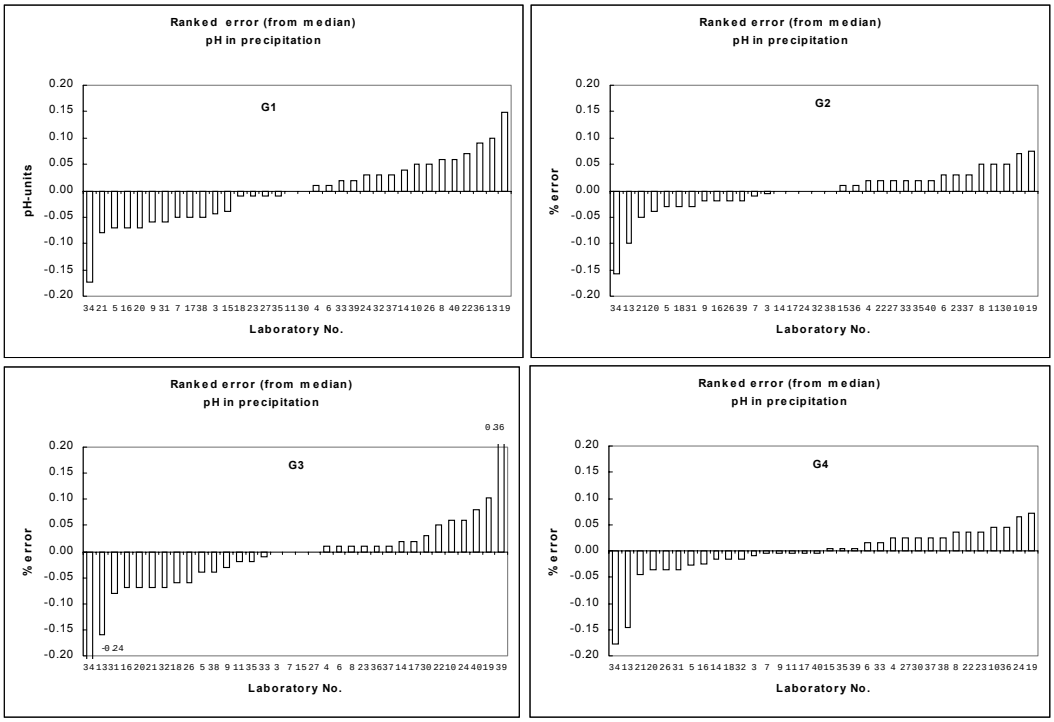


Figure 9.

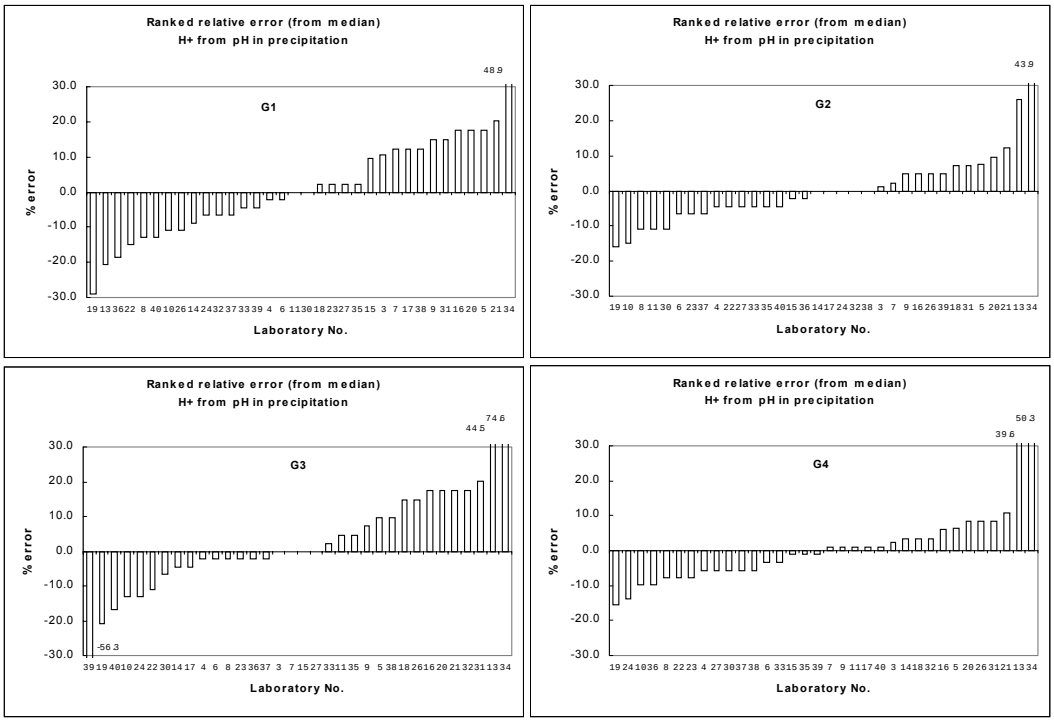


Figure 10.

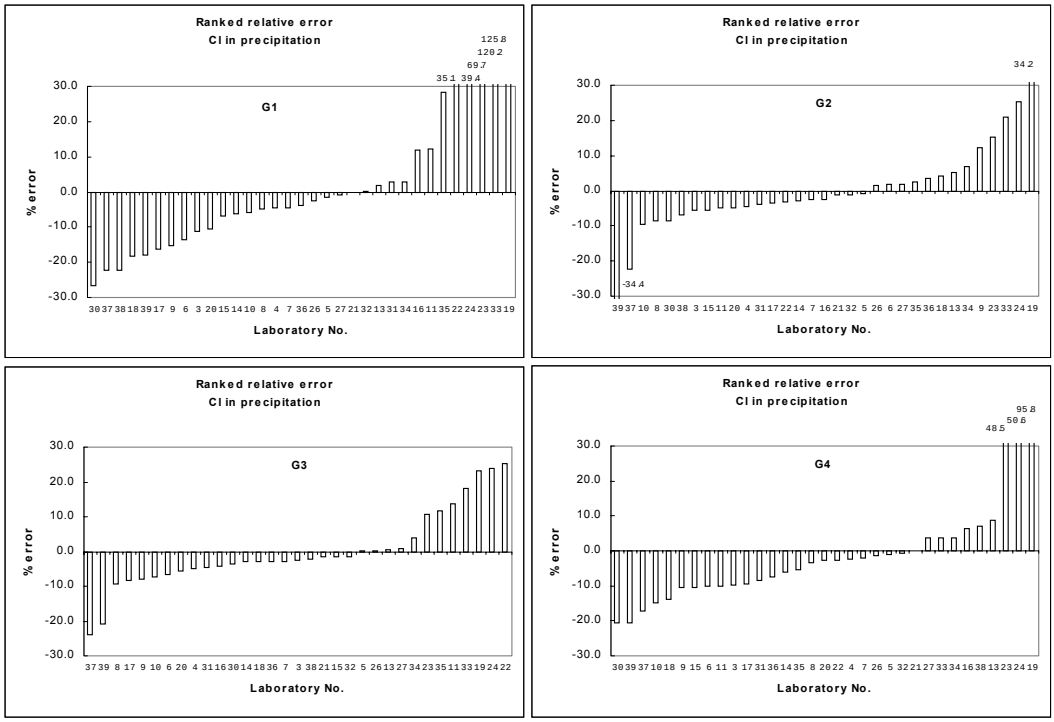


Figure 11.

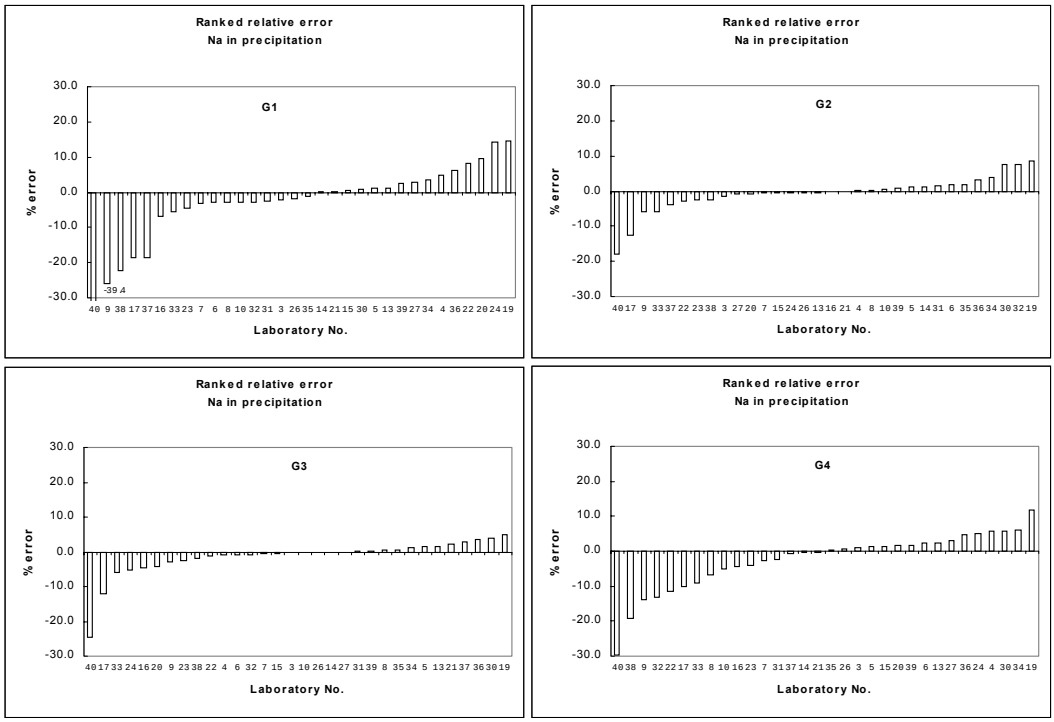


Figure 12.

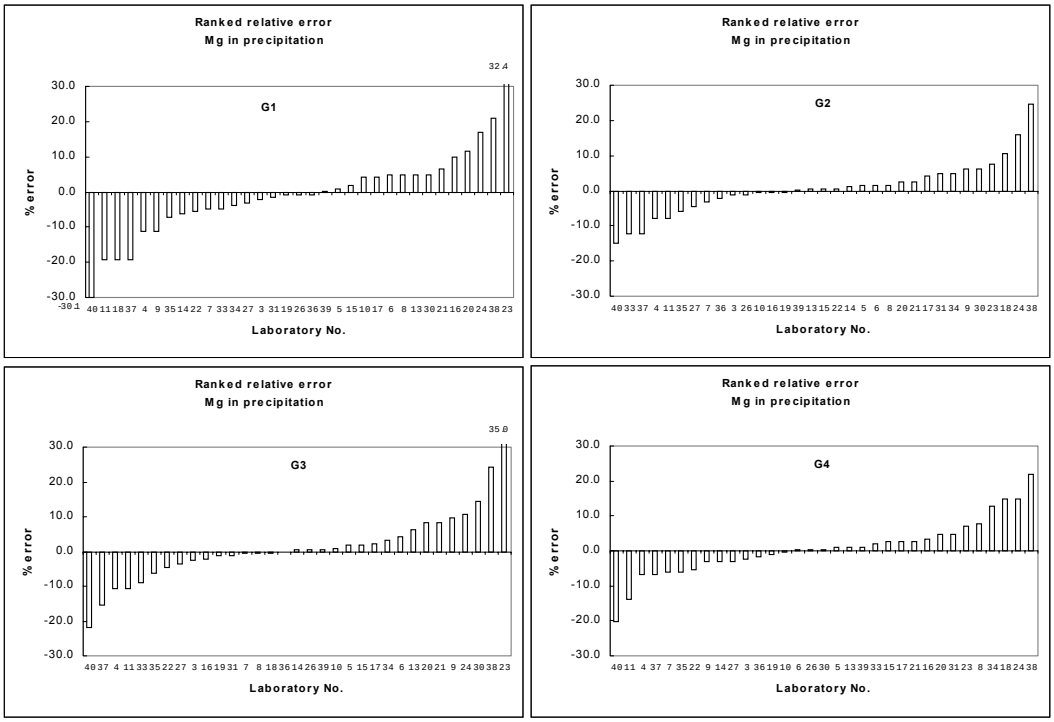


Figure 13.

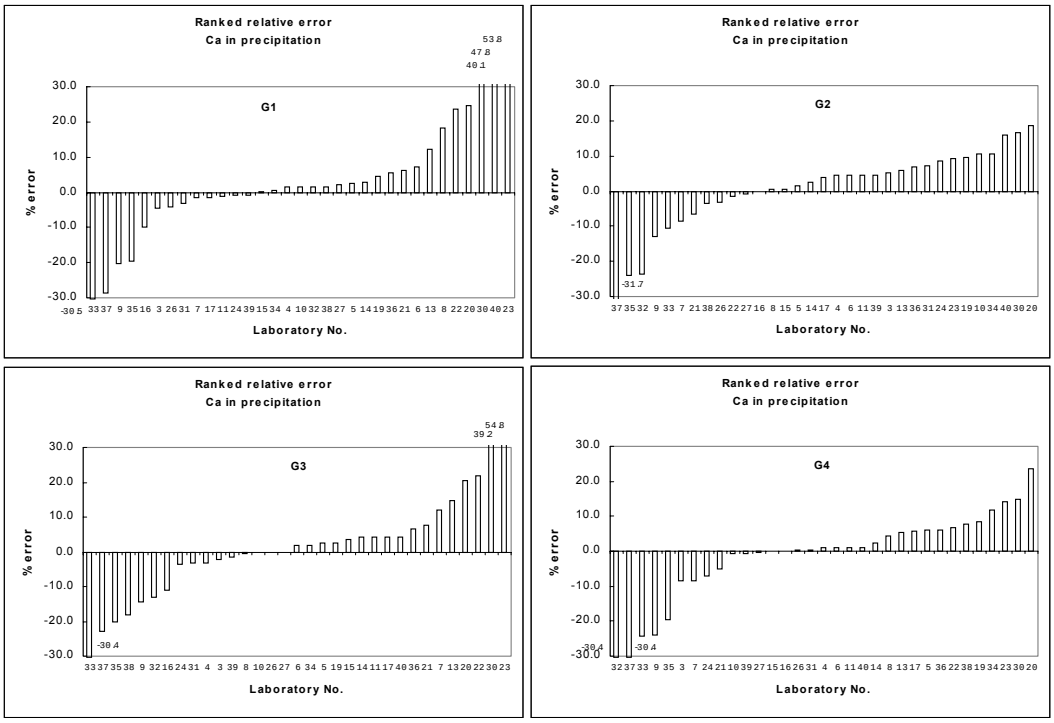


Figure 14.

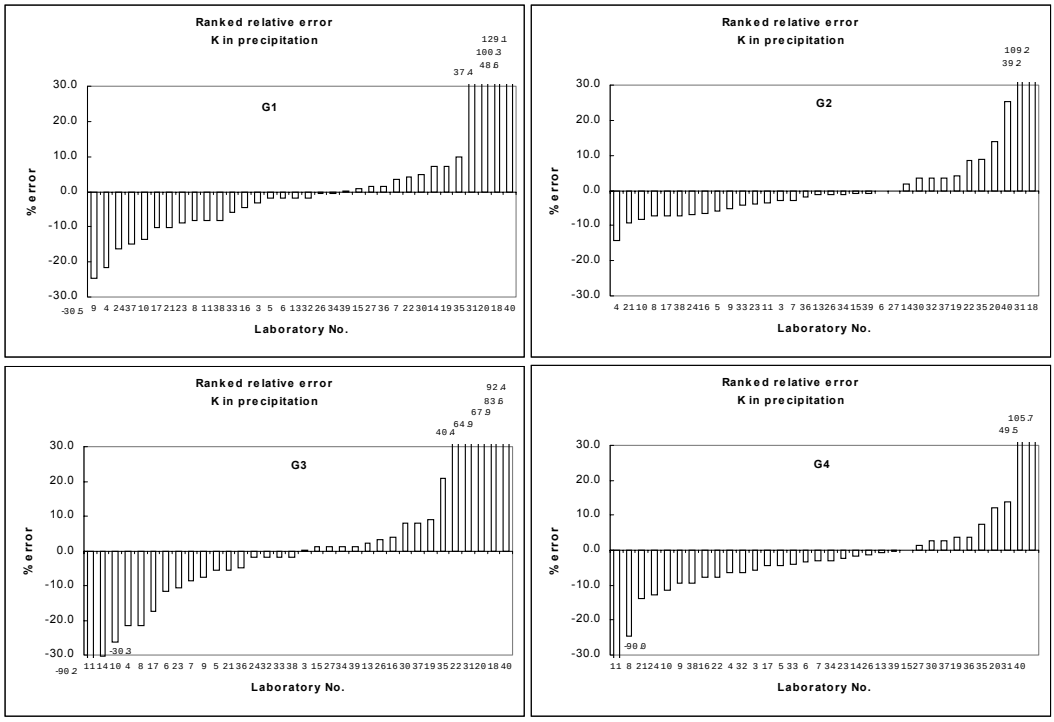


Figure 15.

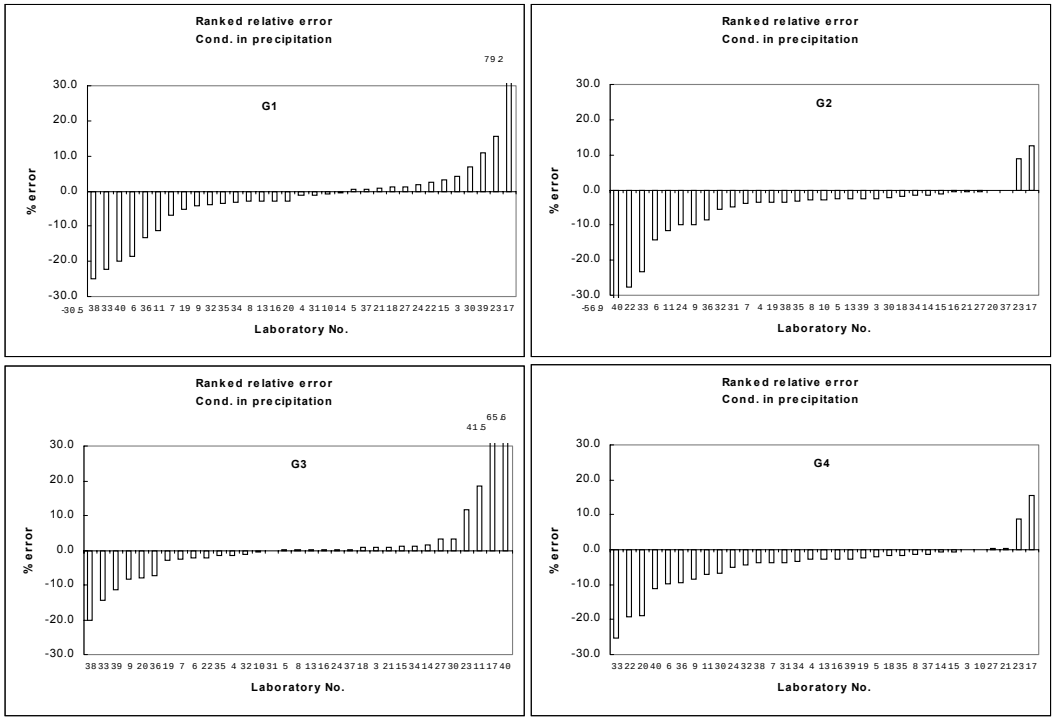


Figure 16.

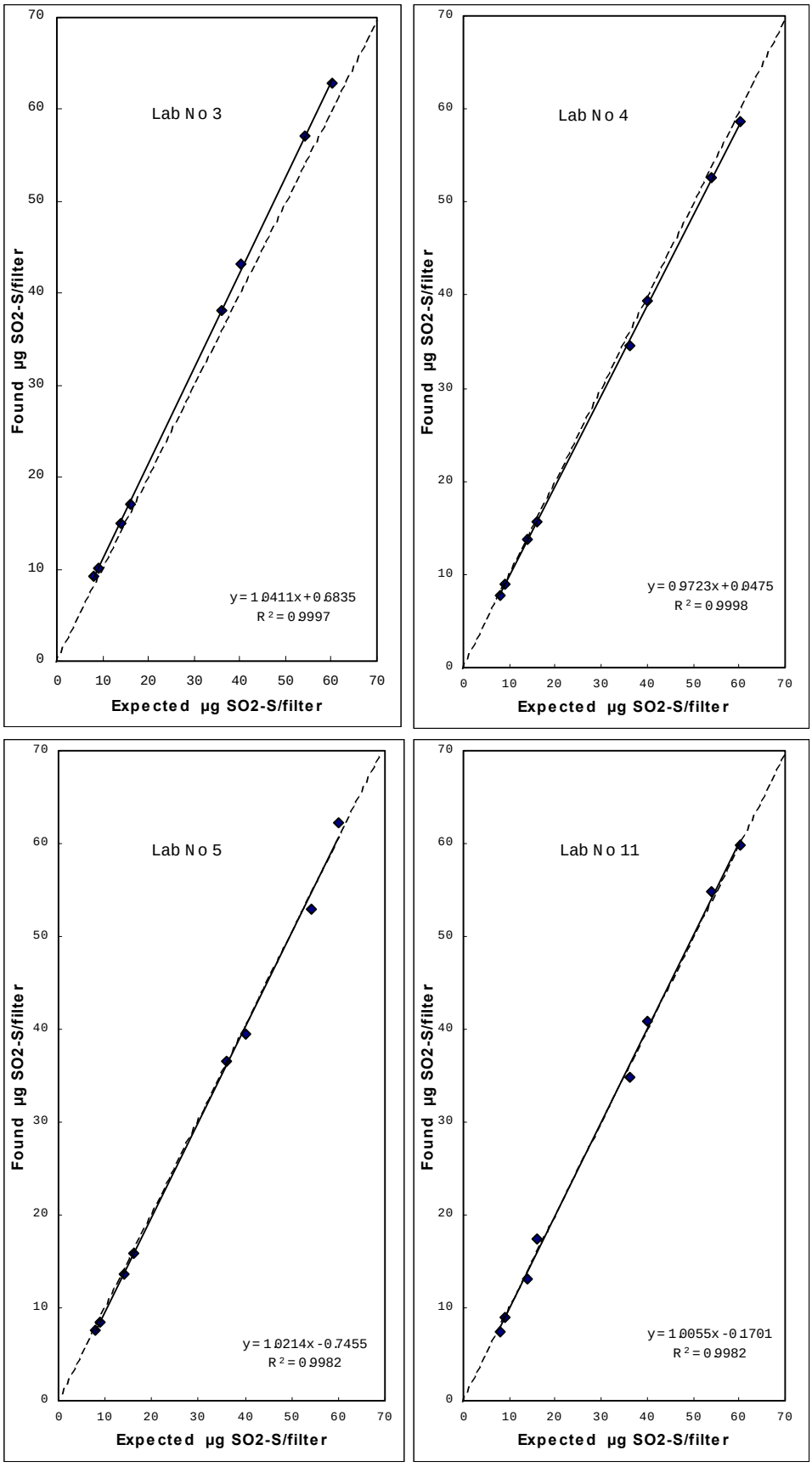

Lab No 3
y = 1.0411x + 0.6835
R² = 0.9997
Found µg SO2-S/filter
Expected µg SO2-S/filter
Lab No 4
y = 0.9723x + 0.0475
R² = 0.9998
Found µg SO2-S/filter
Expected µg SO2-S/filter
Lab No 5
y = 1.0214x - 0.7455
R² = 0.9982
Found µg SO2-S/filter
Expected µg SO2-S/filter
Lab No 11
y = 1.0055x - 0.1701
R² = 0.9982
Found µg SO2-S/filter
Expected µg SO2-S/filter

Figure 17.

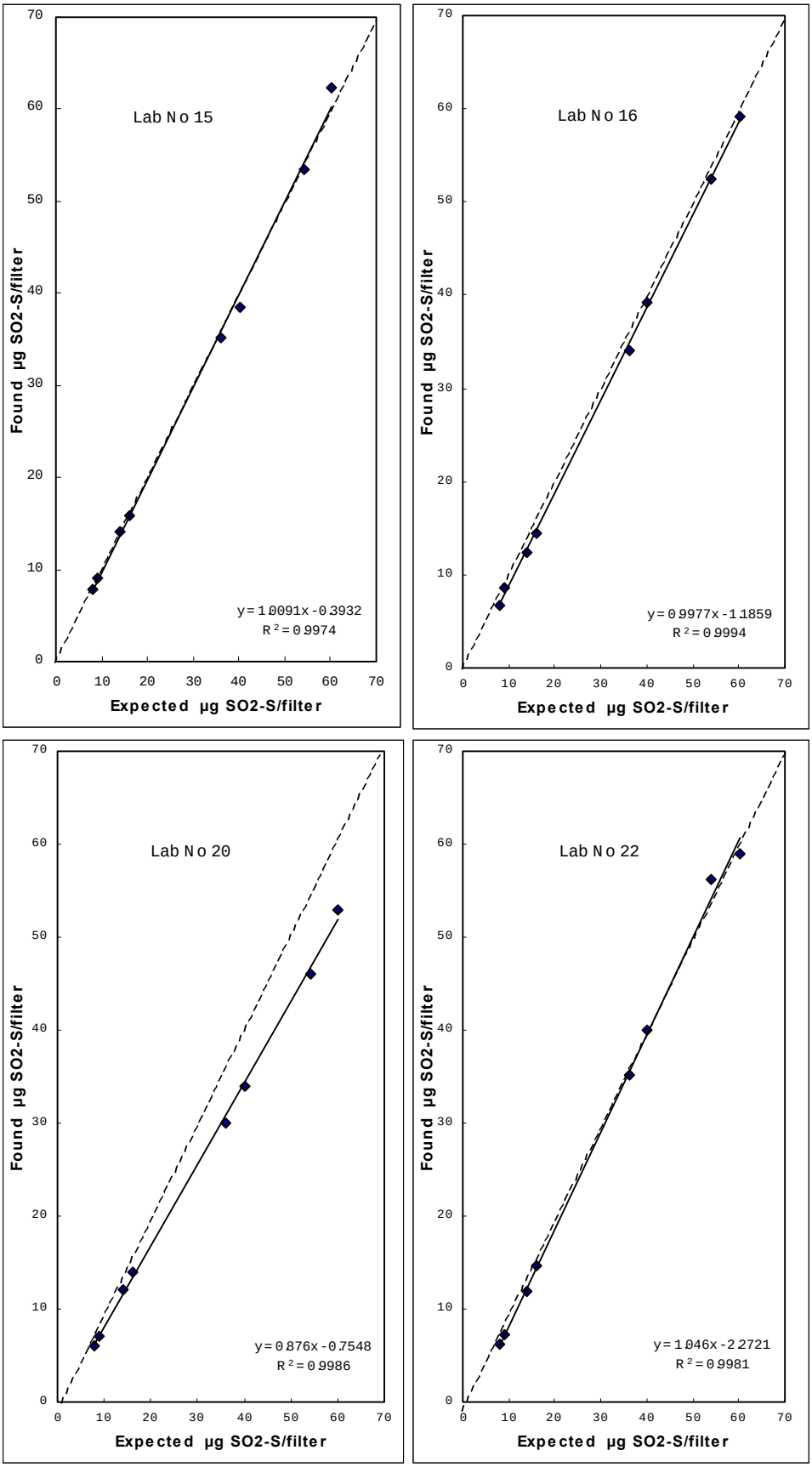


Figure 17, cont.

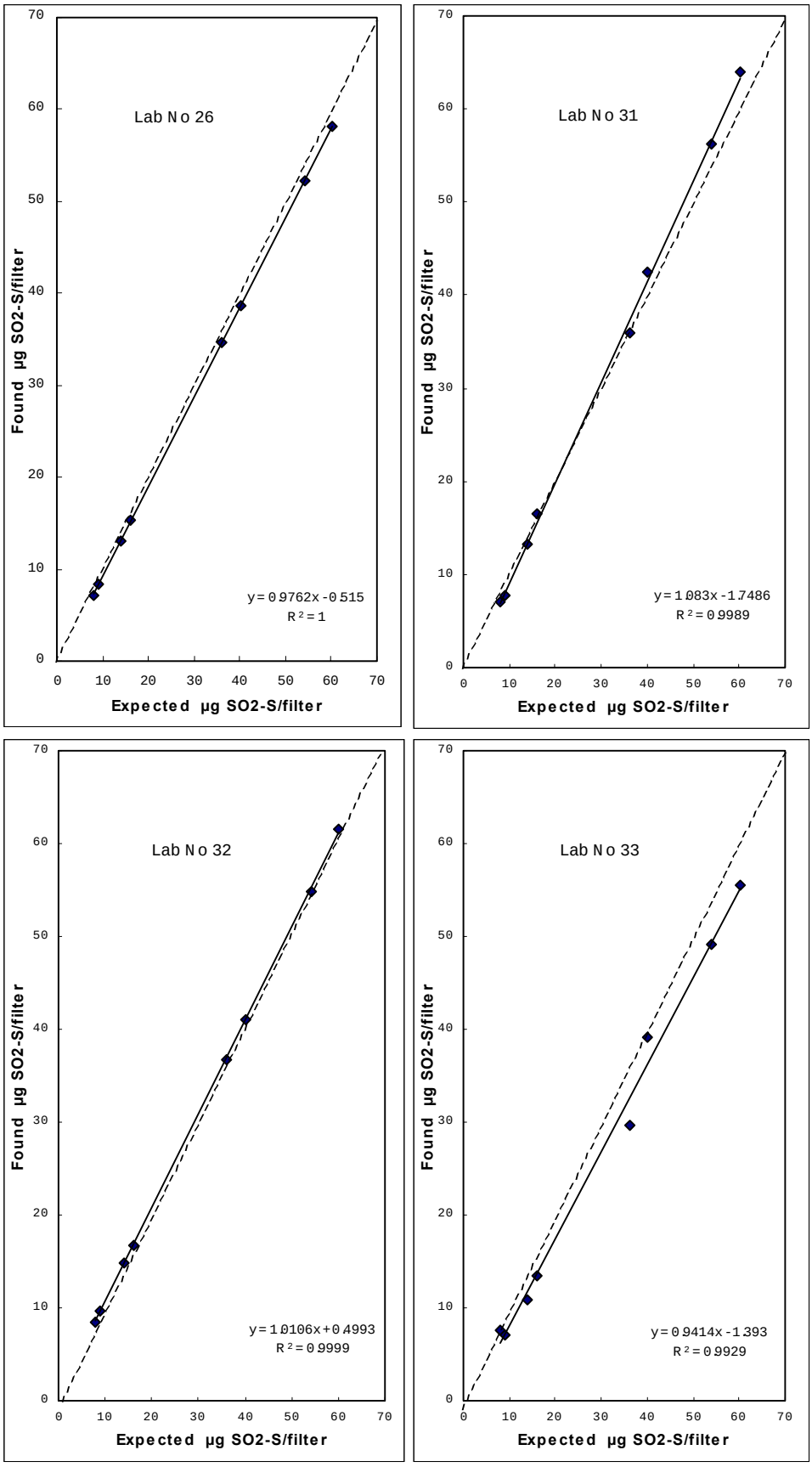


Figure 17, cont.

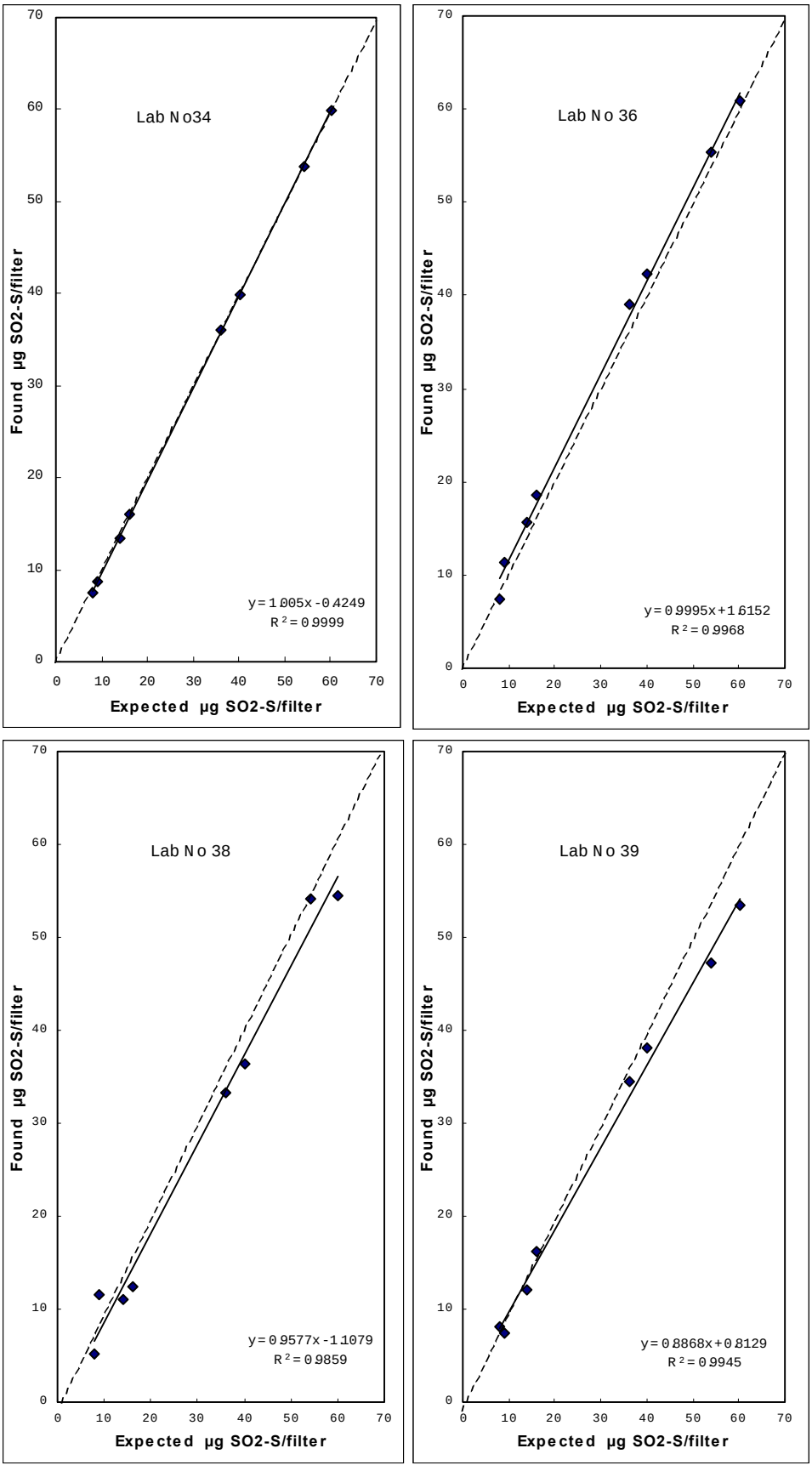


Figure 17, cont.