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

The eighteenth intercomparison of analytical methods within EMEP

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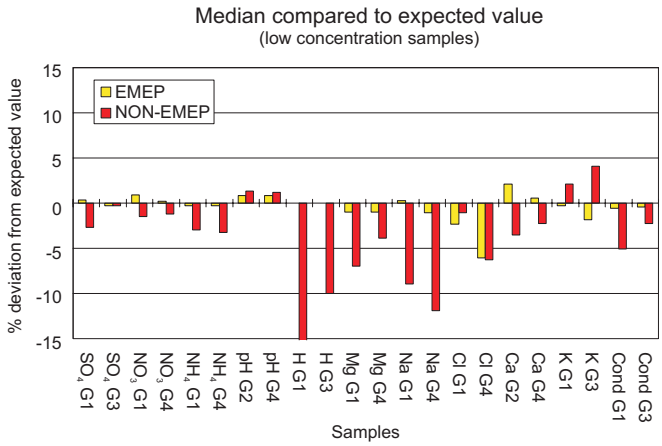

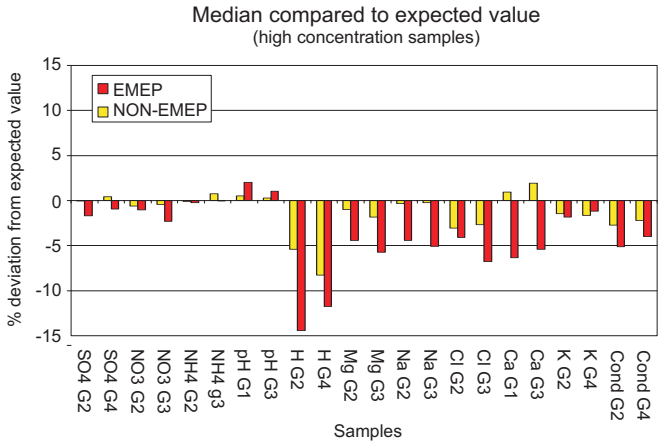

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1. Introduction

32 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).

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

This report gives the results of the eighteenth interlaboratory test.

2. Organisation of the intercomparison

The samples for the eighteenth intercomparison (see Table 1) were prepared and distributed to 65 laboratories in July 2000. In addition to the European participants, two laboratories in North America received samples as a part of the co-operation between EMEP and the North American networks for acid deposition. Also nineteen laboratories within the measurement programme ICP-Forest and four laboratories participating in various other measurement programmes were invited to participate in the eighteenth intercomparison.

Most of the laboratories had returned their results to the CCC within one month after the deadline given as 1 October 2000. A total of 53 laboratories have returned their results. This includes 34 EMEP-laboratories, 15 ICP-Forest laboratories and four other laboratories.

The participating laboratories received the theoretical (expected) values shortly after CCC had received the results. The laboratories were then asked to compare their results with the expected ones, and give corrected values if obvious mistakes e.g. misprints had occurred. A few corrections were reported. In those cases the corrected values are used in this report. More than two month after deadline laboratory 19 reported new results after reanalysing the samples. These new results are not presented in this report. Generally, results from reanalysis of the samples reported after the release of the expected values are not accepted. However, the new results from laboratory 19 are commented in chapter 4.

In accordance with the decision of the Steering Body of EMEP, the results are presented in such a way that the different laboratories are identified. Tables 2a and 2b give the names of the participating laboratories together with the numbers used when presenting the results in tables and figures.

Information received on the analytical methods used is given in Table 17.

3. Treatment of the data

The data reported from the participants are presented in Tables 3–16 and in Figures 1–11.

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

Bar-plots are used for the graphical presentation of the data. Figures 1–10 are showing the relative deviation from expected value for the different laboratories. There is one plot for each single sample.

Figure 11 is showing medians compared to expected value for the results reported by EMEP-laboratories and the other participating laboratories, respectively.

4. Results

Four precipitation samples were distributed and 2026 single results from 52 laboratories were reported. 33 of the reporting laboratories are within EMEP. Most of these laboratories now perform the full precipitation programme in EMEP.

4.1 Sulphate

The results from the determination of sulphate are given in Table 3 and in Figure 1. Laboratory 7 reports two outliers, laboratory 108 reports three outliers, laboratory 18 reports four outliers, laboratories 107, 122 and 39 report one outlier each. The relative standard deviation is in the region of (4.8–10.7)% when outliers are excluded.

Four laboratories report results deviating between 10–20% from expected value and seven laboratories report values that deviate more than 20% from expected value. Out of the nine laboratories that report result more than 10% away from the expected value, six laboratories use other techniques than ion chromatography.

New, improved results are reported by laboratory 19. The new values deviates from expected value by abs (1.4–2.7)%.

4.2 Nitrate

In Table 4 and Figure 2, the results from the determination of nitrate are shown. Laboratories 37, 39 and 114 report one outlier, laboratories 24 and 40 report two outliers, while laboratories 18 and 119 report three outliers each. The relative standard deviation is (2.9–5.2)% when outliers are excluded.

Seven laboratories report results deviating more than 10% from the expected value, while five laboratories report values more than 20% away from expected value. Out of eight laboratories reporting result more than 10% away from the expected value, six laboratories are within the EMEP network.

New, improved results are reported by laboratory 19 for both high-concentration samples and one of the low-concentration samples. The new values deviates from expected value by (0–1.7)%.

4.3 Ammonium

The results from the determination of ammonium are shown in Table 5 and Figure 3. Laboratory 37 reports one outlier, while the laboratories 40 and 103 report four outliers each. The relative standard deviation is (6.2–8.8)%.

Seven laboratories report results that deviate between 10% and 20% from the expected value. Five laboratories report results more than 20% away from expected value.

4.4 pH and strong acid

Table 6 and Figure 4 shows the results of the pH measurements and Tables 7a and 7b show the determination of strong acid. 52 laboratories reported pH-values, while only 2 laboratories reported titrated concentrations of strong acid.

In Table 7a the reported pH-data shown in table 6 are recalculated to $[H^+]$ to obtain realistic standard deviation values.

Laboratory 105 reports four outliers, laboratory 40 reports three outliers and laboratories 107, 108, 115 and 120 report one outlier each.

Sixteen laboratories report values that deviate more than 0.2 pH-units from expected value.

Only two laboratories report results for titrated acidity (see Table 7b).

4.5 Chloride

Table 8 and Figure 5 shows the results from the chloride determination. Laboratory 105 reports three outliers, laboratories 19 and 40 report two outliers each, while laboratories 24 and 37 report one outlier each. The relative standard deviation is (8.2–21.3)% when outliers are excluded.

22 laboratories report results between 10% and 20% away from the expected value. 18 laboratories report results more than 20% away from expected value.

New results are reported by laboratory 19. The results reported for the low concentration samples deviates 17.6–18.2% from expected value. The originally reported results were unused. The reported results for the high concentration samples deviates 6.6–10.2% from expected value.

4.6 Sodium

Table 9 and Figure 6 shows the results from determination of sodium. Laboratories 40 and 105 report too low values for all four samples. Laboratory 116 reports too low value for three samples. Laboratory 22, 37 and 108 report one outlier each. The relative standard deviation is (9.5–16.8)% when outliers are excluded.

Nineteen laboratories report results between 10–20% away from the expected value. Thirteen laboratories report results that deviate more than 20% from expected value.

4.7 Magnesium

The results from determination of magnesium are shown in Table 10 and Figure 7. Laboratory 33 reports too high results for all four samples and laboratory 108 reports two values that deviates more than two standard deviations from the mean value. The relative standard deviation is (9.4–14.6)% with all outliers excluded.

Seven laboratories report values between 10 and 20% away from the expected value. Seven laboratories report results that deviate more than 20% from expected value.

4.8 Calcium

Table 11 and Figure 8 show the results from determination of calcium. Laboratory 104 reports too high results for all four samples. Laboratories 34 and 113 report two outlying results, while laboratories 32 and 108 report one outlier each. The relative standard deviation is (10.3–13.8)% with all outliers excluded.

Twenty-four laboratories report values between (10–20)% away from the expected value, while fourteen laboratories report values that deviate more than 20% from expected value.

4.9 Potassium

The results from the determination of potassium are presented in Table 12 and Figure 9. Laboratory 34 reports too high values for all four samples. Laboratory 10 and 104 report too high values for one sample each. The standard deviation is (15–32) % when outliers are excluded.

Twenty-one laboratories report values between 10–20% and the same number of laboratories report results that deviate more than 20% from the expected value.

4.10 Conductivity and ion balance

In Table 13 and Figure 10 the results from the conductivity measurements are given. Laboratory 12 reports too high results for all four samples. Laboratories 22

and 119 report too low values for three samples, while laboratory 18 reports one value more than 2 standard deviations away from the mean value.

The standard deviation is in the range (4.2–8.9)%, which is about the same as in earlier intercomparisons. Twenty-three values (11.5%) are reported between (10-20)% from expected value, while eight reported values (4%) deviate more than 20%. This is slightly better than earlier intercomparisons.

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 14 the ratios of the measured to the calculated conductivities (from the reported results) are given. As can be seen from inspecting these values, the laboratories 23, 38, 39, 105, 107, 108, 115 and 120 have ratios that are far from 1.

In Table 15 the ratios of equivalent concentration of anions to equivalent concentration cations are shown. This ratio may be used in the quality control for those laboratories that determine all the main components. Laboratories 7, 10, 19, 22, 23, 103, 105, 107, 115 and 120 have ratios that are far from 1.

5. Conclusions

A total of 53 laboratories participated in the intercomparison. 32 of these laboratories are within the EMEP network.

For all the samples analysed the deviations from theoretical value are calculated. Figure 11 shows the median values compared to the theoretical value for all the parameters. The median deviations for the EMEP laboratories (exclusive the median values for H^+) are below 6.1% for the low-concentration samples and below 3% for the high-concentration samples, respectively. The median deviations for the other participating laboratories (exclusive the median values for H^+) are below 12% for the low-concentration samples and below 6.7% for the high-concentration samples, respectively.

Like in the earlier intercomparisons outliers are defined as values that deviates more than two standard deviations from the mean value. Oultiers occurs for almost all samples and parameters. Out of a total of 2026 single results 111 are identified as outliers. This is 5.5% of the reported data, which is about the same as in earlier intercomparisons. However, only four laboratories are responsible for reporting 45.9% of the outliers. These are laboratories 18, 40, 105 and 108, which have eight or more outlying results.

A total of twenty-nine laboratories do not report any outliers. Twenty of these are laboratories within the EMEP network. This is an improvement compared to earlier intercomparisons.

It should be mentioned that some laboratories are using analytical methods that are outdated and not suitable for doing analysis in the concentration levels experienced in EMEP. The main reason these methods still are in use is most

often lack of funding for new and more up-to-date equipment in countries with economy in transition.

In Table 16 the ratio of the median value to expected value for all the parameters in all the samples are shown. As can be seen from this table, all the parameters except from pH and chloride have median values that are in good accordance with the theoretical value.

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Appendix 1

Tables

Table 1: Samples distributed for the sixteenth interlaboratory test.

G.	4 synthetic precipitation samples, containing SO_4^{2-}, NO_3^-, NH_4^+, H^+, Na^+, Mg^{2+} Cl^-, Ca^{2+} and K^+.

Table 2a: EMEP laboratories participating in the eighteenth laboratory intercomparison. The number in front of the names are used in tables and figures.

Austria	(1)	Umweltbundesamt Zweigstelle Sud, Klagenfurt
Canada	(26)	Atmospheric Environment Service, Toronto
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
Germany	(7)	IfE Leipzig GmbH, Umweltlabor
Germany	(8)	Umweltbundesamt, Messtelle Schauinsland
Hungary	(10)	Institute for Atmospheric Physics
Iceland	(11)	Idntæknistofnun Islands (Technological Inst. of Iceland)
Ireland	(12)	Meteorological Service, Dublin
Ireland	(37)	Environmental Protection Agency, Dublin
Italy	(13)	Istituto Inquinamento Atmosferico of C.N.R
Latvia	(33)	Air Pollution Observation Laboratory
Lithuania	(32)	Institute of Physics
Netherlands	(14)	National Institute of Public Health and Environmental Protection (RIVM)
Norway	(15)	Norwegian Institute for Air Research (NILU)
Macedonia	(40)	Hydrometeorological Institute, Skopje
Poland	(16)	Institute of Meteorology and Water Management, Warsaw
Poland	(39)	Environmental Monitoring Laboratory, Institute of Environmental Protection
Portugal	(17)	Direccao Regional do Ambiente e Recursos Naturais do Alentejo, Sines
Romania	(18)	Research and Engineering Institute for Environment
Russian Federation	(22)	Institute of Global Climate and Ecology
Slovakia	(31)	Slovak Hydrometeorological Institute
Slovenia	(36)	Hydrometeorological Institute of Slovenia
Spain	(19)	Centro Nacional de Sanidad Ambiental
Sweden	(20)	Swedish Environmental Research Institute (IVL), Gothenburg
Switzerland	(21)	Swiss Federal Laboratories for Materials Testing (EMPA)
Turkey	(34)	Refik Saydam Institute, Ankara
United Kingdom	(23)	AEA Technology, National Environmental Technology Centre
United States of America	(27)	Illinois State Water Survey
Yugoslavia	(24)	Federal Hydrometeorological Institute, Belgrade

Table 2b: Participating laboratories outside the EMEP network

Bulgaria	(103)	Forestry University
Germany	(104)	Hessige Landwirtschafliche
Germany	(105)	Universität des Saarlandes
Sweden	(106)	IVL Svenska Miljöinstitutet AB, Aneboda
Finland	(107)	The Finnish Forest Institute
Germany	(108)	Institut f. Bundenkunde und Standortlehre, TU Dresden
Germany	(110)	Thüringer Landesanstalt für Landwirtschaft (TTL)
Finland	(111)	Finnish Forest Research Institute, Vantaa Research Centre
Germany	(112)	Niedersächsische Forstliche Versuchsanstalt (NVF)
Germany	(113)	Landesforstanstalt Eberswalde, abt. Waldökologie
Italy	(114)	C.N.R. Istituto Italiano di Idrobiologia
Germany	(115)	Bayerische Landesanstalt f. wald- und Forstwirtshaft
Switzerland	(116)	Institute for Applied Plant Biology
Germany	(117)	Sächsische Landesanstalt für Forsten
Germany	(118)	Forstliche Versuchs-und Forschungsanstalt
Germany	(119)	Landesumweltamt (LUA)
Germany	(120)	Landwirtschaftliche Untersuchungs- und Forschungsanstalt (LUFA)
Germany	(121)	Landesamt für Natur und Umwelt
Russia	(122)	Institue of Global Climate and Ecology

Table 3: Analytical results for sulphate in precipitations samples.

SULPHATE
SAMPLE NO.: G1
THEORETICAL VALUE 0.822
UNIT: µg S/ml

RUN 1:

NUMBER OF LABORATORIES:	50
ARITHMETIC MEAN VALUE:	0.824
MEDIAN:	0.821
STANDARD DEVIATON:	0.173
REL. ST. DEVIATION (%):	21.023

RUN 2:

NUMBER OF LABORATORIES:	46
ARITHMETIC MEAN VALUE:	0.822
MEDIAN:	0.821
STANDARD DEVIATON:	0.040
REL. ST. DEVIATION (%):	4.821

RESULTS IN DECREASING ORDER:

18	1.635 UNUSED	6	0.820	
7	1.201 UNUSED	12	0.820	
39	0.967	110	0.820	
24	0.916	117	0.820	
53	0.885	8	0.818	
54	0.865	19	0.817	
112	0.860	36	0.817	
13	0.850	26	0.815	
23	0.842	3	0.814	
1	0.840	4	0.814	
30	0.840	14	0.811	
105	0.839	31	0.806	
21	0.838	114	0.800	
11	0.835	120	0.800	
16	0.834	15	0.790	
111	0.832	115	0.790	
5	0.830	20	0.787	
10	0.830	116	0.786	
33	0.830	121	0.784	
38	0.830	32	0.762	
119	0.830	118	0.750	
17	0.826	122	0.750	
27	0.825	22	0.728	
34	0.824	107	0.283 UNUSED	
37	0.822	108	0.270 UNUSED	

"UNUSED": DATA UNUSED IN RUN 2

SULPHATE
SAMPLE NO.: G2
THEORETICAL VALUE 1.940
UNIT: µg S/ml

RUN 1:

NUMBER OF LABORATORIES:	50
ARITHMETIC MEAN VALUE:	1.963
MEDIAN:	1.935
STANDARD DEVIATON:	0.286
REL. ST. DEVIATION (%):	14.586

RUN 2:

NUMBER OF LABORATORIES:	47
ARITHMETIC MEAN VALUE:	1.932
MEDIAN:	1.933
STANDARD DEVIATON:	0.132
REL. ST. DEVIATION (%):	6.827

RESULTS IN DECREASING ORDER:

18	3.488 UNUSED	3	1.933	
7	2.601 UNUSED	107	1.930	
17	2.350	31	1.926	
39	2.307	14	1.924	
24	2.164	16	1.921	
115	2.070	1	1.920	
33	2.020	114	1.920	
104	2.020	4	1.918	
21	2.013	8	1.916	
34	2.010	26	1.913	
38	2.000	105	1.908	
30	1.980	118	1.890	
13	1.979	11	1.880	
10	1.970	15	1.830	
111	1.970	20	1.824	
112	1.970	117	1.820	
119	1.970	32	1.814	
36	1.967	120	1.810	
23	1.962	121	1.800	
37	1.948	19	1.798	
27	1.947	116	1.794	
6	1.940	22	1.770	
12	1.940	103	1.739	
110	1.940	122	1.510	
5	1.937	108	1.300 UNUSED	

"UNUSED": DATA UNUSED IN RUN 2

SULPHATE
SAMPLE NO.: G3
THEORETICAL VALUE 1.040
UNIT: µg S/ml

RUN 1:

NUMBER OF LABORATORIES:	50
ARITHMETIC MEAN VALUE:	1.071
MEDIAN:	1.040
STANDARD DEVIATON:	0.290
REL. ST. DEVIATION (%):	27.034

RUN 2:

NUMBER OF LABORATORIES:	48
ARITHMETIC MEAN VALUE:	1.055
MEDIAN:	1.040
STANDARD DEVIATON:	0.113
REL. ST. DEVIATION (%):	10.720

RESULTS IN DECREASING ORDER:

18	2.725 UNUSED	12	1.040	
7	1.565	110	1.040	
122	1.470	14	1.039	
39	1.202	105	1.033	
17	1.157	24	1.032	
115	1.100	36	1.032	
13	1.086	31	1.030	
104	1.082	33	1.030	
30	1.070	26	1.026	
111	1.070	8	1.025	
21	1.067	4	1.024	
16	1.066	15	1.020	
11	1.061	117	1.020	
1	1.060	3	1.019	
10	1.060	114	1.010	
38	1.060	19	1.008	
112	1.060	116	0.986	
119	1.060	20	0.981	
23	1.059	120	0.980	
27	1.050	103	0.971	
107	1.050	32	0.957	
118	1.050	22	0.941	
5	1.047	121	0.921	
34	1.047	37	0.823	
6	1.040	108	0.200 UNUSED	

"UNUSED": DATA UNUSED IN RUN 2

SULPHATE
SAMPLE NO.: G4
THEORETICAL VALUE 1.780
UNIT: µg S/ml

RUN 1:

NUMBER OF LABORATORIES:	50
ARITHMETIC MEAN VALUE:	1.793
MEDIAN:	1.775
STANDARD DEVIATON:	0.268
REL. ST. DEVIATION (%):	14.918

RUN 2:

NUMBER OF LABORATORIES:	47
ARITHMETIC MEAN VALUE:	1.767
MEDIAN:	1.775
STANDARD DEVIATON:	0.124
REL. ST. DEVIATION (%):	7.014

RESULTS IN DECREASING ORDER:

18	3.006 UNUSED	31	1.775	
39	2.610 UNUSED	6	1.770	
7	2.316	12	1.770	
115	1.930	14	1.770	
33	1.890	105	1.769	
13	1.888	114	1.760	
104	1.859	118	1.760	
21	1.833	4	1.751	
24	1.832	1	1.750	
30	1.830	110	1.750	
16	1.821	8	1.749	
38	1.820	26	1.746	
34	1.810	11	1.734	
107	1.810	32	1.684	
119	1.810	20	1.671	
23	1.805	15	1.670	
36	1.804	19	1.659	
10	1.800	120	1.650	
111	1.800	117	1.640	
112	1.800	121	1.640	
27	1.786	103	1.639	
5	1.784	116	1.597	
17	1.784	22	1.578	
37	1.780	108	1.390	
3	1.775	122	1.000 UNUSED	

"UNUSED": DATA UNUSED IN RUN 2

Table 4: Analytical results for nitrate in precipitations samples.

NITRATE
SAMPLE NO.: G1
THEORETICAL VALUE 0.355
UNIT: µg N/ml

RUN 1:
NUMBER OF LABORATORIES: 51
ARITHMETIC MEAN VALUE: 0.356
MEDIAN: 0.357
STANDARD DEVIATON: 0.034
REL. ST. DEVIATION (%): 9.554

RUN 2:
NUMBER OF LABORATORIES: 48
ARITHMETIC MEAN VALUE: 0.357
MEDIAN: 0.358
STANDARD DEVIATON: 0.019
REL. ST. DEVIATION (%): 5.260

RESULTS IN DECREASING ORDER:

40	0.518	UNUSED	27	0.357
24	0.416		107	0.357
11	0.410		16	0.352
39	0.400		37	0.352
4	0.378		14	0.350
17	0.378		15	0.350
19	0.375		112	0.350
1	0.370		113	0.350
10	0.370		31	0.348
38	0.370		34	0.348
13	0.366		103	0.346
105	0.365		36	0.345
5	0.363		3	0.341
6	0.360		12	0.340
26	0.360		33	0.340
30	0.360		104	0.340
114	0.360		32	0.339
115	0.360		111	0.339
117	0.360		116	0.339
118	0.360		7	0.331
120	0.360		110	0.330
8	0.359		22	0.327
20	0.359		108	0.320
23	0.358		119	0.280 UNUSED
121	0.358		18	0.259 UNUSED
21	0.357			

"UNUSED": DATA UNUSED IN RUN 2

NITRATE
SAMPLE NO.: G2
THEORETICAL VALUE 0.889
UNIT: µg N/ml

RUN 1:
NUMBER OF LABORATORIES: 51
ARITHMETIC MEAN VALUE: 0.877
MEDIAN: 0.880
STANDARD DEVIATON: 0.047
REL. ST. DEVIATION (%): 5.397

RUN 2:
NUMBER OF LABORATORIES: 46
ARITHMETIC MEAN VALUE: 0.881
MEDIAN: 0.880
STANDARD DEVIATON: 0.026
REL. ST. DEVIATION (%): 2.983

RESULTS IN DECREASING ORDER:

114	0.990	UNUSED	104	0.880
39	0.987	UNUSED	107	0.880
40	0.970		110	0.880
38	0.920		118	0.880
13	0.915		121	0.880
117	0.910		8	0.879
120	0.910		34	0.879
20	0.904		7	0.875
27	0.904		33	0.875
115	0.900		14	0.874
31	0.899		26	0.874
4	0.898		3	0.869
11	0.898		15	0.860
17	0.898		108	0.860
5	0.894		112	0.860
36	0.894		32	0.857
37	0.894		116	0.840
1	0.890		22	0.837
30	0.890		19	0.836
113	0.890		23	0.833
21	0.889		103	0.830
16	0.887		111	0.830
105	0.883		18	0.770 UNUSED
6	0.880		119	0.730 UNUSED
10	0.880		24	0.728 UNUSED
12	0.880			

"UNUSED": DATA UNUSED IN RUN 2

NITRATE
SAMPLE NO.: G3
THEORETICAL VALUE 0.783
UNIT: µg N/ml

RUN 1:
NUMBER OF LABORATORIES: 51
ARITHMETIC MEAN VALUE: 0.766
MEDIAN: 0.780
STANDARD DEVIATON: 0.066
REL. ST. DEVIATION (%): 8.612

RUN 2:
NUMBER OF LABORATORIES: 50
ARITHMETIC MEAN VALUE: 0.774
MEDIAN: 0.780
STANDARD DEVIATON: 0.033
REL. ST. DEVIATION (%): 4.233

RESULTS IN DECREASING ORDER:

39	0.861		105	0.779
13	0.825		22	0.778
38	0.810		8	0.775
120	0.810		23	0.775
4	0.805		26	0.771
17	0.805		12	0.770
121	0.803		34	0.767
117	0.800		104	0.765
27	0.797		24	0.764
11	0.796		3	0.763
1	0.790		33	0.763
10	0.790		107	0.762
20	0.790		110	0.760
30	0.790		118	0.760
31	0.790		7	0.752
114	0.790		32	0.750
115	0.790		108	0.750
5	0.787		116	0.750
16	0.784		36	0.748
21	0.784		19	0.745
40	0.781		103	0.740
6	0.780		111	0.728
14	0.780		18	0.676
15	0.780		119	0.650
112	0.780		37	0.364 UNUSED
113	0.780			

"UNUSED": DATA UNUSED IN RUN 2

NITRATE
SAMPLE NO.: G4
THEORETICAL VALUE 0.476
UNIT: µg N/ml

RUN 1:
NUMBER OF LABORATORIES: 51
ARITHMETIC MEAN VALUE: 0.475
MEDIAN: 0.474
STANDARD DEVIATON: 0.036
REL. ST. DEVIATION (%): 7.615

RUN 2:
NUMBER OF LABORATORIES: 47
ARITHMETIC MEAN VALUE: 0.475
MEDIAN: 0.474
STANDARD DEVIATON: 0.021
REL. ST. DEVIATION (%): 4.424

RESULTS IN DECREASING ORDER:

24	0.610	UNUSED	121	0.474
40	0.571	UNUSED	14	0.473
119	0.537		16	0.472
120	0.520		107	0.472
11	0.513		26	0.471
112	0.510		6	0.470
13	0.505		23	0.470
31	0.497		118	0.470
17	0.491		37	0.469
1	0.490		36	0.465
38	0.490		34	0.463
105	0.486		32	0.461
5	0.485		115	0.460
20	0.482		3	0.458
10	0.480		104	0.458
12	0.480		110	0.450
15	0.480		103	0.448
27	0.480		7	0.446
30	0.480		33	0.443
113	0.480		111	0.442
114	0.480		116	0.442
117	0.480		22	0.441
19	0.478		108	0.440
21	0.475		119	0.390 UNUSED
4	0.474		18	0.372 UNUSED
8	0.474			

"UNUSED": DATA UNUSED IN RUN 2

Table 5: Analytical results for ammonium in precipitations sample.

AMMONIUM
SAMPLE NO.: G1
THEORETICAL VALUE 0.261
UNIT: µg N/ml

RUN 1:

NUMBER OF LABORATORIES:	52
ARITHMETIC MEAN VALUE:	0.258
MEDIAN:	0.257
STANDARD DEVIATON:	0.056
REL. ST. DEVIATION (%):	21.758

RUN 2:

NUMBER OF LABORATORIES:	50
ARITHMETIC MEAN VALUE:	0.256
MEDIAN:	0.257
STANDARD DEVIATON:	0.022
REL. ST. DEVIATION (%):	8.802

RESULTS IN DECREASING ORDER:

40	0.563	UNUSED	16	0.256
37	0.299		34	0.256
13	0.297		105	0.256
110	0.290		121	0.256
38	0.280		3	0.253
113	0.280		118	0.253
19	0.279		5	0.252
33	0.278		36	0.252
4	0.277		6	0.250
8	0.272		111	0.250
104	0.272		115	0.250
39	0.271		116	0.250
114	0.270		32	0.249
117	0.270		107	0.248
17	0.266		20	0.247
24	0.264		14	0.246
22	0.263		15	0.240
26	0.262		27	0.240
11	0.260		108	0.240
23	0.260		119	0.240
30	0.260		1	0.230
31	0.260		112	0.220
106	0.260		10	0.200
122	0.260		120	0.190
21	0.259		18	0.185
7	0.258		103	0.053 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

AMMONIUM
SAMPLE NO.: G2
THEORETICAL VALUE 0.602
UNIT: µg N/ml

RUN 1:

NUMBER OF LABORATORIES:	52
ARITHMETIC MEAN VALUE:	0.596
MEDIAN:	0.600
STANDARD DEVIATON:	0.071
REL. ST. DEVIATION (%):	11.900

RUN 2:

NUMBER OF LABORATORIES:	50
ARITHMETIC MEAN VALUE:	0.599
MEDIAN:	0.600
STANDARD DEVIATON:	0.037
REL. ST. DEVIATION (%):	6.205

RESULTS IN DECREASING ORDER:

40	0.841	UNUSED	11	0.600
13	0.678		106	0.600
122	0.676		114	0.600
120	0.670		26	0.597
33	0.653		5	0.596
37	0.640		24	0.591
110	0.640		6	0.590
113	0.640		20	0.590
8	0.629		38	0.590
19	0.629		118	0.588
17	0.626		14	0.580
30	0.620		15	0.580
117	0.620		108	0.580
39	0.615		119	0.580
104	0.615		121	0.577
32	0.613		16	0.575
111	0.611		116	0.571
115	0.610		31	0.569
4	0.607		3	0.564
22	0.607		27	0.560
105	0.606		1	0.550
21	0.605		10	0.550
34	0.605		107	0.542
7	0.603		112	0.520
36	0.602		18	0.472
23	0.601		103	0.237 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

AMMONIUM
SAMPLE NO.: G3
THEORETICAL VALUE 0.501
UNIT: µg N/ml

RUN 1:

NUMBER OF LABORATORIES:	52
ARITHMETIC MEAN VALUE:	0.500
MEDIAN:	0.503
STANDARD DEVIATON:	0.077
REL. ST. DEVIATION (%):	15.410

RUN 2:

NUMBER OF LABORATORIES:	49
ARITHMETIC MEAN VALUE:	0.503
MEDIAN:	0.505
STANDARD DEVIATON:	0.033
REL. ST. DEVIATION (%):	6.595

RESULTS IN DECREASING ORDER:

40	0.855	UNUSED	111	0.501
11	0.580		6	0.500
13	0.573		16	0.500
112	0.570		23	0.500
113	0.550		38	0.500
120	0.540		115	0.500
110	0.530		22	0.498
19	0.529		26	0.497
24	0.529		107	0.497
33	0.529		121	0.496
30	0.520		20	0.493
104	0.520		118	0.491
117	0.520		31	0.487
39	0.519		116	0.481
32	0.514		1	0.480
4	0.513		108	0.480
8	0.512		14	0.479
21	0.512		3	0.471
17	0.510		27	0.470
34	0.510		122	0.466
106	0.510		15	0.460
114	0.510		119	0.460
36	0.509		10	0.450
7	0.508		18	0.374
5	0.505		37	0.299 UNUSED
105	0.505		103	0.211 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

AMMONIUM
SAMPLE NO.: G4
THEORETICAL VALUE 0.301
UNIT: µg N/ml

RUN 1:

NUMBER OF LABORATORIES:	52
ARITHMETIC MEAN VALUE:	0.296
MEDIAN:	0.299
STANDARD DEVIATON:	0.052
REL. ST. DEVIATION (%):	17.681

RUN 2:

NUMBER OF LABORATORIES:	50
ARITHMETIC MEAN VALUE:	0.298
MEDIAN:	0.299
STANDARD DEVIATON:	0.025
REL. ST. DEVIATION (%):	8.498

RESULTS IN DECREASING ORDER:

40	0.484	UNUSED	106	0.299
22	0.356		26	0.297
13	0.344		32	0.295
37	0.336		16	0.294
38	0.330		21	0.294
110	0.330		111	0.294
113	0.330		20	0.293
15	0.320		36	0.293
19	0.320		5	0.291
33	0.320		23	0.291
4	0.313		107	0.291
8	0.311		6	0.290
24	0.311		118	0.290
34	0.311		120	0.290
104	0.311		116	0.288
105	0.311		3	0.287
112	0.310		121	0.286
114	0.310		27	0.270
117	0.310		1	0.260
39	0.304		108	0.260
14	0.302		115	0.260
17	0.301		119	0.260
31	0.301		122	0.254
7	0.300		10	0.250
11	0.300		18	0.216
30	0.300		103	0.026 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

Table 6: Analytical results for pH in precipitations samples.

pH
SAMPLE NO.: G1
THEORETICAL VALUE 4.600
UNIT: pH UNITS

RUN 1:
NUMBER OF LABORATORIES: 52
ARITHMETIC MEAN VALUE: 4.622
MEDIAN: 4.640
STANDARD DEVIATON: 0.202
REL. ST. DEVIATION (%): 4.360

RUN 2:
NUMBER OF LABORATORIES: 49
ARITHMETIC MEAN VALUE: 4.626
MEDIAN: 4.640
STANDARD DEVIATON: 0.143
REL. ST. DEVIATION (%): 3.092

RESULTS IN DECREASING ORDER:

108	5.390	UNUSED		
117	4.920			
113	4.880			
19	4.854			
110	4.800			
121	4.790			
1	4.760			
14	4.750			
34	4.737			
4	4.720			
33	4.720			
112	4.720			
114	4.710			
10	4.700			
13	4.700			
119	4.700			
120	4.700			
111	4.690			
22	4.680			
8	4.660			
103	4.660			
118	4.660			
7	4.650			
15	4.650			
26	4.640			
37	4.640			
104	4.640			
21	4.630			
27	4.630			
36	4.630			
106	4.630			
5	4.620			
31	4.610			
3	4.602			
116	4.600			
12	4.590			
32	4.585			
20	4.580			
11	4.560			
16	4.560			
24	4.560			
6	4.540			
30	4.530			
18	4.510			
38	4.500			
17	4.360			
39	4.350			
107	4.300			
115	4.250			
23	4.240			
105	4.170	UNUSED		
40	4.080	UNUSED		

"UNUSED": DATA UNUSED IN RUN 2

pH
SAMPLE NO.: G2
THEORETICAL VALUE 4.050
UNIT: pH UNITS

RUN 1:
NUMBER OF LABORATORIES: 52
ARITHMETIC MEAN VALUE: 4.071
MEDIAN: 4.090
STANDARD DEVIATON: 0.155
REL. ST. DEVIATION (%): 3.812

RUN 2:
NUMBER OF LABORATORIES: 49
ARITHMETIC MEAN VALUE: 4.073
MEDIAN: 4.090
STANDARD DEVIATON: 0.091
REL. ST. DEVIATION (%): 2.228

RESULTS IN DECREASING ORDER:

115	4.780	UNUSED		
11	4.310			
113	4.210			
110	4.200			
112	4.160			
19	4.159			
1	4.150			
108	4.150			
8	4.140			
10	4.130			
4	4.120			
7	4.120			
117	4.120			
14	4.110			
37	4.110			
118	4.110			
3	4.105			
31	4.100			
33	4.100			
103	4.100			
104	4.100			
119	4.100			
120	4.100			
22	4.090			
27	4.090			
36	4.090			
114	4.090			
121	4.090			
34	4.087			
6	4.080			
26	4.080			
5	4.070			
32	4.070			
111	4.070			
116	4.070			
13	4.060			
20	4.060			
21	4.060			
106	4.060			
12	4.040			
15	4.020			
24	4.010			
30	4.000			
16	3.960			
18	3.960			
38	3.950			
17	3.920			
23	3.860			
39	3.840			
107	3.800			
40	3.680	UNUSED		
105	3.650	UNUSED		

"UNUSED": DATA UNUSED IN RUN 2

pH
SAMPLE NO.: G3
THEORETICAL VALUE 4.520
UNIT: pH UNITS

RUN 1:
NUMBER OF LABORATORIES: 52
ARITHMETIC MEAN VALUE: 4.522
MEDIAN: 4.550
STANDARD DEVIATON: 0.142
REL. ST. DEVIATION (%): 3.149

RUN 2:
NUMBER OF LABORATORIES: 49
ARITHMETIC MEAN VALUE: 4.549
MEDIAN: 4.560
STANDARD DEVIATON: 0.090
REL. ST. DEVIATION (%): 1.987

RESULTS IN DECREASING ORDER:

1	4.760			
13	4.760			
113	4.730			
115	4.700			
112	4.660			
10	4.630			
19	4.621			
14	4.620			
37	4.620			
110	4.600			
120	4.600			
22	4.590			
8	4.580			
33	4.580			
4	4.570			
7	4.570			
103	4.570			
111	4.570			
117	4.570			
118	4.570			
119	4.570			
11	4.560			
108	4.560			
114	4.560			
121	4.560			
20	4.550			
27	4.550			
104	4.550			
34	4.543			
5	4.540			
26	4.540			
106	4.540			
116	4.540			
3	4.530			
21	4.530			
32	4.520			
15	4.510			
6	4.490			
12	4.490			
31	4.490			
36	4.470			
16	4.460			
24	4.450			
30	4.450			
18	4.400			
17	4.390			
23	4.390			
38	4.380			
39	4.320			
107	4.200	UNUSED		
105	4.090	UNUSED		
40	3.960	UNUSED		

"UNUSED": DATA UNUSED IN RUN 2

pH
SAMPLE NO.: G4
THEORETICAL VALUE 4.070
UNIT: pH UNITS

RUN 1:
NUMBER OF LABORATORIES: 52
ARITHMETIC MEAN VALUE: 4.099
MEDIAN: 4.120
STANDARD DEVIATON: 0.156
REL. ST. DEVIATION (%): 3.814

RUN 2:
NUMBER OF LABORATORIES: 48
ARITHMETIC MEAN VALUE: 4.092
MEDIAN: 4.120
STANDARD DEVIATON: 0.078
REL. ST. DEVIATION (%): 1.914

RESULTS IN DECREASING ORDER:

115	4.720	UNUSED		
120	4.600	UNUSED		
113	4.220			
110	4.200			
19	4.187			
108	4.180			
10	4.160			
13	4.150			
7	4.140			
112	4.140			
1	4.130			
3	4.130			
4	4.130			
8	4.130			
14	4.130			
37	4.130			
117	4.130			
11	4.120			
22	4.120			
31	4.120			
103	4.120			
104	4.120			
111	4.120			
114	4.120			
118	4.120			
119	4.120			
121	4.120			
27	4.110			
36	4.110			
34	4.108			
33	4.100			
26	4.100			
106	4.100			
116	4.100			
5	4.090			
12	4.080			
20	4.080			
21	4.080			
6	4.060			
15	4.060			
17	4.040			
24	4.030			
16	4.010			
30	3.990			
38	3.980			
18	3.970			
23	3.940			
39	3.870			
107	3.800			
40	3.710	UNUSED		
105	3.690	UNUSED		

"UNUSED": DATA UNUSED IN RUN 2

Table 7a: Analytical results for strong acid calculated from pH in precipitations samples.

STRONG ACID CALCULATED FROM PH
SAMPLE NO.: G1
THEORETICAL VALUE 25.000
UNIT: µeq/l

RUN 1:
NUMBER OF LABORATORIES: 53
ARITHMETIC MEAN VALUE: ********
MEDIAN: 22.910
STANDARD DEVIATON: ********
REL. ST. DEVIATION (%): 726.986

RUN 2:
NUMBER OF LABORATORIES: 52
ARITHMETIC MEAN VALUE: 26.589
MEDIAN: 22.910
STANDARD DEVIATON: 14.095
REL. ST. DEVIATION (%): 53.009

RESULTS IN DECREASING ORDER:

122	******** UNUSED	37	22.910
40	83.180	104	22.910
105	67.610	7	22.390
23	57.540	15	22.390
115	56.230	8	21.880
107	50.120	103	21.880
39	44.670	118	21.880
17	43.650	22	20.890
38	31.620	111	20.420
18	30.900	10	19.950
30	29.510	13	19.950
6	28.840	119	19.950
11	27.540	120	19.950
16	27.540	114	19.500
24	27.540	4	19.050
20	26.300	33	19.050
32	26.000	112	19.050
12	25.700	34	18.320
116	25.120	14	17.780
3	25.000	1	17.380
31	24.550	121	16.220
5	23.990	110	15.850
21	23.440	19	14.000
27	23.440	113	13.180
36	23.440	117	12.020
106	23.440	108	4.070
26	22.910		

"UNUSED": DATA UNUSED IN RUN 2

STRONG ACID CALCULATED FROM PH
SAMPLE NO.: G2
THEORETICAL VALUE 90.000
UNIT: µeq/l

RUN 1:
NUMBER OF LABORATORIES: 53
ARITHMETIC MEAN VALUE: ********
MEDIAN: 81.280
STANDARD DEVIATON: ********
REL. ST. DEVIATION (%): 724.550

RUN 2:
NUMBER OF LABORATORIES: 52
ARITHMETIC MEAN VALUE: 90.116
MEDIAN: 81.280
STANDARD DEVIATON: 33.634
REL. ST. DEVIATION (%): 37.323

RESULTS IN DECREASING ORDER:

112	******** UNUSED	36	81.280
105	223.870	114	81.280
40	208.930	121	81.280
107	158.490	31	79.430
39	144.540	33	79.430
23	138.040	103	79.430
17	120.230	104	79.430
38	112.200	119	79.430
16	109.650	120	79.430
18	109.650	3	78.520
30	100.000	14	77.620
24	97.720	37	77.620
15	95.500	118	77.620
12	91.200	4	75.860
13	87.100	7	75.860
20	87.100	117	75.860
21	87.100	10	74.130
106	87.100	8	72.440
5	85.110	1	70.790
32	85.110	108	70.790
111	85.110	19	69.340
116	85.110	112	69.180
6	83.180	110	63.100
26	83.180	113	61.660
34	81.850	11	48.980
22	81.280	115	16.600
27	81.280		

"UNUSED": DATA UNUSED IN RUN 2

STRONG ACID CALCULATED FROM PH
SAMPLE NO.: G3
THEORETICAL VALUE 30.000
UNIT: µeq/l

RUN 1:
NUMBER OF LABORATORIES: 53
ARITHMETIC MEAN VALUE: ********
MEDIAN: 28.180
STANDARD DEVIATON: ********
REL. ST. DEVIATION (%): 726.776

RUN 2:
NUMBER OF LABORATORIES: 52
ARITHMETIC MEAN VALUE: 32.073
MEDIAN: 28.180
STANDARD DEVIATON: 15.154
REL. ST. DEVIATION (%): 47.248

RESULTS IN DECREASING ORDER:

122	******** UNUSED	104	28.180
40	109.650	11	27.540
105	81.280	108	27.540
107	63.100	114	27.540
39	47.860	121	27.540
38	41.690	4	26.920
17	40.740	7	26.920
23	40.740	103	26.920
18	39.810	111	26.920
24	35.480	117	26.920
30	35.480	118	26.920
16	34.670	119	26.920
36	33.880	8	26.300
6	32.360	33	26.300
12	32.360	22	25.700
31	32.360	100	25.120
15	30.900	120	25.120
32	30.200	14	23.990
3	29.510	37	23.990
21	29.510	19	23.930
5	28.840	10	23.440
26	28.840	112	21.880
106	28.840	115	19.950
116	28.840	113	18.620
34	28.640	1	17.380
20	28.180	13	17.380
27	28.180		

"UNUSED": DATA UNUSED IN RUN 2

STRONG ACID CALCULATED FROM PH
SAMPLE NO.: G4
THEORETICAL VALUE 85.000
UNIT: µeq/l

RUN 1:
NUMBER OF LABORATORIES: 53
ARITHMETIC MEAN VALUE: ********
MEDIAN: 75.860
STANDARD DEVIATON: ********
REL. ST. DEVIATION (%): 724.762

RUN 2:
NUMBER OF LABORATORIES: 52
ARITHMETIC MEAN VALUE: 84.584
MEDIAN: 75.860
STANDARD DEVIATON: 31.029
REL. ST. DEVIATION (%): 36.684

RESULTS IN DECREASING ORDER:

122	******** UNUSED	22	75.860
105	204.170	31	75.860
40	194.980	103	75.860
107	158.490	104	75.860
39	134.900	111	75.860
23	114.820	114	75.860
18	107.150	118	75.860
38	104.710	119	75.860
30	102.330	121	75.860
16	97.720	1	74.130
24	93.330	3	74.130
17	91.200	4	74.130
6	87.100	8	74.130
15	87.100	14	74.130
12	83.180	37	74.130
20	83.180	117	74.130
21	83.180	7	72.440
5	81.280	112	72.440
26	79.430	13	70.790
33	79.430	10	69.180
106	79.430	108	66.070
116	79.430	19	65.010
34	77.980	110	63.100
27	77.620	113	60.260
32	77.620	120	25.120
36	77.620	115	19.050
11	75.860		

"UNUSED": DATA UNUSED IN RUN 2

Table 7b: Analytical results for strong acid in precipitations samples.

STRONG ACIDS SAMPLE NO.: G1 THEORETICAL VALUE 25. UNIT: µeq RUN 1: NUMBER OF LABORATORIES: 2 ARITHMETIC MEAN VALUE: 23.900 MEDIAN: 23.900 STANDARD DEVIATON: 1.556 REL. ST. DEVIATION (%): 6.509 RUN 2: NUMBER OF LABORATORIES: 2 ARITHMETIC MEAN VALUE: 23.900 MEDIAN: 23.900 STANDARD DEVIATON: 1.556 REL. ST. DEVIATION (%): 6.509 RESULTS IN DECREASING ORDER: 6 25.000 14 22.800 "UNUSED": DATA UNUSED IN RUN 2	STRONG ACIDS SAMPLE NO.: G2 THEORETICAL VALUE 90. UNIT: µeq RUN 1: NUMBER OF LABORATORIES: 2 ARITHMETIC MEAN VALUE: 108.800 MEDIAN: 108.800 STANDARD DEVIATON: 26.587 REL. ST. DEVIATION (%): 24.437 RUN 2: NUMBER OF LABORATORIES: 2 ARITHMETIC MEAN VALUE: 108.800 MEDIAN: 108.800 STANDARD DEVIATON: 26.587 REL. ST. DEVIATION (%): 24.437 RESULTS IN DECREASING ORDER: 14 127.600 6 90.000 "UNUSED": DATA UNUSED IN RUN 2
STRONG ACIDS SAMPLE NO.: G3 THEORETICAL VALUE 30. UNIT: µeq RUN 1: NUMBER OF LABORATORIES: 2 ARITHMETIC MEAN VALUE: 29.050 MEDIAN: 29.050 STANDARD DEVIATON: 1.344 REL. ST. DEVIATION (%): 4.625 RUN 2: NUMBER OF LABORATORIES: 2 ARITHMETIC MEAN VALUE: 29.050 MEDIAN: 29.050 STANDARD DEVIATON: 1.344 REL. ST. DEVIATION (%): 4.625 RESULTS IN DECREASING ORDER: 6 30.000 14 28.100 "UNUSED": DATA UNUSED IN RUN 2	STRONG ACIDS SAMPLE NO.: G4 THEORETICAL VALUE 85. UNIT: µeq RUN 1: NUMBER OF LABORATORIES: 2 ARITHMETIC MEAN VALUE: 84.000 MEDIAN: 84.000 STANDARD DEVIATON: 1.414 REL. ST. DEVIATION (%): 1.684 RUN 2: NUMBER OF LABORATORIES: 2 ARITHMETIC MEAN VALUE: 84.000 MEDIAN: 84.000 STANDARD DEVIATON: 1.414 REL. ST. DEVIATION (%): 1.684 RESULTS IN DECREASING ORDER: 6 85.000 14 83.000 "UNUSED": DATA UNUSED IN RUN 2

Table 8: Analytical results for chloride in precipitations samples.

CHLORIDE
SAMPLE NO.: G1
THEORETICAL VALUE 0.203
UNIT: µg Cl/ml

RUN 1:

NUMBER OF LABORATORIES:	49
ARITHMETIC MEAN VALUE:	0.215
MEDIAN:	0.200
STANDARD DEVIATON:	0.077
REL. ST. DEVIATION (%):	35.792

RUN 2:

NUMBER OF LABORATORIES:	46
ARITHMETIC MEAN VALUE:	0.206
MEDIAN:	0.200
STANDARD DEVIATON:	0.044
REL. ST. DEVIATION (%):	21.315

RESULTS IN DECREASING ORDER:

105	0.509	UNUSED	118	0.200
19	0.500	UNUSED	7	0.198
23	0.320		27	0.195
108	0.320		31	0.192
10	0.300		14	0.191
18	0.296		112	0.190
110	0.270		11	0.189
37	0.258		32	0.189
39	0.255		21	0.188
104	0.255		33	0.185
103	0.254		34	0.183
30	0.230		12	0.180
121	0.218		15	0.180
8	0.210		117	0.180
13	0.210		119	0.180
16	0.210		111	0.177
26	0.207		17	0.175
5	0.206		20	0.174
116	0.202		3	0.168
107	0.201		115	0.160
1	0.200		22	0.157
4	0.200		38	0.130
6	0.200		120	0.110
36	0.200		24	0.050 UNUSED
114	0.200			

"UNUSED": DATA UNUSED IN RUN 2

CHLORIDE
SAMPLE NO.: G2
THEORETICAL VALUE 0.579
UNIT: µg Cl/ml

RUN 1:

NUMBER OF LABORATORIES:	50
ARITHMETIC MEAN VALUE:	0.587
MEDIAN:	0.560
STANDARD DEVIATON:	0.115
REL. ST. DEVIATION (%):	19.607

RUN 2:

NUMBER OF LABORATORIES:	48
ARITHMETIC MEAN VALUE:	0.567
MEDIAN:	0.560
STANDARD DEVIATON:	0.052
REL. ST. DEVIATION (%):	9.132

RESULTS IN DECREASING ORDER:

40	1.240	UNUSED	33	0.560
105	0.866	UNUSED	115	0.560
19	0.773		118	0.560
108	0.720		4	0.559
10	0.650		17	0.559
23	0.638		16	0.558
39	0.626		121	0.551
13	0.600		8	0.550
24	0.600		12	0.550
114	0.600		110	0.550
103	0.597		34	0.549
14	0.596		104	0.548
18	0.592		37	0.547
26	0.592		21	0.545
32	0.577		116	0.540
36	0.576		119	0.540
27	0.573		3	0.536
111	0.573		1	0.530
30	0.570		112	0.530
107	0.569		31	0.523
7	0.567		11	0.503
5	0.563		22	0.499
6	0.560		38	0.490
15	0.560		117	0.490
20	0.560		120	0.480

"UNUSED": DATA UNUSED IN RUN 2

CHLORIDE
SAMPLE NO.: G3
THEORETICAL VALUE 0.724
UNIT: µg Cl/ml

RUN 1:

NUMBER OF LABORATORIES:	50
ARITHMETIC MEAN VALUE:	0.712
MEDIAN:	0.700
STANDARD DEVIATON:	0.132
REL. ST. DEVIATION (%):	18.559

RUN 2:

NUMBER OF LABORATORIES:	48
ARITHMETIC MEAN VALUE:	0.706
MEDIAN:	0.700
STANDARD DEVIATON:	0.058
REL. ST. DEVIATION (%):	8.222

RESULTS IN DECREASING ORDER:

40	1.412	UNUSED	6	0.700
19	0.873		12	0.700
18	0.864		15	0.700
105	0.844		118	0.700
10	0.790		16	0.699
39	0.781		20	0.698
103	0.772		3	0.693
23	0.768		17	0.690
13	0.760		21	0.683
24	0.750		31	0.683
27	0.725		108	0.680
26	0.724		119	0.680
22	0.723		11	0.675
30	0.720		8	0.670
114	0.720		110	0.670
36	0.718		116	0.666
14	0.713		120	0.660
7	0.712		104	0.653
33	0.708		112	0.640
111	0.708		38	0.630
32	0.705		117	0.620
4	0.704		121	0.611
5	0.703		115	0.610
107	0.702		34	0.605
1	0.700		37	0.260 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

CHLORIDE
SAMPLE NO.: G4
THEORETICAL VALUE 0.290
UNIT: µg Cl/ml

RUN 1:

NUMBER OF LABORATORIES:	49
ARITHMETIC MEAN VALUE:	0.291
MEDIAN:	0.272
STANDARD DEVIATON:	0.066
REL. ST. DEVIATION (%):	22.864

RUN 2:

NUMBER OF LABORATORIES:	47
ARITHMETIC MEAN VALUE:	0.280
MEDIAN:	0.271
STANDARD DEVIATON:	0.043
REL. ST. DEVIATION (%):	15.411

RESULTS IN DECREASING ORDER:

19	0.570	UNUSED	18	0.271
105	0.498	UNUSED	12	0.270
23	0.423		15	0.270
108	0.380		33	0.270
10	0.370		110	0.270
120	0.370		111	0.270
14	0.340		115	0.270
30	0.340		119	0.270
13	0.323		16	0.269
104	0.320		17	0.268
8	0.300		116	0.265
37	0.293		1	0.260
5	0.290		34	0.260
27	0.290		11	0.258
118	0.290		20	0.254
26	0.288		31	0.254
6	0.280		3	0.247
114	0.280		22	0.243
4	0.279		38	0.240
36	0.278		112	0.230
7	0.275		121	0.227
103	0.274		117	0.220
32	0.273		39	0.216
107	0.273		24	0.200
21	0.272			

"UNUSED": DATA UNUSED IN RUN 2

Table 9: Analytical results for sodium in precipitations samples.

SODIUM
SAMPLE NO.: G1
THEORETICAL VALUE 0.212
UNIT: µg Na/ml

RUN 1:

NUMBER OF LABORATORIES:	48
ARITHMETIC MEAN VALUE:	0.202
MEDIAN:	0.204
STANDARD DEVIATON:	0.049
REL. ST. DEVIATION (%):	24.230

RUN 2:

NUMBER OF LABORATORIES:	45
ARITHMETIC MEAN VALUE:	0.206
MEDIAN:	0.205
STANDARD DEVIATON:	0.035
REL. ST. DEVIATION (%):	16.840

RESULTS IN DECREASING ORDER:

22	0.333	UNUSED	14	0.204
112	0.300		24	0.204
118	0.300		8	0.200
34	0.279		16	0.200
4	0.252		38	0.200
37	0.242		108	0.200
6	0.230		119	0.200
15	0.220		23	0.197
114	0.220		11	0.195
7	0.218		20	0.194
19	0.218		30	0.190
21	0.218		120	0.186
27	0.218		1	0.180
31	0.218		33	0.180
3	0.217		117	0.180
13	0.215		10	0.170
26	0.215		110	0.170
36	0.215		111	0.170
104	0.215		113	0.160
5	0.213		17	0.152
39	0.212		103	0.150
32	0.210		116	0.112
115	0.210		40	0.089 UNUSED
107	0.205		105	0.030 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

SODIUM
SAMPLE NO.: G2
THEORETICAL VALUE 0.698
UNIT: µg Na/ml

RUN 1:

NUMBER OF LABORATORIES:	48
ARITHMETIC MEAN VALUE:	0.658
MEDIAN:	0.690
STANDARD DEVIATON:	0.125
REL. ST. DEVIATION (%):	19.056

RUN 2:

NUMBER OF LABORATORIES:	45
ARITHMETIC MEAN VALUE:	0.685
MEDIAN:	0.690
STANDARD DEVIATON:	0.071
REL. ST. DEVIATION (%):	10.428

RESULTS IN DECREASING ORDER:

37	0.839		14	0.690
32	0.790		15	0.690
34	0.775		38	0.690
4	0.770		39	0.690
112	0.770		118	0.690
6	0.730		23	0.683
119	0.730		33	0.680
3	0.727		110	0.680
5	0.725		17	0.673
114	0.720		104	0.670
20	0.719		107	0.667
31	0.711		120	0.667
1	0.710		19	0.666
27	0.710		24	0.658
115	0.710		16	0.650
36	0.708		117	0.620
7	0.705		10	0.570
21	0.702		113	0.570
30	0.700		111	0.566
26	0.698		108	0.500
22	0.693		103	0.420
13	0.691		40	0.333 UNUSED
8	0.690		116	0.326 UNUSED
11	0.690		105	0.140 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

SODIUM
SAMPLE NO.: G3
THEORETICAL VALUE 0.872
UNIT: µg Na/ml

RUN 1:

NUMBER OF LABORATORIES:	48
ARITHMETIC MEAN VALUE:	0.804
MEDIAN:	0.860
STANDARD DEVIATON:	0.172
REL. ST. DEVIATION (%):	21.385

RUN 2:

NUMBER OF LABORATORIES:	44
ARITHMETIC MEAN VALUE:	0.849
MEDIAN:	0.869
STANDARD DEVIATON:	0.081
REL. ST. DEVIATION (%):	9.540

RESULTS IN DECREASING ORDER:

32	0.980		38	0.860
112	0.950		110	0.860
20	0.942		11	0.859
34	0.918		104	0.858
5	0.910		39	0.856
6	0.910		31	0.853
3	0.901		33	0.850
115	0.900		119	0.850
22	0.893		118	0.840
17	0.892		19	0.835
36	0.891		120	0.829
30	0.890		107	0.827
21	0.888		24	0.824
4	0.887		16	0.790
7	0.881		117	0.780
26	0.877		10	0.720
27	0.875		113	0.710
1	0.870		108	0.700
8	0.870		111	0.698
13	0.870		103	0.500
15	0.870		40	0.398 UNUSED
114	0.870		116	0.387 UNUSED
14	0.868		37	0.244 UNUSED
23	0.860		105	0.200 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

SODIUM
SAMPLE NO.: G4
THEORETICAL VALUE 0.295
UNIT: µg Na/ml

RUN 1:

NUMBER OF LABORATORIES:	48
ARITHMETIC MEAN VALUE:	0.273
MEDIAN:	0.290
STANDARD DEVIATON:	0.060
REL. ST. DEVIATION (%):	21.780

RUN 2:

NUMBER OF LABORATORIES:	44
ARITHMETIC MEAN VALUE:	0.288
MEDIAN:	0.290
STANDARD DEVIATON:	0.034
REL. ST. DEVIATION (%):	11.714

RESULTS IN DECREASING ORDER:

112	0.390		104	0.290
37	0.352		19	0.286
34	0.345		23	0.285
115	0.330		24	0.284
4	0.321		11	0.281
118	0.320		14	0.280
6	0.310		33	0.280
31	0.308		120	0.276
21	0.306		20	0.273
27	0.304		1	0.270
36	0.302		16	0.270
5	0.301		110	0.260
3	0.300		117	0.260
15	0.300		119	0.260
30	0.300		17	0.241
32	0.300		22	0.241
114	0.300		111	0.238
7	0.297		113	0.230
13	0.295		10	0.220
107	0.295		103	0.210
26	0.293		116	0.153 UNUSED
39	0.291		40	0.139 UNUSED
8	0.290		108	0.100 UNUSED
38	0.290		105	0.060 UNUSED

"UNUSED": DATA UNUSED IN RUN 2

Table 10: Analytical results for magnesium in precipitations samples.

MAGNESIUM
SAMPLE NO.: G1
THEORETICAL VALUE 0.116
UNIT: µg Mg/ml

RUN 1:

NUMBER OF LABORATORIES:	46
ARITHMETIC MEAN VALUE:	0.114
MEDIAN:	0.111
STANDARD DEVIATON:	0.027
REL. ST. DEVIATION (%):	23.510

RUN 2:

NUMBER OF LABORATORIES:	44
ARITHMETIC MEAN VALUE:	0.112
MEDIAN:	0.111
STANDARD DEVIATON:	0.013
REL. ST. DEVIATION (%):	11.936

RESULTS IN DECREASING ORDER:

33	0.260 UNUSED	1	0.110	
21	0.135	4	0.110	
30	0.130	8	0.110	
37	0.130	15	0.110	
112	0.130	39	0.110	
14	0.128	113	0.110	
7	0.127	114	0.110	
17	0.123	16	0.109	
34	0.123	111	0.109	
13	0.122	118	0.108	
104	0.122	116	0.106	
11	0.120	120	0.106	
105	0.120	22	0.105	
115	0.120	107	0.105	
5	0.119	24	0.102	
20	0.118	10	0.100	
3	0.116	38	0.100	
26	0.116	6	0.090	
36	0.116	110	0.090	
19	0.115	117	0.090	
31	0.115	103	0.080	
23	0.111	40	0.070	
27	0.111	108	0.060 UNUSED	

"UNUSED": DATA UNUSED IN RUN 2

MAGNESIUM
SAMPLE NO.: G2
THEORETICAL VALUE 0.232
UNIT: µg Mg/ml

RUN 1:

NUMBER OF LABORATORIES:	47
ARITHMETIC MEAN VALUE:	0.241
MEDIAN:	0.229
STANDARD DEVIATON:	0.118
REL. ST. DEVIATION (%):	48.910

RUN 2:

NUMBER OF LABORATORIES:	46
ARITHMETIC MEAN VALUE:	0.224
MEDIAN:	0.229
STANDARD DEVIATON:	0.022
REL. ST. DEVIATION (%):	9.640

RESULTS IN DECREASING ORDER:

33	1.017 UNUSED	16	0.228	
105	0.260	31	0.228	
17	0.249	23	0.226	
14	0.248	120	0.224	
21	0.247	20	0.223	
7	0.246	22	0.223	
37	0.245	39	0.223	
11	0.240	4	0.220	
30	0.240	27	0.220	
34	0.240	38	0.220	
113	0.240	110	0.220	
115	0.240	111	0.218	
5	0.235	116	0.217	
36	0.235	19	0.213	
104	0.234	107	0.211	
3	0.233	6	0.210	
13	0.233	10	0.210	
1	0.230	117	0.200	
8	0.230	119	0.200	
15	0.230	24	0.192	
26	0.230	103	0.180	
114	0.230	108	0.140	
112	0.230	40	0.170	

"UNUSED": DATA UNUSED IN RUN 2

MAGNESIUM
SAMPLE NO.: G3
THEORETICAL VALUE 0.194
UNIT: µg Mg/ml

RUN 1:

NUMBER OF LABORATORIES:	47
ARITHMETIC MEAN VALUE:	0.187
MEDIAN:	0.190
STANDARD DEVIATON:	0.037
REL. ST. DEVIATION (%):	19.619

RUN 2:

NUMBER OF LABORATORIES:	45
ARITHMETIC MEAN VALUE:	0.185
MEDIAN:	0.190
STANDARD DEVIATON:	0.021
REL. ST. DEVIATION (%):	11.429

RESULTS IN DECREASING ORDER:

33	0.373 UNUSED	39	0.189	
21	0.224	118	0.188	
30	0.220	23	0.187	
105	0.220	120	0.185	
7	0.212	16	0.184	
34	0.208	27	0.183	
17	0.206	31	0.183	
104	0.202	20	0.182	
115	0.200	4	0.180	
14	0.198	38	0.180	
5	0.197	116	0.180	
11	0.195	111	0.179	
36	0.194	107	0.176	
13	0.193	6	0.170	
22	0.193	10	0.170	
26	0.192	110	0.170	
19	0.191	24	0.168	
1	0.190	117	0.160	
3	0.190	119	0.140	
8	0.190	37	0.139	
15	0.190	103	0.130	
112	0.190	40	0.125	
113	0.190	108	0.100 UNUSED	
114	0.190			

"UNUSED": DATA UNUSED IN RUN 2

MAGNESIUM
SAMPLE NO.: G4
THEORETICAL VALUE 0.139
UNIT: µg Mg/ml

RUN 1:

NUMBER OF LABORATORIES:	46
ARITHMETIC MEAN VALUE:	0.140
MEDIAN:	0.138
STANDARD DEVIATON:	0.049
REL. ST. DEVIATION (%):	35.339

RUN 2:

NUMBER OF LABORATORIES:	45
ARITHMETIC MEAN VALUE:	0.133
MEDIAN:	0.138
STANDARD DEVIATON:	0.019
REL. ST. DEVIATION (%):	14.434

RESULTS IN DECREASING ORDER:

33	0.442 UNUSED	19	0.138
105	0.160	14	0.137
37	0.158	39	0.136
30	0.150	23	0.134
34	0.150	120	0.134
104	0.150	22	0.133
115	0.150	13	0.132
7	0.149	27	0.131
17	0.146	4	0.130
21	0.146	8	0.130
5	0.144	15	0.130
11	0.143	38	0.130
31	0.143	111	0.130
36	0.143	116	0.129
118	0.142	107	0.127
1	0.140	24	0.122
20	0.140	10	0.120
112	0.140	110	0.120
113	0.140	6	0.110
114	0.140	117	0.110
16	0.139	40	0.090
26	0.139	103	0.090
3	0.138	108	0.050

"UNUSED": DATA UNUSED IN RUN 2

Table 11: Analytical results for calcium in precipitations samples.

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

RUN 1:
NUMBER OF LABORATORIES: 47
ARITHMETIC MEAN VALUE: 0.329
MEDIAN: 0.330
STANDARD DEVIATON: 0.048
REL. ST. DEVIATION (%): 14.558

RUN 2:
NUMBER OF LABORATORIES: 46
ARITHMETIC MEAN VALUE: 0.325
MEDIAN: 0.330
STANDARD DEVIATON: 0.042
REL. ST. DEVIATION (%): 12.809

RESULTS IN DECREASING ORDER:

104	0.492 UNUSED	6	0.330	
21	0.405	118	0.330	
30	0.400	116	0.328	
38	0.400	111	0.314	
34	0.398	107	0.311	
7	0.389	4	0.310	
13	0.371	105	0.310	
8	0.370	119	0.310	
15	0.360	17	0.308	
112	0.360	120	0.301	
37	0.351	31	0.300	
5	0.348	110	0.300	
36	0.345	3	0.297	
26	0.343	16	0.290	
27	0.343	22	0.290	
39	0.341	32	0.290	
19	0.340	20	0.285	
113	0.340	117	0.280	
114	0.340	10	0.260	
115	0.340	24	0.257	
14	0.339	40	0.248	
23	0.338	33	0.240	
11	0.334	103	0.240	
1	0.330			

"UNUSED": DATA UNUSED IN RUN 2

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

RUN 1:
NUMBER OF LABORATORIES: 47
ARITHMETIC MEAN VALUE: 0.255
MEDIAN: 0.244
STANDARD DEVIATON: 0.073
REL. ST. DEVIATION (%): 28.807

RUN 2:
NUMBER OF LABORATORIES: 44
ARITHMETIC MEAN VALUE: 0.238
MEDIAN: 0.240
STANDARD DEVIATON: 0.033
REL. ST. DEVIATION (%): 13.769

RESULTS IN DECREASING ORDER:

113	0.610 UNUSED	16	0.240	
104	0.448 UNUSED	30	0.240	
34	0.415 UNUSED	112	0.240	
22	0.342	23	0.236	
33	0.310	120	0.234	
114	0.300	107	0.231	
15	0.280	111	0.231	
38	0.270	116	0.231	
7	0.260	1	0.230	
8	0.260	4	0.230	
11	0.256	31	0.230	
39	0.256	105	0.220	
13	0.254	110	0.220	
36	0.252	17	0.213	
20	0.251	24	0.212	
37	0.251	40	0.203	
26	0.250	3	0.201	
115	0.250	6	0.200	
118	0.250	117	0.200	
19	0.249	119	0.200	
5	0.245	32	0.180	
14	0.244	103	0.180	
21	0.244	10	0.170	
27	0.244			

"UNUSED": DATA UNUSED IN RUN 2

CALCIUM
SAMPLE NO.: G3
THEORETICAL VALUE 0.383
UNIT: µg Ca/ml

RUN 1:
NUMBER OF LABORATORIES: 48
ARITHMETIC MEAN VALUE: 0.376
MEDIAN: 0.381
STANDARD DEVIATON: 0.070
REL. ST. DEVIATION (%): 18.617

RUN 2:
NUMBER OF LABORATORIES: 45
ARITHMETIC MEAN VALUE: 0.375
MEDIAN: 0.380
STANDARD DEVIATON: 0.044
REL. ST. DEVIATION (%): 11.756

RESULTS IN DECREASING ORDER:

104	0.551 UNUSED	118	0.380	
22	0.517 UNUSED	19	0.379	
38	0.450	23	0.374	
114	0.450	1	0.370	
21	0.447	6	0.370	
30	0.440	120	0.364	
7	0.435	107	0.361	
34	0.434	116	0.361	
115	0.420	119	0.360	
8	0.410	37	0.356	
105	0.410	111	0.355	
17	0.407	20	0.351	
13	0.401	4	0.350	
15	0.400	110	0.350	
32	0.400	16	0.338	
36	0.399	31	0.333	
26	0.396	3	0.332	
5	0.394	24	0.324	
27	0.393	117	0.320	
39	0.392	40	0.306	
112	0.390	10	0.280	
113	0.390	33	0.280	
11	0.389	103	0.270	
14	0.381	108	0.070	UNUSED

"UNUSED": DATA UNUSED IN RUN 2

CALCIUM
SAMPLE NO.: G4
THEORETICAL VALUE 0.287
UNIT: µg Ca/ml

RUN 1:
NUMBER OF LABORATORIES: 47
ARITHMETIC MEAN VALUE: 0.284
MEDIAN: 0.289
STANDARD DEVIATON: 0.046
REL. ST. DEVIATION (%): 16.102

RUN 2:
NUMBER OF LABORATORIES: 43
ARITHMETIC MEAN VALUE: 0.279
MEDIAN: 0.288
STANDARD DEVIATON: 0.029
REL. ST. DEVIATION (%): 10.294

RESULTS IN DECREASING ORDER:

104	0.426 UNUSED	17	0.288	
34	0.400 UNUSED	19	0.287	
113	0.380 UNUSED	22	0.287	
114	0.330	23	0.282	
15	0.320	116	0.281	
115	0.320	4	0.280	
118	0.320	16	0.280	
38	0.310	107	0.275	
7	0.305	120	0.273	
30	0.300	1	0.270	
37	0.300	111	0.269	
105	0.300	31	0.265	
11	0.298	110	0.260	
21	0.298	6	0.250	
39	0.298	10	0.240	
5	0.295	33	0.240	
27	0.295	40	0.236	
14	0.292	3	0.234	
26	0.292	24	0.232	
8	0.290	117	0.230	
36	0.290	119	0.220	
112	0.290	103	0.210	
13	0.289	32	0.150	UNUSED
20	0.289			

"UNUSED": DATA UNUSED IN RUN 2

Table 12: Analytical results for potassium in precipitations samples.

POTASSIUM
SAMPLE NO.: G1
THEORETICAL VALUE 0.127
UNIT: µg K/ml

RUN 1:
NUMBER OF LABORATORIES: 46
ARITHMETIC MEAN VALUE: 0.147
MEDIAN: 0.127
STANDARD DEVIATON: 0.138
REL. ST. DEVIATION (%): 94.165

RUN 2:
NUMBER OF LABORATORIES: 45
ARITHMETIC MEAN VALUE: 0.127
MEDIAN: 0.127
STANDARD DEVIATON: 0.034
REL. ST. DEVIATION (%): 27.129

RESULTS IN DECREASING ORDER:

34	1.034 UNUSED	27	0.127
11	0.266	31	0.127
112	0.230	13	0.125
15	0.160	36	0.121
37	0.152	4	0.120
104	0.148	8	0.120
14	0.147	24	0.120
20	0.141	33	0.120
6	0.140	7	0.119
117	0.140	23	0.119
118	0.140	107	0.115
19	0.138	16	0.110
26	0.135	30	0.110
3	0.133	105	0.110
116	0.133	120	0.108
10	0.130	32	0.105
22	0.130	111	0.105
38	0.130	21	0.104
110	0.130	1	0.100
114	0.130	40	0.099
115	0.130	103	0.090
39	0.128	108	0.050
5	0.127	17	0.046
33	0.250		

"UNUSED": DATA UNUSED IN RUN 2

POTASSIUM
SAMPLE NO.: G2
THEORETICAL VALUE 0.255
UNIT: µg K/ml

RUN 1:
NUMBER OF LABORATORIES: 47
ARITHMETIC MEAN VALUE: 0.267
MEDIAN: 0.250
STANDARD DEVIATON: 0.142
REL. ST. DEVIATION (%): 53.024

RUN 2:
NUMBER OF LABORATORIES: 46
ARITHMETIC MEAN VALUE: 0.248
MEDIAN: 0.250
STANDARD DEVIATON: 0.048
REL. ST. DEVIATION (%): 19.200

RESULTS IN DECREASING ORDER:

34	1.165 UNUSED	38	0.250
22	0.381	116	0.250
11	0.374	119	0.250
114	0.330	120	0.250
15	0.310	7	0.248
117	0.300	23	0.243
37	0.281	36	0.243
20	0.277	4	0.240
6	0.270	8	0.240
112	0.270	10	0.240
14	0.265	30	0.240
107	0.262	24	0.239
115	0.260	1	0.230
118	0.260	105	0.220
39	0.257	111	0.216
3	0.255	21	0.213
26	0.255	32	0.210
27	0.255	103	0.200
13	0.254	16	0.196
5	0.253	40	0.185
31	0.253	17	0.185
104	0.253	108	0.130
19	0.252	110	0.110

"UNUSED": DATA UNUSED IN RUN 2

POTASSIUM
SAMPLE NO.: G3
THEORETICAL VALUE 0.102
UNIT: µg K/ml

RUN 1:
NUMBER OF LABORATORIES: 45
ARITHMETIC MEAN VALUE: 0.162
MEDIAN: 0.101
STANDARD DEVIATON: 0.202
REL. ST. DEVIATION (%): 124.593

RUN 2:
NUMBER OF LABORATORIES: 42
ARITHMETIC MEAN VALUE: 0.109
MEDIAN: 0.100
STANDARD DEVIATON: 0.035
REL. ST. DEVIATION (%): 31.964

RESULTS IN DECREASING ORDER:

104	0.930 UNUSED	24	0.100
10	0.910 UNUSED	36	0.100
34	0.852 UNUSED	38	0.100
11	0.221	120	0.100
112	0.200	107	0.098
37	0.175	13	0.097
15	0.170	21	0.097
22	0.168	3	0.096
114	0.140	5	0.096
117	0.130	23	0.096
118	0.130	40	0.091
6	0.120	4	0.090
110	0.120	8	0.090
14	0.118	16	0.090
20	0.118	30	0.090
31	0.111	33	0.090
115	0.110	111	0.083
19	0.108	1	0.080
27	0.105	32	0.080
26	0.103	103	0.080
7	0.102	105	0.080
116	0.102	108	0.020
39	0.101		
26	0.301		

"UNUSED": DATA UNUSED IN RUN 2

POTASSIUM
SAMPLE NO.: G4
THEORETICAL VALUE 0.306
UNIT: µg K/ml

RUN 1:
NUMBER OF LABORATORIES: 47
ARITHMETIC MEAN VALUE: 0.314
MEDIAN: 0.301
STANDARD DEVIATON: 0.134
REL. ST. DEVIATION (%): 42.840

RUN 2:
NUMBER OF LABORATORIES: 46
ARITHMETIC MEAN VALUE: 0.295
MEDIAN: 0.301
STANDARD DEVIATON: 0.045
REL. ST. DEVIATION (%): 15.307

RESULTS IN DECREASING ORDER:

34	1.164 UNUSED	23	0.300
11	0.412	38	0.300
110	0.390	114	0.300
37	0.367	13	0.296
117	0.350	7	0.293
112	0.330	36	0.291
115	0.330	4	0.290
118	0.330	33	0.290
31	0.329	120	0.289
3	0.323	8	0.280
20	0.323	10	0.280
15	0.320	24	0.279
32	0.320	1	0.270
107	0.311	105	0.270
5	0.310	111	0.253
6	0.310	16	0.250
30	0.310	103	0.250
27	0.309	17	0.243
104	0.308	21	0.243
14	0.307	119	0.230
19	0.306	22	0.222
39	0.304	40	0.208
116	0.302	108	0.150

"UNUSED": DATA UNUSED IN RUN 2

Table 13: Analytical results for conductivity in precipitation samples.

CONDUCTIVITY
SAMPLE NO.: G1
THEORETICAL VALUE 18.600
UNIT: µS/cm

RUN 1:
NUMBER OF LABORATORIES: 50
ARITHMETIC MEAN VALUE: 18.031
MEDIAN: 18.000
STANDARD DEVIATON: 2.482
REL. ST. DEVIATION (%): 13.767

RUN 2:
NUMBER OF LABORATORIES: 49
ARITHMETIC MEAN VALUE: 17.746
MEDIAN: 18.000
STANDARD DEVIATON: 1.463
REL. ST. DEVIATION (%): 8.246

RESULTS IN DECREASING ORDER:

12	32.000 UNUSED	24	18.000	
39	20.830	104	18.000	
23	20.000	106	18.000	
3	19.670	108	18.000	
6	19.300	117	18.000	
20	19.300	120	18.000	
8	19.200	32	17.900	
27	19.100	114	17.700	
31	19.100	36	17.500	
16	19.000	13	17.300	
5	18.700	112	17.300	
15	18.700	4	17.200	
10	18.620	34	17.110	
18	18.600	118	17.000	
19	18.600	11	16.700	
21	18.550	33	16.500	
30	18.540	7	16.460	
38	18.500	121	16.400	
105	18.500	40	16.000	
37	18.200	103	15.750	
111	18.200	107	15.500	
14	18.100	110	15.000	
116	18.100	119	14.700	
1	18.000	22	14.600	
17	18.000	115	13.500	

"UNUSED": DATA UNUSED IN RUN 2

CONDUCTIVITY
SAMPLE NO.: G2
THEORETICAL VALUE 53.800
UNIT: µS/cm

RUN 1:
NUMBER OF LABORATORIES: 50
ARITHMETIC MEAN VALUE: 51.714
MEDIAN: 52.000
STANDARD DEVIATON: 3.591
REL. ST. DEVIATION (%): 6.944

RUN 2:
NUMBER OF LABORATORIES: 46
ARITHMETIC MEAN VALUE: 51.598
MEDIAN: 52.000
STANDARD DEVIATON: 2.102
REL. ST. DEVIATION (%): 4.073

RESULTS IN DECREASING ORDER:

12	65.400 UNUSED	24	52.000	
18	61.100 UNUSED	15	51.800	
115	56.500	108	51.600	
23	55.000	1	51.400	
3	54.400	4	51.400	
16	54.000	13	51.300	
104	54.000	105	51.300	
31	53.800	111	51.300	
38	53.600	106	51.000	
114	53.300	121	51.000	
6	53.200	34	50.900	
19	53.200	112	50.900	
8	53.000	117	50.000	
30	52.980	120	50.000	
27	52.900	36	49.800	
21	52.830	116	49.000	
39	52.670	118	49.000	
14	52.500	11	48.600	
5	52.400	40	48.000	
37	52.300	110	48.000	
107	52.300	103	47.950	
32	52.210	7	47.480	
20	52.200	33	46.500	
10	52.000	119	42.900	UNUSED
17	52.000	22	42.800	UNUSED

"UNUSED": DATA UNUSED IN RUN 2

CONDUCTIVITY
SAMPLE NO.: G3
THEORETICAL VALUE 27.900
UNIT: µS/cm

RUN 1:
NUMBER OF LABORATORIES: 50
ARITHMETIC MEAN VALUE: 27.512
MEDIAN: 27.650
STANDARD DEVIATON: 2.186
REL. ST. DEVIATION (%): 7.946

RUN 2:
NUMBER OF LABORATORIES: 47
ARITHMETIC MEAN VALUE: 27.519
MEDIAN: 27.700
STANDARD DEVIATON: 1.375
REL. ST. DEVIATION (%): 4.997

RESULTS IN DECREASING ORDER:

12	37.300 UNUSED	111	27.600	
18	30.310	21	27.570	
23	30.000	15	27.500	
39	29.730	37	27.350	
36	29.700	1	27.300	
115	29.500	105	27.300	
3	29.490	17	27.250	
31	28.700	4	27.200	
6	28.500	10	27.170	
20	28.500	33	27.000	
34	28.400	120	27.000	
8	28.300	32	26.720	
114	28.200	112	26.600	
19	28.100	108	26.500	
27	28.100	103	26.050	
14	28.000	24	26.000	
16	28.000	118	26.000	
38	28.000	7	25.850	
104	28.000	11	25.800	
106	28.000	13	25.700	
117	28.000	40	25.000	
5	27.800	110	25.000	
30	27.710	107	23.500	
116	27.700	119	22.700	UNUSED
121	27.700	22	22.200	UNUSED

"UNUSED": DATA UNUSED IN RUN 2

CONDUCTIVITY
SAMPLE NO.: G4
THEORETICAL VALUE 45.800
UNIT: µS/cm

RUN 1:
NUMBER OF LABORATORIES: 50
ARITHMETIC MEAN VALUE: 44.195
MEDIAN: 44.150
STANDARD DEVIATON: 2.960
REL. ST. DEVIATION (%): 6.698

RUN 2:
NUMBER OF LABORATORIES: 47
ARITHMETIC MEAN VALUE: 44.229
MEDIAN: 44.300
STANDARD DEVIATON: 1.898
REL. ST. DEVIATION (%): 4.292

RESULTS IN DECREASING ORDER:

12	56.900 UNUSED	4	44.000	
18	48.900	24	44.000	
115	48.900	106	44.000	
23	48.000	108	44.000	
16	46.000	111	44.000	
38	46.000	117	44.000	
3	45.930	120	44.000	
114	45.900	112	43.800	
27	45.600	17	43.750	
6	45.400	10	43.600	
19	45.400	13	43.400	
30	45.310	34	43.300	
21	45.300	105	43.200	
20	45.200	116	43.100	
37	45.200	107	43.000	
5	45.100	36	42.200	
14	45.000	118	42.000	
104	45.000	103	41.260	
31	44.900	11	41.200	
32	44.820	40	41.000	
39	44.680	110	41.000	
8	44.500	7	40.810	
15	44.400	33	40.000	
121	44.400	119	37.100	UNUSED
1	44.300	22	37.000	UNUSED

"UNUSED": DATA UNUSED IN RUN 2

Table 14: Ratio of the measured to the calculated conductivity in synthetic precipitation samples (G1-G4).

Lab. No.	Measured value / Calculated value				Remark
	G1	G2	G3	G4	
1	1.14	1.11	1.17	1.07	
3	1.07	1.10	1.08	1.10	
4	1.03	1.05	1.02	1.05	
5	1.02	1.01	1.01	1.01	
6	0.97	1.04	1.00	0.98	
7	0.84	0.91	0.88	0.93	
8	1.09	1.12	1.07	1.06	
10	1.13	1.09	1.03	1.09	
11	0.83	1.24	0.93	0.96	
12					Missing Na, Mg, Ca and K
13	0.99	0.96	1.05	1.04	
14	1.02	0.79	1.03	1.00	
15	1.07	0.94	0.98	0.96	
16	0.98	0.90	0.96	0.92	
17	0.72	0.78	*	0.91	* Value < LOD
18					Missing Mg, Na, Ca and K
19	1.19	1.16	1.09	1.17	
20	1.03	1.00	1.06	1.01	
21	1.01	1.00	0.98	1.00	
22	0.88	0.86	0.84	0.89	
23	0.66	0.78	0.95	0.85	
24	0.92	0.92	0.88	0.89	
26					Missing conductivity
27	1.06	1.05	1.03	1.06	
30	0.90	0.92	0.91	0.86	
31	1.05	1.08	1.01	1.05	
32	1.00	1.04	1.00	1.08	
33	0.98	0.86	1.00	0.88	
34	0.93	0.95	0.98	0.95	
36	0.97	0.98	1.02	0.97	
37	0.99	1.04	1.44	1.06	
38	0.88	0.87	0.87	0.87	
39	0.78	0.70	0.84	0.66	
40	* ¤	¤	¤	*¤	* Value < LOD ¤ SO2 are missing
103	0.97	1.05	1.12	1.04	
104	0.96	1.06	0.95	1.03	
105	0.56	0.53	0.64	0.51	
106					Only NH_4^+ is reported
107	0.63	0.68	0.60	0.60	
108					Ca^{2+} values are missing
110	0.98	1.09	0.96	1.08	
111	1.09	1.00	1.06	1.04	
112	1.02	1.10	1.04	1.04	
113					Missing conductivity
114	1.06	1.03	1.04	1.07	
115	0.46	1.96	1.19	2.09	
116	1.00	0.98	1.08	1.02	
117	1.31	1.04	1.07	1.07	
118	0.98	1.00	0.98	0.98	
119	*	0.88	*	*	* Value < LOD
120	1.13	1.01	1.04	1.80	
121					Missing Mg^{2+}, Na^+, Ca^{2+} and K^+
122					Missing conductivity

Table 15: Ratio of equivalent concentration of anions to the equivalent concentration of cation measured in synthetic precipitation samples.

Anions/Cations					
Lab. No.	**G1**	**G2**	**G3**	**G4**	**Remarks**
1	1.21	1.12	1.13	1.11	
3	1.00	1.06	1.01	1.08	
4	1.08	1.06	1.03	1.06	
5	1.02	1.02	0.99	1.03	
6	1.03	1.01	1.00	1.02	
7	1.25	1.27	1.20	1.30	
8	1.03	1.07	0.99	1.07	
10	1.88	2.13	1.26	2.79	
11	0.99	1.20	0.96	1.04	
12	*	*	*	*	*Missing Mg, Na, Ca and K
13	1.04	1.01	1.10	1.16	
14	1.01	0.84	1.02	1.02	
15	0.99	0.92	0.98	0.93	
16	1.03	0.93	1.02	0.96	
17	0.87	0.99	*	0.99	*Value<LOD
18	*	*	*	*	*Missing Mg, Na, Ca and K
19	1.25	1.08	1.04	1.15	
20	1.00	0.98	0.98	0.97	
21	0.97	1.03	0.96	1.04	
22	1.76	0.92	0.92	0.96	
23	0.77	0.81	0.95	0.88	
24	1.11	1.02	0.99	1.05	
26	1.02	1.02	0.99	1.03	
27	1.04	1.07	1.04	1.07	
30	0.94	0.96	0.93	0.92	
31	1.00	1.06	1.01	1.07	
32	1.10	1.07	1.01	1.14	
33	0.98	0.78	0.94	0.93	
34	0.78	0.89	0.83	0.86	
36	1.01	1.05	0.94	1.06	
37	0.96	1.01	0.95	1.01	
38	0.89	0.92	0.92	0.89	
39	0.94	0.91	0.99	1.02	
40	*	0.33	0.44	*	* Value<LOD, SO4 values are missing
103	2.71	2.51	1.96	3.97	
104	0.95	1.02	0.82	1.04	
105	0.94	0.67	0.94	0.61	
106					* Only NH4 is reported
107	0.47	0.76	0.82	0.69	
108	*	*	*	*	* Ca values are missing
110	1.18	1.17	1.02	1.14	
111	1.11	1.06	1.09	1.10	
112	1.02	1.12	0.97	1.06	
113	*	*	*	*	* Missing SO4, Cl and K
114	1.05	1.05	0.97	1.04	
115	0.70	1.61	1.05	1.82	
116	1.04	1.07	1.16	1.00	
117	1.28	1.06	1.06	1.04	
118	0.95	1.05	1.02	1.04	
119	*	1.03	*	*	* Values < LOD
120	1.16	0.99	1.02	1.68	
121	*	*	*	*	Missing Mg, Na, Ca and K
122					Reports only NH4 and SO2

Table 16: The ratio of the median values to the theoretical values for all parameters and samples.

Parameter	Sample No.	Median/Expected
SO4-S	G1	1.00
	G2	1.00
	G3	1.00
	G4	1.00
NO3-N	G1	1.00
	G2	0.99
	G3	1.00
	G4	1.00
NH4-N	G1	0.99
	G2	1.00
	G3	1.00
	G4	1.00
pH (Calc. from H+)	G1	0.92
	G2	0.90
	G3	0.94
	G4	0.89
H	G1	0.94
	G2	0.91
	G3	0.98
	G4	0.91
Mg	G1	0.95
	G2	0.99
	G3	0.98
	G4	0.99
Na	G1	0.96
	G2	0.99
	G3	0.99
	G4	0.98
Cl	G1	0.99
	G2	0.97
	G3	0.97
	G4	0.94
Ca	G1	0.98
	G2	1.02
	G3	0.99
	G4	1.01
K	G1	1.00
	G2	0.98
	G3	0.99
	G4	0.98
Cond	G1	0.97
	G2	0.97
	G3	0.99
	G4	0.96

Table 17: Analytical methods used for the determination of chemical constituents in precipitation samples.

Constituents	Methods	Laboratory
SO_4	1. Thorin	18,24,32
	2. Ion chromatography	1, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 26, 27, 30, 31, 33, 34,36,37,38,103,104,105,110,111,114,115, 116,118,119
	3. Capillary Ion Analysis	39
	ICP-AES	108,112,117,120
	FIA	121
	Photometry	122
NO_3	1 Griess after Cd-red.	18, 24, 32,112
	2 Ion chromatography	1, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15,.16, 17, 19, 20, 21, 22, 23, 26, 27, 30, 31, 33,34,36,37,38, 103,105,110,114,115,116,118,119
	3 UV-method	40, 120
	4 Capillary Ion Analysis	39
	FIA / photometry	104,111,113,117
NH_4	1 Indophenol	3, 4, 10, 11, 17, 19, 24, 27, 32, 33, 34, 38, 39, 40, 112,114
	2 Berthelot reaction, salycilate	14, 26,118
	3 Ion chromatography	1, 5, 6, 7, 12, 13, 15, 21, 22, 23, 30, 31, 36,114,115,119
	4 Flow injection analysis (FIA)	8, 20, 37,106,111,113
	5 Chloramin T	16
	6 Nessler method	18,105,122
	Kjeldal	103
	Photometry	104,110,116,117,120
H^+	1 Acidimetric titration	14
	2 Alkali titration to spec. pH	6, 10
Mg	1 Atomic absorption (AAS)	3, 4, 8, 10, 11, 16, 17, 18, 19, 20, 22, 24, 26, 27, 33, 34, 36, 38, 39, 40, 103,105,116
	2 Ion chromatography	1, 5, 6, 7, 12, 13, 15, 21, 23, 30, 31, 37,114
	3 ICP-AES	14,104,108,110,111,112,113,115,117,118, 119,120,121
Na	1 AES	10, 19, 32, 33, 36, 38, 39,116
	2 AAS	3, 4, 8, 11, 16, 17, 18, 20, 24, 26, 27, 34, 40 103,105,108,110,114
	3 ICP-AES	14,104,111,112,113,115,117,118,120,121
	4 Ion chromatography	1, 5, 6, 7, 9, 12, 13, 15, 21, 22, 23, 30, 31, 37,119
Cl	1 Mercury thiocyanate-iron	18, 24, 32,40
	2 Ion chromatography	1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 26, 27, 30, 31, 33, 34, 36, 37, 38, 103,104,105,110,111,114,115,116,118, 119
	3 Capillary Ion Analysis	39
	Potensiometric method	112,117
	Photometric method	120
Ca	1 AAS	3, 4, 8, 11, 16, 17, 18, 19, 20, 22, 24, 26, 27, 34, 36, 38, 40,103,105,116
	2 ICP-AES	14,104,108,110,111,112,113,115,117,118, 120,121
	3 Ion chromatography	119
	4 AES	10, 32, 33, 39
K	1 AAS	3, 4, 8, 11, 16, 17, 18, 19, 20, 24, 26, 27, 34, 103,104,105,108,117
	2 Ion chromatography	1, 5, 6, 7, 9, 12, 13, 15, 21, 22, 23, 30, 31, 37,114,119
	3 AES	10, 32, 33, 36, 38, 39,116
	4 ICP-AES	14,110,111,112,115,118,120,121

Appendix 2

Figures

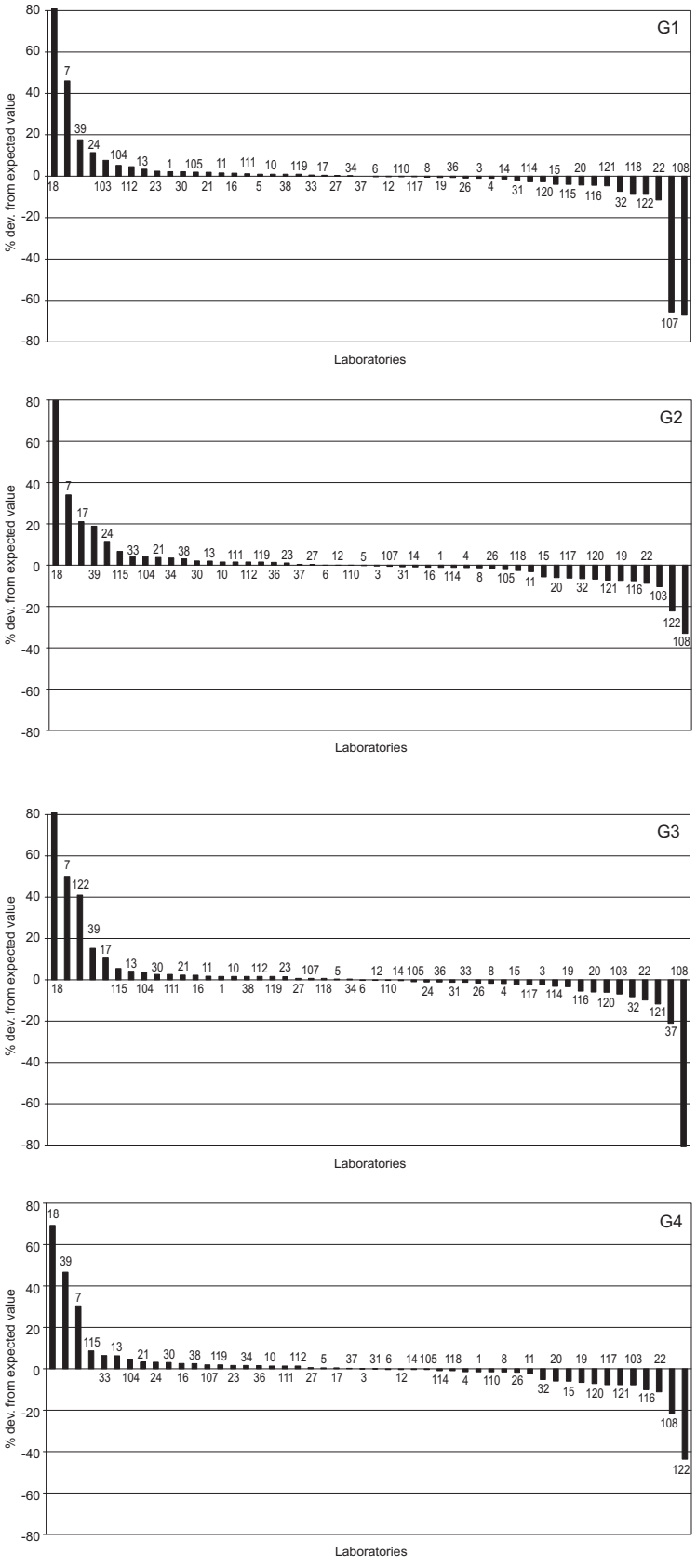

Figure 1: Percent deviation from theoretical value for sulphate.

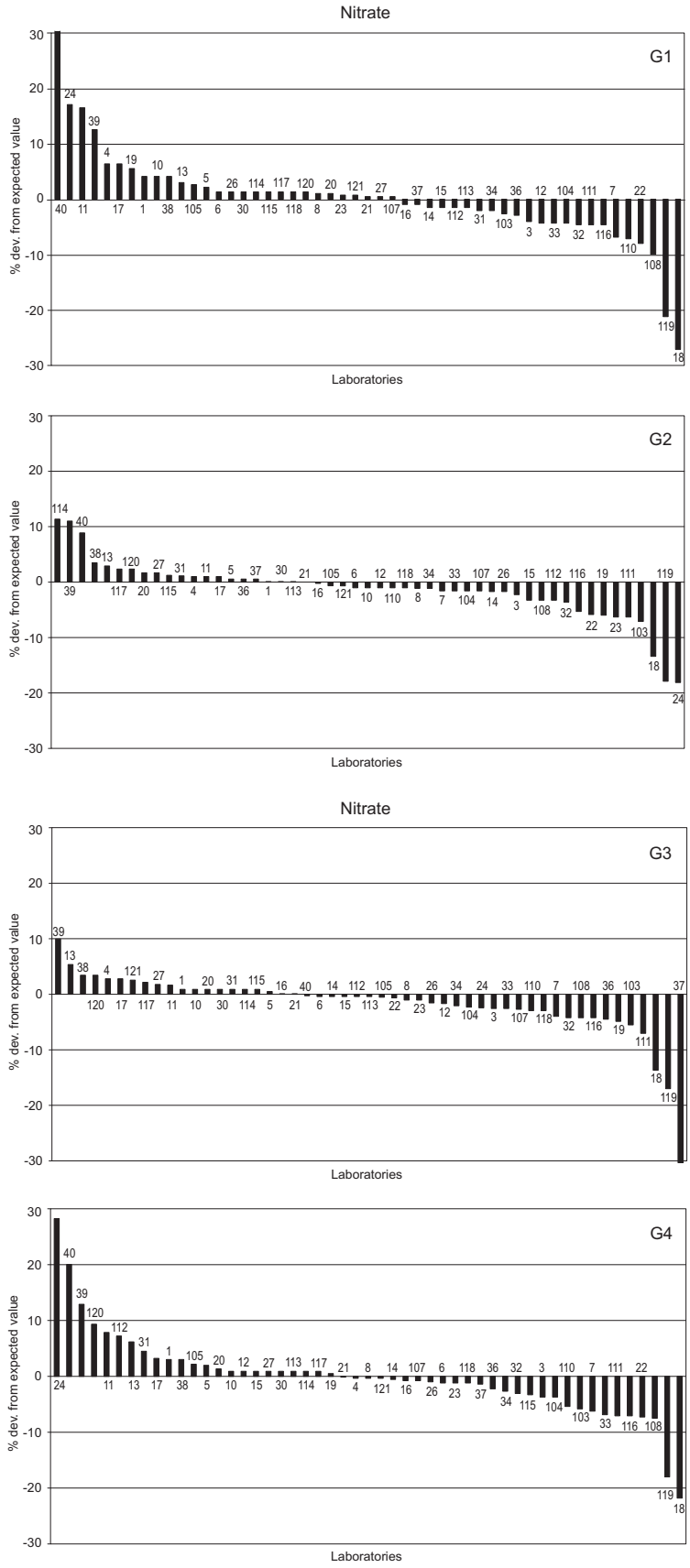

Figure 2: Percent deviation from theoretical value for nitrate.

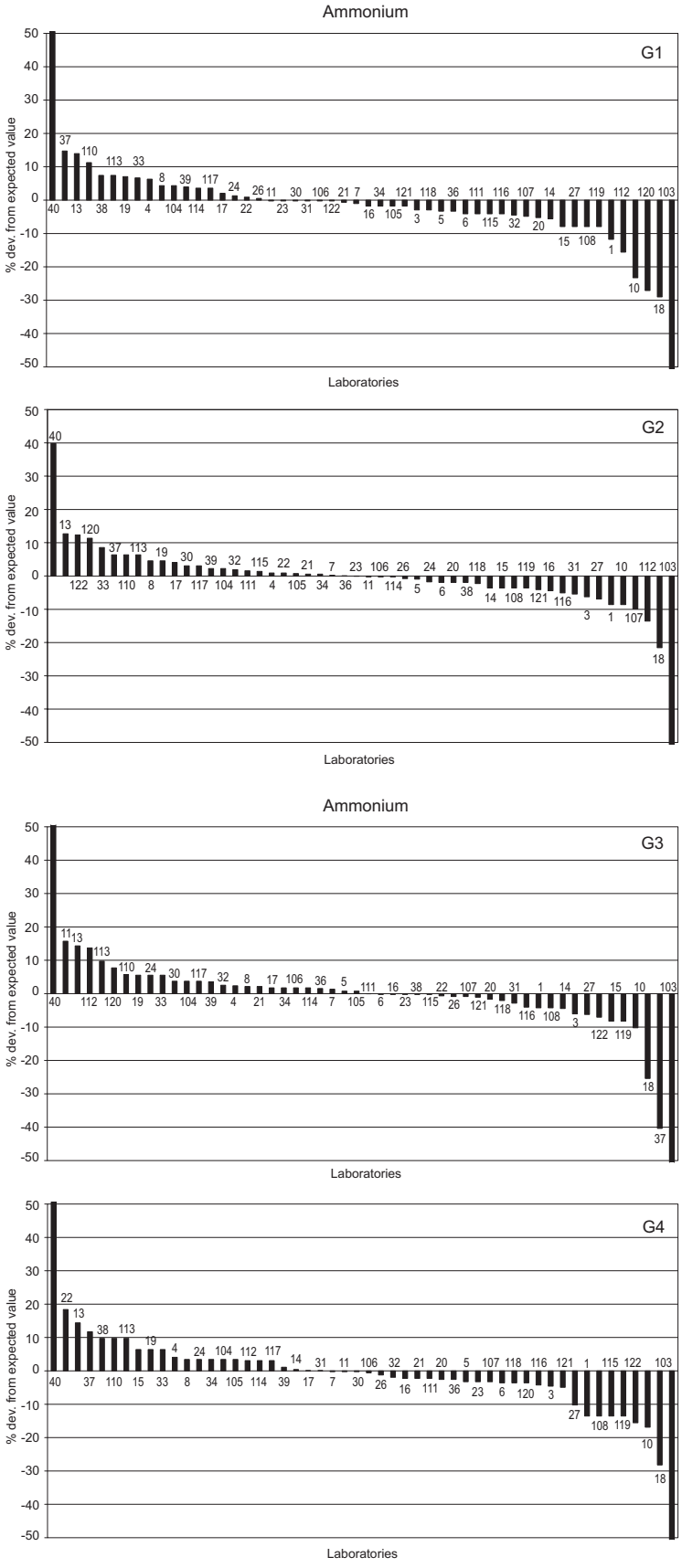

Figure 3: Percent deviation from theoretical value for ammonium.

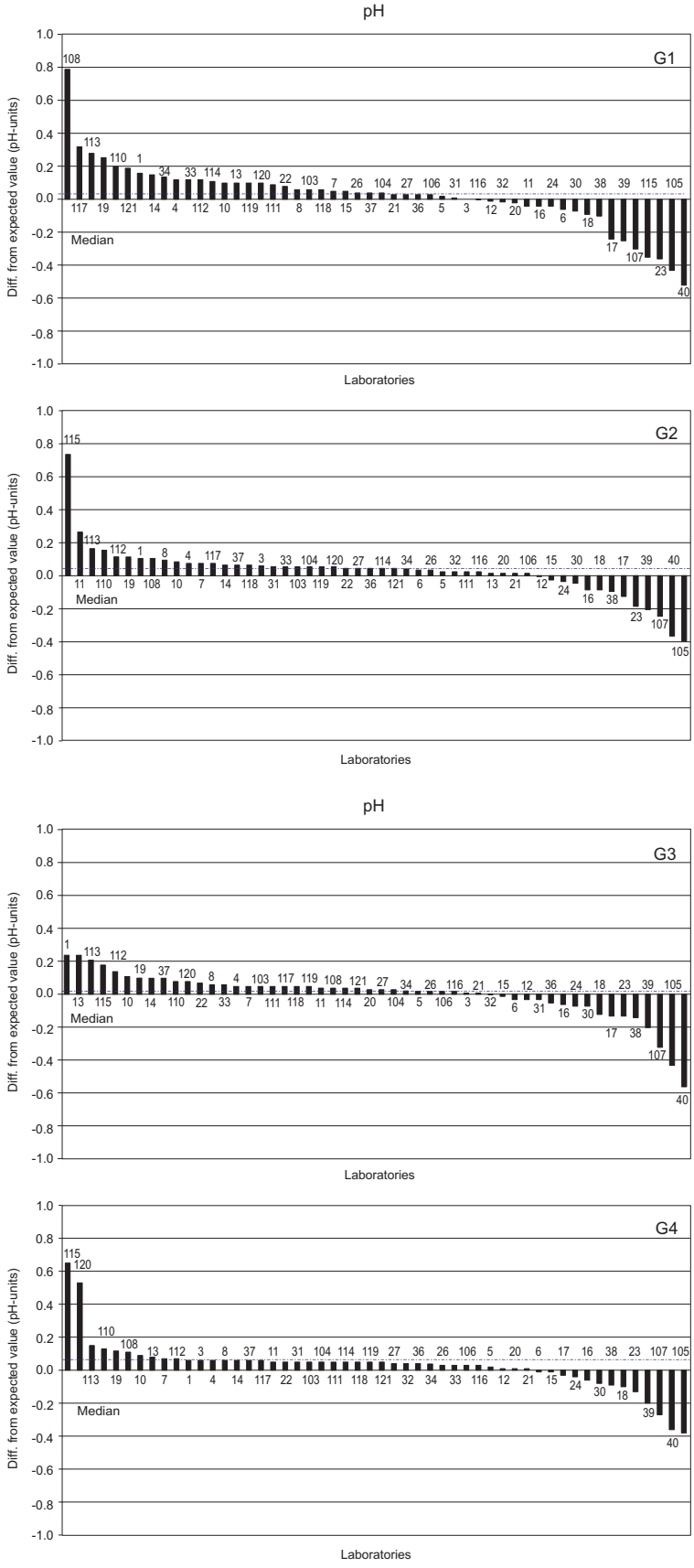

Figure 4: Percent deviation from theoretical value for pH.

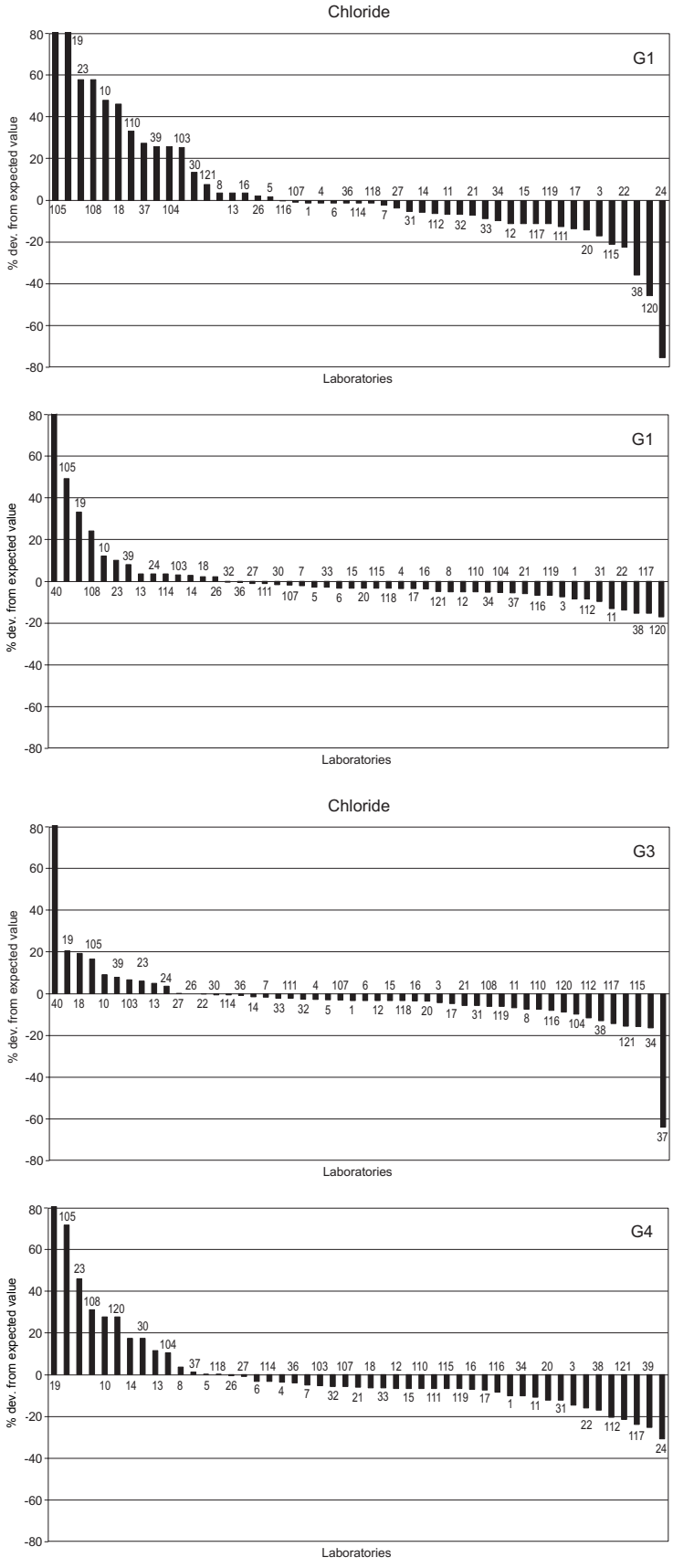

Figure 5: Percent deviation from theoretical value for chloride.

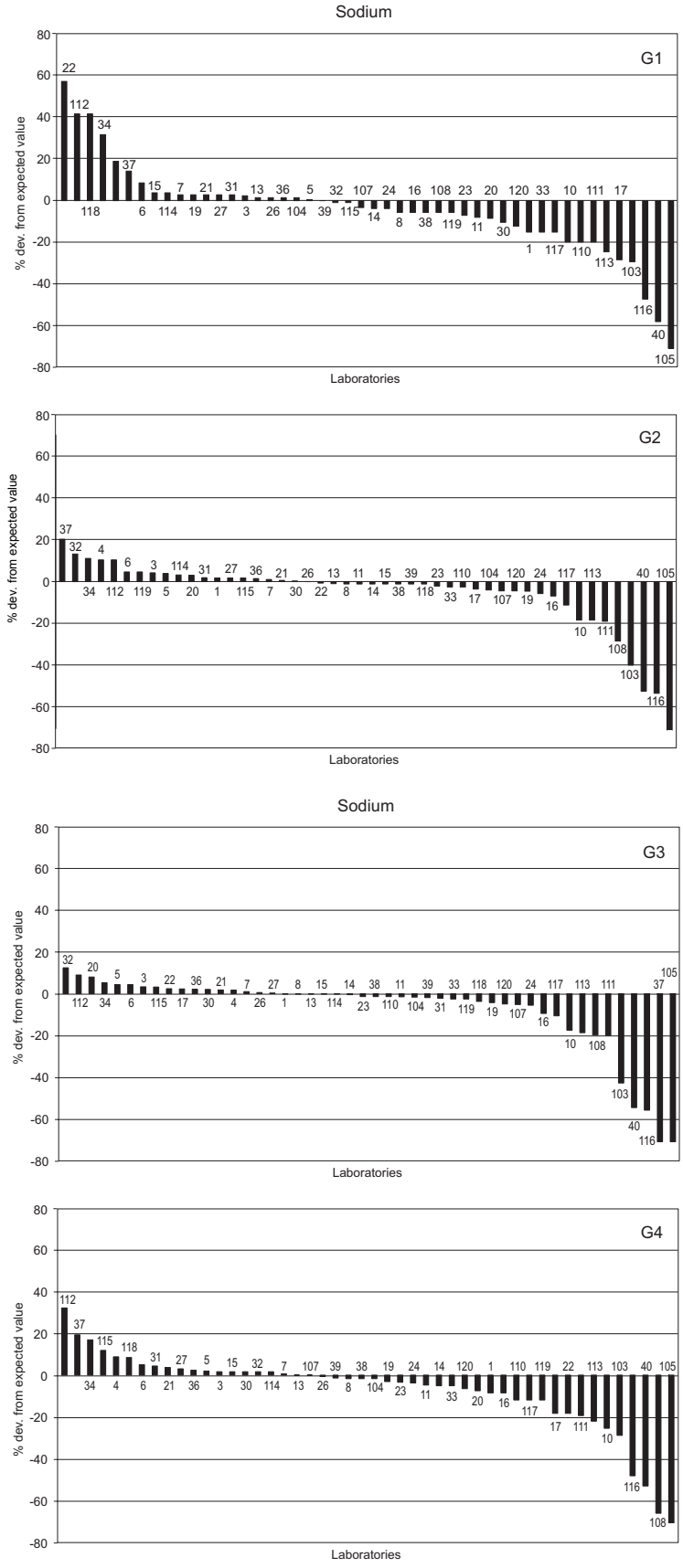

Figure 6: Percent deviation from theoretical value for sodium.

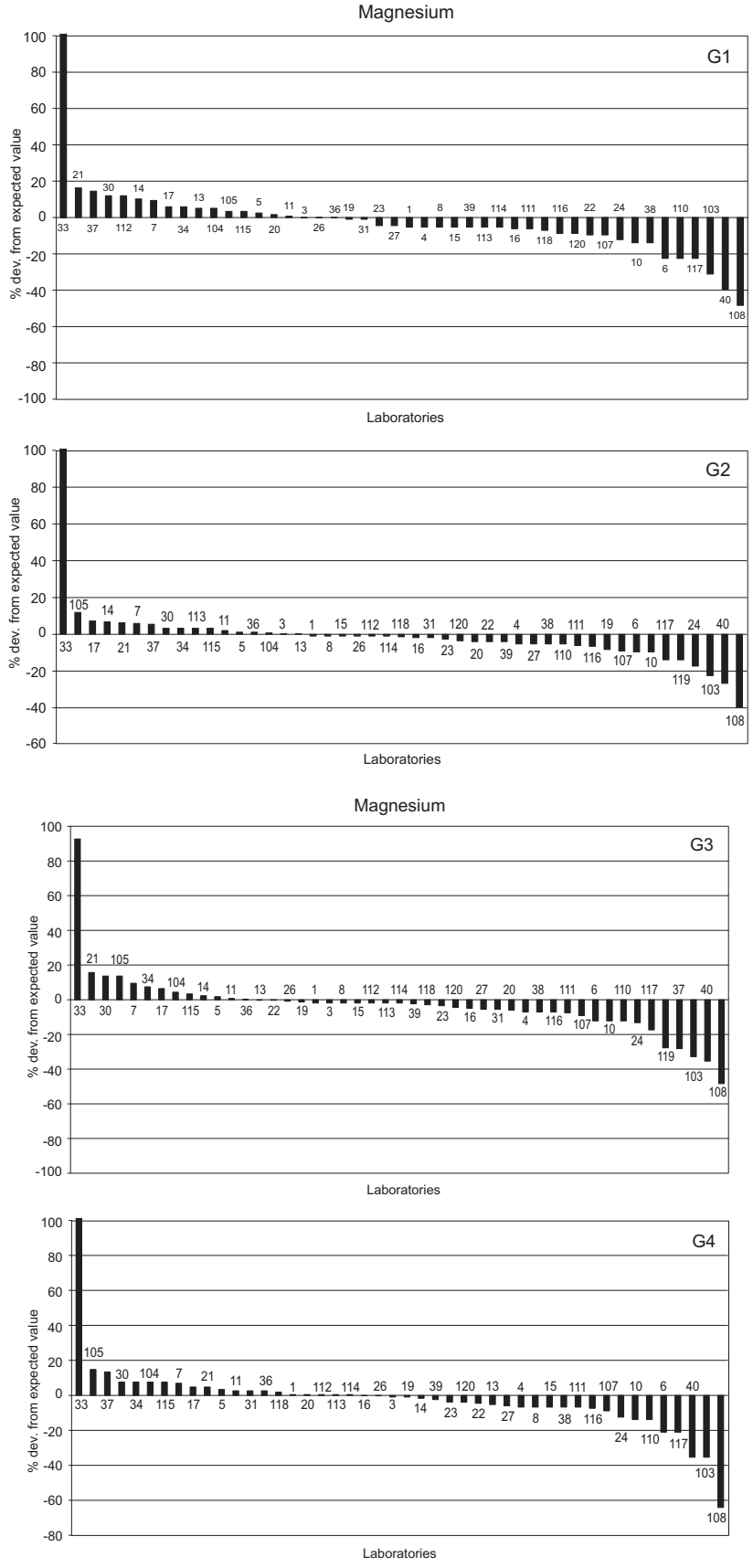

Figure 7: Percent deviation from theoretical value for magnesium.

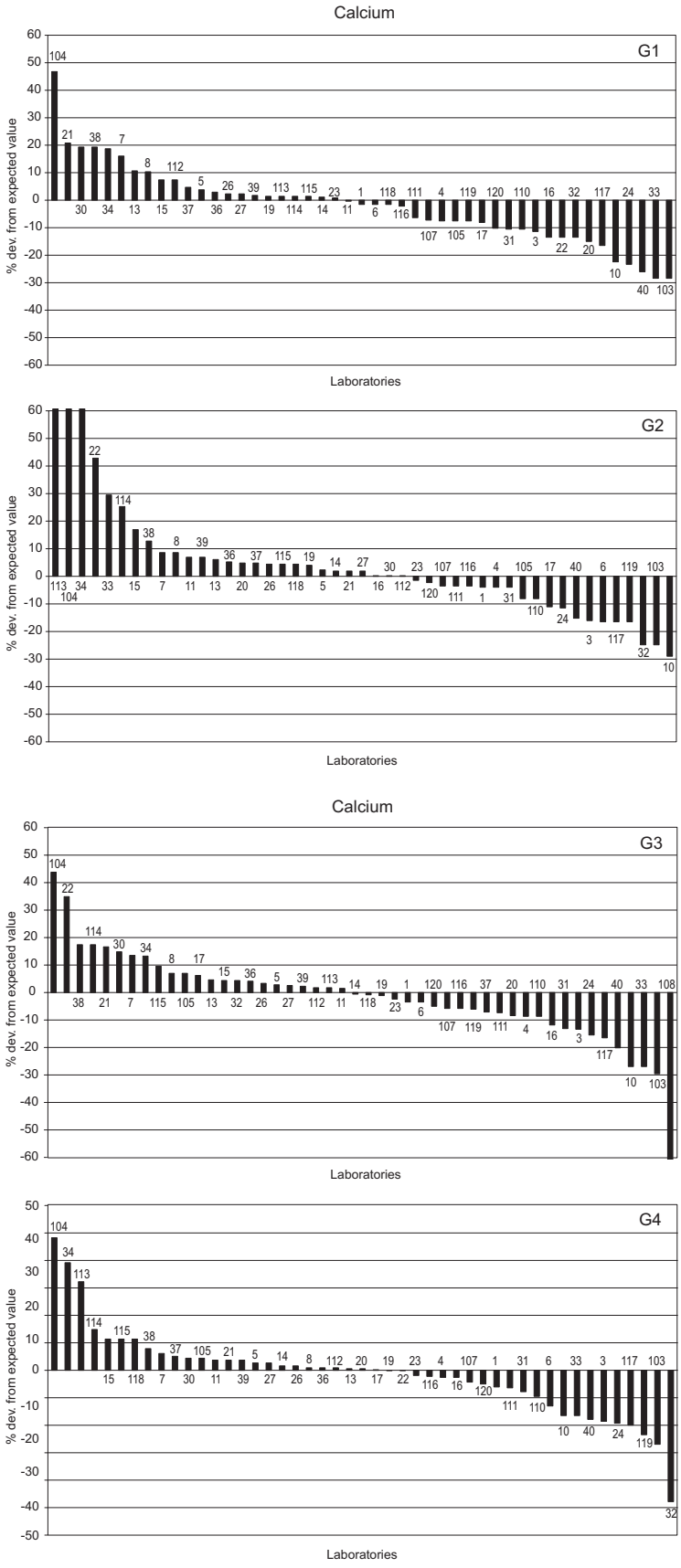

Figure 8: Percent deviation from theoretical value for calcium.

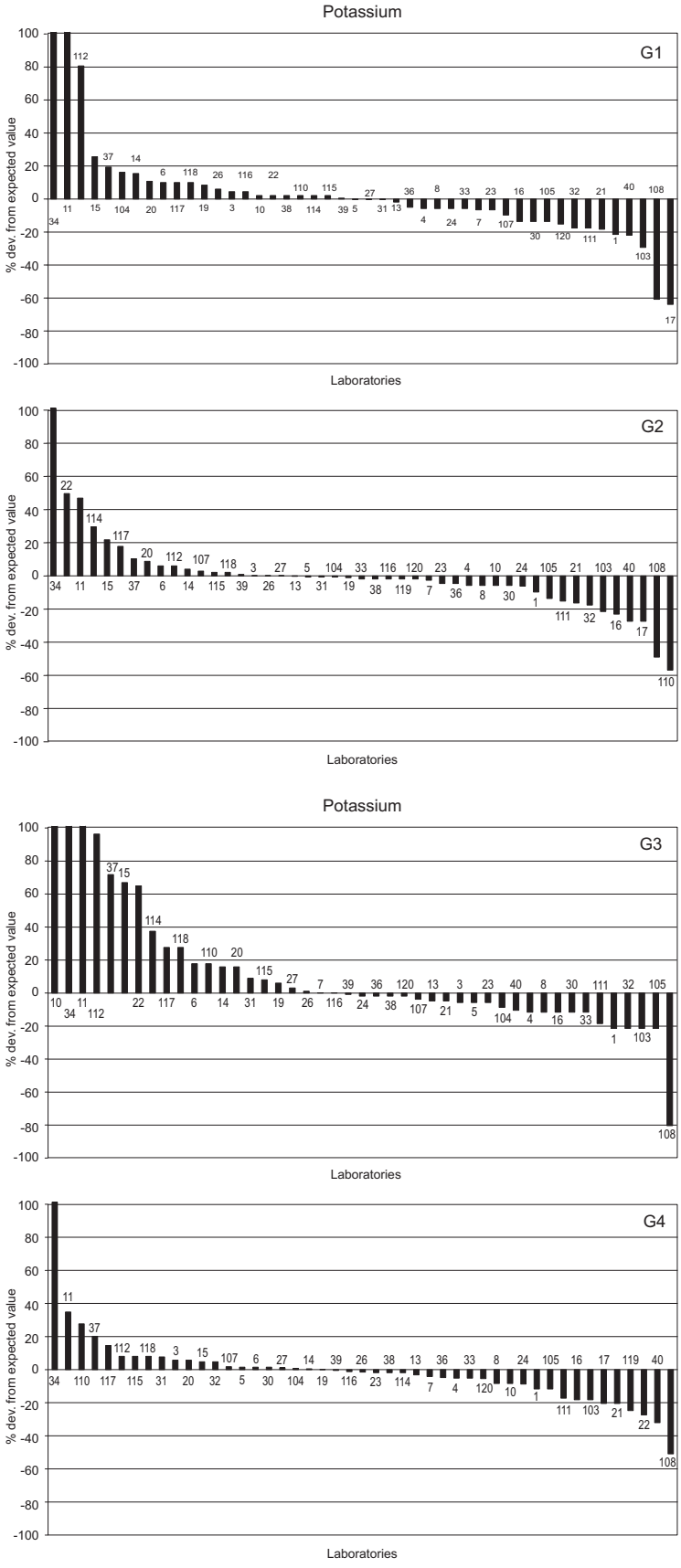

Figure 9: Percent deviation from theoretical value for potassium.

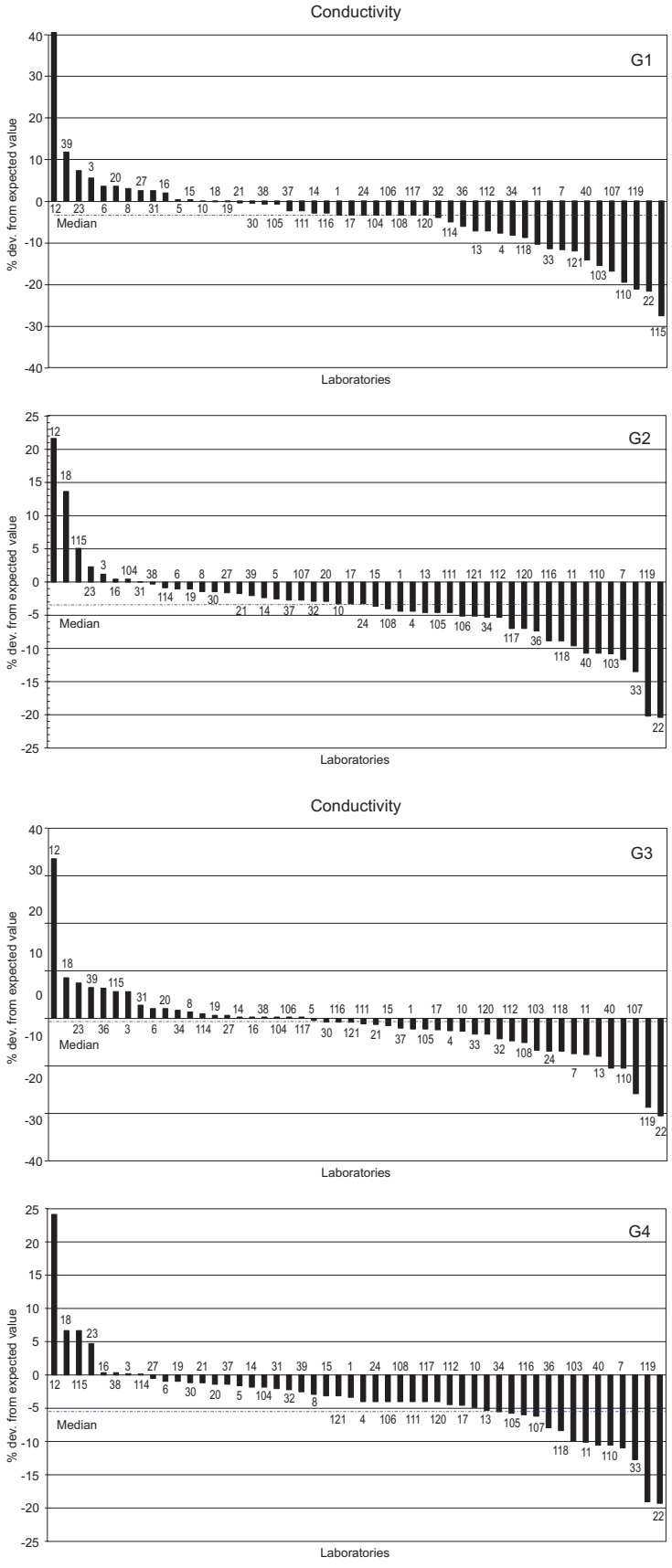

Figure 10: Percent deviation from theoretical value for conductivity.

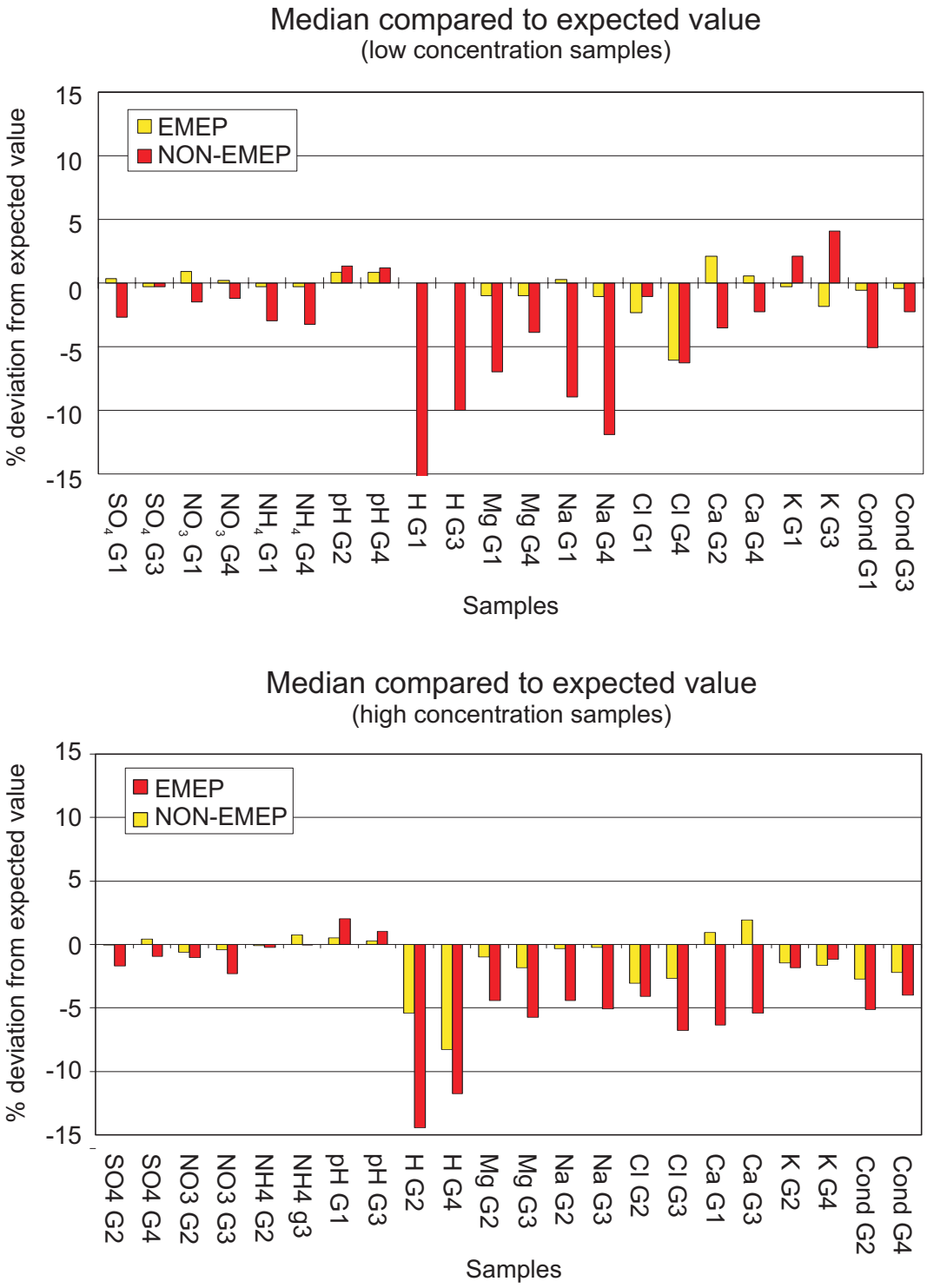

Figure 11: The median compared to theoretical value.