

## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 3, Czech Hydrometeorological Institute, Praha (Czech Republic)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.196	0.201	0.199	0.016	-0.206	S
G2		0.236	0.244	0.241	0.013	-0.368	S
G3		0.602	0.567	0.613	0.195	-0.058	S
G4		0.693	0.688	0.708	0.242	-0.064	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.084	0.08	0.081	0.012	0.305	S
G2		0.234	0.227	0.226	0.016	0.494	S
G3		0.306	0.294	0.302	0.021	0.208	S
G4		0.477	0.454	0.463	0.028	0.494	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.246	0.249	0.245	0.008	0.138	S
G2		0.365	0.366	0.36	0.012	0.41	S
G3		0.504	0.496	0.492	0.017	0.707	S
G4		0.749	0.738	0.73	0.027	0.715	S
G1	Na <sup>+</sup> mg/l	0.332	0.32	0.318	0.028	0.505	S
G2		0.331	0.317	0.313	0.015	1.255	S
G3		1.005	0.948	0.941	0.045	1.434	S
G4		1.11	1.05	1.039	0.041	1.741	S
G1	Mg <sup>2+</sup> mg/l	0.084	0.077	0.077	0.006	1.152	S
G2		0.095	0.088	0.087	0.006	1.357	S
G3		0.251	0.237	0.24	0.014	0.818	S
G4		0.294	0.279	0.277	0.014	1.196	S
G1	Cl <sup>-</sup> mg/l	0.333	0.328	0.324	0.027	0.314	S
G2		0.363	0.367	0.367	0.035	-0.111	S
G3		1.34	1.35	1.333	0.064	0.11	S
G4		1.418	1.43	1.399	0.078	0.246	S
G1	Ca <sup>2+</sup> mg/l	0.112	0.109	0.106	0.012	0.467	S
G2		0.148	0.14	0.136	0.013	0.875	S
G3		0.327	0.294	0.308	0.018	1.107	S
G4		0.369	0.37	0.359	0.024	0.428	S
G1	K <sup>+</sup> mg/l	0.301	0.289	0.28	0.022	0.934	S
G2		0.267	0.255	0.247	0.016	1.256	S
G3		0.455	0.441	0.439	0.023	0.676	S
G4		0.596	0.577	0.573	0.031	0.736	S
G1	pH pH units	5.63	5.55	5.523	0.178	0.6	S
G2		5.57	5.52	5.523	0.174	0.269	S
G3		5.42	5.48	5.487	0.148	-0.451	S
G4		5.45	5.46	5.468	0.129	-0.136	S
G1	Cond µS/cm	6.7	6.73	6.767	1.348	-0.049	S
G2		8.5	8.4	8.392	1.375	0.079	S
G3		16.5	16.02	16.092	1.087	0.375	S
G4		19.8	19.5	19.352	1.052	0.426	S

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If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value,  $\frac{1}{2}$  DL is taken as the reported value in further calculations.

\* Z score is unitless

✎ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:  
<http://www.nilu.no/projects/ccc/intercomparison.html>

## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 4, Aarhus University, Department of Environmental Science (Denmark)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.194	0.201	0.199	0.016	-0.331	S
G2		0.242	0.244	0.241	0.013	0.098	S
G3		0.58	0.567	0.613	0.195	-0.171	S
G4		0.67	0.688	0.708	0.242	-0.159	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.076	0.08	0.081	0.012	-0.388	S
G2		0.211	0.227	0.226	0.016	-0.949	S
G3		0.29	0.294	0.302	0.021	-0.569	S
G4		0.446	0.454	0.463	0.028	-0.627	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.254	0.249	0.245	0.008	1.146	S
G2		0.378	0.366	0.36	0.012	1.48	S
G3		0.512	0.496	0.492	0.017	1.166	S
G4		0.751	0.738	0.73	0.027	0.79	S
G1	Na <sup>+</sup> mg/l	0.335	0.32	0.318	0.028	0.613	S
G2		0.335	0.317	0.313	0.015	1.526	S
G3		0.961	0.948	0.941	0.045	0.449	S
G4		1.06	1.05	1.039	0.041	0.512	S
G1	Mg <sup>2+</sup> mg/l	0.074	0.077	0.077	0.006	-0.443	S
G2		0.082	0.088	0.087	0.006	-0.782	S
G3		0.222	0.237	0.24	0.014	-1.293	S
G4		0.261	0.279	0.277	0.014	-1.134	S
G1	Cl <sup>-</sup> mg/l	0.343	0.328	0.324	0.027	0.681	S
G2		0.371	0.367	0.367	0.035	0.119	S
G3		1.323	1.35	1.333	0.064	-0.155	S
G4		1.391	1.43	1.399	0.078	-0.102	S
G1	Ca <sup>2+</sup> mg/l	0.096	0.109	0.106	0.012	-0.891	S
G2		0.124	0.14	0.136	0.013	-0.935	S
G3		0.285	0.294	0.308	0.018	-1.29	S
G4		0.332	0.37	0.359	0.024	-1.117	S
G1	K <sup>+</sup> mg/l	0.237	0.289	0.28	0.022	-1.933	Q
G2		0.217	0.255	0.247	0.016	-1.957	S
G3		0.371	0.441	0.439	0.023	-2.917	Q
G4		0.501	0.577	0.573	0.031	-2.305	S
G1	pH pH units	5.45	5.55	5.523	0.178	-0.413	S
G2		5.43	5.52	5.523	0.174	-0.536	S
G3		5.41	5.48	5.487	0.148	-0.519	S
G4		5.4	5.46	5.468	0.129	-0.524	S
G1	Cond µS/cm	-999	6.73	6.767	1.348		B
G2		-999	8.4	8.392	1.375		B
G3		-999	16.02	16.092	1.087		B
G4		-999	19.5	19.352	1.052		B

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\* Z score is unitless

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 5, Finnish Meteorological Institute. Air Quality Department (Finland)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.197	0.201	0.199	0.016	-0.144	S
G2		0.251	0.244	0.241	0.013	0.798	S
G3		0.601	0.567	0.613	0.195	-0.064	S
G4		0.684	0.688	0.708	0.242	-0.101	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.082	0.08	0.081	0.012	0.113	S
G2		0.227	0.227	0.226	0.016	0.055	S
G3		0.302	0.294	0.302	0.021	0.014	S
G4		0.461	0.454	0.463	0.028	-0.085	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.257	0.249	0.245	0.008	1.524	S
G2		0.374	0.366	0.36	0.012	1.151	S
G3		0.504	0.496	0.492	0.017	0.707	S
G4		0.749	0.738	0.73	0.027	0.715	S
G1	Na <sup>+</sup> mg/l	0.322	0.32	0.318	0.028	0.142	S
G2		0.321	0.317	0.313	0.015	0.576	S
G3		0.949	0.948	0.941	0.045	0.187	S
G4		1.048	1.05	1.039	0.041	0.215	S
G1	Mg <sup>2+</sup> mg/l	0.081	0.077	0.077	0.006	0.658	S
G2		0.088	0.088	0.087	0.006	0.271	S
G3		0.25	0.237	0.24	0.014	0.752	S
G4		0.288	0.279	0.277	0.014	0.751	S
G1	Cl <sup>-</sup> mg/l	0.327	0.328	0.324	0.027	0.094	S
G2		0.365	0.367	0.367	0.035	-0.053	S
G3		1.342	1.35	1.333	0.064	0.141	S
G4		1.414	1.43	1.399	0.078	0.194	S
G1	Ca <sup>2+</sup> mg/l	0.111	0.109	0.106	0.012	0.408	S
G2		0.147	0.14	0.136	0.013	0.777	S
G3		0.324	0.294	0.308	0.018	0.924	S
G4		0.372	0.37	0.359	0.024	0.549	S
G1	K <sup>+</sup> mg/l	0.304	0.289	0.28	0.022	1.086	S
G2		0.267	0.255	0.247	0.016	1.244	S
G3		0.465	0.441	0.439	0.023	1.121	S
G4		0.596	0.577	0.573	0.031	0.743	S
G1	pH pH units	5.33	5.55	5.523	0.178	-1.088	U
G2		5.45	5.52	5.523	0.174	-0.421	S
G3		5.46	5.48	5.487	0.148	-0.181	S
G4		5.42	5.46	5.468	0.129	-0.369	S
G1	Cond µS/cm	6.52	6.73	6.767	1.348	-0.183	S
G2		8.18	8.4	8.392	1.375	-0.154	S
G3		15.98	16.02	16.092	1.087	-0.103	S
G4		19.45	19.5	19.352	1.052	0.093	S

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 6, SGS France - EHS (France)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.211	0.201	0.199	0.016	0.728	S
G2		0.257	0.244	0.241	0.013	1.264	S
G3		0.626	0.567	0.613	0.195	0.065	Q
G4		0.721	0.688	0.708	0.242	0.052	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.079	0.08	0.081	0.012	-0.138	S
G2		0.254	0.227	0.226	0.016	1.748	S
G3		0.324	0.294	0.302	0.021	1.083	S
G4		0.484	0.454	0.463	0.028	0.748	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.247	0.249	0.245	0.008	0.264	S
G2		0.367	0.366	0.36	0.012	0.575	S
G3		0.503	0.496	0.492	0.017	0.65	S
G4		0.746	0.738	0.73	0.027	0.603	S
G1	Na <sup>+</sup> mg/l	0.323	0.32	0.318	0.028	0.182	S
G2		0.325	0.317	0.313	0.015	0.847	S
G3		0.953	0.948	0.941	0.045	0.27	S
G4		1.065	1.05	1.039	0.041	0.635	S
G1	Mg <sup>2+</sup> mg/l	0.072	0.077	0.077	0.006	-0.762	S
G2		0.081	0.088	0.087	0.006	-0.947	S
G3		0.23	0.237	0.24	0.014	-0.711	S
G4		0.267	0.279	0.277	0.014	-0.71	S
G1	Cl <sup>-</sup> mg/l	0.339	0.328	0.324	0.027	0.534	S
G2		0.38	0.367	0.367	0.035	0.378	S
G3		1.404	1.35	1.333	0.064	1.109	S
G4		1.48	1.43	1.399	0.078	1.044	S
G1	Ca <sup>2+</sup> mg/l	0.109	0.109	0.106	0.012	0.213	S
G2		0.137	0.14	0.136	0.013	0.045	S
G3		0.312	0.294	0.308	0.018	0.251	S
G4		0.368	0.37	0.359	0.024	0.386	S
G1	K <sup>+</sup> mg/l	0.282	0.289	0.28	0.022	0.083	S
G2		0.251	0.255	0.247	0.016	0.228	S
G3		0.436	0.441	0.439	0.023	-0.137	S
G4		0.573	0.577	0.573	0.031	0	S
G1	pH pH units	5.55	5.55	5.523	0.178	0.15	S
G2		5.42	5.52	5.523	0.174	-0.593	S
G3		5.36	5.48	5.487	0.148	-0.858	Q
G4		5.35	5.46	5.468	0.129	-0.911	Q
G1	Cond µS/cm	7.084	6.73	6.767	1.348	0.235	S
G2		9.089	8.4	8.392	1.375	0.507	S
G3		16.54	16.02	16.092	1.087	0.412	S
G4		21.66	19.5	19.352	1.052	2.195	S

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\* Z score is unitless

✎ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:  
<http://www.nilu.no/projects/ccc/intercomparison.html>



## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 7, SGS Analytics Germany GmbH, Niederlassung Markkleeberg (Germany)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.201	0.201	0.199	0.016	0.105	S
G2		0.246	0.244	0.241	0.013	0.409	S
G3		0.603	0.567	0.613	0.195	-0.053	S
G4		0.71	0.688	0.708	0.242	0.007	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.079	0.08	0.081	0.012	-0.171	S
G2		0.212	0.227	0.226	0.016	-0.886	S
G3		0.287	0.294	0.302	0.021	-0.715	S
G4		0.453	0.454	0.463	0.028	-0.374	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.246	0.249	0.245	0.008	0.138	S
G2		0.376	0.366	0.36	0.012	1.315	S
G3		0.519	0.496	0.492	0.017	1.567	S
G4		0.78	0.738	0.73	0.027	1.871	S
G1	Na <sup>+</sup> mg/l	0.295	0.32	0.318	0.028	-0.826	S
G2		0.298	0.317	0.313	0.015	-0.985	S
G3		0.89	0.948	0.941	0.045	-1.14	S
G4		1.003	1.05	1.039	0.041	-0.888	S
G1	Mg <sup>2+</sup> mg/l	0.071	0.077	0.077	0.006	-0.922	S
G2		0.078	0.088	0.087	0.006	-1.441	S
G3		0.222	0.237	0.24	0.014	-1.293	S
G4		0.257	0.279	0.277	0.014	-1.416	S
G1	Cl <sup>-</sup> mg/l	0.325	0.328	0.324	0.027	0.021	S
G2		0.363	0.367	0.367	0.035	-0.111	S
G3		1.314	1.35	1.333	0.064	-0.296	S
G4		1.426	1.43	1.399	0.078	0.349	S
G1	Ca <sup>2+</sup> mg/l	0.089	0.109	0.106	0.012	-1.485	Q
G2		0.121	0.14	0.136	0.013	-1.161	S
G3		0.29	0.294	0.308	0.018	-1.005	S
G4		0.347	0.37	0.359	0.024	-0.491	S
G1	K <sup>+</sup> mg/l	0.27	0.289	0.28	0.022	-0.455	S
G2		0.243	0.255	0.247	0.016	-0.286	S
G3		0.42	0.441	0.439	0.023	-0.821	S
G4		0.582	0.577	0.573	0.031	0.288	S
G1	pH pH units	5.15	5.55	5.523	0.178	-2.101	U
G2		5.15	5.52	5.523	0.174	-2.146	U
G3		5.19	5.48	5.487	0.148	-2.009	U
G4		5.32	5.46	5.468	0.129	-1.144	Q
G1	Cond µS/cm	5.89	6.73	6.767	1.348	-0.65	S
G2		7.78	8.4	8.392	1.375	-0.445	S
G3		14.7	16.02	16.092	1.087	-1.28	S
G4		17.81	19.5	19.352	1.052	-1.467	S

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\* Z score is unitless

✎ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 8, Umweltbundesamt, Langen (Germany)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.195	0.201	0.199	0.016	-0.268	S
G2		0.238	0.244	0.241	0.013	-0.213	S
G3		0.611	0.567	0.613	0.195	-0.012	S
G4		0.659	0.688	0.708	0.242	-0.205	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.08	0.08	0.081	0.012	-0.054	S
G2		0.227	0.227	0.226	0.016	0.055	S
G3		0.301	0.294	0.302	0.021	-0.035	S
G4		0.464	0.454	0.463	0.028	0.024	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.246	0.249	0.245	0.008	0.138	S
G2		0.373	0.366	0.36	0.012	1.068	S
G3		0.479	0.496	0.492	0.017	-0.727	S
G4		0.717	0.738	0.73	0.027	-0.478	S
G1	Na <sup>+</sup> mg/l	0.321	0.32	0.318	0.028	0.11	S
G2		0.319	0.317	0.313	0.015	0.44	S
G3		0.95	0.948	0.941	0.045	0.203	S
G4		1.055	1.05	1.039	0.041	0.389	S
G1	Mg <sup>2+</sup> mg/l	0.077	0.077	0.077	0.006	0.036	S
G2		0.083	0.088	0.087	0.006	-0.618	S
G3		0.235	0.237	0.24	0.014	-0.347	S
G4		0.279	0.279	0.277	0.014	0.137	S
G1	Cl <sup>-</sup> mg/l	0.316	0.328	0.324	0.027	-0.309	S
G2		0.355	0.367	0.367	0.035	-0.341	S
G3		1.361	1.35	1.333	0.064	0.438	S
G4		1.394	1.43	1.399	0.078	-0.063	S
G1	Ca <sup>2+</sup> mg/l	0.104	0.109	0.106	0.012	-0.212	S
G2		0.132	0.14	0.136	0.013	-0.332	S
G3		0.31	0.294	0.308	0.018	0.137	S
G4		0.361	0.37	0.359	0.024	0.094	S
G1	K <sup>+</sup> mg/l	0.281	0.289	0.28	0.022	0.038	S
G2		0.254	0.255	0.247	0.016	0.421	S
G3		0.432	0.441	0.439	0.023	-0.308	S
G4		0.576	0.577	0.573	0.031	0.096	S
G1	pH pH units	5.605	5.55	5.523	0.178	0.459	S
G2		5.47	5.52	5.523	0.174	-0.306	S
G3		5.485	5.48	5.487	0.148	-0.011	S
G4		5.455	5.46	5.468	0.129	-0.097	S
G1	Cond µS/cm	6.9	6.73	6.767	1.348	0.099	S
G2		8.55	8.4	8.392	1.375	0.115	S
G3		16.3	16.02	16.092	1.087	0.191	S
G4		19.75	19.5	19.352	1.052	0.378	S

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\* Z score is unitless

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S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

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B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 10, Air Quality Reference Centre (Hungary)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.212	0.201	0.199	0.016	0.791	S
G2		0.253	0.244	0.241	0.013	0.953	S
G3		0.607	0.567	0.613	0.195	-0.033	S
G4		0.699	0.688	0.708	0.242	-0.039	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.065	0.08	0.081	0.012	-1.307	Q
G2		0.211	0.227	0.226	0.016	-0.949	S
G3		0.284	0.294	0.302	0.021	-0.861	S
G4		0.449	0.454	0.463	0.028	-0.519	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.249	0.249	0.245	0.008	0.516	S
G2		0.359	0.366	0.36	0.012	-0.084	S
G3		0.5	0.496	0.492	0.017	0.477	S
G4		0.739	0.738	0.73	0.027	0.343	S
G1	Na <sup>+</sup> mg/l	0.366	0.32	0.318	0.028	1.729	S
G2		0.357	0.317	0.313	0.015	3.019	S
G3		0.994	0.948	0.941	0.045	1.188	S
G4		1.11	1.05	1.039	0.041	1.741	S
G1	Mg <sup>2+</sup> mg/l	0.072	0.077	0.077	0.006	-0.762	S
G2		0.084	0.088	0.087	0.006	-0.453	S
G3		0.251	0.237	0.24	0.014	0.818	S
G4		0.294	0.279	0.277	0.014	1.196	S
G1	Cl <sup>-</sup> mg/l	0.353	0.328	0.324	0.027	1.048	S
G2		0.379	0.367	0.367	0.035	0.349	S
G3		1.356	1.35	1.333	0.064	0.36	S
G4		1.418	1.43	1.399	0.078	0.246	S
G1	Ca <sup>2+</sup> mg/l	0.123	0.109	0.106	0.012	1.401	S
G2		0.162	0.14	0.136	0.013	1.93	Q
G3		0.329	0.294	0.308	0.018	1.221	S
G4		0.388	0.37	0.359	0.024	1.221	S
G1	K <sup>+</sup> mg/l	0.282	0.289	0.28	0.022	0.083	S
G2		0.249	0.255	0.247	0.016	0.1	S
G3		0.434	0.441	0.439	0.023	-0.222	S
G4		0.568	0.577	0.573	0.031	-0.16	S
G1	pH pH units	5.52	5.55	5.523	0.178	-0.019	S
G2		5.49	5.52	5.523	0.174	-0.191	S
G3		5.54	5.48	5.487	0.148	0.361	S
G4		5.53	5.46	5.468	0.129	0.484	S
G1	Cond µS/cm	6.96	6.73	6.767	1.348	0.143	S
G2		8.78	8.4	8.392	1.375	0.282	S
G3		16.49	16.02	16.092	1.087	0.366	S
G4		19.96	19.5	19.352	1.052	0.578	S

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\* Z score is unitless

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B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 12, Met Eireann, Dublin (Ireland)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.19	0.201	0.199	0.016	-0.58	S
G2		0.23	0.244	0.241	0.013	-0.834	S
G3		0.58	0.567	0.613	0.195	-0.171	S
G4		0.67	0.688	0.708	0.242	-0.159	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.05	0.08	0.081	0.012	-2.559	U
G2		0.25	0.227	0.226	0.016	1.497	S
G3		0.33	0.294	0.302	0.021	1.374	S
G4		0.52	0.454	0.463	0.028	2.05	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.25	0.249	0.245	0.008	0.642	S
G2		0.36	0.366	0.36	0.012	-0.002	S
G3		0.5	0.496	0.492	0.017	0.477	S
G4		0.73	0.738	0.73	0.027	0.007	S
G1	Na <sup>+</sup> mg/l	0.27	0.32	0.318	0.028	-1.725	Q
G2		0.27	0.317	0.313	0.015	-2.885	S
G3		0.9	0.948	0.941	0.045	-0.916	S
G4		0.99	1.05	1.039	0.041	-1.208	S
G1	Mg <sup>2+</sup> mg/l	0.067	0.077	0.077	0.006	-1.56	S
G2		0.078	0.088	0.087	0.006	-1.441	S
G3		0.23	0.237	0.24	0.014	-0.711	S
G4		0.27	0.279	0.277	0.014	-0.498	S
G1	Cl <sup>-</sup> mg/l	0.32	0.328	0.324	0.027	-0.162	S
G2		0.36	0.367	0.367	0.035	-0.197	S
G3		1.29	1.35	1.333	0.064	-0.67	S
G4		1.35	1.43	1.399	0.078	-0.63	S
G1	Ca <sup>2+</sup> mg/l	0.08	0.109	0.106	0.012	-2.249	U
G2		0.11	0.14	0.136	0.013	-1.99	Q
G3		0.26	0.294	0.308	0.018	-2.717	S
G4		0.31	0.37	0.359	0.024	-2.035	Q
G1	K <sup>+</sup> mg/l	0.25	0.289	0.28	0.022	-1.351	S
G2		0.22	0.255	0.247	0.016	-1.764	S
G3		0.4	0.441	0.439	0.023	-1.677	S
G4		0.54	0.577	0.573	0.031	-1.057	S
G1	pH pH units	5.61	5.55	5.523	0.178	0.487	S
G2		5.46	5.52	5.523	0.174	-0.363	S
G3		5.51	5.48	5.487	0.148	0.158	S
G4		5.48	5.46	5.468	0.129	0.096	S
G1	Cond µS/cm	6.7	6.73	6.767	1.348	-0.049	S
G2		8.1	8.4	8.392	1.375	-0.212	S
G3		15.6	16.02	16.092	1.087	-0.452	S
G4		18.9	19.5	19.352	1.052	-0.43	S

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\* Z score is unitless

✎ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:  
<http://www.nilu.no/projects/ccc/intercomparison.html>



## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 15, Norwegian Institute for Air Research NILU (Norway)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.198	0.201	0.199	0.016	-0.081	S
G2		0.245	0.244	0.241	0.013	0.332	S
G3		0.587	0.567	0.613	0.195	-0.135	S
G4		0.68	0.688	0.708	0.242	-0.118	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.086	0.08	0.081	0.012	0.447	S
G2		0.24	0.227	0.226	0.016	0.87	S
G3		0.314	0.294	0.302	0.021	0.597	S
G4		0.473	0.454	0.463	0.028	0.35	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.242	0.249	0.245	0.008	-0.366	S
G2		0.358	0.366	0.36	0.012	-0.166	S
G3		0.49	0.496	0.492	0.017	-0.096	S
G4		0.73	0.738	0.73	0.027	0.007	S
G1	Na <sup>+</sup> mg/l	0.304	0.32	0.318	0.028	-0.502	S
G2		0.304	0.317	0.313	0.015	-0.578	S
G3		0.95	0.948	0.941	0.045	0.203	S
G4		1.053	1.05	1.039	0.041	0.34	S
G1	Mg <sup>2+</sup> mg/l	0.076	0.077	0.077	0.006	-0.124	S
G2		0.086	0.088	0.087	0.006	-0.124	S
G3		0.241	0.237	0.24	0.014	0.09	S
G4		0.278	0.279	0.277	0.014	0.066	S
G1	Cl <sup>-</sup> mg/l	0.33	0.328	0.324	0.027	0.204	S
G2		0.369	0.367	0.367	0.035	0.062	S
G3		1.329	1.35	1.333	0.064	-0.062	S
G4		1.399	1.43	1.399	0.078	0.001	S
G1	Ca <sup>2+</sup> mg/l	0.109	0.109	0.106	0.012	0.213	S
G2		0.137	0.14	0.136	0.013	0.045	S
G3		0.319	0.294	0.308	0.018	0.65	S
G4		0.367	0.37	0.359	0.024	0.344	S
G1	K <sup>+</sup> mg/l	0.275	0.289	0.28	0.022	-0.231	S
G2		0.247	0.255	0.247	0.016	-0.029	S
G3		0.439	0.441	0.439	0.023	-0.008	S
G4		0.574	0.577	0.573	0.031	0.032	S
G1	pH pH units	5.48	5.55	5.523	0.178	-0.244	S
G2		5.52	5.52	5.523	0.174	-0.018	S
G3		5.52	5.48	5.487	0.148	0.226	S
G4		5.46	5.46	5.468	0.129	-0.059	S
G1	Cond µS/cm	6.5	6.73	6.767	1.348	-0.198	S
G2		8.4	8.4	8.392	1.375	0.006	S
G3		14.7	16.02	16.092	1.087	-1.28	S
G4		17.1	19.5	19.352	1.052	-2.142	S

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\* Z score is unitless

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S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 16, Institute of Meteorology and Water Management, Warsaw (Poland)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.2	0.201	0.199	0.016	0.043	S
G2		0.243	0.244	0.241	0.013	0.176	S
G3		0.591	0.567	0.613	0.195	-0.115	S
G4		0.682	0.688	0.708	0.242	-0.109	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.083	0.08	0.081	0.012	0.196	S
G2		0.221	0.227	0.226	0.016	-0.322	S
G3		0.3	0.294	0.302	0.021	-0.083	S
G4		0.451	0.454	0.463	0.028	-0.446	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.248	0.249	0.245	0.008	0.39	S
G2		0.359	0.366	0.36	0.012	-0.084	S
G3		0.492	0.496	0.492	0.017	0.019	S
G4		0.726	0.738	0.73	0.027	-0.142	S
G1	Na <sup>+</sup> mg/l	0.319	0.32	0.318	0.028	0.038	S
G2		0.315	0.317	0.313	0.015	0.169	S
G3		0.937	0.948	0.941	0.045	-0.088	S
G4		1.033	1.05	1.039	0.041	-0.151	S
G1	Mg <sup>2+</sup> mg/l	0.08	0.077	0.077	0.006	0.514	S
G2		0.089	0.088	0.087	0.006	0.37	S
G3		0.246	0.237	0.24	0.014	0.454	S
G4		0.285	0.279	0.277	0.014	0.56	S
G1	Cl <sup>-</sup> mg/l	0.317	0.328	0.324	0.027	-0.272	S
G2		0.35	0.367	0.367	0.035	-0.484	S
G3		1.314	1.35	1.333	0.064	-0.296	S
G4		1.383	1.43	1.399	0.078	-0.205	S
G1	Ca <sup>2+</sup> mg/l	0.105	0.109	0.106	0.012	-0.127	S
G2		0.137	0.14	0.136	0.013	0.045	S
G3		0.309	0.294	0.308	0.018	0.08	S
G4		0.354	0.37	0.359	0.024	-0.198	S
G1	K <sup>+</sup> mg/l	0.289	0.289	0.28	0.022	0.396	S
G2		0.255	0.255	0.247	0.016	0.485	S
G3		0.435	0.441	0.439	0.023	-0.179	S
G4		0.581	0.577	0.573	0.031	0.256	S
G1	pH pH units	5.43	5.55	5.523	0.178	-0.525	Q
G2		5.42	5.52	5.523	0.174	-0.593	S
G3		5.4	5.48	5.487	0.148	-0.587	S
G4		5.36	5.46	5.468	0.129	-0.834	S
G1	Cond µS/cm	6.83	6.73	6.767	1.348	0.047	S
G2		8.6	8.4	8.392	1.375	0.151	S
G3		16	16.02	16.092	1.087	-0.084	S
G4		19.5	19.5	19.352	1.052	0.141	S

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\* Z score is unitless

✎ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 19, Centro Nacional de Sanidad Ambiental (Spain)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.2	0.201	0.199	0.016	0.043	S
G2		0.25	0.244	0.241	0.013	0.72	S
G3		0.57	0.567	0.613	0.195	-0.223	S
G4		0.67	0.688	0.708	0.242	-0.159	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.096	0.08	0.081	0.012	1.265	Q
G2		0.254	0.227	0.226	0.016	1.723	S
G3		0.325	0.294	0.302	0.021	1.126	S
G4		0.506	0.454	0.463	0.028	1.529	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.24	0.249	0.245	0.008	-0.618	S
G2		0.37	0.366	0.36	0.012	0.822	S
G3		0.48	0.496	0.492	0.017	-0.67	S
G4		0.72	0.738	0.73	0.027	-0.366	S
G1	Na <sup>+</sup> mg/l	0.296	0.32	0.318	0.028	-0.79	S
G2		0.312	0.317	0.313	0.015	-0.035	S
G3		0.907	0.948	0.941	0.045	-0.76	S
G4		1.016	1.05	1.039	0.041	-0.569	S
G1	Mg <sup>2+</sup> mg/l	0.08	0.077	0.077	0.006	0.514	S
G2		0.094	0.088	0.087	0.006	1.193	S
G3		0.258	0.237	0.24	0.014	1.327	S
G4		0.301	0.279	0.277	0.014	1.69	S
G1	Cl <sup>-</sup> mg/l	0.37	0.328	0.324	0.027	1.671	S
G2		0.41	0.367	0.367	0.035	1.24	S
G3		1.28	1.35	1.333	0.064	-0.826	S
G4		1.35	1.43	1.399	0.078	-0.63	S
G1	Ca <sup>2+</sup> mg/l	0.105	0.109	0.106	0.012	-0.127	S
G2		0.142	0.14	0.136	0.013	0.422	S
G3		0.316	0.294	0.308	0.018	0.479	S
G4		0.373	0.37	0.359	0.024	0.595	S
G1	K <sup>+</sup> mg/l	0.263	0.289	0.28	0.022	-0.768	S
G2		0.245	0.255	0.247	0.016	-0.157	S
G3		0.428	0.441	0.439	0.023	-0.479	S
G4		0.567	0.577	0.573	0.031	-0.192	S
G1	pH pH units	5.47	5.55	5.523	0.178	-0.3	S
G2		5.48	5.52	5.523	0.174	-0.248	S
G3		5.44	5.48	5.487	0.148	-0.316	S
G4		5.44	5.46	5.468	0.129	-0.214	S
G1	Cond µS/cm	6.51	6.73	6.767	1.348	-0.19	S
G2		8.01	8.4	8.392	1.375	-0.278	S
G3		15.06	16.02	16.092	1.087	-0.949	S
G4		18.17	19.5	19.352	1.052	-1.124	S

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\* Z score is unitless

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 20, Swedish Environmental Research Institute IVL, Gothenburg (Sweden)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.204	0.201	0.199	0.016	0.292	S
G2		0.247	0.244	0.241	0.013	0.487	S
G3		0.591	0.567	0.613	0.195	-0.115	S
G4		0.681	0.688	0.708	0.242	-0.113	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.091	0.08	0.081	0.012	0.864	S
G2		0.231	0.227	0.226	0.016	0.306	S
G3		0.304	0.294	0.302	0.021	0.111	S
G4		0.462	0.454	0.463	0.028	-0.048	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.252	0.249	0.245	0.008	0.894	S
G2		0.368	0.366	0.36	0.012	0.657	S
G3		0.498	0.496	0.492	0.017	0.363	S
G4		0.737	0.738	0.73	0.027	0.268	S
G1	Na <sup>+</sup> mg/l	0.364	0.32	0.318	0.028	1.657	S
G2		0.34	0.317	0.313	0.015	1.865	S
G3		0.933	0.948	0.941	0.045	-0.178	S
G4		0.986	1.05	1.039	0.041	-1.306	S
G1	Mg <sup>2+</sup> mg/l	0.085	0.077	0.077	0.006	1.312	S
G2		0.093	0.088	0.087	0.006	1.028	S
G3		0.249	0.237	0.24	0.014	0.672	S
G4		0.283	0.279	0.277	0.014	0.419	S
G1	Cl <sup>-</sup> mg/l	0.356	0.328	0.324	0.027	1.158	S
G2		0.366	0.367	0.367	0.035	-0.024	S
G3		1.35	1.35	1.333	0.064	0.266	S
G4		1.41	1.43	1.399	0.078	0.143	S
G1	Ca <sup>2+</sup> mg/l	0.125	0.109	0.106	0.012	1.571	S
G2		0.143	0.14	0.136	0.013	0.498	S
G3		0.325	0.294	0.308	0.018	0.993	S
G4		0.364	0.37	0.359	0.024	0.219	S
G1	K <sup>+</sup> mg/l	0.316	0.289	0.28	0.022	1.606	S
G2		0.257	0.255	0.247	0.016	0.614	S
G3		0.466	0.441	0.439	0.023	1.147	S
G4		0.594	0.577	0.573	0.031	0.672	S
G1	pH pH units	5.57	5.55	5.523	0.178	0.262	S
G2		5.45	5.52	5.523	0.174	-0.421	S
G3		5.46	5.48	5.487	0.148	-0.181	S
G4		5.42	5.46	5.468	0.129	-0.369	S
G1	Cond µS/cm	7	6.73	6.767	1.348	0.173	S
G2		8.77	8.4	8.392	1.375	0.275	S
G3		16.3	16.02	16.092	1.087	0.191	S
G4		19.7	19.5	19.352	1.052	0.331	S

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\* Z score is unitless

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S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

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<http://www.nilu.no/projects/ccc/intercomparison.html>



## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 21, Swiss Federal Laboratories for Materials Science and Technology (EMPA) (Switzerland)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.2	0.201	0.199	0.016	0.043	S
G2		0.243	0.244	0.241	0.013	0.176	S
G3		0.583	0.567	0.613	0.195	-0.156	S
G4		0.681	0.688	0.708	0.242	-0.113	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.079	0.08	0.081	0.012	-0.138	S
G2		0.222	0.227	0.226	0.016	-0.259	S
G3		0.289	0.294	0.302	0.021	-0.618	S
G4		0.443	0.454	0.463	0.028	-0.736	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.247	0.249	0.245	0.008	0.264	S
G2		0.358	0.366	0.36	0.012	-0.166	S
G3		0.491	0.496	0.492	0.017	-0.039	S
G4		0.728	0.738	0.73	0.027	-0.067	S
G1	Na <sup>+</sup> mg/l	0.312	0.32	0.318	0.028	-0.214	S
G2		0.31	0.317	0.313	0.015	-0.17	S
G3		0.921	0.948	0.941	0.045	-0.446	S
G4		1.018	1.05	1.039	0.041	-0.52	S
G1	Mg <sup>2+</sup> mg/l	0.082	0.077	0.077	0.006	0.833	S
G2		0.093	0.088	0.087	0.006	1.028	S
G3		0.263	0.237	0.24	0.014	1.691	S
G4		0.307	0.279	0.277	0.014	2.113	S
G1	Cl <sup>-</sup> mg/l	0.32	0.328	0.324	0.027	-0.162	S
G2		0.352	0.367	0.367	0.035	-0.427	S
G3		1.309	1.35	1.333	0.064	-0.374	S
G4		1.376	1.43	1.399	0.078	-0.295	S
G1	Ca <sup>2+</sup> mg/l	0.092	0.109	0.106	0.012	-1.231	Q
G2		0.119	0.14	0.136	0.013	-1.312	Q
G3		0.262	0.294	0.308	0.018	-2.603	S
G4		0.301	0.37	0.359	0.024	-2.41	Q
G1	K <sup>+</sup> mg/l	0.319	0.289	0.28	0.022	1.74	S
G2		0.279	0.255	0.247	0.016	2.028	S
G3		0.49	0.441	0.439	0.023	2.174	S
G4		0.639	0.577	0.573	0.031	2.113	S
G1	pH pH units	5.48	5.55	5.523	0.178	-0.244	S
G2		5.47	5.52	5.523	0.174	-0.306	S
G3		5.45	5.48	5.487	0.148	-0.248	S
G4		5.44	5.46	5.468	0.129	-0.214	S
G1	Cond μS/cm	6.778	6.73	6.767	1.348	0.008	S
G2		8.469	8.4	8.392	1.375	0.056	S
G3		16.17	16.02	16.092	1.087	0.072	S
G4		19.65	19.5	19.352	1.052	0.283	S

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\* Z score is unitless

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

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B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 22, Institute of Global Climate and Ecology (Russian Federation)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.547	0.201	0.199	0.016	21.656	U
G2		0.701	0.244	0.241	0.013	35.78	U
G3		1.857	0.567	0.613	0.195	6.387	U
G4		2.254	0.688	0.708	0.242	6.399	U
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.049	0.08	0.081	0.012	-2.643	U
G2		0.17	0.227	0.226	0.016	-3.52	U
G3		0.237	0.294	0.302	0.021	-3.144	Q
G4		0.398	0.454	0.463	0.028	-2.364	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.237	0.249	0.245	0.008	-0.997	S
G2		0.355	0.366	0.36	0.012	-0.413	S
G3		0.484	0.496	0.492	0.017	-0.44	S
G4		0.736	0.738	0.73	0.027	0.231	S
G1	Na <sup>+</sup> mg/l	0.675	0.32	0.318	0.028	12.845	U
G2		0.29	0.317	0.313	0.015	-1.528	S
G3		0.867	0.948	0.941	0.045	-1.655	S
G4		0.95	1.05	1.039	0.041	-2.191	S
G1	Mg <sup>2+</sup> mg/l	0.259	0.077	0.077	0.006	29.069	U
G2		0.232	0.088	0.087	0.006	23.908	U
G3		0.544	0.237	0.24	0.014	22.148	U
G4		0.627	0.279	0.277	0.014	24.702	U
G1	Cl <sup>-</sup> mg/l	0.365	0.328	0.324	0.027	1.488	S
G2		0.4	0.367	0.367	0.035	0.953	S
G3		1.455	1.35	1.333	0.064	1.904	S
G4		1.563	1.43	1.399	0.078	2.112	S
G1	Ca <sup>2+</sup> mg/l	0.216	0.109	0.106	0.012	9.297	U
G2		0.211	0.14	0.136	0.013	5.624	U
G3		0.387	0.294	0.308	0.018	4.532	U
G4		0.415	0.37	0.359	0.024	2.348	S
G1	K <sup>+</sup> mg/l	0.268	0.289	0.28	0.022	-0.544	S
G2		0.232	0.255	0.247	0.016	-0.993	S
G3		0.403	0.441	0.439	0.023	-1.548	S
G4		0.547	0.577	0.573	0.031	-0.833	S
G1	pH pH units	5.52	5.55	5.523	0.178	-0.019	S
G2		5.48	5.52	5.523	0.174	-0.248	S
G3		5.44	5.48	5.487	0.148	-0.316	S
G4		5.33	5.46	5.468	0.129	-1.067	Q
G1	Cond µS/cm	6.43	6.73	6.767	1.348	-0.25	S
G2		8	8.4	8.392	1.375	-0.285	S
G3		13.7	16.02	16.092	1.087	-2.2	S
G4		16.8	19.5	19.352	1.052	-2.427	S

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\* Z score is unitless

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

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B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 23, Ricardo-AEA Limited (United Kingdom)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.182	0.201	0.199	0.016	-1.078	S
G2		0.225	0.244	0.241	0.013	-1.223	S
G3		0.534	0.567	0.613	0.195	-0.408	S
G4		0.63	0.688	0.708	0.242	-0.325	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.069	0.08	0.081	0.012	-0.956	S
G2		0.21	0.227	0.226	0.016	-1.011	S
G3		0.27	0.294	0.302	0.021	-1.541	S
G4		0.416	0.454	0.463	0.028	-1.713	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.235	0.249	0.245	0.008	-1.249	S
G2		0.347	0.366	0.36	0.012	-1.072	S
G3		0.476	0.496	0.492	0.017	-0.899	S
G4		0.741	0.738	0.73	0.027	0.417	S
G1	Na <sup>+</sup> mg/l	0.286	0.32	0.318	0.028	-1.15	S
G2		0.296	0.317	0.313	0.015	-1.121	S
G3		0.885	0.948	0.941	0.045	-1.252	S
G4		0.976	1.05	1.039	0.041	-1.552	S
G1	Mg <sup>2+</sup> mg/l	0.077	0.077	0.077	0.006	0.02	S
G2		0.086	0.088	0.087	0.006	-0.075	S
G3		0.21	0.237	0.24	0.014	-2.167	S
G4		0.243	0.279	0.277	0.014	-2.404	S
G1	Cl <sup>-</sup> mg/l	0.29	0.328	0.324	0.027	-1.262	S
G2		0.364	0.367	0.367	0.035	-0.082	S
G3		1.17	1.35	1.333	0.064	-2.543	S
G4		1.22	1.43	1.399	0.078	-2.303	S
G1	Ca <sup>2+</sup> mg/l	0.121	0.109	0.106	0.012	1.231	S
G2		0.17	0.14	0.136	0.013	2.533	Q
G3		0.287	0.294	0.308	0.018	-1.176	S
G4		0.312	0.37	0.359	0.024	-1.951	Q
G1	K <sup>+</sup> mg/l	0.248	0.289	0.28	0.022	-1.44	S
G2		0.22	0.255	0.247	0.016	-1.764	S
G3		0.39	0.441	0.439	0.023	-2.104	S
G4		0.514	0.577	0.573	0.031	-1.889	S
G1	pH pH units	5.64	5.55	5.523	0.178	0.656	S
G2		5.69	5.52	5.523	0.174	0.959	Q
G3		5.56	5.48	5.487	0.148	0.497	S
G4		5.52	5.46	5.468	0.129	0.407	S
G1	Cond µS/cm	5.41	6.73	6.767	1.348	-1.006	Q
G2		6.17	8.4	8.392	1.375	-1.615	U
G3		14.75	16.02	16.092	1.087	-1.234	S
G4		17.77	19.5	19.352	1.052	-1.505	S

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 24, Serbian Environmental Protection Agency (Serbia)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	-999	0.201	0.199	0.016		B
G2		-999	0.244	0.241	0.013		B
G3		0.586	0.567	0.613	0.195	-0.141	S
G4		0.691	0.688	0.708	0.242	-0.072	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	-999	0.08	0.081	0.012		B
G2		-999	0.227	0.226	0.016		B
G3		-999	0.294	0.302	0.021		B
G4		-999	0.454	0.463	0.028		B
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	-999	0.249	0.245	0.008		B
G2		-999	0.366	0.36	0.012		B
G3		0.52	0.496	0.492	0.017	1.625	S
G4		0.777	0.738	0.73	0.027	1.759	S
G1	Na <sup>+</sup> mg/l	-999	0.32	0.318	0.028		B
G2		-999	0.317	0.313	0.015		B
G3		-999	0.948	0.941	0.045		B
G4		-999	1.05	1.039	0.041		B
G1	Mg <sup>2+</sup> mg/l	-999	0.077	0.077	0.006		B
G2		-999	0.088	0.087	0.006		B
G3		-999	0.237	0.24	0.014		B
G4		-999	0.279	0.277	0.014		B
G1	Cl <sup>-</sup> mg/l	-999	0.328	0.324	0.027		B
G2		-999	0.367	0.367	0.035		B
G3		1.394	1.35	1.333	0.064	0.953	S
G4		1.485	1.43	1.399	0.078	1.108	S
G1	Ca <sup>2+</sup> mg/l	-999	0.109	0.106	0.012		B
G2		-999	0.14	0.136	0.013		B
G3		-999	0.294	0.308	0.018		B
G4		-999	0.37	0.359	0.024		B
G1	K <sup>+</sup> mg/l	-999	0.289	0.28	0.022		B
G2		-999	0.255	0.247	0.016		B
G3		-999	0.441	0.439	0.023		B
G4		-999	0.577	0.573	0.031		B
G1	pH pH units	-999	5.55	5.523	0.178		B
G2		-999	5.52	5.523	0.174		B
G3		5.61	5.48	5.487	0.148	0.835	Q
G4		5.58	5.46	5.468	0.129	0.872	Q
G1	Cond µS/cm	-999	6.73	6.767	1.348		B
G2		-999	8.4	8.392	1.375		B
G3		16.5	16.02	16.092	1.087	0.375	S
G4		20	19.5	19.352	1.052	0.616	S

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\* Z score is unitless

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

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B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 26, Environment Canada, Ontario (Canada)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.2	0.201	0.199	0.016	0.043	S
G2		0.245	0.244	0.241	0.013	0.332	S
G3		0.589	0.567	0.613	0.195	-0.125	S
G4		0.682	0.688	0.708	0.242	-0.109	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.082	0.08	0.081	0.012	0.113	S
G2		0.23	0.227	0.226	0.016	0.243	S
G3		0.305	0.294	0.302	0.021	0.159	S
G4		0.467	0.454	0.463	0.028	0.132	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.248	0.249	0.245	0.008	0.39	S
G2		0.366	0.366	0.36	0.012	0.492	S
G3		0.496	0.496	0.492	0.017	0.248	S
G4		0.735	0.738	0.73	0.027	0.193	S
G1	Na <sup>+</sup> mg/l	0.312	0.32	0.318	0.028	-0.214	S
G2		0.318	0.317	0.313	0.015	0.372	S
G3		0.929	0.948	0.941	0.045	-0.267	S
G4		1.049	1.05	1.039	0.041	0.242	S
G1	Mg <sup>2+</sup> mg/l	0.079	0.077	0.077	0.006	0.355	S
G2		0.09	0.088	0.087	0.006	0.534	S
G3		0.241	0.237	0.24	0.014	0.09	S
G4		0.28	0.279	0.277	0.014	0.208	S
G1	Cl <sup>-</sup> mg/l	0.327	0.328	0.324	0.027	0.094	S
G2		0.365	0.367	0.367	0.035	-0.053	S
G3		1.337	1.35	1.333	0.064	0.063	S
G4		1.407	1.43	1.399	0.078	0.104	S
G1	Ca <sup>2+</sup> mg/l	0.109	0.109	0.106	0.012	0.213	S
G2		0.143	0.14	0.136	0.013	0.498	S
G3		0.317	0.294	0.308	0.018	0.536	S
G4		0.366	0.37	0.359	0.024	0.302	S
G1	K <sup>+</sup> mg/l	0.286	0.289	0.28	0.022	0.262	S
G2		0.259	0.255	0.247	0.016	0.742	S
G3		0.44	0.441	0.439	0.023	0.035	S
G4		0.579	0.577	0.573	0.031	0.192	S
G1	pH pH units	5.52	5.55	5.523	0.178	-0.019	S
G2		5.53	5.52	5.523	0.174	0.039	S
G3		5.51	5.48	5.487	0.148	0.158	S
G4		5.48	5.46	5.468	0.129	0.096	S
G1	Cond µS/cm	-999	6.73	6.767	1.348		B
G2		-999	8.4	8.392	1.375		B
G3		-999	16.02	16.092	1.087		B
G4		-999	19.5	19.352	1.052		B

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\* Z score is unitless

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

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B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 27, Illinois State Water Survey (United States of America)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.201	0.201	0.199	0.016	0.105	S
G2		0.248	0.244	0.241	0.013	0.565	S
G3		0.606	0.567	0.613	0.195	-0.038	S
G4		0.693	0.688	0.708	0.242	-0.064	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.078	0.08	0.081	0.012	-0.221	S
G2		0.23	0.227	0.226	0.016	0.243	S
G3		0.309	0.294	0.302	0.021	0.354	S
G4		0.466	0.454	0.463	0.028	0.096	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.259	0.249	0.245	0.008	1.776	S
G2		0.383	0.366	0.36	0.012	1.892	S
G3		0.517	0.496	0.492	0.017	1.453	S
G4		0.752	0.738	0.73	0.027	0.827	S
G1	Na <sup>+</sup> mg/l	0.312	0.32	0.318	0.028	-0.214	S
G2		0.316	0.317	0.313	0.015	0.237	S
G3		0.917	0.948	0.941	0.045	-0.536	S
G4		1.016	1.05	1.039	0.041	-0.569	S
G1	Mg <sup>2+</sup> mg/l	0.079	0.077	0.077	0.006	0.355	S
G2		0.09	0.088	0.087	0.006	0.534	S
G3		0.25	0.237	0.24	0.014	0.745	S
G4		0.288	0.279	0.277	0.014	0.772	S
G1	Cl <sup>-</sup> mg/l	0.336	0.328	0.324	0.027	0.424	S
G2		0.377	0.367	0.367	0.035	0.292	S
G3		1.394	1.35	1.333	0.064	0.953	S
G4		1.465	1.43	1.399	0.078	0.851	S
G1	Ca <sup>2+</sup> mg/l	0.112	0.109	0.106	0.012	0.467	S
G2		0.14	0.14	0.136	0.013	0.272	S
G3		0.316	0.294	0.308	0.018	0.479	S
G4		0.365	0.37	0.359	0.024	0.261	S
G1	K <sup>+</sup> mg/l	0.29	0.289	0.28	0.022	0.441	S
G2		0.262	0.255	0.247	0.016	0.935	S
G3		0.446	0.441	0.439	0.023	0.291	S
G4		0.579	0.577	0.573	0.031	0.192	S
G1	pH pH units	5.49	5.55	5.523	0.178	-0.188	S
G2		5.51	5.52	5.523	0.174	-0.076	S
G3		5.48	5.48	5.487	0.148	-0.045	S
G4		5.47	5.46	5.468	0.129	0.019	S
G1	Cond µS/cm	6.8	6.73	6.767	1.348	0.025	S
G2		8.6	8.4	8.392	1.375	0.151	S
G3		16.4	16.02	16.092	1.087	0.283	S
G4		19.8	19.5	19.352	1.052	0.426	S

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\* Z score is unitless

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B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 30, Joint Research Centre, Ispra (Italy)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.169	0.201	0.199	0.016	-1.888	Q
G2		0.208	0.244	0.241	0.013	-2.545	Q
G3		0.552	0.567	0.613	0.195	-0.315	S
G4		0.644	0.688	0.708	0.242	-0.267	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.075	0.08	0.081	0.012	-0.472	S
G2		0.219	0.227	0.226	0.016	-0.447	S
G3		0.306	0.294	0.302	0.021	0.208	S
G4		0.444	0.454	0.463	0.028	-0.7	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.231	0.249	0.245	0.008	-1.753	S
G2		0.346	0.366	0.36	0.012	-1.154	S
G3		0.48	0.496	0.492	0.017	-0.67	S
G4		0.723	0.738	0.73	0.027	-0.254	S
G1	Na <sup>+</sup> mg/l	0.312	0.32	0.318	0.028	-0.214	S
G2		0.308	0.317	0.313	0.015	-0.306	S
G3		0.931	0.948	0.941	0.045	-0.222	S
G4		1.026	1.05	1.039	0.041	-0.323	S
G1	Mg <sup>2+</sup> mg/l	0.079	0.077	0.077	0.006	0.355	S
G2		0.09	0.088	0.087	0.006	0.534	S
G3		0.241	0.237	0.24	0.014	0.09	S
G4		0.28	0.279	0.277	0.014	0.208	S
G1	Cl <sup>-</sup> mg/l	0.335	0.328	0.324	0.027	0.388	S
G2		0.366	0.367	0.367	0.035	-0.024	S
G3		1.454	1.35	1.333	0.064	1.889	S
G4		1.53	1.43	1.399	0.078	1.687	S
G1	Ca <sup>2+</sup> mg/l	0.111	0.109	0.106	0.012	0.382	S
G2		0.158	0.14	0.136	0.013	1.629	S
G3		0.283	0.294	0.308	0.018	-1.404	S
G4		0.339	0.37	0.359	0.024	-0.824	S
G1	K <sup>+</sup> mg/l	0.298	0.289	0.28	0.022	0.799	S
G2		0.256	0.255	0.247	0.016	0.55	S
G3		0.448	0.441	0.439	0.023	0.377	S
G4		0.591	0.577	0.573	0.031	0.576	S
G1	pH pH units	6.57	5.55	5.523	0.178	5.888	U
G2		5.85	5.52	5.523	0.174	1.879	U
G3		5.78	5.48	5.487	0.148	1.987	U
G4		5.71	5.46	5.468	0.129	1.88	U
G1	Cond µS/cm	3.63	6.73	6.767	1.348	-2.326	U
G2		4.67	8.4	8.392	1.375	-2.706	U
G3		9.5	16.02	16.092	1.087	-6.062	U
G4		10.9	19.5	19.352	1.052	-8.038	U

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:  
<http://www.nilu.no/projects/ccc/intercomparison.html>

## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 31, Slovak Hydrometeorological Institute (Slovakia)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.198	0.201	0.199	0.016	-0.081	S
G2		0.242	0.244	0.241	0.013	0.098	S
G3		0.587	0.567	0.613	0.195	-0.135	S
G4		0.678	0.688	0.708	0.242	-0.126	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.081	0.08	0.081	0.012	0.029	S
G2		0.225	0.227	0.226	0.016	-0.071	S
G3		0.303	0.294	0.302	0.021	0.062	S
G4		0.463	0.454	0.463	0.028	-0.012	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.248	0.249	0.245	0.008	0.39	S
G2		0.366	0.366	0.36	0.012	0.492	S
G3		0.503	0.496	0.492	0.017	0.65	S
G4		0.748	0.738	0.73	0.027	0.678	S
G1	Na <sup>+</sup> mg/l	0.3	0.32	0.318	0.028	-0.646	S
G2		0.298	0.317	0.313	0.015	-0.985	S
G3		0.934	0.948	0.941	0.045	-0.155	S
G4		1.038	1.05	1.039	0.041	-0.028	S
G1	Mg <sup>2+</sup> mg/l	0.065	0.077	0.077	0.006	-1.879	Q
G2		0.074	0.088	0.087	0.006	-2.099	Q
G3		0.224	0.237	0.24	0.014	-1.148	S
G4		0.264	0.279	0.277	0.014	-0.922	S
G1	Cl <sup>-</sup> mg/l	0.314	0.328	0.324	0.027	-0.382	S
G2		0.348	0.367	0.367	0.035	-0.542	S
G3		1.304	1.35	1.333	0.064	-0.452	S
G4		1.362	1.43	1.399	0.078	-0.475	S
G1	Ca <sup>2+</sup> mg/l	0.085	0.109	0.106	0.012	-1.825	Q
G2		0.122	0.14	0.136	0.013	-1.085	S
G3		0.3	0.294	0.308	0.018	-0.434	S
G4		0.352	0.37	0.359	0.024	-0.282	S
G1	K <sup>+</sup> mg/l	0.247	0.289	0.28	0.022	-1.485	S
G2		0.228	0.255	0.247	0.016	-1.25	S
G3		0.428	0.441	0.439	0.023	-0.479	S
G4		0.58	0.577	0.573	0.031	0.224	S
G1	pH pH units	5.74	5.55	5.523	0.178	1.219	Q
G2		5.67	5.52	5.523	0.174	0.844	Q
G3		5.52	5.48	5.487	0.148	0.226	S
G4		5.43	5.46	5.468	0.129	-0.291	S
G1	Cond µS/cm	7.1	6.73	6.767	1.348	0.247	S
G2		8.91	8.4	8.392	1.375	0.377	S
G3		16.85	16.02	16.092	1.087	0.697	S
G4		20.35	19.5	19.352	1.052	0.949	S

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\* Z score is unitless

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:  
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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 32, Center for Physical Sciences and Technology (Lithuania)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.207	0.201	0.199	0.016	0.479	S
G2		0.244	0.244	0.241	0.013	0.254	S
G3		0.564	0.567	0.613	0.195	-0.254	S
G4		0.638	0.688	0.708	0.242	-0.291	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.065	0.08	0.081	0.012	-1.307	Q
G2		0.213	0.227	0.226	0.016	-0.823	S
G3		0.298	0.294	0.302	0.021	-0.181	S
G4		0.466	0.454	0.463	0.028	0.096	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.241	0.249	0.245	0.008	-0.492	S
G2		0.348	0.366	0.36	0.012	-0.989	S
G3		0.479	0.496	0.492	0.017	-0.727	S
G4		0.699	0.738	0.73	0.027	-1.148	S
G1	Na <sup>+</sup> mg/l	0.3	0.32	0.318	0.028	-0.646	S
G2		0.316	0.317	0.313	0.015	0.237	S
G3		0.94	0.948	0.941	0.045	-0.021	S
G4		1.06	1.05	1.039	0.041	0.512	S
G1	Mg <sup>2+</sup> mg/l	0.086	0.077	0.077	0.006	1.471	S
G2		0.09	0.088	0.087	0.006	0.534	S
G3		0.238	0.237	0.24	0.014	-0.128	S
G4		0.28	0.279	0.277	0.014	0.208	S
G1	Cl <sup>-</sup> mg/l	0.329	0.328	0.324	0.027	0.168	S
G2		0.343	0.367	0.367	0.035	-0.685	S
G3		1.198	1.35	1.333	0.064	-2.106	S
G4		1.272	1.43	1.399	0.078	-1.634	S
G1	Ca <sup>2+</sup> mg/l	0.116	0.109	0.106	0.012	0.807	S
G2		0.133	0.14	0.136	0.013	-0.256	S
G3		0.294	0.294	0.308	0.018	-0.777	S
G4		0.346	0.37	0.359	0.024	-0.532	S
G1	K <sup>+</sup> mg/l	0.275	0.289	0.28	0.022	-0.231	S
G2		0.271	0.255	0.247	0.016	1.513	S
G3		0.465	0.441	0.439	0.023	1.104	S
G4		0.605	0.577	0.573	0.031	1.024	S
G1	pH pH units	5.43	5.55	5.523	0.178	-0.525	Q
G2		5.43	5.52	5.523	0.174	-0.536	S
G3		5.38	5.48	5.487	0.148	-0.722	Q
G4		5.39	5.46	5.468	0.129	-0.601	S
G1	Cond μS/cm	6.5	6.73	6.767	1.348	-0.198	S
G2		8.8	8.4	8.392	1.375	0.297	S
G3		16.2	16.02	16.092	1.087	0.099	S
G4		19.1	19.5	19.352	1.052	-0.24	S

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\* Z score is unitless

✎ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

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B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 33, Latvian Environment, Geology and Meteorology Centre (Latvia)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.202	0.201	0.199	0.016	0.168	S
G2		0.24	0.244	0.241	0.013	-0.057	S
G3		0.585	0.567	0.613	0.195	-0.146	S
G4		0.667	0.688	0.708	0.242	-0.171	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.066	0.08	0.081	0.012	-1.223	Q
G2		0.2	0.227	0.226	0.016	-1.638	S
G3		0.28	0.294	0.302	0.021	-1.055	S
G4		0.44	0.454	0.463	0.028	-0.845	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.242	0.249	0.245	0.008	-0.366	S
G2		0.36	0.366	0.36	0.012	-0.002	S
G3		0.485	0.496	0.492	0.017	-0.383	S
G4		0.725	0.738	0.73	0.027	-0.179	S
G1	Na <sup>+</sup> mg/l	0.357	0.32	0.318	0.028	1.405	S
G2		0.369	0.317	0.313	0.015	3.833	Q
G3		0.977	0.948	0.941	0.045	0.807	S
G4		1.064	1.05	1.039	0.041	0.61	S
G1	Mg <sup>2+</sup> mg/l	0.069	0.077	0.077	0.006	-1.241	S
G2		0.085	0.088	0.087	0.006	-0.289	S
G3		0.239	0.237	0.24	0.014	-0.056	S
G4		0.28	0.279	0.277	0.014	0.208	S
G1	Cl <sup>-</sup> mg/l	0.308	0.328	0.324	0.027	-0.602	S
G2		0.345	0.367	0.367	0.035	-0.628	S
G3		1.29	1.35	1.333	0.064	-0.67	S
G4		1.384	1.43	1.399	0.078	-0.192	S
G1	Ca <sup>2+</sup> mg/l	0.093	0.109	0.106	0.012	-1.146	S
G2		0.131	0.14	0.136	0.013	-0.407	S
G3		0.33	0.294	0.308	0.018	1.278	S
G4		0.401	0.37	0.359	0.024	1.763	S
G1	K <sup>+</sup> mg/l	0.272	0.289	0.28	0.022	-0.365	S
G2		0.245	0.255	0.247	0.016	-0.157	S
G3		0.433	0.441	0.439	0.023	-0.265	S
G4		0.561	0.577	0.573	0.031	-0.384	S
G1	pH pH units	5.56	5.55	5.523	0.178	0.206	S
G2		5.53	5.52	5.523	0.174	0.039	S
G3		5.5	5.48	5.487	0.148	0.09	S
G4		5.51	5.46	5.468	0.129	0.329	S
G1	Cond µS/cm	7	6.73	6.767	1.348	0.173	S
G2		8.8	8.4	8.392	1.375	0.297	S
G3		16.7	16.02	16.092	1.087	0.559	S
G4		20.2	19.5	19.352	1.052	0.806	S

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\* Z score is unitless

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S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

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B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 34, Ministry of Environment and Urbanisation (Turkey)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.18	0.201	0.199	0.016	-1.203	Q
G2		0.22	0.244	0.241	0.013	-1.612	S
G3		0.56	0.567	0.613	0.195	-0.274	S
G4		0.64	0.688	0.708	0.242	-0.283	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0	0.08	0.081	0.012	-6.735	U
G2		0	0.227	0.226	0.016	-14.18	U
G3		0.1	0.294	0.302	0.021	-9.8	U
G4		0.2	0.454	0.463	0.028	-9.529	U
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.21	0.249	0.245	0.008	-4.4	Q
G2		0.31	0.366	0.36	0.012	-4.118	Q
G3		0.44	0.496	0.492	0.017	-2.964	Q
G4		0.66	0.738	0.73	0.027	-2.602	Q
G1	Na <sup>+</sup> mg/l	0.342	0.32	0.318	0.028	0.865	S
G2		0.341	0.317	0.313	0.015	1.933	S
G3		0.997	0.948	0.941	0.045	1.255	S
G4		1.096	1.05	1.039	0.041	1.397	S
G1	Mg <sup>2+</sup> mg/l	0.077	0.077	0.077	0.006	0.036	S
G2		0.086	0.088	0.087	0.006	-0.124	S
G3		0.237	0.237	0.24	0.014	-0.201	S
G4		0.273	0.279	0.277	0.014	-0.287	S
G1	Cl <sup>-</sup> mg/l	0.31	0.328	0.324	0.027	-0.529	S
G2		0.35	0.367	0.367	0.035	-0.484	S
G3		1.38	1.35	1.333	0.064	0.734	S
G4		1.4	1.43	1.399	0.078	0.014	S
G1	Ca <sup>2+</sup> mg/l	0.114	0.109	0.106	0.012	0.637	S
G2		0.116	0.14	0.136	0.013	-1.538	Q
G3		0.318	0.294	0.308	0.018	0.593	S
G4		0.37	0.37	0.359	0.024	0.469	S
G1	K <sup>+</sup> mg/l	0.309	0.289	0.28	0.022	1.292	S
G2		0.259	0.255	0.247	0.016	0.742	S
G3		0.468	0.441	0.439	0.023	1.233	S
G4		0.629	0.577	0.573	0.031	1.793	S
G1	pH pH units	7.58	5.55	5.523	0.178	11.571	U
G2		6.87	5.52	5.523	0.174	7.743	U
G3		6.82	5.48	5.487	0.148	9.031	U
G4		6.08	5.46	5.468	0.129	4.748	U
G1	Cond µS/cm	9.6	6.73	6.767	1.348	2.101	U
G2		35	8.4	8.392	1.375	19.346	U
G3		20.9	16.02	16.092	1.087	4.422	U
G4		36.6	19.5	19.352	1.052	16.403	U

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\* Z score is unitless

✎ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 35, Meteorological and Hydrological Service of Croatia (Croatia)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.212	0.201	0.199	0.016	0.791	S
G2		0.248	0.244	0.241	0.013	0.565	S
G3		0.602	0.567	0.613	0.195	-0.058	S
G4		0.695	0.688	0.708	0.242	-0.055	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.087	0.08	0.081	0.012	0.53	S
G2		0.232	0.227	0.226	0.016	0.368	S
G3		0.298	0.294	0.302	0.021	-0.181	S
G4		0.473	0.454	0.463	0.028	0.35	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.257	0.249	0.245	0.008	1.524	S
G2		0.369	0.366	0.36	0.012	0.739	S
G3		0.504	0.496	0.492	0.017	0.707	S
G4		0.75	0.738	0.73	0.027	0.753	S
G1	Na <sup>+</sup> mg/l	0.345	0.32	0.318	0.028	0.973	S
G2		0.333	0.317	0.313	0.015	1.39	S
G3		0.973	0.948	0.941	0.045	0.718	S
G4		1.076	1.05	1.039	0.041	0.905	S
G1	Mg <sup>2+</sup> mg/l	0.078	0.077	0.077	0.006	0.195	S
G2		0.089	0.088	0.087	0.006	0.37	S
G3		0.248	0.237	0.24	0.014	0.6	S
G4		0.287	0.279	0.277	0.014	0.702	S
G1	Cl <sup>-</sup> mg/l	0.356	0.328	0.324	0.027	1.158	S
G2		0.376	0.367	0.367	0.035	0.263	S
G3		1.367	1.35	1.333	0.064	0.531	S
G4		1.438	1.43	1.399	0.078	0.503	S
G1	Ca <sup>2+</sup> mg/l	0.114	0.109	0.106	0.012	0.637	S
G2		0.141	0.14	0.136	0.013	0.347	S
G3		0.328	0.294	0.308	0.018	1.164	S
G4		0.382	0.37	0.359	0.024	0.97	S
G1	K <sup>+</sup> mg/l	0.305	0.289	0.28	0.022	1.113	S
G2		0.263	0.255	0.247	0.016	0.999	S
G3		0.468	0.441	0.439	0.023	1.233	S
G4		0.6	0.577	0.573	0.031	0.864	S
G1	pH pH units	6.1	5.55	5.523	0.178	3.244	U
G2		6.08	5.52	5.523	0.174	3.201	U
G3		5.98	5.48	5.487	0.148	3.342	U
G4		5.85	5.46	5.468	0.129	2.965	U
G1	Cond µS/cm	6.96	6.73	6.767	1.348	0.143	S
G2		8.8	8.4	8.392	1.375	0.297	S
G3		16.52	16.02	16.092	1.087	0.394	S
G4		19.95	19.5	19.352	1.052	0.569	S

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\* Z score is unitless

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 36, Slovenian Environment Agency (Slovenia)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.199	0.201	0.199	0.016	-0.019	S
G2		0.242	0.244	0.241	0.013	0.098	S
G3		0.596	0.567	0.613	0.195	-0.089	S
G4		0.694	0.688	0.708	0.242	-0.06	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.078	0.08	0.081	0.012	-0.221	S
G2		0.224	0.227	0.226	0.016	-0.133	S
G3		0.294	0.294	0.302	0.021	-0.375	S
G4		0.461	0.454	0.463	0.028	-0.085	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.247	0.249	0.245	0.008	0.264	S
G2		0.363	0.366	0.36	0.012	0.245	S
G3		0.497	0.496	0.492	0.017	0.305	S
G4		0.736	0.738	0.73	0.027	0.231	S
G1	Na <sup>+</sup> mg/l	0.328	0.32	0.318	0.028	0.361	S
G2		0.326	0.317	0.313	0.015	0.915	S
G3		0.956	0.948	0.941	0.045	0.337	S
G4		1.061	1.05	1.039	0.041	0.537	S
G1	Mg <sup>2+</sup> mg/l	0.081	0.077	0.077	0.006	0.674	S
G2		0.092	0.088	0.087	0.006	0.864	S
G3		0.248	0.237	0.24	0.014	0.6	S
G4		0.283	0.279	0.277	0.014	0.419	S
G1	Cl <sup>-</sup> mg/l	0.312	0.328	0.324	0.027	-0.456	S
G2		0.347	0.367	0.367	0.035	-0.57	S
G3		1.326	1.35	1.333	0.064	-0.109	S
G4		1.399	1.43	1.399	0.078	0.001	S
G1	Ca <sup>2+</sup> mg/l	0.108	0.109	0.106	0.012	0.128	S
G2		0.143	0.14	0.136	0.013	0.498	S
G3		0.318	0.294	0.308	0.018	0.593	S
G4		0.364	0.37	0.359	0.024	0.219	S
G1	K <sup>+</sup> mg/l	0.281	0.289	0.28	0.022	0.038	S
G2		0.247	0.255	0.247	0.016	-0.029	S
G3		0.436	0.441	0.439	0.023	-0.137	S
G4		0.592	0.577	0.573	0.031	0.608	S
G1	pH pH units	5.47	5.55	5.523	0.178	-0.3	S
G2		5.27	5.52	5.523	0.174	-1.456	U
G3		5.36	5.48	5.487	0.148	-0.858	Q
G4		5.48	5.46	5.468	0.129	0.096	S
G1	Cond µS/cm	6.37	6.73	6.767	1.348	-0.294	S
G2		7.98	8.4	8.392	1.375	-0.299	S
G3		15.4	16.02	16.092	1.087	-0.636	S
G4		19	19.5	19.352	1.052	-0.335	S

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\* Z score is unitless

✎ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 38, Estonian Environmental Research Centre, Tallinn (Estonia)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.201	0.201	0.199	0.016	0.105	S
G2		0.244	0.244	0.241	0.013	0.254	S
G3		0.586	0.567	0.613	0.195	-0.141	S
G4		0.679	0.688	0.708	0.242	-0.122	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.081	0.08	0.081	0.012	0.029	S
G2		0.238	0.227	0.226	0.016	0.745	S
G3		0.31	0.294	0.302	0.021	0.402	S
G4		0.467	0.454	0.463	0.028	0.132	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.243	0.249	0.245	0.008	-0.24	S
G2		0.358	0.366	0.36	0.012	-0.166	S
G3		0.491	0.496	0.492	0.017	-0.039	S
G4		0.739	0.738	0.73	0.027	0.343	S
G1	Na <sup>+</sup> mg/l	0.282	0.32	0.318	0.028	-1.293	S
G2		0.276	0.317	0.313	0.015	-2.478	S
G3		0.896	0.948	0.941	0.045	-1.006	S
G4		0.996	1.05	1.039	0.041	-1.06	S
G1	Mg <sup>2+</sup> mg/l	0.075	0.077	0.077	0.006	-0.283	S
G2		0.088	0.088	0.087	0.006	0.205	S
G3		0.242	0.237	0.24	0.014	0.163	S
G4		0.281	0.279	0.277	0.014	0.278	S
G1	Cl <sup>-</sup> mg/l	0.319	0.328	0.324	0.027	-0.199	S
G2		0.355	0.367	0.367	0.035	-0.341	S
G3		1.326	1.35	1.333	0.064	-0.109	S
G4		1.396	1.43	1.399	0.078	-0.037	S
G1	Ca <sup>2+</sup> mg/l	0.09	0.109	0.106	0.012	-1.4	Q
G2		0.124	0.14	0.136	0.013	-0.935	S
G3		0.305	0.294	0.308	0.018	-0.149	S
G4		0.357	0.37	0.359	0.024	-0.073	S
G1	K <sup>+</sup> mg/l	0.277	0.289	0.28	0.022	-0.141	S
G2		0.247	0.255	0.247	0.016	-0.029	S
G3		0.424	0.441	0.439	0.023	-0.65	S
G4		0.56	0.577	0.573	0.031	-0.416	S
G1	pH pH units	5.77	5.55	5.523	0.178	1.388	U
G2		5.82	5.52	5.523	0.174	1.706	U
G3		5.78	5.48	5.487	0.148	1.987	U
G4		5.58	5.46	5.468	0.129	0.872	Q
G1	Cond µS/cm	7.14	6.73	6.767	1.348	0.277	S
G2		8.91	8.4	8.392	1.375	0.377	S
G3		17.2	16.02	16.092	1.087	1.019	S
G4		20.8	19.5	19.352	1.052	1.377	S

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\* Z score is unitless

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 39, Central Environmental Analysis Laboratory - CentLab (Poland)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.198	0.201	0.199	0.016	-0.081	S
G2		0.243	0.244	0.241	0.013	0.176	S
G3		0.597	0.567	0.613	0.195	-0.084	S
G4		0.688	0.688	0.708	0.242	-0.084	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.078	0.08	0.081	0.012	-0.221	S
G2		0.225	0.227	0.226	0.016	-0.071	S
G3		0.318	0.294	0.302	0.021	0.791	S
G4		0.475	0.454	0.463	0.028	0.422	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.249	0.249	0.245	0.008	0.516	S
G2		0.369	0.366	0.36	0.012	0.739	S
G3		0.512	0.496	0.492	0.017	1.166	S
G4		0.758	0.738	0.73	0.027	1.051	S
G1	Na <sup>+</sup> mg/l	0.305	0.32	0.318	0.028	-0.466	S
G2		0.304	0.317	0.313	0.015	-0.578	S
G3		0.928	0.948	0.941	0.045	-0.29	S
G4		1.022	1.05	1.039	0.041	-0.422	S
G1	Mg <sup>2+</sup> mg/l	0.077	0.077	0.077	0.006	0.036	S
G2		0.087	0.088	0.087	0.006	0.041	S
G3		0.243	0.237	0.24	0.014	0.236	S
G4		0.282	0.279	0.277	0.014	0.349	S
G1	Cl <sup>-</sup> mg/l	0.323	0.328	0.324	0.027	-0.052	S
G2		0.353	0.367	0.367	0.035	-0.398	S
G3		1.32	1.35	1.333	0.064	-0.202	S
G4		1.391	1.43	1.399	0.078	-0.102	S
G1	Ca <sup>2+</sup> mg/l	0.106	0.109	0.106	0.012	-0.042	S
G2		0.138	0.14	0.136	0.013	0.121	S
G3		0.314	0.294	0.308	0.018	0.365	S
G4		0.365	0.37	0.359	0.024	0.261	S
G1	K <sup>+</sup> mg/l	0.278	0.289	0.28	0.022	-0.096	S
G2		0.246	0.255	0.247	0.016	-0.093	S
G3		0.428	0.441	0.439	0.023	-0.479	S
G4		0.567	0.577	0.573	0.031	-0.192	S
G1	pH pH units	5.39	5.55	5.523	0.178	-0.75	Q
G2		5.42	5.52	5.523	0.174	-0.593	S
G3		5.41	5.48	5.487	0.148	-0.519	S
G4		5.46	5.46	5.468	0.129	-0.059	S
G1	Cond µS/cm	6.76	6.73	6.767	1.348	-0.005	S
G2		8.21	8.4	8.392	1.375	-0.132	S
G3		15.52	16.02	16.092	1.087	-0.526	S
G4		19.28	19.5	19.352	1.052	-0.069	S

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\* Z score is unitless

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S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:  
<http://www.nilu.no/projects/ccc/intercomparison.html>

## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 40, Hydrometeorological Institute, Skopje (Macedonia)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	-999	0.201	0.199	0.016		B
G2		-999	0.244	0.241	0.013		B
G3		-999	0.567	0.613	0.195		B
G4		-999	0.688	0.708	0.242		B
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.111	0.08	0.081	0.012	2.535	U
G2		0.249	0.227	0.226	0.016	1.434	S
G3		0.371	0.294	0.302	0.021	3.366	U
G4		0.521	0.454	0.463	0.028	2.086	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.215	0.249	0.245	0.008	-3.77	Q
G2		0.331	0.366	0.36	0.012	-2.389	S
G3		0.467	0.496	0.492	0.017	-1.415	S
G4		0.699	0.738	0.73	0.027	-1.148	S
G1	Na <sup>+</sup> mg/l	-999	0.32	0.318	0.028		B
G2		-999	0.317	0.313	0.015		B
G3		-999	0.948	0.941	0.045		B
G4		-999	1.05	1.039	0.041		B
G1	Mg <sup>2+</sup> mg/l	-999	0.077	0.077	0.006		B
G2		-999	0.088	0.087	0.006		B
G3		-999	0.237	0.24	0.014		B
G4		-999	0.279	0.277	0.014		B
G1	Cl <sup>-</sup> mg/l	0.348	0.328	0.324	0.027	0.864	S
G2		0.433	0.367	0.367	0.035	1.901	Q
G3		1.56	1.35	1.333	0.064	3.543	Q
G4		1.623	1.43	1.399	0.078	2.884	S
G1	Ca <sup>2+</sup> mg/l	-999	0.109	0.106	0.012		B
G2		-999	0.14	0.136	0.013		B
G3		-999	0.294	0.308	0.018		B
G4		-999	0.37	0.359	0.024		B
G1	K <sup>+</sup> mg/l	-999	0.289	0.28	0.022		B
G2		-999	0.255	0.247	0.016		B
G3		-999	0.441	0.439	0.023		B
G4		-999	0.577	0.573	0.031		B
G1	pH pH units	5.24	5.55	5.523	0.178	-1.594	U
G2		5.55	5.52	5.523	0.174	0.154	S
G3		5.5	5.48	5.487	0.148	0.09	S
G4		5.35	5.46	5.468	0.129	-0.911	Q
G1	Cond μS/cm	8.9	6.73	6.767	1.348	1.582	U
G2		10	8.4	8.392	1.375	1.169	Q
G3		16	16.02	16.092	1.087	-0.084	S
G4		19	19.5	19.352	1.052	-0.335	S

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\* Z score is unitless

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:  
<http://www.nilu.no/projects/ccc/intercomparison.html>



## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 42, Environment Reference Laboratory, Environment Agency (Moldova)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	-999	0.201	0.199	0.016		B
G2		-999	0.244	0.241	0.013		B
G3		-999	0.567	0.613	0.195		B
G4		-999	0.688	0.708	0.242		B
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	-999	0.08	0.081	0.012		B
G2		-999	0.227	0.226	0.016		B
G3		-999	0.294	0.302	0.021		B
G4		-999	0.454	0.463	0.028		B
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	-999	0.249	0.245	0.008		B
G2		-999	0.366	0.36	0.012		B
G3		-999	0.496	0.492	0.017		B
G4		-999	0.738	0.73	0.027		B
G1	Na <sup>+</sup> mg/l	-999	0.32	0.318	0.028		B
G2		-999	0.317	0.313	0.015		B
G3		-999	0.948	0.941	0.045		B
G4		-999	1.05	1.039	0.041		B
G1	Mg <sup>2+</sup> mg/l	-999	0.077	0.077	0.006		B
G2		-999	0.088	0.087	0.006		B
G3		-999	0.237	0.24	0.014		B
G4		-999	0.279	0.277	0.014		B
G1	Cl <sup>-</sup> mg/l	-999	0.328	0.324	0.027		B
G2		-999	0.367	0.367	0.035		B
G3		-999	1.35	1.333	0.064		B
G4		-999	1.43	1.399	0.078		B
G1	Ca <sup>2+</sup> mg/l	-999	0.109	0.106	0.012		B
G2		-999	0.14	0.136	0.013		B
G3		-999	0.294	0.308	0.018		B
G4		-999	0.37	0.359	0.024		B
G1	K <sup>+</sup> mg/l	-999	0.289	0.28	0.022		B
G2		-999	0.255	0.247	0.016		B
G3		-999	0.441	0.439	0.023		B
G4		-999	0.577	0.573	0.031		B
G1	pH pH units	5.59	5.55	5.523	0.178	0.375	S
G2		5.54	5.52	5.523	0.174	0.097	S
G3		5.68	5.48	5.487	0.148	1.31	Q
G4		5.51	5.46	5.468	0.129	0.329	S
G1	Cond µS/cm	12.63	6.73	6.767	1.348	4.348	U
G2		14.88	8.4	8.392	1.375	4.717	U
G3		17.66	16.02	16.092	1.087	1.442	S
G4		21.32	19.5	19.352	1.052	1.871	S

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\* Z score is unitless

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

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B – Blank: You reported either no value or the detection limit

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<http://www.nilu.no/projects/ccc/intercomparison.html>

## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 46, Diabla Gora Station (Poland)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	-999	0.201	0.199	0.016		B
G2		-999	0.244	0.241	0.013		B
G3		-999	0.567	0.613	0.195		B
G4		-999	0.688	0.708	0.242		B
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	-999	0.08	0.081	0.012		B
G2		-999	0.227	0.226	0.016		B
G3		-999	0.294	0.302	0.021		B
G4		-999	0.454	0.463	0.028		B
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	-999	0.249	0.245	0.008		B
G2		-999	0.366	0.36	0.012		B
G3		-999	0.496	0.492	0.017		B
G4		-999	0.738	0.73	0.027		B
G1	Na <sup>+</sup> mg/l	-999	0.32	0.318	0.028		B
G2		-999	0.317	0.313	0.015		B
G3		-999	0.948	0.941	0.045		B
G4		-999	1.05	1.039	0.041		B
G1	Mg <sup>2+</sup> mg/l	-999	0.077	0.077	0.006		B
G2		-999	0.088	0.087	0.006		B
G3		-999	0.237	0.24	0.014		B
G4		-999	0.279	0.277	0.014		B
G1	Cl <sup>-</sup> mg/l	-999	0.328	0.324	0.027		B
G2		-999	0.367	0.367	0.035		B
G3		-999	1.35	1.333	0.064		B
G4		-999	1.43	1.399	0.078		B
G1	Ca <sup>2+</sup> mg/l	-999	0.109	0.106	0.012		B
G2		-999	0.14	0.136	0.013		B
G3		-999	0.294	0.308	0.018		B
G4		-999	0.37	0.359	0.024		B
G1	K <sup>+</sup> mg/l	-999	0.289	0.28	0.022		B
G2		-999	0.255	0.247	0.016		B
G3		-999	0.441	0.439	0.023		B
G4		-999	0.577	0.573	0.031		B
G1	pH pH units	5.34	5.55	5.523	0.178	-1.032	U
G2		5.42	5.52	5.523	0.174	-0.593	S
G3		5.41	5.48	5.487	0.148	-0.519	S
G4		5.47	5.46	5.468	0.129	0.019	S
G1	Cond µS/cm	6.14	6.73	6.767	1.348	-0.465	S
G2		7.69	8.4	8.392	1.375	-0.51	S
G3		15.69	16.02	16.092	1.087	-0.37	S
G4		18.96	19.5	19.352	1.052	-0.373	S

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\* Z score is unitless

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 47, Jelenia Gora (Poland)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.203	0.201	0.199	0.016	0.23	S
G2		0.234	0.244	0.241	0.013	-0.524	S
G3		0.578	0.567	0.613	0.195	-0.182	S
G4		0.673	0.688	0.708	0.242	-0.147	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.099	0.08	0.081	0.012	1.533	Q
G2		0.256	0.227	0.226	0.016	1.873	S
G3		0.317	0.294	0.302	0.021	0.742	S
G4		0.518	0.454	0.463	0.028	1.978	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.248	0.249	0.245	0.008	0.39	S
G2		0.367	0.366	0.36	0.012	0.575	S
G3		0.509	0.496	0.492	0.017	0.994	S
G4		0.761	0.738	0.73	0.027	1.163	S
G1	Na <sup>+</sup> mg/l	0.31	0.32	0.318	0.028	-0.286	S
G2		0.307	0.317	0.313	0.015	-0.374	S
G3		0.929	0.948	0.941	0.045	-0.267	S
G4		1.027	1.05	1.039	0.041	-0.299	S
G1	Mg <sup>2+</sup> mg/l	0.077	0.077	0.077	0.006	0.036	S
G2		0.091	0.088	0.087	0.006	0.699	S
G3		0.239	0.237	0.24	0.014	-0.056	S
G4		0.279	0.279	0.277	0.014	0.137	S
G1	Cl <sup>-</sup> mg/l	0.319	0.328	0.324	0.027	-0.199	S
G2		0.357	0.367	0.367	0.035	-0.283	S
G3		1.293	1.35	1.333	0.064	-0.624	S
G4		1.39	1.43	1.399	0.078	-0.115	S
G1	Ca <sup>2+</sup> mg/l	0.109	0.109	0.106	0.012	0.213	S
G2		0.14	0.14	0.136	0.013	0.272	S
G3		0.307	0.294	0.308	0.018	-0.035	S
G4		0.362	0.37	0.359	0.024	0.135	S
G1	K <sup>+</sup> mg/l	0.278	0.289	0.28	0.022	-0.096	S
G2		0.247	0.255	0.247	0.016	-0.029	S
G3		0.435	0.441	0.439	0.023	-0.179	S
G4		0.569	0.577	0.573	0.031	-0.128	S
G1	pH pH units	5.5	5.55	5.523	0.178	-0.131	S
G2		5.68	5.52	5.523	0.174	0.901	Q
G3		5.52	5.48	5.487	0.148	0.226	S
G4		5.65	5.46	5.468	0.129	1.415	Q
G1	Cond µS/cm	6.8	6.73	6.767	1.348	0.025	S
G2		8.4	8.4	8.392	1.375	0.006	S
G3		16.3	16.02	16.092	1.087	0.191	S
G4		19.6	19.5	19.352	1.052	0.236	S

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\* Z score is unitless

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S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

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B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 49, The Cyprus Institute (Cyl) (Cyprus)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.202	0.201	0.199	0.016	0.168	S
G2		0.245	0.244	0.241	0.013	0.332	S
G3		0.59	0.567	0.613	0.195	-0.12	S
G4		0.686	0.688	0.708	0.242	-0.093	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.103	0.08	0.081	0.012	1.867	U
G2		0.245	0.227	0.226	0.016	1.183	S
G3		0.33	0.294	0.302	0.021	1.374	S
G4		0.503	0.454	0.463	0.028	1.435	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.252	0.249	0.245	0.008	0.894	S
G2		0.376	0.366	0.36	0.012	1.315	S
G3		0.517	0.496	0.492	0.017	1.453	S
G4		0.777	0.738	0.73	0.027	1.759	S
G1	Na <sup>+</sup> mg/l	0.323	0.32	0.318	0.028	0.182	S
G2		0.312	0.317	0.313	0.015	-0.035	S
G3		0.94	0.948	0.941	0.045	-0.021	S
G4		1.044	1.05	1.039	0.041	0.119	S
G1	Mg <sup>2+</sup> mg/l	0.09	0.077	0.077	0.006	2.109	Q
G2		0.1	0.088	0.087	0.006	2.18	S
G3		0.254	0.237	0.24	0.014	1.036	S
G4		0.302	0.279	0.277	0.014	1.76	S
G1	Cl <sup>-</sup> mg/l	0.324	0.328	0.324	0.027	-0.016	S
G2		0.366	0.367	0.367	0.035	-0.024	S
G3		1.343	1.35	1.333	0.064	0.157	S
G4		1.429	1.43	1.399	0.078	0.387	S
G1	Ca <sup>2+</sup> mg/l	0.107	0.109	0.106	0.012	0.043	S
G2		0.135	0.14	0.136	0.013	-0.105	S
G3		0.307	0.294	0.308	0.018	-0.035	S
G4		0.392	0.37	0.359	0.024	1.388	S
G1	K <sup>+</sup> mg/l	0.274	0.289	0.28	0.022	-0.276	S
G2		0.257	0.255	0.247	0.016	0.614	S
G3		0.443	0.441	0.439	0.023	0.163	S
G4		0.59	0.577	0.573	0.031	0.544	S
G1	pH pH units	-999	5.55	5.523	0.178		B
G2		-999	5.52	5.523	0.174		B
G3		-999	5.48	5.487	0.148		B
G4		-999	5.46	5.468	0.129		B
G1	Cond μS/cm	-999	6.73	6.767	1.348		B
G2		-999	8.4	8.392	1.375		B
G3		-999	16.02	16.092	1.087		B
G4		-999	19.5	19.352	1.052		B

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

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Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:  
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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 50, CEA Saclay - Orme des Merisiers (France)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.182	0.201	0.199	0.016	-1.078	S
G2		0.224	0.244	0.241	0.013	-1.301	S
G3		0.573	0.567	0.613	0.195	-0.207	S
G4		0.668	0.688	0.708	0.242	-0.167	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.089	0.08	0.081	0.012	0.697	S
G2		0.242	0.227	0.226	0.016	0.995	S
G3		0.315	0.294	0.302	0.021	0.645	S
G4		0.46	0.454	0.463	0.028	-0.121	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.233	0.249	0.245	0.008	-1.501	S
G2		0.347	0.366	0.36	0.012	-1.072	S
G3		0.478	0.496	0.492	0.017	-0.784	S
G4		0.716	0.738	0.73	0.027	-0.515	S
G1	Na <sup>+</sup> mg/l	0.311	0.32	0.318	0.028	-0.25	S
G2		0.31	0.317	0.313	0.015	-0.17	S
G3		0.934	0.948	0.941	0.045	-0.155	S
G4		1.038	1.05	1.039	0.041	-0.028	S
G1	Mg <sup>2+</sup> mg/l	0.063	0.077	0.077	0.006	-2.198	Q
G2		0.072	0.088	0.087	0.006	-2.429	Q
G3		0.209	0.237	0.24	0.014	-2.24	S
G4		0.248	0.279	0.277	0.014	-2.051	S
G1	Cl <sup>-</sup> mg/l	0.321	0.328	0.324	0.027	-0.126	S
G2		0.359	0.367	0.367	0.035	-0.226	S
G3		1.339	1.35	1.333	0.064	0.094	S
G4		1.412	1.43	1.399	0.078	0.168	S
G1	Ca <sup>2+</sup> mg/l	0.077	0.109	0.106	0.012	-2.504	U
G2		0.112	0.14	0.136	0.013	-1.839	Q
G3		0.279	0.294	0.308	0.018	-1.633	S
G4		0.308	0.37	0.359	0.024	-2.118	Q
G1	K <sup>+</sup> mg/l	0.27	0.289	0.28	0.022	-0.455	S
G2		0.239	0.255	0.247	0.016	-0.543	S
G3		0.424	0.441	0.439	0.023	-0.65	S
G4		0.559	0.577	0.573	0.031	-0.448	S
G1	pH pH units	5.67	5.55	5.523	0.178	0.825	Q
G2		5.8	5.52	5.523	0.174	1.591	U
G3		5.46	5.48	5.487	0.148	-0.181	S
G4		5.41	5.46	5.468	0.129	-0.446	S
G1	Cond µS/cm	7.062	6.73	6.767	1.348	0.219	S
G2		8.856	8.4	8.392	1.375	0.337	S
G3		16.85	16.02	16.092	1.087	0.697	S
G4		20.2	19.5	19.352	1.052	0.806	S

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 110, Thüringer Landesanstalt für Landwirtschaft und Ländlichen Raum (TLLR) (Germany)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.212	0.201	0.199	0.016	0.791	S
G2		0.275	0.244	0.241	0.013	2.664	Q
G3		0.573	0.567	0.613	0.195	-0.207	S
G4		0.67	0.688	0.708	0.242	-0.159	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.079	0.08	0.081	0.012	-0.113	S
G2		0.201	0.227	0.226	0.016	-1.576	S
G3		0.275	0.294	0.302	0.021	-1.298	S
G4		0.421	0.454	0.463	0.028	-1.532	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.244	0.249	0.245	0.008	-0.114	S
G2		0.361	0.366	0.36	0.012	0.081	S
G3		0.467	0.496	0.492	0.017	-1.415	S
G4		0.711	0.738	0.73	0.027	-0.701	S
G1	Na <sup>+</sup> mg/l	0.321	0.32	0.318	0.028	0.11	S
G2		0.327	0.317	0.313	0.015	0.983	S
G3		0.977	0.948	0.941	0.045	0.807	S
G4		1.08	1.05	1.039	0.041	1.004	S
G1	Mg <sup>2+</sup> mg/l	0.079	0.077	0.077	0.006	0.355	S
G2		0.091	0.088	0.087	0.006	0.699	S
G3		0.25	0.237	0.24	0.014	0.745	S
G4		0.288	0.279	0.277	0.014	0.772	S
G1	Cl <sup>-</sup> mg/l	0.322	0.328	0.324	0.027	-0.089	S
G2		0.468	0.367	0.367	0.035	2.906	U
G3		1.34	1.35	1.333	0.064	0.11	S
G4		1.47	1.43	1.399	0.078	0.915	S
G1	Ca <sup>2+</sup> mg/l	0.105	0.109	0.106	0.012	-0.127	S
G2		0.14	0.14	0.136	0.013	0.272	S
G3		0.314	0.294	0.308	0.018	0.365	S
G4		0.361	0.37	0.359	0.024	0.094	S
G1	K <sup>+</sup> mg/l	0.29	0.289	0.28	0.022	0.441	S
G2		0.26	0.255	0.247	0.016	0.807	S
G3		0.45	0.441	0.439	0.023	0.462	S
G4		0.585	0.577	0.573	0.031	0.384	S
G1	pH pH units	5.43	5.55	5.523	0.178	-0.525	Q
G2		5.43	5.52	5.523	0.174	-0.536	S
G3		5.35	5.48	5.487	0.148	-0.926	Q
G4		5.37	5.46	5.468	0.129	-0.756	S
G1	Cond µS/cm	< 10.000	6.73	6.767	1.348		B
G2		< 10.000	8.4	8.392	1.375		B
G3		16.3	16.02	16.092	1.087	0.191	S
G4		19.6	19.5	19.352	1.052	0.236	S

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:  
<http://www.nilu.no/projects/ccc/intercomparison.html>

## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 112, Nordwestdeutsche Forstliche Versuchsanstalt (NFV) (Germany)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.202	0.201	0.199	0.016	0.168	S
G2		0.249	0.244	0.241	0.013	0.643	S
G3		0.688	0.567	0.613	0.195	0.383	U
G4		0.623	0.688	0.708	0.242	-0.354	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.077	0.08	0.081	0.012	-0.305	S
G2		0.23	0.227	0.226	0.016	0.243	S
G3		0.467	0.294	0.302	0.021	8.03	U
G4		0.305	0.454	0.463	0.028	-5.729	U
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.247	0.249	0.245	0.008	0.264	S
G2		0.349	0.366	0.36	0.012	-0.907	S
G3		0.703	0.496	0.492	0.017	12.122	U
G4		0.471	0.738	0.73	0.027	-9.647	U
G1	Na <sup>+</sup> mg/l	0.327	0.32	0.318	0.028	0.326	S
G2		0.327	0.317	0.313	0.015	0.983	S
G3		1.073	0.948	0.941	0.045	2.956	S
G4		0.967	1.05	1.039	0.041	-1.773	S
G1	Mg <sup>2+</sup> mg/l	0.078	0.077	0.077	0.006	0.259	S
G2		0.087	0.088	0.087	0.006	0.09	S
G3		0.235	0.237	0.24	0.014	-0.369	S
G4		0.271	0.279	0.277	0.014	-0.428	S
G1	Cl <sup>-</sup> mg/l	0.333	0.328	0.324	0.027	0.314	S
G2		0.374	0.367	0.367	0.035	0.205	S
G3		1.37	1.35	1.333	0.064	0.578	S
G4		1.296	1.43	1.399	0.078	-1.325	S
G1	Ca <sup>2+</sup> mg/l	0.105	0.109	0.106	0.012	-0.084	S
G2		0.135	0.14	0.136	0.013	-0.12	S
G3		0.3	0.294	0.308	0.018	-0.457	S
G4		0.346	0.37	0.359	0.024	-0.511	S
G1	K <sup>+</sup> mg/l	0.298	0.289	0.28	0.022	0.799	S
G2		0.265	0.255	0.247	0.016	1.128	S
G3		0.592	0.441	0.439	0.023	6.537	U
G4		0.458	0.577	0.573	0.031	-3.682	Q
G1	pH pH units	5.59	5.55	5.523	0.178	0.375	S
G2		5.56	5.52	5.523	0.174	0.211	S
G3		5.5	5.48	5.487	0.148	0.09	S
G4		5.52	5.46	5.468	0.129	0.407	S
G1	Cond µS/cm	5.9	6.73	6.767	1.348	-0.643	S
G2		7.4	8.4	8.392	1.375	-0.721	S
G3		15.1	16.02	16.092	1.087	-0.912	S
G4		18.5	19.5	19.352	1.052	-0.81	S

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\* Z score is unitless

✎ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:  
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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 114, C.N.R. Institute of Water Research (Italy)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.194	0.201	0.199	0.016	-0.331	S
G2		0.234	0.244	0.241	0.013	-0.524	S
G3		0.581	0.567	0.584	0.033	-0.101	S
G4		0.658	0.688	0.672	0.039	-0.364	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.085	0.08	0.081	0.012	0.363	S
G2		0.225	0.227	0.226	0.016	-0.071	S
G3		0.3	0.294	0.302	0.021	-0.083	S
G4		0.45	0.454	0.463	0.028	-0.483	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.245	0.249	0.245	0.008	0.012	S
G2		0.359	0.366	0.36	0.012	-0.084	S
G3		0.49	0.496	0.492	0.017	-0.096	S
G4		0.724	0.738	0.73	0.027	-0.217	S
G1	Na <sup>+</sup> mg/l	0.28	0.32	0.318	0.028	-1.365	S
G2		0.28	0.317	0.313	0.015	-2.206	S
G3		0.84	0.948	0.941	0.045	-2.259	S
G4		0.92	1.05	1.039	0.041	-2.928	S
G1	Mg <sup>2+</sup> mg/l	0.07	0.077	0.077	0.006	-1.081	S
G2		0.08	0.088	0.087	0.006	-1.112	S
G3		0.22	0.237	0.24	0.014	-1.439	S
G4		0.27	0.279	0.277	0.014	-0.498	S
G1	Cl <sup>-</sup> mg/l	0.31	0.328	0.324	0.027	-0.529	S
G2		0.35	0.367	0.367	0.035	-0.484	S
G3		1.3	1.35	1.333	0.064	-0.514	S
G4		1.36	1.43	1.399	0.078	-0.501	S
G1	Ca <sup>2+</sup> mg/l	0.13	0.109	0.106	0.012	1.996	Q
G2		0.16	0.14	0.136	0.013	1.779	S
G3		0.34	0.294	0.308	0.018	1.849	Q
G4		0.38	0.37	0.359	0.024	0.887	S
G1	K <sup>+</sup> mg/l	0.26	0.289	0.28	0.022	-0.903	S
G2		0.24	0.255	0.247	0.016	-0.479	S
G3		0.41	0.441	0.439	0.023	-1.249	S
G4		0.52	0.577	0.573	0.031	-1.697	S
G1	pH pH units	5.56	5.55	5.523	0.178	0.206	S
G2		5.54	5.52	5.523	0.174	0.097	S
G3		5.51	5.48	5.487	0.148	0.158	S
G4		5.48	5.46	5.468	0.129	0.096	S
G1	Cond μS/cm	-999	0.8	1.293	1.543		B
G2		-999	1	1.27	1.879		B
G3		-999	1.3	1.823	1.687		B
G4		-999	1.5	1.184	2.307		B

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\* Z score is unitless

✎ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

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B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 116, Institute for Applied Plant Biology (Switzerland)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.272	0.201	0.199	0.016	4.54	U
G2		0.246	0.244	0.241	0.013	0.378	S
G3		0.638	0.567	0.613	0.195	0.128	Q
G4		0.733	0.688	0.708	0.242	0.1	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.13	0.08	0.081	0.012	4.121	U
G2		0.365	0.227	0.226	0.016	8.708	U
G3		0.488	0.294	0.302	0.021	9.05	U
G4		0.755	0.454	0.463	0.028	10.553	U
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.247	0.249	0.245	0.008	0.264	S
G2		0.358	0.366	0.36	0.012	-0.175	S
G3		0.492	0.496	0.492	0.017	0.024	S
G4		0.731	0.738	0.73	0.027	0.048	S
G1	Na <sup>+</sup> mg/l	0.4	0.32	0.318	0.028	2.952	U
G2		0.36	0.317	0.313	0.015	3.223	S
G3		1.03	0.948	0.941	0.045	1.993	S
G4		1.13	1.05	1.039	0.041	2.232	S
G1	Mg <sup>2+</sup> mg/l	0.09	0.077	0.077	0.006	2.109	Q
G2		0.1	0.088	0.087	0.006	2.18	S
G3		0.24	0.237	0.24	0.014	0.017	S
G4		0.27	0.279	0.277	0.014	-0.498	S
G1	Cl <sup>-</sup> mg/l	0.334	0.328	0.324	0.027	0.358	S
G2		0.399	0.367	0.367	0.035	0.932	S
G3		1.359	1.35	1.333	0.064	0.409	S
G4		1.474	1.43	1.399	0.078	0.965	S
G1	Ca <sup>2+</sup> mg/l	0.11	0.109	0.106	0.012	0.298	S
G2		0.14	0.14	0.136	0.013	0.272	S
G3		0.29	0.294	0.308	0.018	-1.005	S
G4		0.34	0.37	0.359	0.024	-0.783	S
G1	K <sup>+</sup> mg/l	0.33	0.289	0.28	0.022	2.233	S
G2		0.29	0.255	0.247	0.016	2.734	S
G3		0.47	0.441	0.439	0.023	1.318	S
G4		0.62	0.577	0.573	0.031	1.504	S
G1	pH pH units	5.53	5.55	5.523	0.178	0.037	S
G2		5.4	5.52	5.523	0.174	-0.708	Q
G3		5.46	5.48	5.487	0.148	-0.181	S
G4		5.41	5.46	5.468	0.129	-0.446	S
G1	Cond µS/cm	6.1	6.73	6.767	1.348	-0.494	S
G2		7.5	8.4	8.392	1.375	-0.648	S
G3		14.5	16.02	16.092	1.087	-1.464	S
G4		17.7	19.5	19.352	1.052	-1.571	S

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\* Z score is unitless

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 117, SBS Standortserkundung/Bodenmonitoring (Germany)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.207	0.201	0.199	0.016	0.479	S
G2		0.248	0.244	0.241	0.013	0.565	S
G3		0.581	0.567	0.613	0.195	-0.166	S
G4		0.713	0.688	0.708	0.242	0.019	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.09	0.08	0.081	0.012	0.781	S
G2		0.23	0.227	0.226	0.016	0.243	S
G3		0.3	0.294	0.302	0.021	-0.083	S
G4		0.45	0.454	0.463	0.028	-0.483	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.24	0.249	0.245	0.008	-0.618	S
G2		0.35	0.366	0.36	0.012	-0.825	S
G3		0.47	0.496	0.492	0.017	-1.243	S
G4		0.71	0.738	0.73	0.027	-0.738	S
G1	Na <sup>+</sup> mg/l	0.308	0.32	0.318	0.028	-0.358	S
G2		0.313	0.317	0.313	0.015	0.033	S
G3		0.913	0.948	0.941	0.045	-0.625	S
G4		1.007	1.05	1.039	0.041	-0.79	S
G1	Mg <sup>2+</sup> mg/l	0.072	0.077	0.077	0.006	-0.762	S
G2		0.084	0.088	0.087	0.006	-0.453	S
G3		0.238	0.237	0.24	0.014	-0.128	S
G4		0.268	0.279	0.277	0.014	-0.64	S
G1	Cl <sup>-</sup> mg/l	0.35	0.328	0.324	0.027	0.938	S
G2		0.47	0.367	0.367	0.035	2.964	U
G3		1.25	1.35	1.333	0.064	-1.295	S
G4		1.33	1.43	1.399	0.078	-0.887	S
G1	Ca <sup>2+</sup> mg/l	0.104	0.109	0.106	0.012	-0.212	S
G2		0.137	0.14	0.136	0.013	0.045	S
G3		0.323	0.294	0.308	0.018	0.879	S
G4		0.363	0.37	0.359	0.024	0.177	S
G1	K <sup>+</sup> mg/l	0.232	0.289	0.28	0.022	-2.157	Q
G2		0.226	0.255	0.247	0.016	-1.378	S
G3		0.415	0.441	0.439	0.023	-1.035	S
G4		0.533	0.577	0.573	0.031	-1.281	S
G1	pH pH units	5.23	5.55	5.523	0.178	-1.65	U
G2		5.24	5.52	5.523	0.174	-1.628	U
G3		5.22	5.48	5.487	0.148	-1.806	U
G4		5.24	5.46	5.468	0.129	-1.764	U
G1	Cond µS/cm	< 10.000	6.73	6.767	1.348		B
G2		< 10.000	8.4	8.392	1.375		B
G3		15.9	16.02	16.092	1.087	-0.176	S
G4		20	19.5	19.352	1.052	0.616	S

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\* Z score is unitless

✎ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:  
<http://www.nilu.no/projects/ccc/intercomparison.html>

## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 124, Laboratorium voor Bondemkunde, Gent (Belgium)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.228	0.201	0.199	0.016	1.787	Q
G2		0.264	0.244	0.241	0.013	1.809	S
G3		0.613	0.567	0.613	0.195	-0.002	S
G4		0.711	0.688	0.708	0.242	0.011	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	-999	0.08	0.081	0.012		B
G2		-999	0.227	0.226	0.016		B
G3		-999	0.294	0.302	0.021		B
G4		-999	0.454	0.463	0.028		B
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.257	0.249	0.245	0.008	1.524	S
G2		0.384	0.366	0.36	0.012	1.974	S
G3		0.523	0.496	0.492	0.017	1.797	S
G4		0.771	0.738	0.73	0.027	1.535	S
G1	Na <sup>+</sup> mg/l	0.318	0.32	0.318	0.028	0.002	S
G2		0.32	0.317	0.313	0.015	0.508	S
G3		0.959	0.948	0.941	0.045	0.404	S
G4		1.082	1.05	1.039	0.041	1.053	S
G1	Mg <sup>2+</sup> mg/l	0.076	0.077	0.077	0.006	-0.124	S
G2		0.085	0.088	0.087	0.006	-0.289	S
G3		0.241	0.237	0.24	0.014	0.09	S
G4		0.287	0.279	0.277	0.014	0.702	S
G1	Cl <sup>-</sup> mg/l	0.347	0.328	0.324	0.027	0.828	S
G2		0.38	0.367	0.367	0.035	0.378	S
G3		1.408	1.35	1.333	0.064	1.171	S
G4		1.48	1.43	1.399	0.078	1.044	S
G1	Ca <sup>2+</sup> mg/l	0.105	0.109	0.106	0.012	-0.127	S
G2		0.142	0.14	0.136	0.013	0.422	S
G3		0.306	0.294	0.308	0.018	-0.092	S
G4		0.359	0.37	0.359	0.024	0.01	S
G1	K <sup>+</sup> mg/l	0.238	0.289	0.28	0.022	-1.888	Q
G2		0.219	0.255	0.247	0.016	-1.828	S
G3		0.393	0.441	0.439	0.023	-1.976	S
G4		0.511	0.577	0.573	0.031	-1.985	S
G1	pH pH units	5.69	5.55	5.523	0.178	0.937	Q
G2		5.7	5.52	5.523	0.174	1.016	Q
G3		5.7	5.48	5.487	0.148	1.445	U
G4		5.72	5.46	5.468	0.129	1.957	U
G1	Cond μS/cm	6.6	6.73	6.767	1.348	-0.124	S
G2		7.8	8.4	8.392	1.375	-0.43	S
G3		15.1	16.02	16.092	1.087	-0.912	S
G4		17.4	19.5	19.352	1.052	-1.856	S

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\* Z score is unitless

✎ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:  
<http://www.nilu.no/projects/ccc/intercomparison.html>

## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 145, Estonian Environmental Research Centre, Tartu laboratory (Estonia)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.194	0.201	0.199	0.016	-0.331	S
G2		0.229	0.244	0.241	0.013	-0.912	S
G3		0.566	0.567	0.613	0.195	-0.243	S
G4		0.663	0.688	0.708	0.242	-0.188	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.083	0.08	0.081	0.012	0.171	S
G2		0.235	0.227	0.226	0.016	0.556	S
G3		0.312	0.294	0.302	0.021	0.5	S
G4		0.488	0.454	0.463	0.028	0.892	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.239	0.249	0.245	0.008	-0.745	S
G2		0.348	0.366	0.36	0.012	-0.989	S
G3		0.492	0.496	0.492	0.017	0.019	S
G4		0.717	0.738	0.73	0.027	-0.478	S
G1	Na <sup>+</sup> mg/l	0.3	0.32	0.318	0.028	-0.646	S
G2		0.311	0.317	0.313	0.015	-0.103	S
G3		0.919	0.948	0.941	0.045	-0.491	S
G4		1.013	1.05	1.039	0.041	-0.643	S
G1	Mg <sup>2+</sup> mg/l	0.088	0.077	0.077	0.006	1.822	S
G2		0.092	0.088	0.087	0.006	0.929	S
G3		0.24	0.237	0.24	0.014	-0.012	S
G4		0.269	0.279	0.277	0.014	-0.569	S
G1	Cl <sup>-</sup> mg/l	0.316	0.328	0.324	0.027	-0.309	S
G2		0.35	0.367	0.367	0.035	-0.484	S
G3		1.326	1.35	1.333	0.064	-0.109	S
G4		1.364	1.43	1.399	0.078	-0.449	S
G1	Ca <sup>2+</sup> mg/l	0.126	0.109	0.106	0.012	1.656	Q
G2		0.143	0.14	0.136	0.013	0.498	S
G3		0.326	0.294	0.308	0.018	1.05	S
G4		0.36	0.37	0.359	0.024	0.052	S
G1	K <sup>+</sup> mg/l	0.295	0.289	0.28	0.022	0.665	S
G2		0.26	0.255	0.247	0.016	0.807	S
G3		0.48	0.441	0.439	0.023	1.746	S
G4		0.63	0.577	0.573	0.031	1.825	S
G1	pH pH units	6.909	5.55	5.523	0.178	7.796	U
G2		6.836	5.52	5.523	0.174	7.548	U
G3		7.755	5.48	5.487	0.148	15.364	U
G4		6.682	5.46	5.468	0.129	9.416	U
G1	Cond µS/cm	6.4	6.73	6.767	1.348	-0.272	S
G2		8.1	8.4	8.392	1.375	-0.212	S
G3		15.9	16.02	16.092	1.087	-0.176	S
G4		19.5	19.5	19.352	1.052	0.141	S

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\* Z score is unitless

✎ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:  
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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 153, Slovenian Forestry Institute, Ljubljana (Slovenia)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.188	0.201	0.199	0.016	-0.704	S
G2		0.232	0.244	0.241	0.013	-0.679	S
G3		0.558	0.567	0.613	0.195	-0.284	S
G4		0.648	0.688	0.708	0.242	-0.25	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.069	0.08	0.081	0.012	-0.973	S
G2		0.222	0.227	0.226	0.016	-0.259	S
G3		0.294	0.294	0.302	0.021	-0.375	S
G4		0.453	0.454	0.463	0.028	-0.374	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.234	0.249	0.245	0.008	-1.375	S
G2		0.349	0.366	0.36	0.012	-0.907	S
G3		0.488	0.496	0.492	0.017	-0.211	S
G4		0.711	0.738	0.73	0.027	-0.701	S
G1	Na <sup>+</sup> mg/l	0.395	0.32	0.318	0.028	2.772	Q
G2		0.317	0.317	0.313	0.015	0.305	S
G3		0.995	0.948	0.941	0.045	1.21	S
G4		1.096	1.05	1.039	0.041	1.397	S
G1	Mg <sup>2+</sup> mg/l	0.068	0.077	0.077	0.006	-1.4	S
G2		0.082	0.088	0.087	0.006	-0.782	S
G3		0.24	0.237	0.24	0.014	0.017	S
G4		0.295	0.279	0.277	0.014	1.266	S
G1	Cl <sup>-</sup> mg/l	0.3	0.328	0.324	0.027	-0.896	S
G2		0.334	0.367	0.367	0.035	-0.944	S
G3		1.257	1.35	1.333	0.064	-1.185	S
G4		1.319	1.43	1.399	0.078	-1.029	S
G1	Ca <sup>2+</sup> mg/l	0.091	0.109	0.106	0.012	-1.316	Q
G2		0.121	0.14	0.136	0.013	-1.161	S
G3		0.301	0.294	0.308	0.018	-0.377	S
G4		0.348	0.37	0.359	0.024	-0.449	S
G1	K <sup>+</sup> mg/l	0.294	0.289	0.28	0.022	0.62	S
G2		0.232	0.255	0.247	0.016	-0.993	S
G3		0.43	0.441	0.439	0.023	-0.393	S
G4		0.553	0.577	0.573	0.031	-0.64	S
G1	pH pH units	5.34	5.55	5.523	0.178	-1.032	U
G2		5.32	5.52	5.523	0.174	-1.168	Q
G3		5.37	5.48	5.487	0.148	-0.79	Q
G4		5.26	5.46	5.468	0.129	-1.609	U
G1	Cond μS/cm	7.14	6.73	6.767	1.348	0.277	S
G2		9.01	8.4	8.392	1.375	0.449	S
G3		17.33	16.02	16.092	1.087	1.139	S
G4		20.87	19.5	19.352	1.052	1.443	S

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\* Z score is unitless

✎ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 155, Environmental Research Branch, Farnheim (UK)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.197	0.201	0.199	0.016	-0.144	S
G2		0.241	0.244	0.241	0.013	0.021	S
G3		0.585	0.567	0.613	0.195	-0.146	S
G4		0.679	0.688	0.708	0.242	-0.122	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.103	0.08	0.081	0.012	1.867	U
G2		0.236	0.227	0.226	0.016	0.619	S
G3		0.304	0.294	0.302	0.021	0.111	S
G4		0.499	0.454	0.463	0.028	1.29	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.246	0.249	0.245	0.008	0.138	S
G2		0.362	0.366	0.36	0.012	0.163	S
G3		0.494	0.496	0.492	0.017	0.133	S
G4		0.725	0.738	0.73	0.027	-0.179	S
G1	Na <sup>+</sup> mg/l	0.33	0.32	0.318	0.028	0.433	S
G2		0.317	0.317	0.313	0.015	0.305	S
G3		0.881	0.948	0.941	0.045	-1.342	S
G4		0.965	1.05	1.039	0.041	-1.822	S
G1	Mg <sup>2+</sup> mg/l	0.077	0.077	0.077	0.006	0.036	S
G2		0.088	0.088	0.087	0.006	0.205	S
G3		0.237	0.237	0.24	0.014	-0.201	S
G4		0.274	0.279	0.277	0.014	-0.216	S
G1	Cl <sup>-</sup> mg/l	0.302	0.328	0.324	0.027	-0.822	S
G2		0.341	0.367	0.367	0.035	-0.743	S
G3		1.376	1.35	1.333	0.064	0.672	S
G4		1.456	1.43	1.399	0.078	0.735	S
G1	Ca <sup>2+</sup> mg/l	0.108	0.109	0.106	0.012	0.128	S
G2		0.138	0.14	0.136	0.013	0.121	S
G3		0.307	0.294	0.308	0.018	-0.035	S
G4		0.358	0.37	0.359	0.024	-0.031	S
G1	K <sup>+</sup> mg/l	0.258	0.289	0.28	0.022	-0.992	S
G2		0.233	0.255	0.247	0.016	-0.928	S
G3		0.406	0.441	0.439	0.023	-1.42	S
G4		0.535	0.577	0.573	0.031	-1.217	S
G1	pH pH units	5.47	5.55	5.523	0.178	-0.3	S
G2		5.49	5.52	5.523	0.174	-0.191	S
G3		5.41	5.48	5.487	0.148	-0.519	S
G4		5.43	5.46	5.468	0.129	-0.291	S
G1	Cond µS/cm	6.43	6.73	6.767	1.348	-0.25	S
G2		8.16	8.4	8.392	1.375	-0.169	S
G3		15.81	16.02	16.092	1.087	-0.259	S
G4		19.16	19.5	19.352	1.052	-0.183	S

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\* Z score is unitless

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S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 166, Forest Research Institute, Laboratory of Natural Environment Chemistry (Poland)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.197	0.201	0.199	0.016	-0.144	S
G2		0.245	0.244	0.241	0.013	0.332	S
G3		0.579	0.567	0.613	0.195	-0.177	S
G4		0.682	0.688	0.708	0.242	-0.109	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.085	0.08	0.081	0.012	0.363	S
G2		0.214	0.227	0.226	0.016	-0.76	S
G3		0.268	0.294	0.302	0.021	-1.638	S
G4		0.4	0.454	0.463	0.028	-2.292	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.241	0.249	0.245	0.008	-0.492	S
G2		0.362	0.366	0.36	0.012	0.163	S
G3		0.486	0.496	0.492	0.017	-0.326	S
G4		0.728	0.738	0.73	0.027	-0.067	S
G1	Na <sup>+</sup> mg/l	0.316	0.32	0.318	0.028	-0.07	S
G2		0.313	0.317	0.313	0.015	0.033	S
G3		0.933	0.948	0.941	0.045	-0.178	S
G4		1.029	1.05	1.039	0.041	-0.25	S
G1	Mg <sup>2+</sup> mg/l	0.078	0.077	0.077	0.006	0.195	S
G2		0.09	0.088	0.087	0.006	0.534	S
G3		0.245	0.237	0.24	0.014	0.381	S
G4		0.282	0.279	0.277	0.014	0.349	S
G1	Cl <sup>-</sup> mg/l	0.309	0.328	0.324	0.027	-0.566	S
G2		0.352	0.367	0.367	0.035	-0.427	S
G3		1.3	1.35	1.333	0.064	-0.514	S
G4		1.394	1.43	1.399	0.078	-0.063	S
G1	Ca <sup>2+</sup> mg/l	-999	0.109	0.106	0.012		B
G2		0.13	0.14	0.136	0.013	-0.482	S
G3		0.305	0.294	0.308	0.018	-0.149	S
G4		0.355	0.37	0.359	0.024	-0.157	S
G1	K <sup>+</sup> mg/l	-999	0.289	0.28	0.022		B
G2		-999	0.255	0.247	0.016		B
G3		0.445	0.441	0.439	0.023	0.249	S
G4		0.588	0.577	0.573	0.031	0.48	S
G1	pH pH units	-999	5.55	5.523	0.178		B
G2		-999	5.52	5.523	0.174		B
G3		-999	5.48	5.487	0.148		B
G4		-999	5.46	5.468	0.129		B
G1	Cond µS/cm	-999	6.73	6.767	1.348		B
G2		-999	8.4	8.392	1.375		B
G3		16.56	16.02	16.092	1.087	0.431	S
G4		19.71	19.5	19.352	1.052	0.34	S

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 178, Laboratory of Hydrochemistry and Atmospheric Chemistry an EANET Monitoring Laboratory (Russian Federation)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>†</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.196	0.201	0.199	0.016	-0.206	S
G2		0.237	0.244	0.241	0.013	-0.29	S
G3		0.562	0.567	0.613	0.195	-0.264	S
G4		0.648	0.688	0.708	0.242	-0.25	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.088	0.08	0.081	0.012	0.614	S
G2		0.229	0.227	0.226	0.016	0.18	S
G3		0.302	0.294	0.302	0.021	0.014	S
G4		0.47	0.454	0.463	0.028	0.241	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.245	0.249	0.245	0.008	0.012	S
G2		0.36	0.366	0.36	0.012	-0.002	S
G3		0.48	0.496	0.492	0.017	-0.67	S
G4		0.719	0.738	0.73	0.027	-0.403	S
G1	Na <sup>+</sup> mg/l	0.299	0.32	0.318	0.028	-0.682	S
G2		0.3	0.317	0.313	0.015	-0.849	S
G3		0.9	0.948	0.941	0.045	-0.916	S
G4		1.001	1.05	1.039	0.041	-0.938	S
G1	Mg <sup>2+</sup> mg/l	0.07	0.077	0.077	0.006	-1.081	S
G2		0.082	0.088	0.087	0.006	-0.782	S
G3		0.229	0.237	0.24	0.014	-0.784	S
G4		0.268	0.279	0.277	0.014	-0.64	S
G1	Cl <sup>-</sup> mg/l	0.318	0.328	0.324	0.027	-0.236	S
G2		0.353	0.367	0.367	0.035	-0.398	S
G3		1.284	1.35	1.333	0.064	-0.764	S
G4		1.356	1.43	1.399	0.078	-0.552	S
G1	Ca <sup>2+</sup> mg/l	0.105	0.109	0.106	0.012	-0.127	S
G2		0.139	0.14	0.136	0.013	0.196	S
G3		0.303	0.294	0.308	0.018	-0.263	S
G4		0.356	0.37	0.359	0.024	-0.115	S
G1	K <sup>+</sup> mg/l	0.271	0.289	0.28	0.022	-0.41	S
G2		0.244	0.255	0.247	0.016	-0.222	S
G3		0.42	0.441	0.439	0.023	-0.821	S
G4		0.55	0.577	0.573	0.031	-0.736	S
G1	pH pH units	5.61	5.55	5.523	0.178	0.487	S
G2		5.52	5.52	5.523	0.174	-0.018	S
G3		5.45	5.48	5.487	0.148	-0.248	S
G4		5.41	5.46	5.468	0.129	-0.446	S
G1	Cond µS/cm	6.09	6.73	6.767	1.348	-0.502	S
G2		8.11	8.4	8.392	1.375	-0.205	S
G3		16.02	16.02	16.092	1.087	-0.066	S
G4		19.5	19.5	19.352	1.052	0.141	S

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\* Z score is unitless

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 179, Environmental Pollution Monitoring Center (Russian Federation)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.19	0.201	0.199	0.016	-0.58	S
G2		0.235	0.244	0.241	0.013	-0.446	S
G3		0.57	0.567	0.613	0.195	-0.223	S
G4		0.675	0.688	0.708	0.242	-0.138	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.08	0.08	0.081	0.012	-0.054	S
G2		0.22	0.227	0.226	0.016	-0.384	S
G3		0.298	0.294	0.302	0.021	-0.181	S
G4		0.465	0.454	0.463	0.028	0.06	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.24	0.249	0.245	0.008	-0.618	S
G2		0.353	0.366	0.36	0.012	-0.578	S
G3		0.48	0.496	0.492	0.017	-0.67	S
G4		0.678	0.738	0.73	0.027	-1.931	S
G1	Na <sup>+</sup> mg/l	0.303	0.32	0.318	0.028	-0.538	S
G2		0.292	0.317	0.313	0.015	-1.392	S
G3		0.895	0.948	0.941	0.045	-1.028	S
G4		1.03	1.05	1.039	0.041	-0.225	S
G1	Mg <sup>2+</sup> mg/l	< 0.100	0.077	0.077	0.006		B
G2		< 0.100	0.088	0.087	0.006		B
G3		0.224	0.237	0.24	0.014	-1.148	S
G4		0.263	0.279	0.277	0.014	-0.992	S
G1	Cl <sup>-</sup> mg/l	0.346	0.328	0.324	0.027	0.791	S
G2		0.387	0.367	0.367	0.035	0.579	S
G3		1.317	1.35	1.333	0.064	-0.249	S
G4		1.4	1.43	1.399	0.078	0.014	S
G1	Ca <sup>2+</sup> mg/l	0.117	0.109	0.106	0.012	0.892	S
G2		0.126	0.14	0.136	0.013	-0.784	S
G3		0.302	0.294	0.308	0.018	-0.32	S
G4		0.329	0.37	0.359	0.024	-1.242	S
G1	K <sup>+</sup> mg/l	0.29	0.289	0.28	0.022	0.441	S
G2		0.254	0.255	0.247	0.016	0.421	S
G3		0.453	0.441	0.439	0.023	0.591	S
G4		0.561	0.577	0.573	0.031	-0.384	S
G1	pH pH units	-999	5.55	5.523	0.178		B
G2		-999	5.52	5.523	0.174		B
G3		-999	5.48	5.487	0.148		B
G4		-999	5.46	5.468	0.129		B
G1	Cond µS/cm	7.111	6.73	6.767	1.348	0.255	S
G2		8.659	8.4	8.392	1.375	0.194	S
G3		15.87	16.02	16.092	1.087	-0.204	S
G4		18.82	19.5	19.352	1.052	-0.506	S

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 181, TNO innovation for life (The Netherlands)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.2	0.201	0.199	0.016	0.043	S
G2		0.24	0.244	0.241	0.013	-0.057	S
G3		0.57	0.567	0.613	0.195	-0.223	S
G4		0.67	0.688	0.708	0.242	-0.159	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.08	0.08	0.081	0.012	-0.054	S
G2		0.23	0.227	0.226	0.016	0.243	S
G3		0.3	0.294	0.302	0.021	-0.083	S
G4		0.45	0.454	0.463	0.028	-0.483	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.25	0.249	0.245	0.008	0.642	S
G2		0.36	0.366	0.36	0.012	-0.002	S
G3		0.48	0.496	0.492	0.017	-0.67	S
G4		0.73	0.738	0.73	0.027	0.007	S
G1	Na <sup>+</sup> mg/l	0.32	0.32	0.318	0.028	0.074	S
G2		0.32	0.317	0.313	0.015	0.508	S
G3		0.93	0.948	0.941	0.045	-0.245	S
G4		1.04	1.05	1.039	0.041	0.021	S
G1	Mg <sup>2+</sup> mg/l	0.08	0.077	0.077	0.006	0.514	S
G2		0.09	0.088	0.087	0.006	0.534	S
G3		0.24	0.237	0.24	0.014	0.017	S
G4		0.28	0.279	0.277	0.014	0.208	S
G1	Cl <sup>-</sup> mg/l	0.34	0.328	0.324	0.027	0.571	S
G2		0.38	0.367	0.367	0.035	0.378	S
G3		1.3	1.35	1.333	0.064	-0.514	S
G4		1.4	1.43	1.399	0.078	0.014	S
G1	Ca <sup>2+</sup> mg/l	0.11	0.109	0.106	0.012	0.298	S
G2		0.14	0.14	0.136	0.013	0.272	S
G3		0.31	0.294	0.308	0.018	0.137	S
G4		0.37	0.37	0.359	0.024	0.469	S
G1	K <sup>+</sup> mg/l	0.3	0.289	0.28	0.022	0.889	S
G2		0.26	0.255	0.247	0.016	0.807	S
G3		0.45	0.441	0.439	0.023	0.462	S
G4		0.59	0.577	0.573	0.031	0.544	S
G1	pH pH units	5.57	5.55	5.523	0.178	0.262	S
G2		5.61	5.52	5.523	0.174	0.499	S
G3		5.54	5.48	5.487	0.148	0.361	S
G4		5.66	5.46	5.468	0.129	1.492	U
G1	Cond μS/cm	4	6.73	6.767	1.348	-2.052	U
G2		7	8.4	8.392	1.375	-1.012	Q
G3		16	16.02	16.092	1.087	-0.084	S
G4		20	19.5	19.352	1.052	0.616	S

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\* Z score is unitless

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B – Blank: You reported either no value or the detection limit

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<http://www.nilu.no/projects/ccc/intercomparison.html>

## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 187, Public Health Institute - Nis, Department for Sanitary Chemistry (Republic of Serbia)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	-999	0.201	0.199	0.016		B
G2		-999	0.244	0.241	0.013		B
G3		-999	0.567	0.613	0.195		B
G4		-999	0.688	0.708	0.242		B
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	-999	0.08	0.081	0.012		B
G2		-999	0.227	0.226	0.016		B
G3		-999	0.294	0.302	0.021		B
G4		-999	0.454	0.463	0.028		B
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	-999	0.249	0.245	0.008		B
G2		-999	0.366	0.36	0.012		B
G3		-999	0.496	0.492	0.017		B
G4		-999	0.738	0.73	0.027		B
G1	Na <sup>+</sup> mg/l	0.292	0.32	0.318	0.028	-0.934	S
G2		0.298	0.317	0.313	0.015	-0.985	S
G3		1.047	0.948	0.941	0.045	2.374	S
G4		1.105	1.05	1.039	0.041	1.618	S
G1	Mg <sup>2+</sup> mg/l	0.072	0.077	0.077	0.006	-0.762	S
G2		0.079	0.088	0.087	0.006	-1.276	S
G3		0.241	0.237	0.24	0.014	0.09	S
G4		0.252	0.279	0.277	0.014	-1.769	S
G1	Cl <sup>-</sup> mg/l	-999	0.328	0.324	0.027		B
G2		-999	0.367	0.367	0.035		B
G3		-999	1.35	1.333	0.064		B
G4		-999	1.43	1.399	0.078		B
G1	Ca <sup>2+</sup> mg/l	-999	0.109	0.106	0.012		B
G2		-999	0.14	0.136	0.013		B
G3		-999	0.294	0.308	0.018		B
G4		-999	0.37	0.359	0.024		B
G1	K <sup>+</sup> mg/l	0.176	0.289	0.28	0.022	-4.665	U
G2		0.198	0.255	0.247	0.016	-3.178	Q
G3		0.452	0.441	0.439	0.023	0.548	S
G4		0.401	0.577	0.573	0.031	-5.506	U
G1	pH pH units	-999	5.55	5.523	0.178		B
G2		-999	5.52	5.523	0.174		B
G3		-999	5.48	5.487	0.148		B
G4		-999	5.46	5.468	0.129		B
G1	Cond µS/cm	-999	6.73	6.767	1.348		B
G2		-999	8.4	8.392	1.375		B
G3		-999	16.02	16.092	1.087		B
G4		-999	19.5	19.352	1.052		B

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

U – Unsatisfactory: Your result deviates more than  $\pm 20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , more than  $\pm 25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and more than  $\pm 0.2$  pH-units for pH

B – Blank: You reported either no value or the detection limit

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<http://www.nilu.no/projects/ccc/intercomparison.html>

## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 193, Institute of Public Health of Vojvodina (Republic of Serbia)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.16	0.201	0.199	0.016	-2.448	U
G2		0.2	0.244	0.241	0.013	-3.167	Q
G3		0.44	0.567	0.613	0.195	-0.89	U
G4		0.47	0.688	0.708	0.242	-0.987	U
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	< 0.100	0.08	0.081	0.012		B
G2		0.22	0.227	0.226	0.016	-0.384	S
G3		0.32	0.294	0.302	0.021	0.888	S
G4		0.49	0.454	0.463	0.028	0.965	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.2	0.249	0.245	0.008	-5.66	Q
G2		0.32	0.366	0.36	0.012	-3.294	Q
G3		0.41	0.496	0.492	0.017	-4.685	Q
G4		0.65	0.738	0.73	0.027	-2.975	Q
G1	Na <sup>+</sup> mg/l	-999	0.32	0.318	0.028		B
G2		0.27	0.317	0.313	0.015	-2.885	S
G3		1.18	0.948	0.941	0.045	5.351	Q
G4		1.05	1.05	1.039	0.041	0.266	S
G1	Mg <sup>2+</sup> mg/l	-999	0.077	0.077	0.006		B
G2		-999	0.088	0.087	0.006		B
G3		0.23	0.237	0.24	0.014	-0.711	S
G4		0.25	0.279	0.277	0.014	-1.91	S
G1	Cl <sup>-</sup> mg/l	0.19	0.328	0.324	0.027	-4.929	U
G2		0.24	0.367	0.367	0.035	-3.645	U
G3		1.26	1.35	1.333	0.064	-1.139	S
G4		1.21	1.43	1.399	0.078	-2.432	Q
G1	Ca <sup>2+</sup> mg/l	0.16	0.109	0.106	0.012	4.543	U
G2		0.11	0.14	0.136	0.013	-1.99	Q
G3		0.23	0.294	0.308	0.018	-4.43	Q
G4		0.22	0.37	0.359	0.024	-5.791	U
G1	K <sup>+</sup> mg/l	0.17	0.289	0.28	0.022	-4.934	U
G2		0.22	0.255	0.247	0.016	-1.764	S
G3		0.45	0.441	0.439	0.023	0.462	S
G4		0.46	0.577	0.573	0.031	-3.618	Q
G1	pH pH units	-999	5.55	5.523	0.178		B
G2		-999	5.52	5.523	0.174		B
G3		-999	5.48	5.487	0.148		B
G4		-999	5.46	5.468	0.129		B
G1	Cond µS/cm	-999	6.73	6.767	1.348		B
G2		-999	8.4	8.392	1.375		B
G3		-999	16.02	16.092	1.087		B
G4		-999	19.5	19.352	1.052		B

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

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B – Blank: You reported either no value or the detection limit

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 200, FUB AG (Switzerland)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	0.199	0.201	0.199	0.016	-0.019	S
G2		0.244	0.244	0.241	0.013	0.254	S
G3		0.591	0.567	0.613	0.195	-0.115	S
G4		0.685	0.688	0.708	0.242	-0.097	S
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.078	0.08	0.081	0.012	-0.221	S
G2		0.223	0.227	0.226	0.016	-0.196	S
G3		0.296	0.294	0.302	0.021	-0.278	S
G4		0.452	0.454	0.463	0.028	-0.41	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.247	0.249	0.245	0.008	0.264	S
G2		0.365	0.366	0.36	0.012	0.41	S
G3		0.499	0.496	0.492	0.017	0.42	S
G4		0.742	0.738	0.73	0.027	0.454	S
G1	Na <sup>+</sup> mg/l	0.327	0.32	0.318	0.028	0.326	S
G2		0.317	0.317	0.313	0.015	0.305	S
G3		0.949	0.948	0.941	0.045	0.18	S
G4		1.062	1.05	1.039	0.041	0.561	S
G1	Mg <sup>2+</sup> mg/l	0.08	0.077	0.077	0.006	0.514	S
G2		0.085	0.088	0.087	0.006	-0.289	S
G3		0.239	0.237	0.24	0.014	-0.056	S
G4		0.287	0.279	0.277	0.014	0.702	S
G1	Cl <sup>-</sup> mg/l	0.297	0.328	0.324	0.027	-1.006	S
G2		0.343	0.367	0.367	0.035	-0.685	S
G3		1.34	1.35	1.333	0.064	0.11	S
G4		1.415	1.43	1.399	0.078	0.207	S
G1	Ca <sup>2+</sup> mg/l	0.115	0.109	0.106	0.012	0.722	S
G2		0.148	0.14	0.136	0.013	0.875	S
G3		0.322	0.294	0.308	0.018	0.822	S
G4		0.399	0.37	0.359	0.024	1.68	S
G1	K <sup>+</sup> mg/l	0.285	0.289	0.28	0.022	0.217	S
G2		0.251	0.255	0.247	0.016	0.228	S
G3		0.441	0.441	0.439	0.023	0.077	S
G4		0.581	0.577	0.573	0.031	0.256	S
G1	pH pH units	5.26	5.55	5.523	0.178	-1.482	U
G2		5.33	5.52	5.523	0.174	-1.111	Q
G3		5.22	5.48	5.487	0.148	-1.806	U
G4		5.22	5.46	5.468	0.129	-1.919	U
G1	Cond µS/cm	6.79	6.73	6.767	1.348	0.017	S
G2		8.34	8.4	8.392	1.375	-0.038	S
G3		16.08	16.02	16.092	1.087	-0.011	S
G4		19.05	19.5	19.352	1.052	-0.287	S

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Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

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## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 201, Public Health Institute "Timok" (Republic of Serbia)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	-999	0.201	0.199	0.016		B
G2		-999	0.244	0.241	0.013		B
G3		-999	0.567	0.613	0.195		B
G4		-999	0.688	0.708	0.242		B
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.075	0.08	0.081	0.012	-0.472	S
G2		0.215	0.227	0.226	0.016	-0.698	S
G3		0.283	0.294	0.302	0.021	-0.909	S
G4		0.444	0.454	0.463	0.028	-0.7	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.203	0.249	0.245	0.008	-5.282	Q
G2		0.335	0.366	0.36	0.012	-2.06	S
G3		0.499	0.496	0.492	0.017	0.42	S
G4		0.73	0.738	0.73	0.027	0.007	S
G1	Na <sup>+</sup> mg/l	-999	0.32	0.318	0.028		B
G2		-999	0.317	0.313	0.015		B
G3		-999	0.948	0.941	0.045		B
G4		-999	1.05	1.039	0.041		B
G1	Mg <sup>2+</sup> mg/l	-999	0.077	0.077	0.006		B
G2		-999	0.088	0.087	0.006		B
G3		-999	0.237	0.24	0.014		B
G4		-999	0.279	0.277	0.014		B
G1	Cl <sup>-</sup> mg/l	2.799	0.328	0.324	0.027	90.74	U
G2		5.599	0.367	0.367	0.035	150.344	U
G3		8.399	1.35	1.333	0.064	110.268	U
G4		11.199	1.43	1.399	0.078	126.148	U
G1	Ca <sup>2+</sup> mg/l	0.109	0.109	0.106	0.012	0.213	S
G2		0.148	0.14	0.136	0.013	0.875	S
G3		0.235	0.294	0.308	0.018	-4.144	Q
G4		0.277	0.37	0.359	0.024	-3.412	U
G1	K <sup>+</sup> mg/l	-999	0.289	0.28	0.022		B
G2		-999	0.255	0.247	0.016		B
G3		-999	0.441	0.439	0.023		B
G4		-999	0.577	0.573	0.031		B
G1	pH pH units	5.933	5.55	5.523	0.178	2.305	U
G2		5.785	5.52	5.523	0.174	1.505	U
G3		5.671	5.48	5.487	0.148	1.249	Q
G4		5.68	5.46	5.468	0.129	1.647	U
G1	Cond µS/cm	43	6.73	6.767	1.348	26.872	U
G2		22.3	8.4	8.392	1.375	10.112	U
G3		29.8	16.02	16.092	1.087	12.606	U
G4		36.7	19.5	19.352	1.052	16.498	U

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If your laboratory reported values as less than the detection limit, and your detection limit is lower than the expected value,  $\frac{1}{2}$  DL is taken as the reported value in further calculations.

\* Z score is unitless

✎ EMEP quality norm; letters indicate:

S – Satisfactory: Your result deviates less than  $\pm 10\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , less than  $\pm 15\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and less than  $\pm 0.1$  pH-units for pH

Q – Questionable: Your result deviates between  $\pm 10\text{-}20\%$  of the expected value for  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ , between  $\pm 15\text{-}25\%$  of the expected value for  $\text{NH}_4^+$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and cond and between  $\pm 0.1\text{-}0.2$  pH-units for pH

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B – Blank: You reported either no value or the detection limit

Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:  
<http://www.nilu.no/projects/ccc/intercomparison.html>

## EMEP – 39<sup>th</sup> intercomparison of analytical methods - 2021

Laboratory 203, The Public Health Institute Vranje(Republic of Serbia)

### Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm <sup>x</sup>
G1	SO <sub>4</sub> <sup>2-</sup> mg S/l	< 1.000	0.201	0.199	0.016		B
G2		< 1.000	0.244	0.241	0.013		B
G3		< 1.000	0.567	0.613	0.195		B
G4		< 1.000	0.688	0.708	0.242		B
G1	NH <sub>4</sub> <sup>+</sup> mg N/l	0.075	0.08	0.081	0.012	-0.472	S
G2		0.218	0.227	0.226	0.016	-0.51	S
G3		0.305	0.294	0.302	0.021	0.159	S
G4		0.465	0.454	0.463	0.028	0.06	S
G1	NO <sub>3</sub> <sup>-</sup> mg N/l	0.203	0.249	0.245	0.008	-5.282	Q
G2		0.33	0.366	0.36	0.012	-2.471	S
G3		0.45	0.496	0.492	0.017	-2.391	S
G4		0.69	0.738	0.73	0.027	-1.484	S
G1	Na <sup>+</sup> mg/l	0.27	0.32	0.318	0.028	-1.725	Q
G2		0.3	0.317	0.313	0.015	-0.849	S
G3		1.05	0.948	0.941	0.045	2.441	S
G4		1.11	1.05	1.039	0.041	1.741	S
G1	Mg <sup>2+</sup> mg/l	0.07	0.077	0.077	0.006	-1.081	S
G2		0.08	0.088	0.087	0.006	-1.112	S
G3		0.29	0.237	0.24	0.014	3.657	Q
G4		0.28	0.279	0.277	0.014	0.208	S
G1	Cl <sup>-</sup> mg/l	< 1.000	0.328	0.324	0.027		B
G2		< 1.000	0.367	0.367	0.035		B
G3		1.3	1.35	1.333	0.064	-0.514	S
G4		1.25	1.43	1.399	0.078	-1.917	S
G1	Ca <sup>2+</sup> mg/l	< 0.500	0.109	0.106	0.012		B
G2		< 0.500	0.14	0.136	0.013		B
G3		< 0.500	0.294	0.308	0.018		B
G4		< 0.500	0.37	0.359	0.024		B
G1	K <sup>+</sup> mg/l	0.18	0.289	0.28	0.022	-4.486	U
G2		0.17	0.255	0.247	0.016	-4.977	U
G3		0.48	0.441	0.439	0.023	1.746	S
G4		0.43	0.577	0.573	0.031	-4.578	U
G1	pH pH units	-999	5.55	5.523	0.178		B
G2		-999	5.52	5.523	0.174		B
G3		-999	5.48	5.487	0.148		B
G4		-999	5.46	5.468	0.129		B
G1	Cond µS/cm	-999	6.73	6.767	1.348		B
G2		-999	8.4	8.392	1.375		B
G3		-999	16.02	16.092	1.087		B
G4		-999	19.5	19.352	1.052		B

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