



EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.645	0.663	0.656	0.024	-0.482	S
G2		0.47	0.477	0.47	0.029	-0.008	S
G3		0.362	0.375	0.364	0.025	-0.072	S
G4		0.218	0.235	0.231	0.019	-0.688	S
G1	NH ₄ ⁺ mg N/l	0.27	0.241	0.238	0.029	1.111	S
G2		0.295	0.254	0.252	0.024	1.772	Q
G3		0.22	0.187	0.188	0.011	2.826	Q
G4		0.206	0.174	0.172	0.017	1.997	Q
G1	NO ₃ ⁻ mg N/l	0.459	0.462	0.455	0.012	0.338	S
G2		0.494	0.501	0.49	0.018	0.206	S
G3		0.337	0.346	0.34	0.016	-0.17	S
G4		0.334	0.343	0.334	0.015	-0.032	S
G1	Na ⁺ mg/l	0.775	0.644	0.629	0.039	3.78	Q
G2		0.732	0.751	0.736	0.044	-0.099	S
G3		0.435	0.456	0.445	0.032	-0.327	S
G4		0.555	0.574	0.561	0.032	-0.172	S
G1	Mg ²⁺ mg/l	0.311	0.32	0.323	0.019	-0.659	S
G2		0.184	0.196	0.197	0.016	-0.781	S
G3		0.147	0.155	0.154	0.014	-0.487	S
G4		0.09	0.093	0.093	0.009	-0.299	S
G1	Cl ⁻ mg/l	0.725	0.772	0.763	0.054	-0.694	S
G2		0.927	0.965	0.929	0.055	-0.033	S
G3		0.561	0.579	0.574	0.094	-0.141	S
G4		0.702	0.734	0.716	0.047	-0.293	S
G1	Ca ²⁺ mg/l	0.273	0.268	0.259	0.023	0.617	S
G2		0.223	0.243	0.23	0.028	-0.253	S
G3		0.178	0.192	0.177	0.022	0.066	S
G4		0.109	0.115	0.109	0.021	0.019	S
G1	K ⁺ mg/l	0.381	0.374	0.365	0.02	0.791	S
G2		0.462	0.475	0.459	0.028	0.094	S
G3		0.294	0.306	0.298	0.019	-0.216	S
G4		0.29	0.306	0.297	0.019	-0.38	S
G1	pH pH units	5.789	5.43	5.453	0.114	2.955	U
G2		5.45	5.45	5.475	0.102	-0.249	S
G3		5.511	5.51	5.486	0.092	0.274	S
G4		5.535	5.48	5.483	0.088	0.591	S
G1	Cond µS/cm	14.22	14.16	14.225	1.357	-0.004	S
G2		13.62	13.68	13.606	0.732	0.019	S
G3		9.97	9.76	9.901	0.639	0.108	S
G4		9.44	9.13	9.343	0.588	0.165	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 SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 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 – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.667	0.663	0.656	0.024	0.452	S
G2		0.467	0.477	0.47	0.029	-0.112	S
G3		0.367	0.375	0.364	0.025	0.125	S
G4		0.232	0.235	0.231	0.019	0.061	S
G1	NH ₄ ⁺ mg N/l	0.237	0.241	0.238	0.029	-0.019	S
G2		0.245	0.254	0.252	0.024	-0.301	S
G3		0.182	0.187	0.188	0.011	-0.498	S
G4		0.167	0.174	0.172	0.017	-0.319	S
G1	NO ₃ ⁻ mg N/l	0.468	0.462	0.455	0.012	1.061	S
G2		0.502	0.501	0.49	0.018	0.649	S
G3		0.351	0.346	0.34	0.016	0.68	S
G4		0.346	0.343	0.334	0.015	0.775	S
G1	Na ⁺ mg/l	0.645	0.644	0.629	0.039	0.413	S
G2		0.756	0.751	0.736	0.044	0.443	S
G3		0.457	0.456	0.445	0.032	0.371	S
G4		0.579	0.574	0.561	0.032	0.573	S
G1	Mg ²⁺ mg/l	0.289	0.32	0.323	0.019	-1.824	S
G2		0.183	0.196	0.197	0.016	-0.841	S
G3		0.139	0.155	0.154	0.014	-1.066	S
G4		0.085	0.093	0.093	0.009	-0.877	S
G1	Cl ⁻ mg/l	0.782	0.772	0.763	0.054	0.353	S
G2		0.958	0.965	0.929	0.055	0.532	S
G3		0.586	0.579	0.574	0.094	0.126	S
G4		0.732	0.734	0.716	0.047	0.351	S
G1	Ca ²⁺ mg/l	0.239	0.268	0.259	0.023	-0.852	S
G2		0.204	0.243	0.23	0.028	-0.943	Q
G3		0.161	0.192	0.177	0.022	-0.715	Q
G4		0.098	0.115	0.109	0.021	-0.514	S
G1	K ⁺ mg/l	0.322	0.374	0.365	0.02	-2.166	S
G2		0.411	0.475	0.459	0.028	-1.746	S
G3		0.259	0.306	0.298	0.019	-2.074	Q
G4		0.262	0.306	0.297	0.019	-1.867	S
G1	pH pH units	5.36	5.43	5.453	0.114	-0.82	S
G2		5.38	5.45	5.475	0.102	-0.934	S
G3		5.4	5.51	5.486	0.092	-0.936	Q
G4		5.42	5.48	5.483	0.088	-0.715	S
G1	Cond µS/cm	-999	14.16	14.225	1.357		B
G2		-999	13.68	13.606	0.732		B
G3		-999	9.76	9.901	0.639		B
G4		-999	9.13	9.343	0.588		B

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Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

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Laboratory 5, Finnish Meteorological Institute, Atmospheric Composition, Air Quality (Finland)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.656	0.663	0.656	0.024	-0.013	S
G2		0.473	0.477	0.47	0.029	0.109	S
G3		0.387	0.375	0.364	0.025	0.896	S
G4		0.242	0.235	0.231	0.019	0.59	S
G1	NH ₄ ⁺ mg N/l	0.242	0.241	0.238	0.029	0.145	S
G2		0.253	0.254	0.252	0.024	0.017	S
G3		0.183	0.187	0.188	0.011	-0.404	S
G4		0.171	0.174	0.172	0.017	-0.068	S
G1	NO ₃ ⁻ mg N/l	0.465	0.462	0.455	0.012	0.846	S
G2		0.499	0.501	0.49	0.018	0.495	S
G3		0.354	0.346	0.34	0.016	0.883	S
G4		0.343	0.343	0.334	0.015	0.581	S
G1	Na ⁺ mg/l	0.649	0.644	0.629	0.039	0.52	S
G2		0.758	0.751	0.736	0.044	0.477	S
G3		0.459	0.456	0.445	0.032	0.434	S
G4		0.581	0.574	0.561	0.032	0.62	S
G1	Mg ²⁺ mg/l	0.327	0.32	0.323	0.019	0.205	S
G2		0.196	0.196	0.197	0.016	-0.055	S
G3		0.156	0.155	0.154	0.014	0.154	S
G4		0.091	0.093	0.093	0.009	-0.209	S
G1	Cl ⁻ mg/l	0.757	0.772	0.763	0.054	-0.105	S
G2		0.947	0.965	0.929	0.055	0.33	S
G3		0.567	0.579	0.574	0.094	-0.075	S
G4		0.722	0.734	0.716	0.047	0.132	S
G1	Ca ²⁺ mg/l	0.264	0.268	0.259	0.023	0.209	S
G2		0.238	0.243	0.23	0.028	0.303	S
G3		0.187	0.192	0.177	0.022	0.463	S
G4		0.113	0.115	0.109	0.021	0.197	S
G1	K ⁺ mg/l	0.384	0.374	0.365	0.02	0.928	S
G2		0.491	0.475	0.459	0.028	1.157	S
G3		0.316	0.306	0.298	0.019	0.936	S
G4		0.317	0.306	0.297	0.019	1.029	S
G1	pH pH units	5.35	5.43	5.453	0.114	-0.908	S
G2		5.44	5.45	5.475	0.102	-0.347	S
G3		5.41	5.51	5.486	0.092	-0.827	S
G4		5.43	5.48	5.483	0.088	-0.601	S
G1	Cond µS/cm	14.57	14.16	14.225	1.357	0.254	S
G2		13.86	13.68	13.606	0.732	0.347	S
G3		9.97	9.76	9.901	0.639	0.108	S
G4		9.38	9.13	9.343	0.588	0.063	S

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.669	0.663	0.656	0.024	0.537	S
G2		0.48	0.477	0.47	0.029	0.338	S
G3		0.377	0.375	0.364	0.025	0.519	S
G4		0.238	0.235	0.231	0.019	0.381	S
G1	NH ₄ ⁺ mg N/l	0.259	0.241	0.238	0.029	0.734	S
G2		0.27	0.254	0.252	0.024	0.735	S
G3		0.178	0.187	0.188	0.011	-0.847	S
G4		0.164	0.174	0.172	0.017	-0.497	S
G1	NO ₃ ⁻ mg N/l	0.463	0.462	0.455	0.012	0.659	S
G2		0.5	0.501	0.49	0.018	0.538	S
G3		0.348	0.346	0.34	0.016	0.498	S
G4		0.343	0.343	0.334	0.015	0.573	S
G1	Na ⁺ mg/l	0.63	0.644	0.629	0.039	0.024	S
G2		0.735	0.751	0.736	0.044	-0.031	S
G3		0.448	0.456	0.445	0.032	0.085	S
G4		0.565	0.574	0.561	0.032	0.138	S
G1	Mg ²⁺ mg/l	0.314	0.32	0.323	0.019	-0.5	S
G2		0.187	0.196	0.197	0.016	-0.599	S
G3		0.147	0.155	0.154	0.014	-0.487	S
G4		0.086	0.093	0.093	0.009	-0.762	S
G1	Cl ⁻ mg/l	0.76	0.772	0.763	0.054	-0.051	S
G2		0.952	0.965	0.929	0.055	0.423	S
G3		0.571	0.579	0.574	0.094	-0.034	S
G4		0.726	0.734	0.716	0.047	0.222	S
G1	Ca ²⁺ mg/l	0.23	0.268	0.259	0.023	-1.24	S
G2		0.209	0.243	0.23	0.028	-0.761	S
G3		0.164	0.192	0.177	0.022	-0.577	S
G4		0.089	0.115	0.109	0.021	-0.949	Q
G1	K ⁺ mg/l	0.369	0.374	0.365	0.02	0.19	S
G2		0.468	0.475	0.459	0.028	0.31	S
G3		0.303	0.306	0.298	0.019	0.262	S
G4		0.301	0.306	0.297	0.019	0.204	S
G1	pH pH units	5.48	5.43	5.453	0.114	0.236	S
G2		5.55	5.45	5.475	0.102	0.73	S
G3		5.46	5.51	5.486	0.092	-0.282	S
G4		5.43	5.48	5.483	0.088	-0.601	S
G1	Cond µS/cm	13.05	14.16	14.225	1.357	-0.866	S
G2		12.72	13.68	13.606	0.732	-1.21	S
G3		9.85	9.76	9.901	0.639	-0.08	S
G4		9.37	9.13	9.343	0.588	0.046	S

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.663	0.663	0.656	0.024	0.282	S
G2		0.445	0.477	0.47	0.029	-0.872	S
G3		0.325	0.375	0.364	0.025	-1.528	Q
G4		0.235	0.235	0.231	0.019	0.221	S
G1	NH ₄ ⁺ mg N/l	0.238	0.241	0.238	0.029	0.015	S
G2		0.246	0.254	0.252	0.024	-0.26	S
G3		0.177	0.187	0.188	0.011	-0.935	S
G4		0.167	0.174	0.172	0.017	-0.319	S
G1	NO ₃ ⁻ mg N/l	0.463	0.462	0.455	0.012	0.659	S
G2		0.501	0.501	0.49	0.018	0.594	S
G3		0.334	0.346	0.34	0.016	-0.353	S
G4		0.329	0.343	0.334	0.015	-0.368	S
G1	Na ⁺ mg/l	0.609	0.644	0.629	0.039	-0.52	S
G2		0.712	0.751	0.736	0.044	-0.551	S
G3		0.429	0.456	0.445	0.032	-0.517	S
G4		0.544	0.574	0.561	0.032	-0.513	S
G1	Mg ²⁺ mg/l	0.312	0.32	0.323	0.019	-0.606	S
G2		0.195	0.196	0.197	0.016	-0.113	S
G3		0.158	0.155	0.154	0.014	0.309	S
G4		0.1	0.093	0.093	0.009	0.858	S
G1	Cl ⁻ mg/l	0.776	0.772	0.763	0.054	0.243	S
G2		0.96	0.965	0.929	0.055	0.568	S
G3		0.595	0.579	0.574	0.094	0.222	S
G4		0.745	0.734	0.716	0.047	0.629	S
G1	Ca ²⁺ mg/l	0.246	0.268	0.259	0.023	-0.549	S
G2		0.223	0.243	0.23	0.028	-0.253	S
G3		0.176	0.192	0.177	0.022	-0.026	S
G4		0.108	0.115	0.109	0.021	-0.029	S
G1	K ⁺ mg/l	0.365	0.374	0.365	0.02	-0.011	S
G2		0.462	0.475	0.459	0.028	0.094	S
G3		0.299	0.306	0.298	0.019	0.05	S
G4		0.299	0.306	0.297	0.019	0.098	S
G1	pH pH units	-999	5.43	5.453	0.114		B
G2		-999	5.45	5.475	0.102		B
G3		-999	5.51	5.486	0.092		B
G4		-999	5.48	5.483	0.088		B
G1	Cond µS/cm	-999	14.16	14.225	1.357		B
G2		-999	13.68	13.606	0.732		B
G3		-999	9.76	9.901	0.639		B
G4		-999	9.13	9.343	0.588		B

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

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EMEP – 40th intercomparison of analytical methods - 2022

Laboratory 8, Umweltbundesamt, Langen (Germany)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.64	0.663	0.656	0.024	-0.695	S
G2		0.472	0.477	0.47	0.029	0.061	S
G3		0.365	0.375	0.364	0.025	0.047	S
G4		0.226	0.235	0.231	0.019	-0.26	S
G1	NH ₄ ⁺ mg N/l	0.236	0.241	0.238	0.029	-0.053	S
G2		0.246	0.254	0.252	0.024	-0.26	S
G3		0.179	0.187	0.188	0.011	-0.76	S
G4		0.167	0.174	0.172	0.017	-0.319	S
G1	NO ₃ ⁻ mg N/l	0.442	0.462	0.455	0.012	-1.027	S
G2		0.477	0.501	0.49	0.018	-0.737	S
G3		0.343	0.346	0.34	0.016	0.194	S
G4		0.342	0.343	0.334	0.015	0.506	S
G1	Na ⁺ mg/l	0.638	0.644	0.629	0.039	0.231	S
G2		0.749	0.751	0.736	0.044	0.285	S
G3		0.451	0.456	0.445	0.032	0.181	S
G4		0.572	0.574	0.561	0.032	0.356	S
G1	Mg ²⁺ mg/l	0.318	0.32	0.323	0.019	-0.288	S
G2		0.185	0.196	0.197	0.016	-0.72	S
G3		0.144	0.155	0.154	0.014	-0.704	S
G4		0.084	0.093	0.093	0.009	-0.993	S
G1	Cl ⁻ mg/l	0.765	0.772	0.763	0.054	0.041	S
G2		0.964	0.965	0.929	0.055	0.641	S
G3		0.571	0.579	0.574	0.094	-0.034	S
G4		0.726	0.734	0.716	0.047	0.222	S
G1	Ca ²⁺ mg/l	0.255	0.268	0.259	0.023	-0.161	S
G2		0.226	0.243	0.23	0.028	-0.144	S
G3		0.177	0.192	0.177	0.022	0.02	S
G4		0.11	0.115	0.109	0.021	0.068	S
G1	K ⁺ mg/l	0.359	0.374	0.365	0.02	-0.312	S
G2		0.422	0.475	0.459	0.028	-1.349	S
G3		0.289	0.306	0.298	0.019	-0.481	S
G4		0.289	0.306	0.297	0.019	-0.433	S
G1	pH pH units	5.45	5.43	5.453	0.114	-0.028	S
G2		5.45	5.45	5.475	0.102	-0.249	S
G3		5.46	5.51	5.486	0.092	-0.282	S
G4		5.48	5.48	5.483	0.088	-0.034	S
G1	Cond µS/cm	14.2	14.16	14.225	1.357	-0.019	S
G2		13.9	13.68	13.606	0.732	0.402	S
G3		10	9.76	9.901	0.639	0.155	S
G4		9.3	9.13	9.343	0.588	-0.073	S

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.671	0.663	0.656	0.024	0.622	S
G2		0.489	0.477	0.47	0.029	0.649	S
G3		0.382	0.375	0.364	0.025	0.716	S
G4		0.248	0.235	0.231	0.019	0.916	S
G1	NH ₄ ⁺ mg N/l	0.23	0.241	0.238	0.029	-0.258	S
G2		0.232	0.254	0.252	0.024	-0.841	S
G3		0.168	0.187	0.188	0.011	-1.722	S
G4		0.159	0.174	0.172	0.017	-0.794	S
G1	NO ₃ ⁻ mg N/l	0.448	0.462	0.455	0.012	-0.545	S
G2		0.495	0.501	0.49	0.018	0.261	S
G3		0.343	0.346	0.34	0.016	0.194	S
G4		0.342	0.343	0.334	0.015	0.506	S
G1	Na ⁺ mg/l	0.65	0.644	0.629	0.039	0.542	S
G2		0.755	0.751	0.736	0.044	0.421	S
G3		0.476	0.456	0.445	0.032	0.974	S
G4		0.576	0.574	0.561	0.032	0.48	S
G1	Mg ²⁺ mg/l	0.31	0.32	0.323	0.019	-0.712	S
G2		0.181	0.196	0.197	0.016	-0.963	S
G3		0.145	0.155	0.154	0.014	-0.632	S
G4		0.08	0.093	0.093	0.009	-1.456	S
G1	Cl ⁻ mg/l	0.769	0.772	0.763	0.054	0.114	S
G2		0.995	0.965	0.929	0.055	1.206	S
G3		0.628	0.579	0.574	0.094	0.575	S
G4		0.733	0.734	0.716	0.047	0.372	S
G1	Ca ²⁺ mg/l	0.239	0.268	0.259	0.023	-0.852	S
G2		0.208	0.243	0.23	0.028	-0.798	S
G3		0.155	0.192	0.177	0.022	-0.991	Q
G4		0.081	0.115	0.109	0.021	-1.337	U
G1	K ⁺ mg/l	0.366	0.374	0.365	0.02	0.039	S
G2		0.467	0.475	0.459	0.028	0.274	S
G3		0.295	0.306	0.298	0.019	-0.162	S
G4		0.292	0.306	0.297	0.019	-0.274	S
G1	pH pH units	5.36	5.43	5.453	0.114	-0.82	S
G2		5.44	5.45	5.475	0.102	-0.347	S
G3		5.48	5.51	5.486	0.092	-0.064	S
G4		5.42	5.48	5.483	0.088	-0.715	S
G1	Cond µS/cm	14.69	14.16	14.225	1.357	0.342	S
G2		13.97	13.68	13.606	0.732	0.498	S
G3		10.32	9.76	9.901	0.639	0.655	S
G4		9.67	9.13	9.343	0.588	0.556	S

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.64	0.663	0.656	0.024	-0.695	S
G2		0.44	0.477	0.47	0.029	-1.045	S
G3		0.3	0.375	0.364	0.025	-2.512	U
G4		0.2	0.235	0.231	0.019	-1.65	Q
G1	NH ₄ ⁺ mg N/l	0.27	0.241	0.238	0.029	1.111	S
G2		0.28	0.254	0.252	0.024	1.15	S
G3		0.2	0.187	0.188	0.011	1.077	S
G4		0.19	0.174	0.172	0.017	1.047	S
G1	NO ₃ ⁻ mg N/l	0.47	0.462	0.455	0.012	1.221	S
G2		0.5	0.501	0.49	0.018	0.538	S
G3		0.35	0.346	0.34	0.016	0.619	S
G4		0.35	0.343	0.334	0.015	1.043	S
G1	Na ⁺ mg/l	0.61	0.644	0.629	0.039	-0.494	S
G2		0.7	0.751	0.736	0.044	-0.823	S
G3		0.43	0.456	0.445	0.032	-0.486	S
G4		0.55	0.574	0.561	0.032	-0.327	S
G1	Mg ²⁺ mg/l	0.3	0.32	0.323	0.019	-1.242	S
G2		0.2	0.196	0.197	0.016	0.191	S
G3		0.15	0.155	0.154	0.014	-0.27	S
G4		0.08	0.093	0.093	0.009	-1.456	S
G1	Cl ⁻ mg/l	0.74	0.772	0.763	0.054	-0.418	S
G2		0.92	0.965	0.929	0.055	-0.16	S
G3		0.56	0.579	0.574	0.094	-0.152	S
G4		0.71	0.734	0.716	0.047	-0.121	S
G1	Ca ²⁺ mg/l	0.23	0.268	0.259	0.023	-1.24	S
G2		0.21	0.243	0.23	0.028	-0.725	S
G3		0.16	0.192	0.177	0.022	-0.761	Q
G4		0.09	0.115	0.109	0.021	-0.901	Q
G1	K ⁺ mg/l	0.36	0.374	0.365	0.02	-0.261	S
G2		0.46	0.475	0.459	0.028	0.021	S
G3		0.29	0.306	0.298	0.019	-0.428	S
G4		0.29	0.306	0.297	0.019	-0.38	S
G1	pH pH units	5.06	5.43	5.453	0.114	-3.46	U
G2		5.15	5.45	5.475	0.102	-3.185	U
G3		5.23	5.51	5.486	0.092	-2.789	U
G4		5.15	5.48	5.483	0.088	-3.781	U
G1	Cond µS/cm	14.6	14.16	14.225	1.357	0.276	S
G2		14	13.68	13.606	0.732	0.539	S
G3		10.5	9.76	9.901	0.639	0.937	S
G4		10.2	9.13	9.343	0.588	1.458	S

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.632	0.663	0.656	0.024	-1.034	S
G2		0.46	0.477	0.47	0.029	-0.354	S
G3		0.356	0.375	0.364	0.025	-0.308	S
G4		0.224	0.235	0.231	0.019	-0.367	S
G1	NH ₄ ⁺ mg N/l	0.274	0.241	0.238	0.029	1.247	S
G2		0.283	0.254	0.252	0.024	1.274	S
G3		0.206	0.187	0.188	0.011	1.601	S
G4		0.197	0.174	0.172	0.017	1.462	S
G1	NO ₃ ⁻ mg N/l	0.46	0.462	0.455	0.012	0.418	S
G2		0.494	0.501	0.49	0.018	0.206	S
G3		0.348	0.346	0.34	0.016	0.498	S
G4		0.341	0.343	0.334	0.015	0.439	S
G1	Na ⁺ mg/l	0.65	0.644	0.629	0.039	0.542	S
G2		0.757	0.751	0.736	0.044	0.466	S
G3		0.455	0.456	0.445	0.032	0.308	S
G4		0.582	0.574	0.561	0.032	0.666	S
G1	Mg ²⁺ mg/l	0.321	0.32	0.323	0.019	-0.129	S
G2		0.189	0.196	0.197	0.016	-0.477	S
G3		0.142	0.155	0.154	0.014	-0.849	S
G4		0.084	0.093	0.093	0.009	-0.993	S
G1	Cl ⁻ mg/l	0.723	0.772	0.763	0.054	-0.731	S
G2		0.912	0.965	0.929	0.055	-0.306	S
G3		0.552	0.579	0.574	0.094	-0.237	S
G4		0.694	0.734	0.716	0.047	-0.465	S
G1	Ca ²⁺ mg/l	0.247	0.268	0.259	0.023	-0.506	S
G2		0.217	0.243	0.23	0.028	-0.471	S
G3		0.16	0.192	0.177	0.022	-0.761	Q
G4		0.097	0.115	0.109	0.021	-0.562	Q
G1	K ⁺ mg/l	0.37	0.374	0.365	0.02	0.24	S
G2		0.474	0.475	0.459	0.028	0.527	S
G3		0.301	0.306	0.298	0.019	0.156	S
G4		0.296	0.306	0.297	0.019	-0.062	S
G1	pH pH units	5.49	5.43	5.453	0.114	0.324	S
G2		5.51	5.45	5.475	0.102	0.338	S
G3		5.49	5.51	5.486	0.092	0.045	S
G4		5.51	5.48	5.483	0.088	0.307	S
G1	Cond µS/cm	13.7	14.16	14.225	1.357	-0.387	S
G2		14.1	13.68	13.606	0.732	0.675	S
G3		11.4	9.76	9.901	0.639	2.346	Q
G4		9.7	9.13	9.343	0.588	0.607	S

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Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , 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 SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 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 – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.661	0.663	0.656	0.024	0.197	S
G2		0.474	0.477	0.47	0.029	0.13	S
G3		0.375	0.375	0.364	0.025	0.44	S
G4		0.23	0.235	0.231	0.019	-0.046	S
G1	NH ₄ ⁺ mg N/l	0.24	0.241	0.238	0.029	0.084	S
G2		0.254	0.254	0.252	0.024	0.072	S
G3		0.181	0.187	0.188	0.011	-0.585	S
G4		0.177	0.174	0.172	0.017	0.275	S
G1	NO ₃ ⁻ mg N/l	0.459	0.462	0.455	0.012	0.338	S
G2		0.496	0.501	0.49	0.018	0.317	S
G3		0.346	0.346	0.34	0.016	0.376	S
G4		0.343	0.343	0.334	0.015	0.573	S
G1	Na ⁺ mg/l	0.662	0.644	0.629	0.039	0.853	S
G2		0.771	0.751	0.736	0.044	0.782	S
G3		0.452	0.456	0.445	0.032	0.212	S
G4		0.575	0.574	0.561	0.032	0.449	S
G1	Mg ²⁺ mg/l	0.311	0.32	0.323	0.019	-0.659	S
G2		0.189	0.196	0.197	0.016	-0.477	S
G3		0.148	0.155	0.154	0.014	-0.414	S
G4		0.09	0.093	0.093	0.009	-0.299	S
G1	Cl ⁻ mg/l	0.756	0.772	0.763	0.054	-0.125	S
G2		0.948	0.965	0.929	0.055	0.35	S
G3		0.573	0.579	0.574	0.094	-0.013	S
G4		0.727	0.734	0.716	0.047	0.243	S
G1	Ca ²⁺ mg/l	0.265	0.268	0.259	0.023	0.271	S
G2		0.241	0.243	0.23	0.028	0.4	S
G3		0.191	0.192	0.177	0.022	0.663	S
G4		0.114	0.115	0.109	0.021	0.261	S
G1	K ⁺ mg/l	0.374	0.374	0.365	0.02	0.44	S
G2		0.456	0.475	0.459	0.028	-0.123	S
G3		0.3	0.306	0.298	0.019	0.103	S
G4		0.298	0.306	0.297	0.019	0.045	S
G1	pH pH units	5.32	5.43	5.453	0.114	-1.172	Q
G2		5.31	5.45	5.475	0.102	-1.619	Q
G3		5.42	5.51	5.486	0.092	-0.718	S
G4		5.42	5.48	5.483	0.088	-0.715	S
G1	Cond µS/cm	14.49	14.16	14.225	1.357	0.195	S
G2		14.16	13.68	13.606	0.732	0.757	S
G3		9.94	9.76	9.901	0.639	0.061	S
G4		9.25	9.13	9.343	0.588	-0.158	S

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

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.64	0.663	0.656	0.024	-0.695	S
G2		0.45	0.477	0.47	0.029	-0.699	S
G3		0.35	0.375	0.364	0.025	-0.544	S
G4		0.21	0.235	0.231	0.019	-1.116	Q
G1	NH ₄ ⁺ mg N/l	0.23	0.241	0.238	0.029	-0.258	S
G2		0.23	0.254	0.252	0.024	-0.924	S
G3		0.17	0.187	0.188	0.011	-1.547	S
G4		0.16	0.174	0.172	0.017	-0.734	S
G1	NO ₃ ⁻ mg N/l	0.45	0.462	0.455	0.012	-0.384	S
G2		0.49	0.501	0.49	0.018	-0.016	S
G3		0.34	0.346	0.34	0.016	0.012	S
G4		0.33	0.343	0.334	0.015	-0.301	S
G1	Na ⁺ mg/l	0.638	0.644	0.629	0.039	0.231	S
G2		0.73	0.751	0.736	0.044	-0.144	S
G3		0.448	0.456	0.445	0.032	0.085	S
G4		0.565	0.574	0.561	0.032	0.138	S
G1	Mg ²⁺ mg/l	0.333	0.32	0.323	0.019	0.506	S
G2		0.202	0.196	0.197	0.016	0.312	S
G3		0.167	0.155	0.154	0.014	0.961	S
G4		0.099	0.093	0.093	0.009	0.742	S
G1	Cl ⁻ mg/l	0.69	0.772	0.763	0.054	-1.337	S
G2		0.89	0.965	0.929	0.055	-0.706	S
G3		0.54	0.579	0.574	0.094	-0.365	S
G4		0.68	0.734	0.716	0.047	-0.765	S
G1	Ca ²⁺ mg/l	0.263	0.268	0.259	0.023	0.185	S
G2		0.238	0.243	0.23	0.028	0.291	S
G3		0.186	0.192	0.177	0.022	0.434	S
G4		0.111	0.115	0.109	0.021	0.116	S
G1	K ⁺ mg/l	0.359	0.374	0.365	0.02	-0.312	S
G2		0.447	0.475	0.459	0.028	-0.448	S
G3		0.288	0.306	0.298	0.019	-0.534	S
G4		0.287	0.306	0.297	0.019	-0.54	S
G1	pH pH units	5.544	5.43	5.453	0.114	0.799	Q
G2		5.625	5.45	5.475	0.102	1.464	Q
G3		5.594	5.51	5.486	0.092	1.178	S
G4		5.575	5.48	5.483	0.088	1.045	S
G1	Cond µS/cm	13.88	14.16	14.225	1.357	-0.254	S
G2		13.54	13.68	13.606	0.732	-0.09	S
G3		11.33	9.76	9.901	0.639	2.236	Q
G4		10.39	9.13	9.343	0.588	1.782	S

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.655	0.663	0.656	0.024	-0.058	S
G2		0.471	0.477	0.47	0.029	0.027	S
G3		0.374	0.375	0.364	0.025	0.401	S
G4		0.234	0.235	0.231	0.019	0.168	S
G1	NH ₄ ⁺ mg N/l	0.244	0.241	0.238	0.029	0.221	S
G2		0.259	0.254	0.252	0.024	0.279	S
G3		0.19	0.187	0.188	0.011	0.202	S
G4		0.177	0.174	0.172	0.017	0.275	S
G1	NO ₃ ⁻ mg N/l	0.455	0.462	0.455	0.012	0.017	S
G2		0.491	0.501	0.49	0.018	0.039	S
G3		0.342	0.346	0.34	0.016	0.133	S
G4		0.339	0.343	0.334	0.015	0.304	S
G1	Na ⁺ mg/l	0.605	0.644	0.629	0.039	-0.624	S
G2		0.704	0.751	0.736	0.044	-0.732	S
G3		0.434	0.456	0.445	0.032	-0.359	S
G4		0.534	0.574	0.561	0.032	-0.823	S
G1	Mg ²⁺ mg/l	0.315	0.32	0.323	0.019	-0.447	S
G2		0.19	0.196	0.197	0.016	-0.416	S
G3		0.154	0.155	0.154	0.014	0.02	S
G4		0.091	0.093	0.093	0.009	-0.183	S
G1	Cl ⁻ mg/l	0.777	0.772	0.763	0.054	0.261	S
G2		0.963	0.965	0.929	0.055	0.623	S
G3		0.575	0.579	0.574	0.094	0.009	S
G4		0.738	0.734	0.716	0.047	0.479	S
G1	Ca ²⁺ mg/l	0.254	0.268	0.259	0.023	-0.204	S
G2		0.231	0.243	0.23	0.028	0.037	S
G3		0.184	0.192	0.177	0.022	0.342	S
G4		0.109	0.115	0.109	0.021	0.019	S
G1	K ⁺ mg/l	0.368	0.374	0.365	0.02	0.139	S
G2		0.461	0.475	0.459	0.028	0.058	S
G3		0.302	0.306	0.298	0.019	0.209	S
G4		0.296	0.306	0.297	0.019	-0.062	S
G1	pH pH units	5.41	5.43	5.453	0.114	-0.38	S
G2		5.44	5.45	5.475	0.102	-0.347	S
G3		5.45	5.51	5.486	0.092	-0.391	S
G4		5.47	5.48	5.483	0.088	-0.147	S
G1	Cond µS/cm	14.9	14.16	14.225	1.357	0.497	S
G2		14.4	13.68	13.606	0.732	1.085	S
G3		10.6	9.76	9.901	0.639	1.094	S
G4		9.9	9.13	9.343	0.588	0.948	S

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

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.668	0.663	0.656	0.024	0.495	S
G2		0.476	0.477	0.47	0.029	0.2	S
G3		0.375	0.375	0.364	0.025	0.44	S
G4		0.23	0.235	0.231	0.019	-0.046	S
G1	NH ₄ ⁺ mg N/l	0.246	0.241	0.238	0.029	0.289	S
G2		0.256	0.254	0.252	0.024	0.155	S
G3		0.185	0.187	0.188	0.011	-0.235	S
G4		0.171	0.174	0.172	0.017	-0.081	S
G1	NO ₃ ⁻ mg N/l	0.466	0.462	0.455	0.012	0.9	S
G2		0.501	0.501	0.49	0.018	0.594	S
G3		0.349	0.346	0.34	0.016	0.558	S
G4		0.345	0.343	0.334	0.015	0.707	S
G1	Na ⁺ mg/l	0.63	0.644	0.629	0.039	0.024	S
G2		0.745	0.751	0.736	0.044	0.195	S
G3		0.451	0.456	0.445	0.032	0.181	S
G4		0.57	0.574	0.561	0.032	0.294	S
G1	Mg ²⁺ mg/l	0.332	0.32	0.323	0.019	0.453	S
G2		0.201	0.196	0.197	0.016	0.251	S
G3		0.158	0.155	0.154	0.014	0.309	S
G4		0.096	0.093	0.093	0.009	0.395	S
G1	Cl ⁻ mg/l	0.764	0.772	0.763	0.054	0.022	S
G2		0.957	0.965	0.929	0.055	0.514	S
G3		0.573	0.579	0.574	0.094	-0.013	S
G4		0.728	0.734	0.716	0.047	0.265	S
G1	Ca ²⁺ mg/l	0.259	0.268	0.259	0.023	0.012	S
G2		0.23	0.243	0.23	0.028	0.001	S
G3		0.176	0.192	0.177	0.022	-0.026	S
G4		0.101	0.115	0.109	0.021	-0.368	S
G1	K ⁺ mg/l	0.385	0.374	0.365	0.02	0.991	S
G2		0.489	0.475	0.459	0.028	1.068	S
G3		0.316	0.306	0.298	0.019	0.953	S
G4		0.315	0.306	0.297	0.019	0.947	S
G1	pH pH units	5.42	5.43	5.453	0.114	-0.292	S
G2		5.45	5.45	5.475	0.102	-0.249	S
G3		5.47	5.51	5.486	0.092	-0.173	S
G4		5.47	5.48	5.483	0.088	-0.147	S
G1	Cond µS/cm	14.27	14.16	14.225	1.357	0.033	S
G2		13.65	13.68	13.606	0.732	0.06	S
G3		9.99	9.76	9.901	0.639	0.139	S
G4		9.3	9.13	9.343	0.588	-0.073	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 SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 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 – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.542	0.663	0.656	0.024	-4.857	Q
G2		0.107	0.477	0.47	0.029	-12.556	U
G3		0.05	0.375	0.364	0.025	-12.355	U
G4		0.026	0.235	0.231	0.019	-10.953	U
G1	NH ₄ ⁺ mg N/l	0.165	0.241	0.238	0.029	-2.483	U
G2		0.239	0.254	0.252	0.024	-0.55	S
G3		0.18	0.187	0.188	0.011	-0.673	S
G4		0.158	0.174	0.172	0.017	-0.853	S
G1	NO ₃ ⁻ mg N/l	0.498	0.462	0.455	0.012	3.469	S
G2		0.32	0.501	0.49	0.018	-9.446	U
G3		0.328	0.346	0.34	0.016	-0.717	S
G4		0.323	0.343	0.334	0.015	-0.771	S
G1	Na ⁺ mg/l	0.561	0.644	0.629	0.039	-1.763	S
G2		0.674	0.751	0.736	0.044	-1.41	S
G3		0.406	0.456	0.445	0.032	-1.247	S
G4		0.508	0.574	0.561	0.032	-1.63	S
G1	Mg ²⁺ mg/l	0.74	0.32	0.323	0.019	22.065	U
G2		0.465	0.196	0.197	0.016	16.281	U
G3		0.394	0.155	0.154	0.014	17.392	U
G4		0.256	0.093	0.093	0.009	18.908	U
G1	Cl ⁻ mg/l	0.85	0.772	0.763	0.054	1.601	S
G2		0.829	0.965	0.929	0.055	-1.817	S
G3		0.528	0.579	0.574	0.094	-0.493	S
G4		0.658	0.734	0.716	0.047	-1.237	S
G1	Ca ²⁺ mg/l	0.33	0.268	0.259	0.023	3.079	Q
G2		0.362	0.243	0.23	0.028	4.793	U
G3		0.287	0.192	0.177	0.022	5.073	U
G4		0.199	0.115	0.109	0.021	4.378	U
G1	K ⁺ mg/l	0.35	0.374	0.365	0.02	-0.763	S
G2		0.438	0.475	0.459	0.028	-0.772	S
G3		0.277	0.306	0.298	0.019	-1.118	S
G4		0.284	0.306	0.297	0.019	-0.699	S
G1	pH pH units	5.39	5.43	5.453	0.114	-0.556	S
G2		5.45	5.45	5.475	0.102	-0.249	S
G3		5.51	5.51	5.486	0.092	0.263	S
G4		5.47	5.48	5.483	0.088	-0.147	S
G1	Cond µS/cm	15.7	14.16	14.225	1.357	1.087	S
G2		14.6	13.68	13.606	0.732	1.358	S
G3		11.1	9.76	9.901	0.639	1.876	S
G4		10.7	9.13	9.343	0.588	2.309	Q

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Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , 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 SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.608	0.663	0.656	0.024	-2.054	S
G2		0.423	0.477	0.47	0.029	-1.633	Q
G3		0.332	0.375	0.364	0.025	-1.253	Q
G4		0.2	0.235	0.231	0.019	-1.65	Q
G1	NH ₄ ⁺ mg N/l	0.212	0.241	0.238	0.029	-0.874	S
G2		0.238	0.254	0.252	0.024	-0.592	S
G3		0.173	0.187	0.188	0.011	-1.285	S
G4		0.158	0.174	0.172	0.017	-0.853	S
G1	NO ₃ ⁻ mg N/l	0.482	0.462	0.455	0.012	2.185	S
G2		0.518	0.501	0.49	0.018	1.537	S
G3		0.36	0.346	0.34	0.016	1.226	S
G4		0.356	0.343	0.334	0.015	1.447	S
G1	Na ⁺ mg/l	0.597	0.644	0.629	0.039	-0.831	S
G2		0.673	0.751	0.736	0.044	-1.433	S
G3		0.416	0.456	0.445	0.032	-0.93	S
G4		0.532	0.574	0.561	0.032	-0.885	S
G1	Mg ²⁺ mg/l	0.167	0.32	0.323	0.019	-8.287	U
G2		0.163	0.196	0.197	0.016	-2.056	Q
G3		0.12	0.155	0.154	0.014	-2.441	Q
G4		0.083	0.093	0.093	0.009	-1.074	S
G1	Cl ⁻ mg/l	0.727	0.772	0.763	0.054	-0.657	S
G2		0.893	0.965	0.929	0.055	-0.652	S
G3		0.542	0.579	0.574	0.094	-0.344	S
G4		0.684	0.734	0.716	0.047	-0.679	S
G1	Ca ²⁺ mg/l	0.195	0.268	0.259	0.023	-2.752	U
G2		0.158	0.243	0.23	0.028	-2.613	U
G3		0.121	0.192	0.177	0.022	-2.553	U
G4		0.073	0.115	0.109	0.021	-1.71	U
G1	K ⁺ mg/l	0.332	0.374	0.365	0.02	-1.664	S
G2		0.402	0.475	0.459	0.028	-2.071	Q
G3		0.244	0.306	0.298	0.019	-2.87	Q
G4		0.262	0.306	0.297	0.019	-1.867	S
G1	pH pH units	4.99	5.43	5.453	0.114	-4.076	U
G2		5.02	5.45	5.475	0.102	-4.458	U
G3		5.11	5.51	5.486	0.092	-4.096	U
G4		5.1	5.48	5.483	0.088	-4.349	U
G1	Cond µS/cm	12.8	14.16	14.225	1.357	-1.05	S
G2		12.2	13.68	13.606	0.732	-1.92	S
G3		8.96	9.76	9.901	0.639	-1.473	S
G4		8.43	9.13	9.343	0.588	-1.554	S

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EMEP – 40th intercomparison of analytical methods - 2022

Laboratory 24, Serbian Environmental Protection Agency (Republic of Serbia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.685	0.663	0.656	0.024	1.217	S
G2		0.481	0.477	0.47	0.029	0.372	S
G3		0.378	0.375	0.364	0.025	0.558	S
G4		0.236	0.235	0.231	0.019	0.274	S
G1	NH ₄ ⁺ mg N/l	-999	0.241	0.238	0.029		B
G2		-999	0.254	0.252	0.024		B
G3		-999	0.187	0.188	0.011		B
G4		-999	0.174	0.172	0.017		B
G1	NO ₃ ⁻ mg N/l	0.478	0.462	0.455	0.012	1.863	S
G2		0.51	0.501	0.49	0.018	1.093	S
G3		0.354	0.346	0.34	0.016	0.862	S
G4		0.35	0.343	0.334	0.015	1.043	S
G1	Na ⁺ mg/l	-999	0.644	0.629	0.039		B
G2		-999	0.751	0.736	0.044		B
G3		-999	0.456	0.445	0.032		B
G4		-999	0.574	0.561	0.032		B
G1	Mg ²⁺ mg/l	-999	0.32	0.323	0.019		B
G2		-999	0.196	0.197	0.016		B
G3		-999	0.155	0.154	0.014		B
G4		-999	0.093	0.093	0.009		B
G1	Cl ⁻ mg/l	0.815	0.772	0.763	0.054	0.959	S
G2		0.985	0.965	0.929	0.055	1.023	S
G3		0.578	0.579	0.574	0.094	0.041	S
G4		0.745	0.734	0.716	0.047	0.629	S
G1	Ca ²⁺ mg/l	-999	0.268	0.259	0.023		B
G2		-999	0.243	0.23	0.028		B
G3		-999	0.192	0.177	0.022		B
G4		-999	0.115	0.109	0.021		B
G1	K ⁺ mg/l	-999	0.374	0.365	0.02		B
G2		-999	0.475	0.459	0.028		B
G3		-999	0.306	0.298	0.019		B
G4		-999	0.306	0.297	0.019		B
G1	pH pH units	-999	5.43	5.453	0.114		B
G2		-999	5.45	5.475	0.102		B
G3		-999	5.51	5.486	0.092		B
G4		-999	5.48	5.483	0.088		B
G1	Cond µS/cm	14.95	14.16	14.225	1.357	0.534	S
G2		14	13.68	13.606	0.732	0.539	S
G3		9.9	9.76	9.901	0.639	-0.002	S
G4		9.4	9.13	9.343	0.588	0.097	S

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.658	0.663	0.656	0.024	0.07	S
G2		0.474	0.477	0.47	0.029	0.13	S
G3		0.367	0.375	0.364	0.025	0.125	S
G4		0.234	0.235	0.231	0.019	0.168	S
G1	NH ₄ ⁺ mg N/l	0.23	0.241	0.238	0.029	-0.258	S
G2		0.253	0.254	0.252	0.024	0.03	S
G3		0.189	0.187	0.188	0.011	0.115	S
G4		0.175	0.174	0.172	0.017	0.156	S
G1	NO ₃ ⁻ mg N/l	0.457	0.462	0.455	0.012	0.178	S
G2		0.492	0.501	0.49	0.018	0.095	S
G3		0.345	0.346	0.34	0.016	0.315	S
G4		0.345	0.343	0.334	0.015	0.707	S
G1	Na ⁺ mg/l	-999	0.644	0.629	0.039		B
G2		-999	0.751	0.736	0.044		B
G3		-999	0.456	0.445	0.032		B
G4		-999	0.574	0.561	0.032		B
G1	Mg ²⁺ mg/l	-999	0.32	0.323	0.019		B
G2		-999	0.196	0.197	0.016		B
G3		-999	0.155	0.154	0.014		B
G4		-999	0.093	0.093	0.009		B
G1	Cl ⁻ mg/l	0.774	0.772	0.763	0.054	0.206	S
G2		0.96	0.965	0.929	0.055	0.568	S
G3		0.591	0.579	0.574	0.094	0.18	S
G4		0.748	0.734	0.716	0.047	0.694	S
G1	Ca ²⁺ mg/l	-999	0.268	0.259	0.023		B
G2		-999	0.243	0.23	0.028		B
G3		-999	0.192	0.177	0.022		B
G4		-999	0.115	0.109	0.021		B
G1	K ⁺ mg/l	-999	0.374	0.365	0.02		B
G2		-999	0.475	0.459	0.028		B
G3		-999	0.306	0.298	0.019		B
G4		-999	0.306	0.297	0.019		B
G1	pH pH units	5.65	5.43	5.453	0.114	1.732	U
G2		5.71	5.45	5.475	0.102	2.296	U
G3		5.69	5.51	5.486	0.092	2.224	Q
G4		5.67	5.48	5.483	0.088	2.124	Q
G1	Cond µS/cm	-999	14.16	14.225	1.357		B
G2		-999	13.68	13.606	0.732		B
G3		-999	9.76	9.901	0.639		B
G4		-999	9.13	9.343	0.588		B

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U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.68	0.663	0.656	0.024	1.004	S
G2		0.494	0.477	0.47	0.029	0.822	S
G3		0.386	0.375	0.364	0.025	0.873	S
G4		0.237	0.235	0.231	0.019	0.328	S
G1	NH ₄ ⁺ mg N/l	0.243	0.241	0.238	0.029	0.187	S
G2		0.248	0.254	0.252	0.024	-0.177	S
G3		0.181	0.187	0.188	0.011	-0.585	S
G4		0.167	0.174	0.172	0.017	-0.319	S
G1	NO ₃ ⁻ mg N/l	0.466	0.462	0.455	0.012	0.9	S
G2		0.498	0.501	0.49	0.018	0.428	S
G3		0.354	0.346	0.34	0.016	0.862	S
G4		0.349	0.343	0.334	0.015	0.976	S
G1	Na ⁺ mg/l	0.618	0.644	0.629	0.039	-0.287	S
G2		0.701	0.751	0.736	0.044	-0.8	S
G3		0.432	0.456	0.445	0.032	-0.422	S
G4		0.542	0.574	0.561	0.032	-0.575	S
G1	Mg ²⁺ mg/l	0.322	0.32	0.323	0.019	-0.076	S
G2		0.195	0.196	0.197	0.016	-0.113	S
G3		0.155	0.155	0.154	0.014	0.092	S
G4		0.094	0.093	0.093	0.009	0.164	S
G1	Cl ⁻ mg/l	0.784	0.772	0.763	0.054	0.389	S
G2		0.963	0.965	0.929	0.055	0.623	S
G3		0.597	0.579	0.574	0.094	0.244	S
G4		0.751	0.734	0.716	0.047	0.758	S
G1	Ca ²⁺ mg/l	0.259	0.268	0.259	0.023	0.012	S
G2		0.233	0.243	0.23	0.028	0.11	S
G3		0.185	0.192	0.177	0.022	0.388	S
G4		0.112	0.115	0.109	0.021	0.164	S
G1	K ⁺ mg/l	0.368	0.374	0.365	0.02	0.139	S
G2		0.459	0.475	0.459	0.028	-0.015	S
G3		0.301	0.306	0.298	0.019	0.156	S
G4		0.299	0.306	0.297	0.019	0.098	S
G1	pH pH units	5.42	5.43	5.453	0.114	-0.292	S
G2		5.44	5.45	5.475	0.102	-0.347	S
G3		5.46	5.51	5.486	0.092	-0.282	S
G4		5.45	5.48	5.483	0.088	-0.374	S
G1	Cond µS/cm	14.2	14.16	14.225	1.357	-0.019	S
G2		13.7	13.68	13.606	0.732	0.129	S
G3		10.2	9.76	9.901	0.639	0.468	S
G4		9.4	9.13	9.343	0.588	0.097	S

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Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 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 – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.642	0.663	0.656	0.024	-0.61	S
G2		0.443	0.477	0.47	0.029	-0.941	S
G3		0.338	0.375	0.364	0.025	-1.016	S
G4		0.198	0.235	0.231	0.019	-1.757	Q
G1	NH ₄ ⁺ mg N/l	0.267	0.241	0.238	0.029	1.008	S
G2		0.279	0.254	0.252	0.024	1.109	S
G3		0.204	0.187	0.188	0.011	1.426	S
G4		0.192	0.174	0.172	0.017	1.166	S
G1	NO ₃ ⁻ mg N/l	0.45	0.462	0.455	0.012	-0.384	S
G2		0.484	0.501	0.49	0.018	-0.349	S
G3		0.329	0.346	0.34	0.016	-0.656	S
G4		0.326	0.343	0.334	0.015	-0.569	S
G1	Na ⁺ mg/l	0.63	0.644	0.629	0.039	0.024	S
G2		0.733	0.751	0.736	0.044	-0.077	S
G3		0.445	0.456	0.445	0.032	-0.01	S
G4		0.565	0.574	0.561	0.032	0.138	S
G1	Mg ²⁺ mg/l	0.371	0.32	0.323	0.019	2.519	Q
G2		0.219	0.196	0.197	0.016	1.344	S
G3		0.168	0.155	0.154	0.014	1.033	S
G4		0.1	0.093	0.093	0.009	0.858	S
G1	Cl ⁻ mg/l	0.775	0.772	0.763	0.054	0.224	S
G2		0.98	0.965	0.929	0.055	0.932	S
G3		0.559	0.579	0.574	0.094	-0.162	S
G4		0.729	0.734	0.716	0.047	0.286	S
G1	Ca ²⁺ mg/l	0.418	0.268	0.259	0.023	6.88	U
G2		0.373	0.243	0.23	0.028	5.193	U
G3		0.284	0.192	0.177	0.022	4.936	U
G4		0.184	0.115	0.109	0.021	3.652	U
G1	K ⁺ mg/l	0.468	0.374	0.365	0.02	5.151	U
G2		0.578	0.475	0.459	0.028	4.279	Q
G3		0.377	0.306	0.298	0.019	4.191	Q
G4		0.382	0.306	0.297	0.019	4.505	Q
G1	pH pH units	5.58	5.43	5.453	0.114	1.116	Q
G2		5.53	5.45	5.475	0.102	0.534	S
G3		5.54	5.51	5.486	0.092	0.59	S
G4		5.54	5.48	5.483	0.088	0.648	S
G1	Cond µS/cm	14	14.16	14.225	1.357	-0.166	S
G2		13.4	13.68	13.606	0.732	-0.281	S
G3		9.77	9.76	9.901	0.639	-0.205	S
G4		9.11	9.13	9.343	0.588	-0.397	S

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.605	0.663	0.656	0.024	-2.181	S
G2		0.433	0.477	0.47	0.029	-1.287	S
G3		0.341	0.375	0.364	0.025	-0.898	S
G4		0.217	0.235	0.231	0.019	-0.741	S
G1	NH ₄ ⁺ mg N/l	0.257	0.241	0.238	0.029	0.666	S
G2		0.27	0.254	0.252	0.024	0.735	S
G3		0.199	0.187	0.188	0.011	0.989	S
G4		0.203	0.174	0.172	0.017	1.819	Q
G1	NO ₃ ⁻ mg N/l	0.455	0.462	0.455	0.012	0.017	S
G2		0.489	0.501	0.49	0.018	-0.072	S
G3		0.339	0.346	0.34	0.016	-0.049	S
G4		0.335	0.343	0.334	0.015	0.035	S
G1	Na ⁺ mg/l	0.618	0.644	0.629	0.039	-0.287	S
G2		0.718	0.751	0.736	0.044	-0.416	S
G3		0.434	0.456	0.445	0.032	-0.359	S
G4		0.549	0.574	0.561	0.032	-0.358	S
G1	Mg ²⁺ mg/l	0.314	0.32	0.323	0.019	-0.5	S
G2		0.186	0.196	0.197	0.016	-0.659	S
G3		0.146	0.155	0.154	0.014	-0.559	S
G4		0.088	0.093	0.093	0.009	-0.53	S
G1	Cl ⁻ mg/l	0.735	0.772	0.763	0.054	-0.51	S
G2		0.917	0.965	0.929	0.055	-0.215	S
G3		0.546	0.579	0.574	0.094	-0.301	S
G4		0.699	0.734	0.716	0.047	-0.357	S
G1	Ca ²⁺ mg/l	0.26	0.268	0.259	0.023	0.055	S
G2		0.233	0.243	0.23	0.028	0.11	S
G3		0.18	0.192	0.177	0.022	0.158	S
G4		0.113	0.115	0.109	0.021	0.213	S
G1	K ⁺ mg/l	0.371	0.374	0.365	0.02	0.29	S
G2		0.455	0.475	0.459	0.028	-0.159	S
G3		0.291	0.306	0.298	0.019	-0.375	S
G4		0.295	0.306	0.297	0.019	-0.115	S
G1	pH pH units	5.6	5.43	5.453	0.114	1.292	Q
G2		5.56	5.45	5.475	0.102	0.828	Q
G3		5.6	5.51	5.486	0.092	1.244	S
G4		5.56	5.48	5.483	0.088	0.875	S
G1	Cond µS/cm	15	14.16	14.225	1.357	0.571	S
G2		14.35	13.68	13.606	0.732	1.017	S
G3		10.8	9.76	9.901	0.639	1.407	S
G4		9.92	9.13	9.343	0.588	0.982	S

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.667	0.663	0.656	0.024	0.452	S
G2		0.476	0.477	0.47	0.029	0.2	S
G3		0.363	0.375	0.364	0.025	-0.032	S
G4		0.207	0.235	0.231	0.019	-1.276	Q
G1	NH ₄ ⁺ mg N/l	0.248	0.241	0.238	0.029	0.358	S
G2		0.254	0.254	0.252	0.024	0.072	S
G3		0.184	0.187	0.188	0.011	-0.323	S
G4		0.171	0.174	0.172	0.017	-0.081	S
G1	NO ₃ ⁻ mg N/l	0.454	0.462	0.455	0.012	-0.063	S
G2		0.492	0.501	0.49	0.018	0.095	S
G3		0.327	0.346	0.34	0.016	-0.778	S
G4		0.318	0.343	0.334	0.015	-1.107	S
G1	Na ⁺ mg/l	0.57	0.644	0.629	0.039	-1.53	S
G2		0.676	0.751	0.736	0.044	-1.365	S
G3		0.502	0.456	0.445	0.032	1.799	S
G4		0.665	0.574	0.561	0.032	3.24	Q
G1	Mg ²⁺ mg/l	-999	0.32	0.323	0.019		B
G2		-999	0.196	0.197	0.016		B
G3		-999	0.155	0.154	0.014		B
G4		-999	0.093	0.093	0.009		B
G1	Cl ⁻ mg/l	0.755	0.772	0.763	0.054	-0.143	S
G2		0.95	0.965	0.929	0.055	0.386	S
G3		0.522	0.579	0.574	0.094	-0.558	S
G4		0.669	0.734	0.716	0.047	-1.001	S
G1	Ca ²⁺ mg/l	-999	0.268	0.259	0.023		B
G2		-999	0.243	0.23	0.028		B
G3		-999	0.192	0.177	0.022		B
G4		-999	0.115	0.109	0.021		B
G1	K ⁺ mg/l	0.35	0.374	0.365	0.02	-0.763	S
G2		0.48	0.475	0.459	0.028	0.743	S
G3		0.306	0.306	0.298	0.019	0.422	S
G4		0.315	0.306	0.297	0.019	0.947	S
G1	pH pH units	5.43	5.43	5.453	0.114	-0.204	S
G2		5.43	5.45	5.475	0.102	-0.445	S
G3		5.45	5.51	5.486	0.092	-0.391	S
G4		5.48	5.48	5.483	0.088	-0.034	S
G1	Cond µS/cm	14.1	14.16	14.225	1.357	-0.092	S
G2		13.7	13.68	13.606	0.732	0.129	S
G3		9.8	9.76	9.901	0.639	-0.158	S
G4		10.7	9.13	9.343	0.588	2.309	Q

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.657	0.663	0.656	0.024	0.027	S
G2		0.46	0.477	0.47	0.029	-0.354	S
G3		0.355	0.375	0.364	0.025	-0.347	S
G4		0.23	0.235	0.231	0.019	-0.046	S
G1	NH ₄ ⁺ mg N/l	0.249	0.241	0.238	0.029	0.392	S
G2		0.266	0.254	0.252	0.024	0.569	S
G3		0.193	0.187	0.188	0.011	0.464	S
G4		0.173	0.174	0.172	0.017	0.038	S
G1	NO ₃ ⁻ mg N/l	0.446	0.462	0.455	0.012	-0.706	S
G2		0.485	0.501	0.49	0.018	-0.294	S
G3		0.334	0.346	0.34	0.016	-0.353	S
G4		0.337	0.343	0.334	0.015	0.17	S
G1	Na ⁺ mg/l	0.591	0.644	0.629	0.039	-0.986	S
G2		0.711	0.751	0.736	0.044	-0.574	S
G3		0.42	0.456	0.445	0.032	-0.803	S
G4		0.544	0.574	0.561	0.032	-0.513	S
G1	Mg ²⁺ mg/l	0.325	0.32	0.323	0.019	0.082	S
G2		0.199	0.196	0.197	0.016	0.13	S
G3		0.165	0.155	0.154	0.014	0.816	S
G4		0.104	0.093	0.093	0.009	1.321	S
G1	Cl ⁻ mg/l	0.69	0.772	0.763	0.054	-1.337	S
G2		0.87	0.965	0.929	0.055	-1.071	S
G3		0.515	0.579	0.574	0.094	-0.632	S
G4		0.67	0.734	0.716	0.047	-0.979	S
G1	Ca ²⁺ mg/l	0.264	0.268	0.259	0.023	0.228	S
G2		0.228	0.243	0.23	0.028	-0.072	S
G3		0.159	0.192	0.177	0.022	-0.807	Q
G4		0.104	0.115	0.109	0.021	-0.223	S
G1	K ⁺ mg/l	0.364	0.374	0.365	0.02	-0.061	S
G2		0.461	0.475	0.459	0.028	0.058	S
G3		0.3	0.306	0.298	0.019	0.103	S
G4		0.299	0.306	0.297	0.019	0.098	S
G1	pH pH units	5.6	5.43	5.453	0.114	1.292	Q
G2		5.5	5.45	5.475	0.102	0.24	S
G3		5.5	5.51	5.486	0.092	0.154	S
G4		5.5	5.48	5.483	0.088	0.194	S
G1	Cond µS/cm	14	14.16	14.225	1.357	-0.166	S
G2		14.4	13.68	13.606	0.732	1.085	S
G3		10.4	9.76	9.901	0.639	0.781	S
G4		9.74	9.13	9.343	0.588	0.675	S

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Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

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

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.642	0.663	0.656	0.024	-0.61	S
G2		0.509	0.477	0.47	0.029	1.34	S
G3		0.421	0.375	0.364	0.025	2.251	Q
G4		0.312	0.235	0.231	0.019	4.338	U
G1	NH ₄ ⁺ mg N/l	0.13	0.241	0.238	0.029	-3.681	U
G2		0.16	0.254	0.252	0.024	-3.827	U
G3		0.11	0.187	0.188	0.011	-6.794	U
G4		0.03	0.174	0.172	0.017	-8.452	U
G1	NO ₃ ⁻ mg N/l	0.437	0.462	0.455	0.012	-1.428	S
G2		0.474	0.501	0.49	0.018	-0.904	S
G3		0.335	0.346	0.34	0.016	-0.292	S
G4		0.332	0.343	0.334	0.015	-0.166	S
G1	Na ⁺ mg/l	0.674	0.644	0.629	0.039	1.164	S
G2		0.934	0.751	0.736	0.044	4.467	Q
G3		0.47	0.456	0.445	0.032	0.783	S
G4		0.609	0.574	0.561	0.032	1.503	S
G1	Mg ²⁺ mg/l	0.385	0.32	0.323	0.019	3.261	Q
G2		0.26	0.196	0.197	0.016	3.834	U
G3		0.186	0.155	0.154	0.014	2.336	Q
G4		0.11	0.093	0.093	0.009	2.015	Q
G1	Cl ⁻ mg/l	4.291	0.772	0.763	0.054	64.785	U
G2		1.581	0.965	0.929	0.055	11.876	U
G3		1.205	0.579	0.574	0.094	6.739	U
G4		1.28	0.734	0.716	0.047	12.106	U
G1	Ca ²⁺ mg/l	0.249	0.268	0.259	0.023	-0.42	S
G2		0.268	0.243	0.23	0.028	1.381	S
G3		0.176	0.192	0.177	0.022	-0.026	S
G4		0.104	0.115	0.109	0.021	-0.223	S
G1	K ⁺ mg/l	0.376	0.374	0.365	0.02	0.54	S
G2		0.53	0.475	0.459	0.028	2.547	S
G3		0.345	0.306	0.298	0.019	2.492	S
G4		0.345	0.306	0.297	0.019	2.541	S
G1	pH pH units	5.441	5.43	5.453	0.114	-0.107	S
G2		5.906	5.45	5.475	0.102	4.214	U
G3		5.566	5.51	5.486	0.092	0.873	S
G4		5.806	5.48	5.483	0.088	3.669	U
G1	Cond µS/cm	139.1	14.16	14.225	1.357	92.003	U
G2		78	13.68	13.606	0.732	87.949	U
G3		167.2	9.76	9.901	0.639	246.189	U
G4		59.8	9.13	9.343	0.588	85.864	U

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.674	0.663	0.656	0.024	0.749	S
G2		0.48	0.477	0.47	0.029	0.338	S
G3		0.382	0.375	0.364	0.025	0.716	S
G4		0.241	0.235	0.231	0.019	0.542	S
G1	NH ₄ ⁺ mg N/l	0.244	0.241	0.238	0.029	0.221	S
G2		0.252	0.254	0.252	0.024	-0.011	S
G3		0.187	0.187	0.188	0.011	-0.06	S
G4		0.171	0.174	0.172	0.017	-0.081	S
G1	NO ₃ ⁻ mg N/l	0.482	0.462	0.455	0.012	2.185	S
G2		0.517	0.501	0.49	0.018	1.481	S
G3		0.362	0.346	0.34	0.016	1.348	S
G4		0.357	0.343	0.334	0.015	1.514	S
G1	Na ⁺ mg/l	0.654	0.644	0.629	0.039	0.646	S
G2		0.76	0.751	0.736	0.044	0.534	S
G3		0.464	0.456	0.445	0.032	0.593	S
G4		0.586	0.574	0.561	0.032	0.79	S
G1	Mg ²⁺ mg/l	0.333	0.32	0.323	0.019	0.506	S
G2		0.201	0.196	0.197	0.016	0.251	S
G3		0.159	0.155	0.154	0.014	0.382	S
G4		0.096	0.093	0.093	0.009	0.395	S
G1	Cl ⁻ mg/l	0.781	0.772	0.763	0.054	0.334	S
G2		0.986	0.965	0.929	0.055	1.042	S
G3		0.587	0.579	0.574	0.094	0.137	S
G4		0.745	0.734	0.716	0.047	0.629	S
G1	Ca ²⁺ mg/l	0.268	0.268	0.259	0.023	0.401	S
G2		0.246	0.243	0.23	0.028	0.582	S
G3		0.192	0.192	0.177	0.022	0.709	S
G4		0.115	0.115	0.109	0.021	0.31	S
G1	K ⁺ mg/l	0.38	0.374	0.365	0.02	0.741	S
G2		0.482	0.475	0.459	0.028	0.815	S
G3		0.31	0.306	0.298	0.019	0.634	S
G4		0.308	0.306	0.297	0.019	0.576	S
G1	pH pH units	5.83	5.43	5.453	0.114	3.315	U
G2		5.85	5.45	5.475	0.102	3.666	U
G3		6	5.51	5.486	0.092	5.603	U
G4		5.87	5.48	5.483	0.088	4.395	U
G1	Cond µS/cm	14.2	14.16	14.225	1.357	-0.019	S
G2		13.6	13.68	13.606	0.732	-0.008	S
G3		9.8	9.76	9.901	0.639	-0.158	S
G4		9.4	9.13	9.343	0.588	0.097	S

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.665	0.663	0.656	0.024	0.367	S
G2		0.472	0.477	0.47	0.029	0.061	S
G3		0.371	0.375	0.364	0.025	0.283	S
G4		0.231	0.235	0.231	0.019	0.007	S
G1	NH ₄ ⁺ mg N/l	0.2	0.241	0.238	0.029	-1.285	Q
G2		0.25	0.254	0.252	0.024	-0.094	S
G3		0.191	0.187	0.188	0.011	0.289	S
G4		0.174	0.174	0.172	0.017	0.097	S
G1	NO ₃ ⁻ mg N/l	0.45	0.462	0.455	0.012	-0.384	S
G2		0.485	0.501	0.49	0.018	-0.294	S
G3		0.338	0.346	0.34	0.016	-0.11	S
G4		0.334	0.343	0.334	0.015	-0.032	S
G1	Na ⁺ mg/l	0.643	0.644	0.629	0.039	0.361	S
G2		0.744	0.751	0.736	0.044	0.172	S
G3		0.462	0.456	0.445	0.032	0.53	S
G4		0.574	0.574	0.561	0.032	0.418	S
G1	Mg ²⁺ mg/l	0.323	0.32	0.323	0.019	-0.023	S
G2		0.198	0.196	0.197	0.016	0.069	S
G3		0.16	0.155	0.154	0.014	0.454	S
G4		0.098	0.093	0.093	0.009	0.627	S
G1	Cl ⁻ mg/l	0.751	0.772	0.763	0.054	-0.216	S
G2		0.944	0.965	0.929	0.055	0.277	S
G3		0.563	0.579	0.574	0.094	-0.12	S
G4		0.717	0.734	0.716	0.047	0.029	S
G1	Ca ²⁺ mg/l	0.27	0.268	0.259	0.023	0.487	S
G2		0.239	0.243	0.23	0.028	0.328	S
G3		0.194	0.192	0.177	0.022	0.801	S
G4		0.117	0.115	0.109	0.021	0.407	S
G1	K ⁺ mg/l	0.367	0.374	0.365	0.02	0.089	S
G2		0.446	0.475	0.459	0.028	-0.484	S
G3		0.298	0.306	0.298	0.019	-0.003	S
G4		0.284	0.306	0.297	0.019	-0.699	S
G1	pH pH units	5.33	5.43	5.453	0.114	-1.084	S
G2		5.64	5.45	5.475	0.102	1.611	Q
G3		5.58	5.51	5.486	0.092	1.026	S
G4		5.53	5.48	5.483	0.088	0.534	S
G1	Cond µS/cm	14.7	14.16	14.225	1.357	0.35	S
G2		13.7	13.68	13.606	0.732	0.129	S
G3		9.96	9.76	9.901	0.639	0.092	S
G4		9.22	9.13	9.343	0.588	-0.209	S

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.667	0.663	0.656	0.024	0.452	S
G2		0.474	0.477	0.47	0.029	0.13	S
G3		0.374	0.375	0.364	0.025	0.401	S
G4		0.236	0.235	0.231	0.019	0.274	S
G1	NH ₄ ⁺ mg N/l	0.256	0.241	0.238	0.029	0.631	S
G2		0.267	0.254	0.252	0.024	0.611	S
G3		0.196	0.187	0.188	0.011	0.727	S
G4		0.165	0.174	0.172	0.017	-0.437	S
G1	NO ₃ ⁻ mg N/l	0.461	0.462	0.455	0.012	0.499	S
G2		0.494	0.501	0.49	0.018	0.206	S
G3		0.34	0.346	0.34	0.016	0.012	S
G4		0.337	0.343	0.334	0.015	0.17	S
G1	Na ⁺ mg/l	0.583	0.644	0.629	0.039	-1.193	S
G2		0.688	0.751	0.736	0.044	-1.094	S
G3		0.404	0.456	0.445	0.032	-1.31	S
G4		0.519	0.574	0.561	0.032	-1.288	S
G1	Mg ²⁺ mg/l	0.317	0.32	0.323	0.019	-0.341	S
G2		0.205	0.196	0.197	0.016	0.494	S
G3		0.162	0.155	0.154	0.014	0.599	S
G4		0.104	0.093	0.093	0.009	1.321	S
G1	Cl ⁻ mg/l	0.765	0.772	0.763	0.054	0.041	S
G2		0.948	0.965	0.929	0.055	0.35	S
G3		0.576	0.579	0.574	0.094	0.019	S
G4		0.72	0.734	0.716	0.047	0.093	S
G1	Ca ²⁺ mg/l	0.267	0.268	0.259	0.023	0.358	S
G2		0.231	0.243	0.23	0.028	0.037	S
G3		0.186	0.192	0.177	0.022	0.434	S
G4		0.12	0.115	0.109	0.021	0.552	S
G1	K ⁺ mg/l	0.368	0.374	0.365	0.02	0.139	S
G2		0.473	0.475	0.459	0.028	0.49	S
G3		0.295	0.306	0.298	0.019	-0.162	S
G4		0.298	0.306	0.297	0.019	0.045	S
G1	pH pH units	5.45	5.43	5.453	0.114	-0.028	S
G2		5.475	5.45	5.475	0.102	-0.004	S
G3		5.515	5.51	5.486	0.092	0.317	S
G4		5.425	5.48	5.483	0.088	-0.658	S
G1	Cond µS/cm	13.98	14.16	14.225	1.357	-0.181	S
G2		13.71	13.68	13.606	0.732	0.142	S
G3		10.18	9.76	9.901	0.639	0.436	S
G4		9.77	9.13	9.343	0.588	0.726	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 SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

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

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.704	0.663	0.656	0.024	2.024	S
G2		0.499	0.477	0.47	0.029	0.995	S
G3		0.39	0.375	0.364	0.025	1.031	S
G4		0.226	0.235	0.231	0.019	-0.26	S
G1	NH ₄ ⁺ mg N/l	0.253	0.241	0.238	0.029	0.529	S
G2		0.248	0.254	0.252	0.024	-0.177	S
G3		0.192	0.187	0.188	0.011	0.377	S
G4		0.16	0.174	0.172	0.017	-0.734	S
G1	NO ₃ ⁻ mg N/l	0.472	0.462	0.455	0.012	1.382	S
G2		0.509	0.501	0.49	0.018	1.038	S
G3		0.354	0.346	0.34	0.016	0.862	S
G4		0.34	0.343	0.334	0.015	0.371	S
G1	Na ⁺ mg/l	0.637	0.644	0.629	0.039	0.205	S
G2		0.742	0.751	0.736	0.044	0.127	S
G3		0.456	0.456	0.445	0.032	0.339	S
G4		0.57	0.574	0.561	0.032	0.294	S
G1	Mg ²⁺ mg/l	0.332	0.32	0.323	0.019	0.453	S
G2		0.2	0.196	0.197	0.016	0.191	S
G3		0.159	0.155	0.154	0.014	0.382	S
G4		0.096	0.093	0.093	0.009	0.395	S
G1	Cl ⁻ mg/l	0.746	0.772	0.763	0.054	-0.308	S
G2		0.939	0.965	0.929	0.055	0.186	S
G3		0.581	0.579	0.574	0.094	0.073	S
G4		0.68	0.734	0.716	0.047	-0.765	S
G1	Ca ²⁺ mg/l	0.266	0.268	0.259	0.023	0.315	S
G2		0.242	0.243	0.23	0.028	0.437	S
G3		0.191	0.192	0.177	0.022	0.663	S
G4		0.121	0.115	0.109	0.021	0.6	S
G1	K ⁺ mg/l	0.375	0.374	0.365	0.02	0.49	S
G2		0.468	0.475	0.459	0.028	0.31	S
G3		0.307	0.306	0.298	0.019	0.475	S
G4		0.31	0.306	0.297	0.019	0.682	S
G1	pH pH units	5.35	5.43	5.453	0.114	-0.908	S
G2		5.28	5.45	5.475	0.102	-1.913	Q
G3		5.39	5.51	5.486	0.092	-1.045	Q
G4		5.48	5.48	5.483	0.088	-0.034	S
G1	Cond µS/cm	15.01	14.16	14.225	1.357	0.578	S
G2		13.569	13.68	13.606	0.732	-0.05	S
G3		10.079	9.76	9.901	0.639	0.278	S
G4		9.394	9.13	9.343	0.588	0.087	S

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Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 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 – 40th intercomparison of analytical methods - 2022

Laboratory 40, Hydrometeorological Service of the Republic of North Macedonia (North Macedonia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	-999	0.663	0.656	0.024		B
G2		-999	0.477	0.47	0.029		B
G3		-999	0.375	0.364	0.025		B
G4		-999	0.235	0.231	0.019		B
G1	NH ₄ ⁺ mg N/l	0.174	0.241	0.238	0.029	-2.175	U
G2		0.172	0.254	0.252	0.024	-3.329	U
G3		0.102	0.187	0.188	0.011	-7.494	U
G4		0.105	0.174	0.172	0.017	-3.999	U
G1	NO ₃ ⁻ mg N/l	0.437	0.462	0.455	0.012	-1.428	S
G2		0.513	0.501	0.49	0.018	1.26	S
G3		0.403	0.346	0.34	0.016	3.838	Q
G4		0.356	0.343	0.334	0.015	1.447	S
G1	Na ⁺ mg/l	-999	0.644	0.629	0.039		B
G2		-999	0.751	0.736	0.044		B
G3		-999	0.456	0.445	0.032		B
G4		-999	0.574	0.561	0.032		B
G1	Mg ²⁺ mg/l	-999	0.32	0.323	0.019		B
G2		-999	0.196	0.197	0.016		B
G3		-999	0.155	0.154	0.014		B
G4		-999	0.093	0.093	0.009		B
G1	Cl ⁻ mg/l	0.793	0.772	0.763	0.054	0.555	S
G2		1.075	0.965	0.929	0.055	2.662	S
G3		0.647	0.579	0.574	0.094	0.778	S
G4		0.867	0.734	0.716	0.047	3.247	Q
G1	Ca ²⁺ mg/l	-999	0.268	0.259	0.023		B
G2		-999	0.243	0.23	0.028		B
G3		-999	0.192	0.177	0.022		B
G4		-999	0.115	0.109	0.021		B
G1	K ⁺ mg/l	-999	0.374	0.365	0.02		B
G2		-999	0.475	0.459	0.028		B
G3		-999	0.306	0.298	0.019		B
G4		-999	0.306	0.297	0.019		B
G1	pH pH units	5.22	5.43	5.453	0.114	-2.052	U
G2		5.34	5.45	5.475	0.102	-1.326	Q
G3		5.44	5.51	5.486	0.092	-0.5	S
G4		5.33	5.48	5.483	0.088	-1.737	Q
G1	Cond µS/cm	13	14.16	14.225	1.357	-0.903	S
G2		12.6	13.68	13.606	0.732	-1.374	S
G3		9	9.76	9.901	0.639	-1.411	S
G4		9	9.13	9.343	0.588	-0.584	S

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EMEP – 40th intercomparison of analytical methods - 2022

Laboratory 43, Air, Water and Soil Analyses Laboratory, LEPL National Environmental Agency (Georgia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.71	0.663	0.656	0.024	2.278	S
G2		0.56	0.477	0.47	0.029	3.103	Q
G3		0.29	0.375	0.364	0.025	-2.906	U
G4		0.39	0.235	0.231	0.019	8.508	U
G1	NH ₄ ⁺ mg N/l	-999	0.241	0.238	0.029		B
G2		-999	0.254	0.252	0.024		B
G3		-999	0.187	0.188	0.011		B
G4		-999	0.174	0.172	0.017		B
G1	NO ₃ ⁻ mg N/l	0.43	0.462	0.455	0.012	-1.99	S
G2		0.86	0.501	0.49	0.018	20.508	U
G3		0.51	0.346	0.34	0.016	10.335	U
G4		0.53	0.343	0.334	0.015	13.139	U
G1	Na ⁺ mg/l	-999	0.644	0.629	0.039		B
G2		-999	0.751	0.736	0.044		B
G3		-999	0.456	0.445	0.032		B
G4		-999	0.574	0.561	0.032		B
G1	Mg ²⁺ mg/l	-999	0.32	0.323	0.019		B
G2		-999	0.196	0.197	0.016		B
G3		-999	0.155	0.154	0.014		B
G4		-999	0.093	0.093	0.009		B
G1	Cl ⁻ mg/l	1.02	0.772	0.763	0.054	4.723	U
G2		0.67	0.965	0.929	0.055	-4.713	U
G3		0.45	0.579	0.574	0.094	-1.327	Q
G4		0.91	0.734	0.716	0.047	4.169	Q
G1	Ca ²⁺ mg/l	-999	0.268	0.259	0.023		B
G2		-999	0.243	0.23	0.028		B
G3		-999	0.192	0.177	0.022		B
G4		-999	0.115	0.109	0.021		B
G1	K ⁺ mg/l	-999	0.374	0.365	0.02		B
G2		-999	0.475	0.459	0.028		B
G3		-999	0.306	0.298	0.019		B
G4		-999	0.306	0.297	0.019		B
G1	pH pH units	-999	5.43	5.453	0.114		B
G2		-999	5.45	5.475	0.102		B
G3		-999	5.51	5.486	0.092		B
G4		-999	5.48	5.483	0.088		B
G1	Cond µS/cm	-999	14.16	14.225	1.357		B
G2		-999	13.68	13.606	0.732		B
G3		-999	9.76	9.901	0.639		B
G4		-999	9.13	9.343	0.588		B

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EMEP – 40th intercomparison of analytical methods - 2022

Laboratory 45, Environmental Impact Monitoring Center, Yerevan (Armenia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.667	0.663	0.656	0.024	0.439	S
G2		0.478	0.477	0.47	0.029	0.279	S
G3		0.366	0.375	0.364	0.025	0.086	S
G4		0.237	0.235	0.231	0.019	0.328	S
G1	NH ₄ ⁺ mg N/l	0.566	0.241	0.238	0.029	11.241	U
G2		0.485	0.254	0.252	0.024	9.652	U
G3		0.255	0.187	0.188	0.011	5.886	U
G4		0.188	0.174	0.172	0.017	0.928	S
G1	NO ₃ ⁻ mg N/l	0.46	0.462	0.455	0.012	0.386	S
G2		0.491	0.501	0.49	0.018	0.061	S
G3		0.337	0.346	0.34	0.016	-0.195	S
G4		0.336	0.343	0.334	0.015	0.069	S
G1	Na ⁺ mg/l	0.723	0.644	0.629	0.039	2.422	S
G2		0.805	0.751	0.736	0.044	1.549	S
G3		0.511	0.456	0.445	0.032	2.091	S
G4		0.613	0.574	0.561	0.032	1.64	S
G1	Mg ²⁺ mg/l	0.354	0.32	0.323	0.019	1.64	S
G2		0.214	0.196	0.197	0.016	1.047	S
G3		0.174	0.155	0.154	0.014	1.467	S
G4		0.104	0.093	0.093	0.009	1.344	S
G1	Cl ⁻ mg/l	0.783	0.772	0.763	0.054	0.375	S
G2		0.976	0.965	0.929	0.055	0.86	S
G3		0.576	0.579	0.574	0.094	0.023	S
G4		0.742	0.734	0.716	0.047	0.572	S
G1	Ca ²⁺ mg/l	0.283	0.268	0.259	0.023	1.036	S
G2		0.252	0.243	0.23	0.028	0.814	S
G3		0.203	0.192	0.177	0.022	1.219	S
G4		0.123	0.115	0.109	0.021	0.692	S
G1	K ⁺ mg/l	0.4	0.374	0.365	0.02	1.758	S
G2		0.502	0.475	0.459	0.028	1.544	S
G3		0.326	0.306	0.298	0.019	1.499	S
G4		0.315	0.306	0.297	0.019	0.958	S
G1	pH pH units	5.157	5.43	5.453	0.114	-2.606	U
G2		5.148	5.45	5.475	0.102	-3.205	U
G3		5.1	5.51	5.486	0.092	-4.205	U
G4		5.093	5.48	5.483	0.088	-4.428	U
G1	Cond µS/cm	14	14.16	14.225	1.357	-0.166	S
G2		13.6	13.68	13.606	0.732	-0.008	S
G3		10	9.76	9.901	0.639	0.155	S
G4		9.5	9.13	9.343	0.588	0.267	S

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Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , 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 SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	-999	0.663	0.656	0.024		B
G2		-999	0.477	0.47	0.029		B
G3		-999	0.375	0.364	0.025		B
G4		-999	0.235	0.231	0.019		B
G1	NH ₄ ⁺ mg N/l	-999	0.241	0.238	0.029		B
G2		-999	0.254	0.252	0.024		B
G3		-999	0.187	0.188	0.011		B
G4		-999	0.174	0.172	0.017		B
G1	NO ₃ ⁻ mg N/l	-999	0.462	0.455	0.012		B
G2		-999	0.501	0.49	0.018		B
G3		-999	0.346	0.34	0.016		B
G4		-999	0.343	0.334	0.015		B
G1	Na ⁺ mg/l	-999	0.644	0.629	0.039		B
G2		-999	0.751	0.736	0.044		B
G3		-999	0.456	0.445	0.032		B
G4		-999	0.574	0.561	0.032		B
G1	Mg ²⁺ mg/l	-999	0.32	0.323	0.019		B
G2		-999	0.196	0.197	0.016		B
G3		-999	0.155	0.154	0.014		B
G4		-999	0.093	0.093	0.009		B
G1	Cl ⁻ mg/l	-999	0.772	0.763	0.054		B
G2		-999	0.965	0.929	0.055		B
G3		-999	0.579	0.574	0.094		B
G4		-999	0.734	0.716	0.047		B
G1	Ca ²⁺ mg/l	-999	0.268	0.259	0.023		B
G2		-999	0.243	0.23	0.028		B
G3		-999	0.192	0.177	0.022		B
G4		-999	0.115	0.109	0.021		B
G1	K ⁺ mg/l	-999	0.374	0.365	0.02		B
G2		-999	0.475	0.459	0.028		B
G3		-999	0.306	0.298	0.019		B
G4		-999	0.306	0.297	0.019		B
G1	pH pH units	5.39	5.43	5.453	0.114	-0.556	S
G2		5.41	5.45	5.475	0.102	-0.64	S
G3		5.43	5.51	5.486	0.092	-0.609	S
G4		5.36	5.48	5.483	0.088	-1.396	Q
G1	Cond µS/cm	14.22	14.16	14.225	1.357	-0.004	S
G2		13.49	13.68	13.606	0.732	-0.158	S
G3		9.73	9.76	9.901	0.639	-0.268	S
G4		9.24	9.13	9.343	0.588	-0.175	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 SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , 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 SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 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 – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.647	0.663	0.656	0.024	-0.397	S
G2		0.452	0.477	0.47	0.029	-0.63	S
G3		0.35	0.375	0.364	0.025	-0.544	S
G4		0.218	0.235	0.231	0.019	-0.688	S
G1	NH ₄ ⁺ mg N/l	0.26	0.241	0.238	0.029	0.768	S
G2		0.259	0.254	0.252	0.024	0.279	S
G3		0.198	0.187	0.188	0.011	0.902	S
G4		0.185	0.174	0.172	0.017	0.75	S
G1	NO ₃ ⁻ mg N/l	0.456	0.462	0.455	0.012	0.097	S
G2		0.484	0.501	0.49	0.018	-0.349	S
G3		0.33	0.346	0.34	0.016	-0.596	S
G4		0.326	0.343	0.334	0.015	-0.569	S
G1	Na ⁺ mg/l	0.647	0.644	0.629	0.039	0.464	S
G2		0.758	0.751	0.736	0.044	0.488	S
G3		0.457	0.456	0.445	0.032	0.371	S
G4		0.586	0.574	0.561	0.032	0.79	S
G1	Mg ²⁺ mg/l	0.337	0.32	0.323	0.019	0.718	S
G2		0.202	0.196	0.197	0.016	0.312	S
G3		0.16	0.155	0.154	0.014	0.454	S
G4		0.099	0.093	0.093	0.009	0.742	S
G1	Cl ⁻ mg/l	0.77	0.772	0.763	0.054	0.132	S
G2		0.942	0.965	0.929	0.055	0.24	S
G3		0.554	0.579	0.574	0.094	-0.216	S
G4		0.709	0.734	0.716	0.047	-0.143	S
G1	Ca ²⁺ mg/l	0.281	0.268	0.259	0.023	0.962	S
G2		0.25	0.243	0.23	0.028	0.727	S
G3		0.195	0.192	0.177	0.022	0.847	S
G4		0.123	0.115	0.109	0.021	0.697	S
G1	K ⁺ mg/l	0.36	0.374	0.365	0.02	-0.261	S
G2		0.457	0.475	0.459	0.028	-0.087	S
G3		0.289	0.306	0.298	0.019	-0.481	S
G4		0.292	0.306	0.297	0.019	-0.274	S
G1	pH pH units	-999	5.43	5.453	0.114		B
G2		-999	5.45	5.475	0.102		B
G3		-999	5.51	5.486	0.092		B
G4		-999	5.48	5.483	0.088		B
G1	Cond µS/cm	-999	14.16	14.225	1.357		B
G2		-999	13.68	13.606	0.732		B
G3		-999	9.76	9.901	0.639		B
G4		-999	9.13	9.343	0.588		B

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* Z score is unitless

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Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.635	0.663	0.656	0.024	-0.907	S
G2		0.446	0.477	0.47	0.029	-0.837	S
G3		0.343	0.375	0.364	0.025	-0.82	S
G4		0.209	0.235	0.231	0.019	-1.169	Q
G1	NH ₄ ⁺ mg N/l	0.239	0.241	0.238	0.029	0.05	S
G2		0.249	0.254	0.252	0.024	-0.136	S
G3		0.187	0.187	0.188	0.011	-0.06	S
G4		0.153	0.174	0.172	0.017	-1.15	S
G1	NO ₃ ⁻ mg N/l	0.461	0.462	0.455	0.012	0.499	S
G2		0.5	0.501	0.49	0.018	0.538	S
G3		0.338	0.346	0.34	0.016	-0.11	S
G4		0.336	0.343	0.334	0.015	0.103	S
G1	Na ⁺ mg/l	0.594	0.644	0.629	0.039	-0.908	S
G2		0.701	0.751	0.736	0.044	-0.8	S
G3		0.422	0.456	0.445	0.032	-0.739	S
G4		0.535	0.574	0.561	0.032	-0.792	S
G1	Mg ²⁺ mg/l	0.306	0.32	0.323	0.019	-0.924	S
G2		0.179	0.196	0.197	0.016	-1.084	S
G3		0.14	0.155	0.154	0.014	-0.994	S
G4		0.081	0.093	0.093	0.009	-1.34	S
G1	Cl ⁻ mg/l	0.751	0.772	0.763	0.054	-0.216	S
G2		0.95	0.965	0.929	0.055	0.386	S
G3		0.558	0.579	0.574	0.094	-0.173	S
G4		0.72	0.734	0.716	0.047	0.093	S
G1	Ca ²⁺ mg/l	0.174	0.268	0.259	0.023	-3.659	U
G2		0.159	0.243	0.23	0.028	-2.577	U
G3		0.124	0.192	0.177	0.022	-2.415	U
G4		0.077	0.115	0.109	0.021	-1.531	U
G1	K ⁺ mg/l	0.352	0.374	0.365	0.02	-0.662	S
G2		0.392	0.475	0.459	0.028	-2.432	Q
G3		0.285	0.306	0.298	0.019	-0.693	S
G4		0.293	0.306	0.297	0.019	-0.221	S
G1	pH pH units	5.54	5.43	5.453	0.114	0.764	Q
G2		5.52	5.45	5.475	0.102	0.436	S
G3		5.31	5.51	5.486	0.092	-1.917	U
G4		5.56	5.48	5.483	0.088	0.875	S
G1	Cond µS/cm	14.905	14.16	14.225	1.357	0.501	S
G2		14.29	13.68	13.606	0.732	0.935	S
G3		10.66	9.76	9.901	0.639	1.188	S
G4		9.842	9.13	9.343	0.588	0.849	S

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EMEP – 40th intercomparison of analytical methods - 2022

Laboratory 53, ARPA UMBRIA multisite laboratory (Italy)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.68	0.663	0.656	0.024	1.004	S
G2		0.57	0.477	0.47	0.029	3.449	Q
G3		0.48	0.375	0.364	0.025	4.574	U
G4		0.36	0.235	0.231	0.019	6.904	U
G1	NH ₄ ⁺ mg N/l	0.05	0.241	0.238	0.029	-6.419	U
G2		0.07	0.254	0.252	0.024	-7.559	U
G3		< 0.040	0.187	0.188	0.011	-14.665	U
G4		< 0.040	0.174	0.172	0.017	-9.045	U
G1	NO ₃ ⁻ mg N/l	0.52	0.462	0.455	0.012	5.235	S
G2		0.56	0.501	0.49	0.018	3.867	S
G3		0.42	0.346	0.34	0.016	4.87	Q
G4		0.42	0.343	0.334	0.015	5.747	Q
G1	Na ⁺ mg/l	0.57	0.644	0.629	0.039	-1.53	S
G2		0.68	0.751	0.736	0.044	-1.275	S
G3		0.4	0.456	0.445	0.032	-1.437	S
G4		0.52	0.574	0.561	0.032	-1.257	S
G1	Mg ²⁺ mg/l	0.35	0.32	0.323	0.019	1.407	S
G2		0.22	0.196	0.197	0.016	1.405	S
G3		0.18	0.155	0.154	0.014	1.902	Q
G4		0.11	0.093	0.093	0.009	2.015	Q
G1	Cl ⁻ mg/l	0.86	0.772	0.763	0.054	1.785	S
G2		0.96	0.965	0.929	0.055	0.568	S
G3		0.6	0.579	0.574	0.094	0.276	S
G4		0.75	0.734	0.716	0.047	0.737	S
G1	Ca ²⁺ mg/l	0.31	0.268	0.259	0.023	2.215	Q
G2		0.32	0.243	0.23	0.028	3.269	U
G3		0.28	0.192	0.177	0.022	4.752	U
G4		0.18	0.115	0.109	0.021	3.458	U
G1	K ⁺ mg/l	0.36	0.374	0.365	0.02	-0.261	S
G2		0.47	0.475	0.459	0.028	0.382	S
G3		0.31	0.306	0.298	0.019	0.634	S
G4		0.31	0.306	0.297	0.019	0.682	S
G1	pH pH units	-999	5.43	5.453	0.114		B
G2		-999	5.45	5.475	0.102		B
G3		-999	5.51	5.486	0.092		B
G4		-999	5.48	5.483	0.088		B
G1	Cond µS/cm	-999	14.16	14.225	1.357		B
G2		-999	13.68	13.606	0.732		B
G3		-999	9.76	9.901	0.639		B
G4		-999	9.13	9.343	0.588		B

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Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

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

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EMEP – 40th intercomparison of analytical methods - 2022

Laboratory 54, Central Research Laboratory; Division in Lublin (Poland)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.606	0.663	0.656	0.024	-2.139	S
G2		0.417	0.477	0.47	0.029	-1.84	Q
G3		0.309	0.375	0.364	0.025	-2.158	Q
G4		0.208	0.235	0.231	0.019	-1.223	Q
G1	NH ₄ ⁺ mg N/l	0.27	0.241	0.238	0.029	1.111	S
G2		0.282	0.254	0.252	0.024	1.233	S
G3		0.214	0.187	0.188	0.011	2.301	S
G4		0.194	0.174	0.172	0.017	1.284	S
G1	NO ₃ ⁻ mg N/l	0.429	0.462	0.455	0.012	-2.07	S
G2		0.449	0.501	0.49	0.018	-2.291	S
G3		0.291	0.346	0.34	0.016	-2.964	Q
G4		0.276	0.343	0.334	0.015	-3.929	Q
G1	Na ⁺ mg/l	0.565	0.644	0.629	0.039	-1.66	S
G2		0.65	0.751	0.736	0.044	-1.953	S
G3		0.384	0.456	0.445	0.032	-1.945	Q
G4		0.482	0.574	0.561	0.032	-2.436	Q
G1	Mg ²⁺ mg/l	0.301	0.32	0.323	0.019	-1.189	S
G2		0.178	0.196	0.197	0.016	-1.145	S
G3		0.14	0.155	0.154	0.014	-0.994	S
G4		0.083	0.093	0.093	0.009	-1.109	S
G1	Cl ⁻ mg/l	0.745	0.772	0.763	0.054	-0.327	S
G2		0.895	0.965	0.929	0.055	-0.615	S
G3		0.544	0.579	0.574	0.094	-0.323	S
G4		0.702	0.734	0.716	0.047	-0.293	S
G1	Ca ²⁺ mg/l	0.233	0.268	0.259	0.023	-1.111	S
G2		0.21	0.243	0.23	0.028	-0.725	S
G3		0.155	0.192	0.177	0.022	-0.991	Q
G4		0.091	0.115	0.109	0.021	-0.853	Q
G1	K ⁺ mg/l	0.35	0.374	0.365	0.02	-0.763	S
G2		0.438	0.475	0.459	0.028	-0.772	S
G3		0.275	0.306	0.298	0.019	-1.224	S
G4		0.272	0.306	0.297	0.019	-1.336	S
G1	pH pH units	5.81	5.43	5.453	0.114	3.139	U
G2		5.65	5.45	5.475	0.102	1.709	U
G3		5.58	5.51	5.486	0.092	1.026	S
G4		5.53	5.48	5.483	0.088	0.534	S
G1	Cond µS/cm	14	14.16	14.225	1.357	-0.166	S
G2		13.5	13.68	13.606	0.732	-0.144	S
G3		10.1	9.76	9.901	0.639	0.311	S
G4		9.3	9.13	9.343	0.588	-0.073	S

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Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 0.2 pH-units for pH

U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 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 – 40th intercomparison of analytical methods - 2022

Laboratory 110, Thüringer Landesamt für Landwirtschaft und ländlichen Raum (TLLLR) (Germany)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.629	0.663	0.656	0.024	-1.162	S
G2		0.468	0.477	0.47	0.029	-0.077	S
G3		0.364	0.375	0.364	0.025	0.007	S
G4		0.239	0.235	0.231	0.019	0.435	S
G1	NH ₄ ⁺ mg N/l	0.231	0.241	0.238	0.029	-0.224	S
G2		0.24	0.254	0.252	0.024	-0.509	S
G3		0.175	0.187	0.188	0.011	-1.11	S
G4		0.152	0.174	0.172	0.017	-1.209	S
G1	NO ₃ ⁻ mg N/l	0.437	0.462	0.455	0.012	-1.428	S
G2		0.469	0.501	0.49	0.018	-1.181	S
G3		0.316	0.346	0.34	0.016	-1.446	S
G4		0.317	0.343	0.334	0.015	-1.174	S
G1	Na ⁺ mg/l	0.607	0.644	0.629	0.039	-0.572	S
G2		0.722	0.751	0.736	0.044	-0.325	S
G3		0.429	0.456	0.445	0.032	-0.517	S
G4		0.553	0.574	0.561	0.032	-0.234	S
G1	Mg ²⁺ mg/l	0.321	0.32	0.323	0.019	-0.129	S
G2		0.195	0.196	0.197	0.016	-0.113	S
G3		0.155	0.155	0.154	0.014	0.092	S
G4		0.095	0.093	0.093	0.009	0.28	S
G1	Cl ⁻ mg/l	0.73	0.772	0.763	0.054	-0.602	S
G2		0.87	0.965	0.929	0.055	-1.071	S
G3		0.5	0.579	0.574	0.094	-0.793	S
G4		0.66	0.734	0.716	0.047	-1.194	S
G1	Ca ²⁺ mg/l	0.227	0.268	0.259	0.023	-1.37	Q
G2		0.204	0.243	0.23	0.028	-0.943	Q
G3		0.155	0.192	0.177	0.022	-0.991	Q
G4		0.082	0.115	0.109	0.021	-1.288	U
G1	K ⁺ mg/l	0.334	0.374	0.365	0.02	-1.564	S
G2		0.431	0.475	0.459	0.028	-1.025	S
G3		0.268	0.306	0.298	0.019	-1.596	S
G4		0.261	0.306	0.297	0.019	-1.92	S
G1	pH pH units	5.23	5.43	5.453	0.114	-1.964	Q
G2		5.22	5.45	5.475	0.102	-2.5	U
G3		5.3	5.51	5.486	0.092	-2.026	U
G4		5.25	5.48	5.483	0.088	-2.646	U
G1	Cond µS/cm	13.5	14.16	14.225	1.357	-0.534	S
G2		12.8	13.68	13.606	0.732	-1.1	S
G3		9.3	9.76	9.901	0.639	-0.941	S
G4		8.8	9.13	9.343	0.588	-0.924	S

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Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.685	0.663	0.656	0.024	1.217	S
G2		0.491	0.477	0.47	0.029	0.718	S
G3		0.385	0.375	0.364	0.025	0.834	S
G4		0.239	0.235	0.231	0.019	0.435	S
G1	NH ₄ ⁺ mg N/l	0.246	0.241	0.238	0.029	0.289	S
G2		0.258	0.254	0.252	0.024	0.238	S
G3		0.189	0.187	0.188	0.011	0.115	S
G4		0.163	0.174	0.172	0.017	-0.556	S
G1	NO ₃ ⁻ mg N/l	0.458	0.462	0.455	0.012	0.258	S
G2		0.491	0.501	0.49	0.018	0.039	S
G3		0.343	0.346	0.34	0.016	0.194	S
G4		0.34	0.343	0.334	0.015	0.371	S
G1	Na ⁺ mg/l	0.656	0.644	0.629	0.039	0.697	S
G2		0.766	0.751	0.736	0.044	0.669	S
G3		0.47	0.456	0.445	0.032	0.783	S
G4		0.596	0.574	0.561	0.032	1.1	S
G1	Mg ²⁺ mg/l	0.326	0.32	0.323	0.019	0.135	S
G2		0.198	0.196	0.197	0.016	0.069	S
G3		0.156	0.155	0.154	0.014	0.165	S
G4		0.095	0.093	0.093	0.009	0.28	S
G1	Cl ⁻ mg/l	0.743	0.772	0.763	0.054	-0.363	S
G2		0.92	0.965	0.929	0.055	-0.16	S
G3		0.571	0.579	0.574	0.094	-0.034	S
G4		0.722	0.734	0.716	0.047	0.136	S
G1	Ca ²⁺ mg/l	0.257	0.268	0.259	0.023	-0.074	S
G2		0.234	0.243	0.23	0.028	0.146	S
G3		0.182	0.192	0.177	0.022	0.25	S
G4		0.112	0.115	0.109	0.021	0.164	S
G1	K ⁺ mg/l	0.377	0.374	0.365	0.02	0.59	S
G2		0.485	0.475	0.459	0.028	0.923	S
G3		0.307	0.306	0.298	0.019	0.475	S
G4		0.317	0.306	0.297	0.019	1.054	S
G1	pH pH units	5.56	5.43	5.453	0.114	0.94	Q
G2		5.52	5.45	5.475	0.102	0.436	S
G3		5.56	5.51	5.486	0.092	0.808	S
G4		5.47	5.48	5.483	0.088	-0.147	S
G1	Cond µS/cm	13.1	14.16	14.225	1.357	-0.829	S
G2		12.7	13.68	13.606	0.732	-1.237	S
G3		9	9.76	9.901	0.639	-1.411	S
G4		8.5	9.13	9.343	0.588	-1.435	S

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Please check the EMEP intercalibration website for more statistics, Youden plots, updated expected values ect:

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.634	0.663	0.656	0.024	-0.949	S
G2		0.457	0.477	0.47	0.029	-0.457	S
G3		0.364	0.375	0.364	0.025	0.007	S
G4		0.23	0.235	0.231	0.019	-0.046	S
G1	NH ₄ ⁺ mg N/l	0.23	0.241	0.238	0.029	-0.258	S
G2		0.24	0.254	0.252	0.024	-0.509	S
G3		0.17	0.187	0.188	0.011	-1.547	S
G4		0.16	0.174	0.172	0.017	-0.734	S
G1	NO ₃ ⁻ mg N/l	0.456	0.462	0.455	0.012	0.097	S
G2		0.493	0.501	0.49	0.018	0.15	S
G3		0.345	0.346	0.34	0.016	0.315	S
G4		0.339	0.343	0.334	0.015	0.304	S
G1	Na ⁺ mg/l	0.63	0.644	0.629	0.039	0.024	S
G2		0.74	0.751	0.736	0.044	0.082	S
G3		0.45	0.456	0.445	0.032	0.149	S
G4		0.59	0.574	0.561	0.032	0.914	S
G1	Mg ²⁺ mg/l	0.35	0.32	0.323	0.019	1.407	S
G2		0.23	0.196	0.197	0.016	2.012	Q
G3		0.17	0.155	0.154	0.014	1.178	S
G4		0.1	0.093	0.093	0.009	0.858	S
G1	Cl ⁻ mg/l	0.72	0.772	0.763	0.054	-0.786	S
G2		0.91	0.965	0.929	0.055	-0.342	S
G3		0.58	0.579	0.574	0.094	0.062	S
G4		0.69	0.734	0.716	0.047	-0.55	S
G1	Ca ²⁺ mg/l	0.29	0.268	0.259	0.023	1.351	S
G2		0.25	0.243	0.23	0.028	0.727	S
G3		0.23	0.192	0.177	0.022	2.455	Q
G4		0.15	0.115	0.109	0.021	2.005	U
G1	K ⁺ mg/l	0.37	0.374	0.365	0.02	0.24	S
G2		0.46	0.475	0.459	0.028	0.021	S
G3		0.31	0.306	0.298	0.019	0.634	S
G4		0.31	0.306	0.297	0.019	0.682	S
G1	pH pH units	5.59	5.43	5.453	0.114	1.204	Q
G2		5.57	5.45	5.475	0.102	0.926	Q
G3		5.53	5.51	5.486	0.092	0.481	S
G4		5.52	5.48	5.483	0.088	0.421	S
G1	Cond µS/cm	13.9	14.16	14.225	1.357	-0.24	S
G2		13.4	13.68	13.606	0.732	-0.281	S
G3		9.7	9.76	9.901	0.639	-0.315	S
G4		9.1	9.13	9.343	0.588	-0.414	S

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EMEP – 40th intercomparison of analytical methods - 2022

Laboratory 115, Bayerische Landesanstalt für Wald- und Forstwirtschaft (Germany)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.634	0.663	0.656	0.024	-0.949	S
G2		0.445	0.477	0.47	0.029	-0.872	S
G3		0.347	0.375	0.364	0.025	-0.662	S
G4		0.222	0.235	0.231	0.019	-0.474	S
G1	NH ₄ ⁺ mg N/l	0.242	0.241	0.238	0.029	0.152	S
G2		0.246	0.254	0.252	0.024	-0.26	S
G3		0.182	0.187	0.188	0.011	-0.498	S
G4		0.172	0.174	0.172	0.017	-0.022	S
G1	NO ₃ ⁻ mg N/l	0.435	0.462	0.455	0.012	-1.589	S
G2		0.466	0.501	0.49	0.018	-1.348	S
G3		0.318	0.346	0.34	0.016	-1.324	S
G4		0.31	0.343	0.334	0.015	-1.644	S
G1	Na ⁺ mg/l	0.636	0.644	0.629	0.039	0.179	S
G2		0.732	0.751	0.736	0.044	-0.099	S
G3		0.446	0.456	0.445	0.032	0.022	S
G4		0.556	0.574	0.561	0.032	-0.141	S
G1	Mg ²⁺ mg/l	0.303	0.32	0.323	0.019	-1.083	S
G2		0.182	0.196	0.197	0.016	-0.902	S
G3		0.143	0.155	0.154	0.014	-0.776	S
G4		0.085	0.093	0.093	0.009	-0.877	S
G1	Cl ⁻ mg/l	0.729	0.772	0.763	0.054	-0.62	S
G2		0.916	0.965	0.929	0.055	-0.233	S
G3		0.539	0.579	0.574	0.094	-0.376	S
G4		0.695	0.734	0.716	0.047	-0.443	S
G1	Ca ²⁺ mg/l	0.251	0.268	0.259	0.023	-0.333	S
G2		0.227	0.243	0.23	0.028	-0.108	S
G3		0.172	0.192	0.177	0.022	-0.21	S
G4		0.106	0.115	0.109	0.021	-0.126	S
G1	K ⁺ mg/l	0.423	0.374	0.365	0.02	2.896	S
G2		0.465	0.475	0.459	0.028	0.202	S
G3		0.357	0.306	0.298	0.019	3.129	Q
G4		0.338	0.306	0.297	0.019	2.169	S
G1	pH pH units	5.45	5.43	5.453	0.114	-0.028	S
G2		5.45	5.45	5.475	0.102	-0.249	S
G3		5.46	5.51	5.486	0.092	-0.282	S
G4		5.45	5.48	5.483	0.088	-0.374	S
G1	Cond µS/cm	12.9	14.16	14.225	1.357	-0.976	S
G2		12.4	13.68	13.606	0.732	-1.647	S
G3		8.9	9.76	9.901	0.639	-1.567	S
G4		8.4	9.13	9.343	0.588	-1.605	S

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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 – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.637	0.663	0.656	0.024	-0.835	S
G2		0.463	0.477	0.47	0.029	-0.239	S
G3		0.373	0.375	0.364	0.025	0.35	S
G4		0.226	0.235	0.231	0.019	-0.244	S
G1	NH ₄ ⁺ mg N/l	0.231	0.241	0.238	0.029	-0.224	S
G2		0.247	0.254	0.252	0.024	-0.219	S
G3		0.186	0.187	0.188	0.011	-0.148	S
G4		0.172	0.174	0.172	0.017	-0.022	S
G1	NO ₃ ⁻ mg N/l	0.436	0.462	0.455	0.012	-1.476	S
G2		0.475	0.501	0.49	0.018	-0.826	S
G3		0.345	0.346	0.34	0.016	0.303	S
G4		0.326	0.343	0.334	0.015	-0.589	S
G1	Na ⁺ mg/l	0.69	0.644	0.629	0.039	1.578	S
G2		0.83	0.751	0.736	0.044	2.116	S
G3		0.49	0.456	0.445	0.032	1.418	S
G4		0.6	0.574	0.561	0.032	1.224	S
G1	Mg ²⁺ mg/l	0.34	0.32	0.323	0.019	0.877	S
G2		0.23	0.196	0.197	0.016	2.012	Q
G3		0.18	0.155	0.154	0.014	1.902	Q
G4		0.11	0.093	0.093	0.009	2.015	Q
G1	Cl ⁻ mg/l	0.727	0.772	0.763	0.054	-0.652	S
G2		0.933	0.965	0.929	0.055	0.078	S
G3		0.585	0.579	0.574	0.094	0.114	S
G4		0.703	0.734	0.716	0.047	-0.267	S
G1	Ca ²⁺ mg/l	0.29	0.268	0.259	0.023	1.351	S
G2		0.27	0.243	0.23	0.028	1.453	S
G3		0.21	0.192	0.177	0.022	1.536	S
G4		0.13	0.115	0.109	0.021	1.036	S
G1	K ⁺ mg/l	0.41	0.374	0.365	0.02	2.244	S
G2		0.53	0.475	0.459	0.028	2.547	S
G3		0.33	0.306	0.298	0.019	1.696	S
G4		0.33	0.306	0.297	0.019	1.744	S
G1	pH pH units	5.48	5.43	5.453	0.114	0.236	S
G2		5.48	5.45	5.475	0.102	0.045	S
G3		5.51	5.51	5.486	0.092	0.263	S
G4		5.41	5.48	5.483	0.088	-0.829	S
G1	Cond µS/cm	13	14.16	14.225	1.357	-0.903	S
G2		12.5	13.68	13.606	0.732	-1.51	S
G3		9.2	9.76	9.901	0.639	-1.098	S
G4		8.5	9.13	9.343	0.588	-1.435	S

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.68	0.663	0.656	0.024	1.004	S
G2		0.48	0.477	0.47	0.029	0.338	S
G3		0.38	0.375	0.364	0.025	0.637	S
G4		0.23	0.235	0.231	0.019	-0.046	S
G1	NH ₄ ⁺ mg N/l	0.24	0.241	0.238	0.029	0.084	S
G2		0.25	0.254	0.252	0.024	-0.094	S
G3		0.18	0.187	0.188	0.011	-0.673	S
G4		0.16	0.174	0.172	0.017	-0.734	S
G1	NO ₃ ⁻ mg N/l	0.46	0.462	0.455	0.012	0.418	S
G2		0.5	0.501	0.49	0.018	0.538	S
G3		0.35	0.346	0.34	0.016	0.619	S
G4		0.35	0.343	0.334	0.015	1.043	S
G1	Na ⁺ mg/l	0.686	0.644	0.629	0.039	1.474	S
G2		0.796	0.751	0.736	0.044	1.347	S
G3		0.482	0.456	0.445	0.032	1.164	S
G4		0.608	0.574	0.561	0.032	1.472	S
G1	Mg ²⁺ mg/l	0.326	0.32	0.323	0.019	0.135	S
G2		0.2	0.196	0.197	0.016	0.191	S
G3		0.155	0.155	0.154	0.014	0.092	S
G4		0.092	0.093	0.093	0.009	-0.067	S
G1	Cl ⁻ mg/l	0.73	0.772	0.763	0.054	-0.602	S
G2		0.86	0.965	0.929	0.055	-1.253	S
G3		0.5	0.579	0.574	0.094	-0.793	S
G4		0.59	0.734	0.716	0.047	-2.696	Q
G1	Ca ²⁺ mg/l	0.247	0.268	0.259	0.023	-0.506	S
G2		0.223	0.243	0.23	0.028	-0.253	S
G3		0.172	0.192	0.177	0.022	-0.21	S
G4		0.1	0.115	0.109	0.021	-0.417	S
G1	K ⁺ mg/l	0.35	0.374	0.365	0.02	-0.763	S
G2		0.43	0.475	0.459	0.028	-1.061	S
G3		0.28	0.306	0.298	0.019	-0.959	S
G4		0.2	0.306	0.297	0.019	-5.16	U
G1	pH pH units	5.42	5.43	5.453	0.114	-0.292	S
G2		5.43	5.45	5.475	0.102	-0.445	S
G3		5.47	5.51	5.486	0.092	-0.173	S
G4		5.45	5.48	5.483	0.088	-0.374	S
G1	Cond µS/cm	13.7	14.16	14.225	1.357	-0.387	S
G2		13.2	13.68	13.606	0.732	-0.554	S
G3		9.4	9.76	9.901	0.639	-0.785	S
G4		8.8	9.13	9.343	0.588	-0.924	S

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EMEP – 40th intercomparison of analytical methods - 2022

Laboratory 118, Forstliche Versuchs-und Forschungsanstalt (Germany)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.76	0.663	0.656	0.024	4.402	Q
G2		0.52	0.477	0.47	0.029	1.721	S
G3		0.41	0.375	0.364	0.025	1.818	S
G4		0.27	0.235	0.231	0.019	2.092	Q
G1	NH ₄ ⁺ mg N/l	0.158	0.241	0.238	0.029	-2.722	U
G2		0.235	0.254	0.252	0.024	-0.716	S
G3		0.175	0.187	0.188	0.011	-1.11	S
G4		0.158	0.174	0.172	0.017	-0.853	S
G1	NO ₃ ⁻ mg N/l	0.45	0.462	0.455	0.012	-0.384	S
G2		0.483	0.501	0.49	0.018	-0.405	S
G3		0.333	0.346	0.34	0.016	-0.413	S
G4		0.34	0.343	0.334	0.015	0.371	S
G1	Na ⁺ mg/l	0.585	0.644	0.629	0.039	-1.142	S
G2		0.68	0.751	0.736	0.044	-1.275	S
G3		0.405	0.456	0.445	0.032	-1.279	S
G4		0.505	0.574	0.561	0.032	-1.723	S
G1	Mg ²⁺ mg/l	0.298	0.32	0.323	0.019	-1.348	S
G2		0.174	0.196	0.197	0.016	-1.388	S
G3		0.135	0.155	0.154	0.014	-1.355	S
G4		0.075	0.093	0.093	0.009	-2.034	Q
G1	Cl ⁻ mg/l	0.725	0.772	0.763	0.054	-0.694	S
G2		0.9	0.965	0.929	0.055	-0.524	S
G3		0.545	0.579	0.574	0.094	-0.312	S
G4		0.705	0.734	0.716	0.047	-0.229	S
G1	Ca ²⁺ mg/l	0.225	0.268	0.259	0.023	-1.456	Q
G2		0.2	0.243	0.23	0.028	-1.088	Q
G3		0.155	0.192	0.177	0.022	-0.991	Q
G4		0.09	0.115	0.109	0.021	-0.901	Q
G1	K ⁺ mg/l	0.35	0.374	0.365	0.02	-0.763	S
G2		0.445	0.475	0.459	0.028	-0.52	S
G3		0.28	0.306	0.298	0.019	-0.959	S
G4		0.2	0.306	0.297	0.019	-5.16	U
G1	pH pH units	5.39	5.43	5.453	0.114	-0.556	S
G2		5.49	5.45	5.475	0.102	0.143	S
G3		5.54	5.51	5.486	0.092	0.59	S
G4		5.54	5.48	5.483	0.088	0.648	S
G1	Cond µS/cm	13	14.16	14.225	1.357	-0.903	S
G2		12	13.68	13.606	0.732	-2.193	S
G3		8.5	9.76	9.901	0.639	-2.193	S
G4		8.5	9.13	9.343	0.588	-1.435	S

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EMEP – 40th intercomparison of analytical methods - 2022

Laboratory 120, Landwirtschaftliche Untersuchungs- und Forschungsanstalt LUFA (Germany)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.661	0.663	0.656	0.024	0.197	S
G2		0.479	0.477	0.47	0.029	0.321	S
G3		0.371	0.375	0.364	0.025	0.283	S
G4		0.242	0.235	0.231	0.019	0.595	S
G1	NH ₄ ⁺ mg N/l	0.25	0.241	0.238	0.029	0.426	S
G2		0.26	0.254	0.252	0.024	0.321	S
G3		0.19	0.187	0.188	0.011	0.202	S
G4		0.18	0.174	0.172	0.017	0.453	S
G1	NO ₃ ⁻ mg N/l	0.44	0.462	0.455	0.012	-1.187	S
G2		0.48	0.501	0.49	0.018	-0.571	S
G3		0.33	0.346	0.34	0.016	-0.596	S
G4		0.33	0.343	0.334	0.015	-0.301	S
G1	Na ⁺ mg/l	0.629	0.644	0.629	0.039	-0.002	S
G2		0.738	0.751	0.736	0.044	0.036	S
G3		0.449	0.456	0.445	0.032	0.117	S
G4		0.564	0.574	0.561	0.032	0.107	S
G1	Mg ²⁺ mg/l	0.324	0.32	0.323	0.019	0.03	S
G2		0.195	0.196	0.197	0.016	-0.113	S
G3		0.157	0.155	0.154	0.014	0.237	S
G4		0.098	0.093	0.093	0.009	0.627	S
G1	Cl ⁻ mg/l	0.75	0.772	0.763	0.054	-0.235	S
G2		0.96	0.965	0.929	0.055	0.568	S
G3		0.57	0.579	0.574	0.094	-0.045	S
G4		0.74	0.734	0.716	0.047	0.522	S
G1	Ca ²⁺ mg/l	0.259	0.268	0.259	0.023	0.012	S
G2		0.239	0.243	0.23	0.028	0.328	S
G3		0.186	0.192	0.177	0.022	0.434	S
G4		0.116	0.115	0.109	0.021	0.358	S
G1	K ⁺ mg/l	0.325	0.374	0.365	0.02	-2.015	S
G2		0.411	0.475	0.459	0.028	-1.746	S
G3		0.261	0.306	0.298	0.019	-1.968	S
G4		0.26	0.306	0.297	0.019	-1.973	Q
G1	pH pH units	5.53	5.43	5.453	0.114	0.676	Q
G2		5.54	5.45	5.475	0.102	0.632	S
G3		5.55	5.51	5.486	0.092	0.699	S
G4		5.55	5.48	5.483	0.088	0.761	S
G1	Cond µS/cm	14.4	14.16	14.225	1.357	0.129	S
G2		13.7	13.68	13.606	0.732	0.129	S
G3		9.9	9.76	9.901	0.639	-0.002	S
G4		9.4	9.13	9.343	0.588	0.097	S

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S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , 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 SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 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 – 40th intercomparison of analytical methods - 2022

Laboratory 121, Landeslabor Schleswig-Holstein (Germany)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.76	0.663	0.656	0.024	4.402	Q
G2		0.467	0.477	0.47	0.029	-0.112	S
G3		0.473	0.375	0.364	0.025	4.298	U
G4		0.263	0.235	0.231	0.019	1.718	Q
G1	NH ₄ ⁺ mg N/l	0.23	0.241	0.238	0.029	-0.258	S
G2		0.238	0.254	0.252	0.024	-0.592	S
G3		0.173	0.187	0.188	0.011	-1.285	S
G4		0.164	0.174	0.172	0.017	-0.497	S
G1	NO ₃ ⁻ mg N/l	0.459	0.462	0.455	0.012	0.338	S
G2		0.492	0.501	0.49	0.018	0.095	S
G3		0.341	0.346	0.34	0.016	0.072	S
G4		0.336	0.343	0.334	0.015	0.103	S
G1	Na ⁺ mg/l	0.623	0.644	0.629	0.039	-0.157	S
G2		0.736	0.751	0.736	0.044	-0.009	S
G3		0.498	0.456	0.445	0.032	1.672	S
G4		0.623	0.574	0.561	0.032	1.937	S
G1	Mg ²⁺ mg/l	0.316	0.32	0.323	0.019	-0.394	S
G2		0.192	0.196	0.197	0.016	-0.295	S
G3		0.156	0.155	0.154	0.014	0.165	S
G4		0.092	0.093	0.093	0.009	-0.067	S
G1	Cl ⁻ mg/l	0.678	0.772	0.763	0.054	-1.557	S
G2		0.85	0.965	0.929	0.055	-1.435	S
G3		0.5	0.579	0.574	0.094	-0.793	S
G4		0.647	0.734	0.716	0.047	-1.473	S
G1	Ca ²⁺ mg/l	0.255	0.268	0.259	0.023	-0.161	S
G2		0.232	0.243	0.23	0.028	0.074	S
G3		0.185	0.192	0.177	0.022	0.388	S
G4		0.114	0.115	0.109	0.021	0.261	S
G1	K ⁺ mg/l	0.395	0.374	0.365	0.02	1.492	S
G2		0.479	0.475	0.459	0.028	0.707	S
G3		0.316	0.306	0.298	0.019	0.953	S
G4		0.32	0.306	0.297	0.019	1.213	S
G1	pH pH units	5.46	5.43	5.453	0.114	0.06	S
G2		5.49	5.45	5.475	0.102	0.143	S
G3		5.54	5.51	5.486	0.092	0.59	S
G4		5.51	5.48	5.483	0.088	0.307	S
G1	Cond µS/cm	12.9	14.16	14.225	1.357	-0.976	S
G2		12.3	13.68	13.606	0.732	-1.783	S
G3		8.7	9.76	9.901	0.639	-1.88	S
G4		8.1	9.13	9.343	0.588	-2.115	S

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U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

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

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.659	0.663	0.656	0.024	0.112	S
G2		0.46	0.477	0.47	0.029	-0.354	S
G3		0.347	0.375	0.364	0.025	-0.662	S
G4		0.216	0.235	0.231	0.019	-0.795	S
G1	NH ₄ ⁺ mg N/l	-999	0.241	0.238	0.029		B
G2		-999	0.254	0.252	0.024		B
G3		-999	0.187	0.188	0.011		B
G4		-999	0.174	0.172	0.017		B
G1	NO ₃ ⁻ mg N/l	0.44	0.462	0.455	0.012	-1.187	S
G2		0.463	0.501	0.49	0.018	-1.514	S
G3		0.327	0.346	0.34	0.016	-0.778	S
G4		0.309	0.343	0.334	0.015	-1.712	S
G1	Na ⁺ mg/l	0.67	0.644	0.629	0.039	1.06	S
G2		0.77	0.751	0.736	0.044	0.76	S
G3		0.456	0.456	0.445	0.032	0.339	S
G4		0.564	0.574	0.561	0.032	0.107	S
G1	Mg ²⁺ mg/l	0.324	0.32	0.323	0.019	0.03	S
G2		0.196	0.196	0.197	0.016	-0.052	S
G3		0.152	0.155	0.154	0.014	-0.125	S
G4		0.092	0.093	0.093	0.009	-0.067	S
G1	Cl ⁻ mg/l	0.736	0.772	0.763	0.054	-0.492	S
G2		0.923	0.965	0.929	0.055	-0.106	S
G3		0.538	0.579	0.574	0.094	-0.387	S
G4		0.688	0.734	0.716	0.047	-0.593	S
G1	Ca ²⁺ mg/l	0.259	0.268	0.259	0.023	0.012	S
G2		0.234	0.243	0.23	0.028	0.146	S
G3		0.181	0.192	0.177	0.022	0.204	S
G4		0.111	0.115	0.109	0.021	0.116	S
G1	K ⁺ mg/l	0.391	0.374	0.365	0.02	1.292	S
G2		0.492	0.475	0.459	0.028	1.176	S
G3		0.298	0.306	0.298	0.019	-0.003	S
G4		0.296	0.306	0.297	0.019	-0.062	S
G1	pH pH units	5.58	5.43	5.453	0.114	1.116	Q
G2		5.61	5.45	5.475	0.102	1.317	Q
G3		5.67	5.51	5.486	0.092	2.006	Q
G4		5.63	5.48	5.483	0.088	1.67	Q
G1	Cond µS/cm	22	14.16	14.225	1.357	5.728	U
G2		15.3	13.68	13.606	0.732	2.314	S
G3		8.9	9.76	9.901	0.639	-1.567	S
G4		8.6	9.13	9.343	0.588	-1.265	S

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

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EMEP – 40th intercomparison of analytical methods - 2022

Laboratory 125, Bayerisches Landesamt für Umweltschutz, Augsburg (Germany)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.651	0.663	0.656	0.024	-0.227	S
G2		0.464	0.477	0.47	0.029	-0.215	S
G3		0.363	0.375	0.364	0.025	-0.032	S
G4		0.226	0.235	0.231	0.019	-0.26	S
G1	NH ₄ ⁺ mg N/l	0.267	0.241	0.238	0.029	1.008	S
G2		0.276	0.254	0.252	0.024	0.984	S
G3		0.198	0.187	0.188	0.011	0.902	S
G4		0.189	0.174	0.172	0.017	0.987	S
G1	NO ₃ ⁻ mg N/l	0.455	0.462	0.455	0.012	0.017	S
G2		0.489	0.501	0.49	0.018	-0.072	S
G3		0.341	0.346	0.34	0.016	0.072	S
G4		0.339	0.343	0.334	0.015	0.304	S
G1	Na ⁺ mg/l	0.596	0.644	0.629	0.039	-0.857	S
G2		0.707	0.751	0.736	0.044	-0.664	S
G3		0.428	0.456	0.445	0.032	-0.549	S
G4		0.545	0.574	0.561	0.032	-0.482	S
G1	Mg ²⁺ mg/l	0.313	0.32	0.323	0.019	-0.553	S
G2		0.193	0.196	0.197	0.016	-0.234	S
G3		0.152	0.155	0.154	0.014	-0.125	S
G4		0.094	0.093	0.093	0.009	0.118	S
G1	Cl ⁻ mg/l	0.757	0.772	0.763	0.054	-0.106	S
G2		0.942	0.965	0.929	0.055	0.24	S
G3		0.565	0.579	0.574	0.094	-0.098	S
G4		0.727	0.734	0.716	0.047	0.243	S
G1	Ca ²⁺ mg/l	0.258	0.268	0.259	0.023	-0.031	S
G2		0.216	0.243	0.23	0.028	-0.507	S
G3		0.179	0.192	0.177	0.022	0.112	S
G4		0.11	0.115	0.109	0.021	0.068	S
G1	K ⁺ mg/l	0.369	0.374	0.365	0.02	0.19	S
G2		0.474	0.475	0.459	0.028	0.527	S
G3		0.305	0.306	0.298	0.019	0.368	S
G4		0.307	0.306	0.297	0.019	0.523	S
G1	pH pH units	5.51	5.43	5.453	0.114	0.5	S
G2		5.47	5.45	5.475	0.102	-0.053	S
G3		5.47	5.51	5.486	0.092	-0.173	S
G4		5.48	5.48	5.483	0.088	-0.034	S
G1	Cond µS/cm	14.5	14.16	14.225	1.357	0.202	S
G2		13.9	13.68	13.606	0.732	0.402	S
G3		10.1	9.76	9.901	0.639	0.311	S
G4		9.6	9.13	9.343	0.588	0.437	S

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.654	0.663	0.656	0.024	-0.1	S
G2		0.474	0.477	0.47	0.029	0.13	S
G3		0.389	0.375	0.364	0.025	0.991	S
G4		0.237	0.235	0.231	0.019	0.328	S
G1	NH ₄ ⁺ mg N/l	0.247	0.241	0.238	0.029	0.323	S
G2		0.263	0.254	0.252	0.024	0.445	S
G3		0.187	0.187	0.188	0.011	-0.06	S
G4		0.176	0.174	0.172	0.017	0.216	S
G1	NO ₃ ⁻ mg N/l	0.464	0.462	0.455	0.012	0.739	S
G2		0.479	0.501	0.49	0.018	-0.626	S
G3		0.342	0.346	0.34	0.016	0.133	S
G4		0.337	0.343	0.334	0.015	0.17	S
G1	Na ⁺ mg/l	0.623	0.644	0.629	0.039	-0.157	S
G2		0.726	0.751	0.736	0.044	-0.235	S
G3		0.41	0.456	0.445	0.032	-1.12	S
G4		0.541	0.574	0.561	0.032	-0.606	S
G1	Mg ²⁺ mg/l	0.304	0.32	0.323	0.019	-1.03	S
G2		0.181	0.196	0.197	0.016	-0.963	S
G3		0.128	0.155	0.154	0.014	-1.862	Q
G4		0.084	0.093	0.093	0.009	-0.982	S
G1	Cl ⁻ mg/l	0.725	0.772	0.763	0.054	-0.694	S
G2		0.905	0.965	0.929	0.055	-0.433	S
G3		0.55	0.579	0.574	0.094	-0.258	S
G4		0.702	0.734	0.716	0.047	-0.293	S
G1	Ca ²⁺ mg/l	0.254	0.268	0.259	0.023	-0.204	S
G2		0.226	0.243	0.23	0.028	-0.144	S
G3		0.154	0.192	0.177	0.022	-1.037	Q
G4		0.092	0.115	0.109	0.021	-0.79	Q
G1	K ⁺ mg/l	0.365	0.374	0.365	0.02	-0.011	S
G2		0.474	0.475	0.459	0.028	0.527	S
G3		0.298	0.306	0.298	0.019	-0.003	S
G4		0.288	0.306	0.297	0.019	-0.487	S
G1	pH pH units	5.539	5.43	5.453	0.114	0.755	Q
G2		5.529	5.45	5.475	0.102	0.524	S
G3		5.595	5.51	5.486	0.092	1.189	S
G4		5.725	5.48	5.483	0.088	2.749	U
G1	Cond µS/cm	14.1	14.16	14.225	1.357	-0.092	S
G2		13.5	13.68	13.606	0.732	-0.144	S
G3		9.8	9.76	9.901	0.639	-0.158	S
G4		9.4	9.13	9.343	0.588	0.097	S

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.672	0.663	0.656	0.024	0.664	S
G2		0.481	0.477	0.47	0.029	0.372	S
G3		0.387	0.375	0.364	0.025	0.913	S
G4		0.238	0.235	0.231	0.019	0.381	S
G1	NH ₄ ⁺ mg N/l	0.25	0.241	0.238	0.029	0.426	S
G2		0.252	0.254	0.252	0.024	-0.011	S
G3		0.189	0.187	0.188	0.011	0.115	S
G4		0.174	0.174	0.172	0.017	0.097	S
G1	NO ₃ ⁻ mg N/l	0.463	0.462	0.455	0.012	0.659	S
G2		0.501	0.501	0.49	0.018	0.594	S
G3		0.348	0.346	0.34	0.016	0.498	S
G4		0.338	0.343	0.334	0.015	0.237	S
G1	Na ⁺ mg/l	0.712	0.644	0.629	0.039	2.148	S
G2		0.844	0.751	0.736	0.044	2.432	S
G3		0.506	0.456	0.445	0.032	1.926	S
G4		0.635	0.574	0.561	0.032	2.31	S
G1	Mg ²⁺ mg/l	0.338	0.32	0.323	0.019	0.771	S
G2		0.21	0.196	0.197	0.016	0.798	S
G3		0.167	0.155	0.154	0.014	0.961	S
G4		0.096	0.093	0.093	0.009	0.395	S
G1	Cl ⁻ mg/l	0.938	0.772	0.763	0.054	3.217	Q
G2		1.804	0.965	0.929	0.055	15.937	U
G3		2.822	0.579	0.574	0.094	24.013	U
G4		1.406	0.734	0.716	0.047	14.81	U
G1	Ca ²⁺ mg/l	0.283	0.268	0.259	0.023	1.049	S
G2		0.252	0.243	0.23	0.028	0.8	S
G3		0.205	0.192	0.177	0.022	1.306	S
G4		0.153	0.115	0.109	0.021	2.15	U
G1	K ⁺ mg/l	0.364	0.374	0.365	0.02	-0.061	S
G2		0.467	0.475	0.459	0.028	0.274	S
G3		0.297	0.306	0.298	0.019	-0.056	S
G4		0.294	0.306	0.297	0.019	-0.168	S
G1	pH pH units	5.37	5.43	5.453	0.114	-0.732	S
G2		5.3	5.45	5.475	0.102	-1.717	Q
G3		5.31	5.51	5.486	0.092	-1.917	U
G4		5.43	5.48	5.483	0.088	-0.601	S
G1	Cond µS/cm	14.92	14.16	14.225	1.357	0.512	S
G2		14.52	13.68	13.606	0.732	1.249	S
G3		10.65	9.76	9.901	0.639	1.172	S
G4		10.05	9.13	9.343	0.588	1.203	S

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* Z score is unitless

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U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

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

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.654	0.663	0.656	0.024	-0.1	S
G2		0.461	0.477	0.47	0.029	-0.319	S
G3		0.358	0.375	0.364	0.025	-0.229	S
G4		0.219	0.235	0.231	0.019	-0.634	S
G1	NH ₄ ⁺ mg N/l	0.255	0.241	0.238	0.029	0.597	S
G2		0.26	0.254	0.252	0.024	0.321	S
G3		0.197	0.187	0.188	0.011	0.814	S
G4		0.189	0.174	0.172	0.017	0.987	S
G1	NO ₃ ⁻ mg N/l	0.447	0.462	0.455	0.012	-0.625	S
G2		0.482	0.501	0.49	0.018	-0.46	S
G3		0.331	0.346	0.34	0.016	-0.535	S
G4		0.328	0.343	0.334	0.015	-0.435	S
G1	Na ⁺ mg/l	0.644	0.644	0.629	0.039	0.387	S
G2		0.757	0.751	0.736	0.044	0.466	S
G3		0.447	0.456	0.445	0.032	0.054	S
G4		0.57	0.574	0.561	0.032	0.294	S
G1	Mg ²⁺ mg/l	0.326	0.32	0.323	0.019	0.135	S
G2		0.198	0.196	0.197	0.016	0.069	S
G3		0.155	0.155	0.154	0.014	0.092	S
G4		0.094	0.093	0.093	0.009	0.164	S
G1	Cl ⁻ mg/l	0.752	0.772	0.763	0.054	-0.198	S
G2		0.945	0.965	0.929	0.055	0.295	S
G3		0.553	0.579	0.574	0.094	-0.226	S
G4		0.702	0.734	0.716	0.047	-0.293	S
G1	Ca ²⁺ mg/l	0.257	0.268	0.259	0.023	-0.074	S
G2		0.233	0.243	0.23	0.028	0.11	S
G3		0.179	0.192	0.177	0.022	0.112	S
G4		0.111	0.115	0.109	0.021	0.116	S
G1	K ⁺ mg/l	0.357	0.374	0.365	0.02	-0.412	S
G2		0.448	0.475	0.459	0.028	-0.411	S
G3		0.291	0.306	0.298	0.019	-0.375	S
G4		0.292	0.306	0.297	0.019	-0.274	S
G1	pH pH units	5.6	5.43	5.453	0.114	1.292	Q
G2		5.55	5.45	5.475	0.102	0.73	S
G3		5.53	5.51	5.486	0.092	0.481	S
G4		5.49	5.48	5.483	0.088	0.08	S
G1	Cond µS/cm	14.01	14.16	14.225	1.357	-0.159	S
G2		13.35	13.68	13.606	0.732	-0.349	S
G3		9.69	9.76	9.901	0.639	-0.331	S
G4		9.11	9.13	9.343	0.588	-0.397	S

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EMEP – 40th intercomparison of analytical methods - 2022

Laboratory 158, Asia Center for Air Pollution Research (ACAP) (Japan)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.658	0.663	0.656	0.024	0.07	S
G2		0.475	0.477	0.47	0.029	0.165	S
G3		0.377	0.375	0.364	0.025	0.519	S
G4		0.232	0.235	0.231	0.019	0.061	S
G1	NH ₄ ⁺ mg N/l	0.239	0.241	0.238	0.029	0.05	S
G2		0.244	0.254	0.252	0.024	-0.343	S
G3		0.184	0.187	0.188	0.011	-0.323	S
G4		0.169	0.174	0.172	0.017	-0.2	S
G1	NO ₃ ⁻ mg N/l	0.456	0.462	0.455	0.012	0.097	S
G2		0.489	0.501	0.49	0.018	-0.072	S
G3		0.345	0.346	0.34	0.016	0.315	S
G4		0.341	0.343	0.334	0.015	0.439	S
G1	Na ⁺ mg/l	0.643	0.644	0.629	0.039	0.361	S
G2		0.749	0.751	0.736	0.044	0.285	S
G3		0.456	0.456	0.445	0.032	0.339	S
G4		0.574	0.574	0.561	0.032	0.418	S
G1	Mg ²⁺ mg/l	0.331	0.32	0.323	0.019	0.4	S
G2		0.2	0.196	0.197	0.016	0.191	S
G3		0.159	0.155	0.154	0.014	0.382	S
G4		0.096	0.093	0.093	0.009	0.395	S
G1	Cl ⁻ mg/l	0.762	0.772	0.763	0.054	-0.014	S
G2		0.941	0.965	0.929	0.055	0.222	S
G3		0.581	0.579	0.574	0.094	0.073	S
G4		0.728	0.734	0.716	0.047	0.265	S
G1	Ca ²⁺ mg/l	0.263	0.268	0.259	0.023	0.185	S
G2		0.421	0.243	0.23	0.028	6.935	U
G3		0.188	0.192	0.177	0.022	0.525	S
G4		0.113	0.115	0.109	0.021	0.213	S
G1	K ⁺ mg/l	0.378	0.374	0.365	0.02	0.641	S
G2		0.476	0.475	0.459	0.028	0.599	S
G3		0.309	0.306	0.298	0.019	0.581	S
G4		0.308	0.306	0.297	0.019	0.576	S
G1	pH pH units	5.62	5.43	5.453	0.114	1.468	Q
G2		5.59	5.45	5.475	0.102	1.121	Q
G3		5.56	5.51	5.486	0.092	0.808	S
G4		5.59	5.48	5.483	0.088	1.216	Q
G1	Cond µS/cm	14.1	14.16	14.225	1.357	-0.092	S
G2		13.7	13.68	13.606	0.732	0.129	S
G3		9.8	9.76	9.901	0.639	-0.158	S
G4		9.2	9.13	9.343	0.588	-0.244	S

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.67	0.663	0.656	0.024	0.579	S
G2		0.481	0.477	0.47	0.029	0.372	S
G3		0.374	0.375	0.364	0.025	0.401	S
G4		0.236	0.235	0.231	0.019	0.274	S
G1	NH ₄ ⁺ mg N/l	0.251	0.241	0.238	0.029	0.46	S
G2		0.261	0.254	0.252	0.024	0.362	S
G3		0.196	0.187	0.188	0.011	0.727	S
G4		0.182	0.174	0.172	0.017	0.572	S
G1	NO ₃ ⁻ mg N/l	0.457	0.462	0.455	0.012	0.178	S
G2		0.495	0.501	0.49	0.018	0.261	S
G3		0.343	0.346	0.34	0.016	0.194	S
G4		0.342	0.343	0.334	0.015	0.506	S
G1	Na ⁺ mg/l	0.657	0.644	0.629	0.039	0.723	S
G2		0.784	0.751	0.736	0.044	1.076	S
G3		0.468	0.456	0.445	0.032	0.72	S
G4		0.575	0.574	0.561	0.032	0.449	S
G1	Mg ²⁺ mg/l	0.354	0.32	0.323	0.019	1.619	S
G2		0.211	0.196	0.197	0.016	0.859	S
G3		0.165	0.155	0.154	0.014	0.816	S
G4		0.1	0.093	0.093	0.009	0.858	S
G1	Cl ⁻ mg/l	0.76	0.772	0.763	0.054	-0.051	S
G2		0.958	0.965	0.929	0.055	0.532	S
G3		0.579	0.579	0.574	0.094	0.051	S
G4		0.735	0.734	0.716	0.047	0.415	S
G1	Ca ²⁺ mg/l	0.251	0.268	0.259	0.023	-0.333	S
G2		0.228	0.243	0.23	0.028	-0.072	S
G3		0.18	0.192	0.177	0.022	0.158	S
G4		0.107	0.115	0.109	0.021	-0.078	S
G1	K ⁺ mg/l	-999	0.374	0.365	0.02		B
G2		-999	0.475	0.459	0.028		B
G3		-999	0.306	0.298	0.019		B
G4		-999	0.306	0.297	0.019		B
G1	pH pH units	5.31	5.43	5.453	0.114	-1.26	Q
G2		5.33	5.45	5.475	0.102	-1.423	Q
G3		5.42	5.51	5.486	0.092	-0.718	S
G4		5.41	5.48	5.483	0.088	-0.829	S
G1	Cond µS/cm	14.42	14.16	14.225	1.357	0.144	S
G2		14.13	13.68	13.606	0.732	0.716	S
G3		10.1	9.76	9.901	0.639	0.311	S
G4		9.59	9.13	9.343	0.588	0.42	S

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EMEP – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	0.603	0.663	0.656	0.024	-2.266	S
G2		0.442	0.477	0.47	0.029	-0.976	S
G3		0.319	0.375	0.364	0.025	-1.764	Q
G4		0.218	0.235	0.231	0.019	-0.688	S
G1	NH ₄ ⁺ mg N/l	-999	0.241	0.238	0.029		B
G2		-999	0.254	0.252	0.024		B
G3		-999	0.187	0.188	0.011		B
G4		-999	0.174	0.172	0.017		B
G1	NO ₃ ⁻ mg N/l	0.403	0.462	0.455	0.012	-4.158	S
G2		0.449	0.501	0.49	0.018	-2.291	S
G3		0.292	0.346	0.34	0.016	-2.903	Q
G4		0.293	0.343	0.334	0.015	-2.787	S
G1	Na ⁺ mg/l	-999	0.644	0.629	0.039		B
G2		-999	0.751	0.736	0.044		B
G3		-999	0.456	0.445	0.032		B
G4		-999	0.574	0.561	0.032		B
G1	Mg ²⁺ mg/l	-999	0.32	0.323	0.019		B
G2		-999	0.196	0.197	0.016		B
G3		-999	0.155	0.154	0.014		B
G4		-999	0.093	0.093	0.009		B
G1	Cl ⁻ mg/l	0.745	0.772	0.763	0.054	-0.327	S
G2		0.909	0.965	0.929	0.055	-0.36	S
G3		0.625	0.579	0.574	0.094	0.543	S
G4		0.71	0.734	0.716	0.047	-0.121	S
G1	Ca ²⁺ mg/l	-999	0.268	0.259	0.023		B
G2		-999	0.243	0.23	0.028		B
G3		-999	0.192	0.177	0.022		B
G4		-999	0.115	0.109	0.021		B
G1	K ⁺ mg/l	-999	0.374	0.365	0.02		B
G2		-999	0.475	0.459	0.028		B
G3		-999	0.306	0.298	0.019		B
G4		-999	0.306	0.297	0.019		B
G1	pH pH units	5.57	5.43	5.453	0.114	1.028	Q
G2		5.37	5.45	5.475	0.102	-1.032	S
G3		5.4	5.51	5.486	0.092	-0.936	Q
G4		5.3	5.48	5.483	0.088	-2.078	Q
G1	Cond µS/cm	14.25	14.16	14.225	1.357	0.018	S
G2		15.25	13.68	13.606	0.732	2.246	S
G3		9.95	9.76	9.901	0.639	0.076	S
G4		9.84	9.13	9.343	0.588	0.846	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 SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , 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 SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 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 – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	-999	0.663	0.656	0.024		B
G2		-999	0.477	0.47	0.029		B
G3		-999	0.375	0.364	0.025		B
G4		-999	0.235	0.231	0.019		B
G1	NH ₄ ⁺ mg N/l	-999	0.241	0.238	0.029		B
G2		-999	0.254	0.252	0.024		B
G3		-999	0.187	0.188	0.011		B
G4		-999	0.174	0.172	0.017		B
G1	NO ₃ ⁻ mg N/l	-999	0.462	0.455	0.012		B
G2		-999	0.501	0.49	0.018		B
G3		-999	0.346	0.34	0.016		B
G4		-999	0.343	0.334	0.015		B
G1	Na ⁺ mg/l	0.5	0.644	0.629	0.039	-3.343	Q
G2		0.573	0.751	0.736	0.044	-3.693	Q
G3		0.32	0.456	0.445	0.032	-3.975	U
G4		0.41	0.574	0.561	0.032	-4.669	U
G1	Mg ²⁺ mg/l	0.312	0.32	0.323	0.019	-0.606	S
G2		0.17	0.196	0.197	0.016	-1.631	S
G3		0.13	0.155	0.154	0.014	-1.717	Q
G4		0.08	0.093	0.093	0.009	-1.456	S
G1	Cl ⁻ mg/l	-999	0.772	0.763	0.054		B
G2		-999	0.965	0.929	0.055		B
G3		-999	0.579	0.574	0.094		B
G4		-999	0.734	0.716	0.047		B
G1	Ca ²⁺ mg/l	0.231	0.268	0.259	0.023	-1.197	S
G2		0.198	0.243	0.23	0.028	-1.161	Q
G3		0.13	0.192	0.177	0.022	-2.139	U
G4		0.06	0.115	0.109	0.021	-2.354	U
G1	K ⁺ mg/l	0.232	0.374	0.365	0.02	-6.676	U
G2		0.29	0.475	0.459	0.028	-6.112	U
G3		0.169	0.306	0.298	0.019	-6.852	U
G4		0.16	0.306	0.297	0.019	-7.284	U
G1	pH pH units	-999	5.43	5.453	0.114		B
G2		-999	5.45	5.475	0.102		B
G3		-999	5.51	5.486	0.092		B
G4		-999	5.48	5.483	0.088		B
G1	Cond µS/cm	-999	14.16	14.225	1.357		B
G2		-999	13.68	13.606	0.732		B
G3		-999	9.76	9.901	0.639		B
G4		-999	9.13	9.343	0.588		B

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Q – Questionable: Your result deviates between ± 10 - 20% of the expected value for SO_4^{2-} and NO_3^- ; between ± 15 - 25% of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between ± 0.1 - 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 – 40th intercomparison of analytical methods - 2022

Laboratory 189, Institute of Public Health - Kikinda (Republic of Serbia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	-999	0.663	0.656	0.024		B
G2		-999	0.477	0.47	0.029		B
G3		-999	0.375	0.364	0.025		B
G4		-999	0.235	0.231	0.019		B
G1	NH ₄ ⁺ mg N/l	-999	0.241	0.238	0.029		B
G2		-999	0.254	0.252	0.024		B
G3		-999	0.187	0.188	0.011		B
G4		-999	0.174	0.172	0.017		B
G1	NO ₃ ⁻ mg N/l	-999	0.462	0.455	0.012		B
G2		-999	0.501	0.49	0.018		B
G3		-999	0.346	0.34	0.016		B
G4		-999	0.343	0.334	0.015		B
G1	Na ⁺ mg/l	0.658	0.644	0.629	0.039	0.749	S
G2		0.809	0.751	0.736	0.044	1.641	S
G3		0.463	0.456	0.445	0.032	0.561	S
G4		0.526	0.574	0.561	0.032	-1.071	S
G1	Mg ²⁺ mg/l	0.299	0.32	0.323	0.019	-1.295	S
G2		0.186	0.196	0.197	0.016	-0.659	S
G3		0.13	0.155	0.154	0.014	-1.717	Q
G4		0.079	0.093	0.093	0.009	-1.572	Q
G1	Cl ⁻ mg/l	-999	0.772	0.763	0.054		B
G2		-999	0.965	0.929	0.055		B
G3		-999	0.579	0.574	0.094		B
G4		-999	0.734	0.716	0.047		B
G1	Ca ²⁺ mg/l	0.386	0.268	0.259	0.023	5.498	U
G2		0.361	0.243	0.23	0.028	4.757	U
G3		0.331	0.192	0.177	0.022	7.095	U
G4		0.264	0.115	0.109	0.021	7.526	U
G1	K ⁺ mg/l	0.355	0.374	0.365	0.02	-0.512	S
G2		0.442	0.475	0.459	0.028	-0.628	S
G3		0.301	0.306	0.298	0.019	0.156	S
G4		0.285	0.306	0.297	0.019	-0.646	S
G1	pH pH units	-999	5.43	5.453	0.114		B
G2		-999	5.45	5.475	0.102		B
G3		-999	5.51	5.486	0.092		B
G4		-999	5.48	5.483	0.088		B
G1	Cond µS/cm	-999	14.16	14.225	1.357		B
G2		-999	13.68	13.606	0.732		B
G3		-999	9.76	9.901	0.639		B
G4		-999	9.13	9.343	0.588		B

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Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and between $\pm 0.1\text{-}0.2$ pH-units for pH

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EMEP – 40th intercomparison of analytical methods - 2022

Laboratory 198, Institute for public health - Sremska Mitrovica (Republic of Serbia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	-999	0.663	0.656	0.024		B
G2		-999	0.477	0.47	0.029		B
G3		-999	0.375	0.364	0.025		B
G4		-999	0.235	0.231	0.019		B
G1	NH ₄ ⁺ mg N/l	-999	0.241	0.238	0.029		B
G2		-999	0.254	0.252	0.024		B
G3		-999	0.187	0.188	0.011		B
G4		-999	0.174	0.172	0.017		B
G1	NO ₃ ⁻ mg N/l	-999	0.462	0.455	0.012		B
G2		-999	0.501	0.49	0.018		B
G3		-999	0.346	0.34	0.016		B
G4		-999	0.343	0.334	0.015		B
G1	Na ⁺ mg/l	0.663	0.644	0.629	0.039	0.879	S
G2		0.811	0.751	0.736	0.044	1.686	S
G3		0.488	0.456	0.445	0.032	1.355	S
G4		0.55	0.574	0.561	0.032	-0.327	S
G1	Mg ²⁺ mg/l	-999	0.32	0.323	0.019		B
G2		-999	0.196	0.197	0.016		B
G3		-999	0.155	0.154	0.014		B
G4		-999	0.093	0.093	0.009		B
G1	Cl ⁻ mg/l	-999	0.772	0.763	0.054		B
G2		-999	0.965	0.929	0.055		B
G3		-999	0.579	0.574	0.094		B
G4		-999	0.734	0.716	0.047		B
G1	Ca ²⁺ mg/l	-999	0.268	0.259	0.023		B
G2		-999	0.243	0.23	0.028		B
G3		-999	0.192	0.177	0.022		B
G4		-999	0.115	0.109	0.021		B
G1	K ⁺ mg/l	0.364	0.374	0.365	0.02	-0.061	S
G2		0.456	0.475	0.459	0.028	-0.123	S
G3		0.311	0.306	0.298	0.019	0.687	S
G4		0.3	0.306	0.297	0.019	0.151	S
G1	pH pH units	-999	5.43	5.453	0.114		B
G2		-999	5.45	5.475	0.102		B
G3		-999	5.51	5.486	0.092		B
G4		-999	5.48	5.483	0.088		B
G1	Cond µS/cm	-999	14.16	14.225	1.357		B
G2		-999	13.68	13.606	0.732		B
G3		-999	9.76	9.901	0.639		B
G4		-999	9.13	9.343	0.588		B

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U – Unsatisfactory: Your result deviates more than $\pm 20\%$ of the expected value for SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 0.2 pH-units for pH

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

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EMEP – 40th intercomparison of analytical methods - 2022

Laboratory 200, FUB AG (Switzerland)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.691	0.663	0.656	0.024	1.471	S
G2		0.473	0.477	0.47	0.029	0.096	S
G3		0.376	0.375	0.364	0.025	0.48	S
G4		0.236	0.235	0.231	0.019	0.274	S
G1	NH ₄ ⁺ mg N/l	0.245	0.241	0.238	0.029	0.255	S
G2		0.253	0.254	0.252	0.024	0.03	S
G3		0.185	0.187	0.188	0.011	-0.235	S
G4		0.174	0.174	0.172	0.017	0.097	S
G1	NO ₃ ⁻ mg N/l	0.462	0.462	0.455	0.012	0.579	S
G2		0.493	0.501	0.49	0.018	0.15	S
G3		0.348	0.346	0.34	0.016	0.498	S
G4		0.343	0.343	0.334	0.015	0.573	S
G1	Na ⁺ mg/l	0.634	0.644	0.629	0.039	0.128	S
G2		0.743	0.751	0.736	0.044	0.149	S
G3		0.453	0.456	0.445	0.032	0.244	S
G4		0.58	0.574	0.561	0.032	0.604	S
G1	Mg ²⁺ mg/l	0.344	0.32	0.323	0.019	1.089	S
G2		0.206	0.196	0.197	0.016	0.555	S
G3		0.164	0.155	0.154	0.014	0.744	S
G4		0.096	0.093	0.093	0.009	0.395	S
G1	Cl ⁻ mg/l	0.742	0.772	0.763	0.054	-0.382	S
G2		0.909	0.965	0.929	0.055	-0.36	S
G3		0.545	0.579	0.574	0.094	-0.312	S
G4		0.693	0.734	0.716	0.047	-0.486	S
G1	Ca ²⁺ mg/l	0.287	0.268	0.259	0.023	1.222	S
G2		0.285	0.243	0.23	0.028	1.998	Q
G3		0.21	0.192	0.177	0.022	1.536	S
G4		0.127	0.115	0.109	0.021	0.891	S
G1	K ⁺ mg/l	0.377	0.374	0.365	0.02	0.59	S
G2		0.482	0.475	0.459	0.028	0.815	S
G3		0.316	0.306	0.298	0.019	0.953	S
G4		0.314	0.306	0.297	0.019	0.894	S
G1	pH pH units	-999	5.43	5.453	0.114		B
G2		-999	5.45	5.475	0.102		B
G3		-999	5.51	5.486	0.092		B
G4		-999	5.48	5.483	0.088		B
G1	Cond µS/cm	14.25	14.16	14.225	1.357	0.018	S
G2		13.79	13.68	13.606	0.732	0.252	S
G3		10.06	9.76	9.901	0.639	0.248	S
G4		9.37	9.13	9.343	0.588	0.046	S

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S – Satisfactory: Your result deviates less than $\pm 10\%$ of the expected value for SO_4^{2-} and NO_3^- ; less than $\pm 15\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and less than ± 0.1 pH-units for pH

Q – Questionable: Your result deviates between $\pm 10\text{-}20\%$ of the expected value for SO_4^{2-} and NO_3^- ; between $\pm 15\text{-}25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , 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 SO_4^{2-} and NO_3^- ; more than $\pm 25\%$ of the expected value for NH_4^+ , Cl^- , Na^+ , Mg^{2+} , Ca^{2+} , K^+ and cond and more than ± 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 – 40th intercomparison of analytical methods - 2022

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 ^x
G1	SO ₄ ²⁻ mg S/l	-999	0.663	0.656	0.024		B
G2		-999	0.477	0.47	0.029		B
G3		-999	0.375	0.364	0.025		B
G4		-999	0.235	0.231	0.019		B
G1	NH ₄ ⁺ mg N/l	-999	0.241	0.238	0.029		B
G2		-999	0.254	0.252	0.024		B
G3		-999	0.187	0.188	0.011		B
G4		-999	0.174	0.172	0.017		B
G1	NO ₃ ⁻ mg N/l	-999	0.462	0.455	0.012		B
G2		-999	0.501	0.49	0.018		B
G3		-999	0.346	0.34	0.016		B
G4		-999	0.343	0.334	0.015		B
G1	Na ⁺ mg/l	0.653	0.644	0.629	0.039	0.62	S
G2		0.805	0.751	0.736	0.044	1.551	S
G3		0.451	0.456	0.445	0.032	0.181	S
G4		0.506	0.574	0.561	0.032	-1.692	S
G1	Mg ²⁺ mg/l	0.312	0.32	0.323	0.019	-0.606	S
G2		0.198	0.196	0.197	0.016	0.069	S
G3		0.141	0.155	0.154	0.014	-0.921	S
G4		0.085	0.093	0.093	0.009	-0.877	S
G1	Cl ⁻ mg/l	-999	0.772	0.763	0.054		B
G2		-999	0.965	0.929	0.055		B
G3		-999	0.579	0.574	0.094		B
G4		-999	0.734	0.716	0.047		B
G1	Ca ²⁺ mg/l	< 0.500	0.268	0.259	0.023		B
G2		< 0.500	0.243	0.23	0.028		B
G3		< 0.500	0.192	0.177	0.022		B
G4		< 0.500	0.115	0.109	0.021		B
G1	K ⁺ mg/l	0.363	0.374	0.365	0.02	-0.111	S
G2		0.44	0.475	0.459	0.028	-0.7	S
G3		0.315	0.306	0.298	0.019	0.899	S
G4		0.271	0.306	0.297	0.019	-1.389	S
G1	pH pH units	-999	5.43	5.453	0.114		B
G2		-999	5.45	5.475	0.102		B
G3		-999	5.51	5.486	0.092		B
G4		-999	5.48	5.483	0.088		B
G1	Cond µS/cm	-999	14.16	14.225	1.357		B
G2		-999	13.68	13.606	0.732		B
G3		-999	9.76	9.901	0.639		B
G4		-999	9.13	9.343	0.588		B

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EMEP – 40th intercomparison of analytical methods - 2022

Laboratory 207, IRMB - Institute of Mining and Metallurgy Bor (Republic of Serbia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.69	0.663	0.656	0.024	1.429	S
G2		0.48	0.477	0.47	0.029	0.338	S
G3		0.4	0.375	0.364	0.025	1.424	S
G4		0.26	0.235	0.231	0.019	1.558	Q
G1	NH ₄ ⁺ mg N/l	< 0.500	0.241	0.238	0.029		B
G2		< 0.500	0.254	0.252	0.024		B
G3		< 0.500	0.187	0.188	0.011		B
G4		< 0.500	0.174	0.172	0.017		B
G1	NO ₃ ⁻ mg N/l	0.44	0.462	0.455	0.012	-1.187	S
G2		0.48	0.501	0.49	0.018	-0.571	S
G3		0.34	0.346	0.34	0.016	0.012	S
G4		0.33	0.343	0.334	0.015	-0.301	S
G1	Na ⁺ mg/l	0.55	0.644	0.629	0.039	-2.048	S
G2		0.68	0.751	0.736	0.044	-1.275	S
G3		0.38	0.456	0.445	0.032	-2.072	Q
G4		0.52	0.574	0.561	0.032	-1.257	S
G1	Mg ²⁺ mg/l	0.31	0.32	0.323	0.019	-0.712	S
G2		0.2	0.196	0.197	0.016	0.191	S
G3		< 0.200	0.155	0.154	0.014		B
G4		< 0.200	0.093	0.093	0.009		B
G1	Cl ⁻ mg/l	0.79	0.772	0.763	0.054	0.5	S
G2		0.95	0.965	0.929	0.055	0.386	S
G3		0.6	0.579	0.574	0.094	0.276	S
G4		0.74	0.734	0.716	0.047	0.522	S
G1	Ca ²⁺ mg/l	< 0.500	0.268	0.259	0.023		B
G2		< 0.500	0.243	0.23	0.028		B
G3		< 0.500	0.192	0.177	0.022		B
G4		< 0.500	0.115	0.109	0.021		B
G1	K ⁺ mg/l	0.33	0.374	0.365	0.02	-1.765	S
G2		0.43	0.475	0.459	0.028	-1.061	S
G3		0.3	0.306	0.298	0.019	0.103	S
G4		0.27	0.306	0.297	0.019	-1.442	S
G1	pH pH units	-999	5.43	5.453	0.114		B
G2		-999	5.45	5.475	0.102		B
G3		-999	5.51	5.486	0.092		B
G4		-999	5.48	5.483	0.088		B
G1	Cond µS/cm	-999	14.16	14.225	1.357		B
G2		-999	13.68	13.606	0.732		B
G3		-999	9.76	9.901	0.639		B
G4		-999	9.13	9.343	0.588		B

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EMEP – 40th intercomparison of analytical methods - 2022

Laboratory 208, VINCA - Vinca Institute of Nuclear Sciences (Republic of Serbia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.651	0.663	0.656	0.024	-0.24	S
G2		0.459	0.477	0.47	0.029	-0.405	S
G3		0.357	0.375	0.364	0.025	-0.253	S
G4		0.221	0.235	0.231	0.019	-0.528	S
G1	NH ₄ ⁺ mg N/l	-999	0.241	0.238	0.029		B
G2		-999	0.254	0.252	0.024		B
G3		-999	0.187	0.188	0.011		B
G4		-999	0.174	0.172	0.017		B
G1	NO ₃ ⁻ mg N/l	0.448	0.462	0.455	0.012	-0.553	S
G2		0.481	0.501	0.49	0.018	-0.488	S
G3		0.337	0.346	0.34	0.016	-0.17	S
G4		0.334	0.343	0.334	0.015	-0.052	S
G1	Na ⁺ mg/l	0.48	0.644	0.629	0.039	-3.861	U
G2		0.69	0.751	0.736	0.044	-1.049	S
G3		0.39	0.456	0.445	0.032	-1.755	S
G4		0.51	0.574	0.561	0.032	-1.568	S
G1	Mg ²⁺ mg/l	< 0.300	0.32	0.323	0.019	-9.187	U
G2		< 0.300	0.196	0.197	0.016		B
G3		< 0.300	0.155	0.154	0.014		B
G4		< 0.300	0.093	0.093	0.009		B
G1	Cl ⁻ mg/l	0.762	0.772	0.763	0.054	-0.014	S
G2		0.932	0.965	0.929	0.055	0.062	S
G3		0.565	0.579	0.574	0.094	-0.099	S
G4		0.713	0.734	0.716	0.047	-0.066	S
G1	Ca ²⁺ mg/l	< 2.000	0.268	0.259	0.023		B
G2		< 2.000	0.243	0.23	0.028		B
G3		< 2.000	0.192	0.177	0.022		B
G4		< 2.000	0.115	0.109	0.021		B
G1	K ⁺ mg/l	0.33	0.374	0.365	0.02	-1.765	S
G2		0.43	0.475	0.459	0.028	-1.061	S
G3		0.27	0.306	0.298	0.019	-1.49	S
G4		0.29	0.306	0.297	0.019	-0.38	S
G1	pH pH units	5.5	5.43	5.453	0.114	0.412	S
G2		5.5	5.45	5.475	0.102	0.24	S
G3		5.5	5.51	5.486	0.092	0.154	S
G4		5.5	5.48	5.483	0.088	0.194	S
G1	Cond µS/cm	-999	14.16	14.225	1.357		B
G2		-999	13.68	13.606	0.732		B
G3		-999	9.76	9.901	0.639		B
G4		-999	9.13	9.343	0.588		B

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EMEP – 40th intercomparison of analytical methods - 2022

Laboratory 209, PHIB - Public Health Institute of Belgrade (Republic of Serbia)

Precipitation (G-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
G1	SO ₄ ²⁻ mg S/l	0.656	0.663	0.656	0.024	-0.015	S
G2		0.393	0.477	0.47	0.029	-2.67	Q
G3		0.363	0.375	0.364	0.025	-0.032	S
G4		0.23	0.235	0.231	0.019	-0.046	S
G1	NH ₄ ⁺ mg N/l	0.24	0.241	0.238	0.029	0.084	S
G2		0.299	0.254	0.252	0.024	1.938	Q
G3		0.203	0.187	0.188	0.011	1.339	S
G4		0.202	0.174	0.172	0.017	1.759	Q
G1	NO ₃ ⁻ mg N/l	0.418	0.462	0.455	0.012	-2.953	S
G2		0.45	0.501	0.49	0.018	-2.235	S
G3		0.312	0.346	0.34	0.016	-1.689	S
G4		0.31	0.343	0.334	0.015	-1.644	S
G1	Na ⁺ mg/l	0.547	0.644	0.629	0.039	-2.126	Q
G2		0.66	0.751	0.736	0.044	-1.727	S
G3		0.376	0.456	0.445	0.032	-2.199	Q
G4		0.575	0.574	0.561	0.032	0.449	S
G1	Mg ²⁺ mg/l	0.314	0.32	0.323	0.019	-0.5	S
G2		< 0.250	0.196	0.197	0.016		B
G3		< 0.250	0.155	0.154	0.014		B
G4		< 0.250	0.093	0.093	0.009		B
G1	Cl ⁻ mg/l	0.735	0.772	0.763	0.054	-0.51	S
G2		0.868	0.965	0.929	0.055	-1.107	S
G3		0.544	0.579	0.574	0.094	-0.323	S
G4		0.662	0.734	0.716	0.047	-1.151	S
G1	Ca ²⁺ mg/l	< 2.000	0.268	0.259	0.023		B
G2		< 2.000	0.243	0.23	0.028		B
G3		< 2.000	0.192	0.177	0.022		B
G4		< 2.000	0.115	0.109	0.021		B
G1	K ⁺ mg/l	0.364	0.374	0.365	0.02	-0.061	S
G2		0.459	0.475	0.459	0.028	-0.015	S
G3		0.329	0.306	0.298	0.019	1.643	S
G4		0.456	0.306	0.297	0.019	8.435	U
G1	pH pH units	5.5	5.43	5.453	0.114	0.412	S
G2		5.5	5.45	5.475	0.102	0.24	S
G3		5.5	5.51	5.486	0.092	0.154	S
G4		5.5	5.48	5.483	0.088	0.194	S
G1	Cond µS/cm	12.3	14.16	14.225	1.357	-1.418	S
G2		12.7	13.68	13.606	0.732	-1.237	S
G3		9.4	9.76	9.901	0.639	-0.785	S
G4		8.3	9.13	9.343	0.588	-1.775	S

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