

EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	0.313	0.336	0.343	0.026	-1.162	S
H2		0.229	0.156	0.162	0.034	1.954	Q
H3		0.356	0.324	0.323	0.029	1.138	S
H4		0.412	0.336	0.355	0.039	1.453	S
H1	Cd $\mu\text{g/l}$	0.034	0.034	0.035	0.007	-0.21	S
H2		< 0.033	0.02	0.019	0.004		B
H3		< 0.033	0.022	0.023	0.004		B
H4		0.038	0.036	0.039	0.004	-0.153	S
H1	Cr $\mu\text{g/l}$	0.229	0.264	0.273	0.017	-2.611	S
H2		0.153	0.195	0.188	0.018	-2.003	S
H3		0.252	0.288	0.288	0.016	-2.189	S
H4		0.327	0.36	0.363	0.022	-1.648	S
H1	Cu $\mu\text{g/l}$	0.54	0.576	0.566	0.066	-0.392	S
H2		0.546	0.585	0.544	0.081	0.022	S
H3		0.294	0.324	0.298	0.09	-0.04	S
H4		0.464	0.495	0.487	0.053	-0.432	S
H1	Ni $\mu\text{g/l}$	0.287	0.288	0.283	0.04	0.108	S
H2		0.248	0.273	0.26	0.027	-0.448	S
H3		0.412	0.432	0.424	0.056	-0.219	S
H4		0.332	0.36	0.353	0.032	-0.663	S
H1	Pb $\mu\text{g/l}$	0.552	0.576	0.56	0.05	-0.156	S
H2		0.312	0.351	0.32	0.03	-0.268	S
H3		0.346	0.36	0.346	0.062	0.002	S
H4		0.712	0.72	0.731	0.064	-0.299	S
H1	Zn $\mu\text{g/l}$	2.777	2.88	3.104	0.544	-0.6	S
H2		2.346	2.73	2.593	0.432	-0.571	S
H3		3.282	3.42	3.594	0.552	-0.566	S
H4		3.685	3.83	4.005	0.465	-0.689	S

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

* Z score in unitless

☒ EMEP quality norm; letters indicate:

S – Satisfactory: Your results deviates less than $\pm 25\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $< 1 \mu\text{g/l}$, Cd $< 0,5 \mu\text{g/l}$, Zn $< 10 \mu\text{g/l}$ and Cu $< 2 \mu\text{g/l}$ and less than $\pm 15\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $> 1 \mu\text{g/l}$, Cd $> 0,5 \mu\text{g/l}$, Zn $> 10 \mu\text{g/l}$ and Cu $> 2 \mu\text{g/l}$

Q – Questionable: Your result deviates between $\pm 25-50\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $< 1 \mu\text{g/l}$, Cd $< 0,5 \mu\text{g/l}$, Zn $< 10 \mu\text{g/l}$ and Cu $< 2 \mu\text{g/l}$ and between $\pm 15-30\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $> 1 \mu\text{g/l}$, Cd $> 0,5 \mu\text{g/l}$, Zn $> 10 \mu\text{g/l}$ and Cu $> 2 \mu\text{g/l}$

U – Unsatisfactory: Your result deviates more than $\pm 50\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $< 1 \mu\text{g/l}$, Cd $< 0,5 \mu\text{g/l}$, Zn $< 10 \mu\text{g/l}$ and Cu $< 2 \mu\text{g/l}$ and more than $\pm 30\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $> 1 \mu\text{g/l}$, Cd $> 0,5 \mu\text{g/l}$, Zn $> 10 \mu\text{g/l}$ and Cu $> 2 \mu\text{g/l}$

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 – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	0.323	0.336	0.343	0.026	-0.778	S
H2		0.144	0.156	0.162	0.034	-0.51	S
H3		0.314	0.324	0.323	0.029	-0.32	S
H4		0.334	0.336	0.355	0.039	-0.531	S
H1	Cd $\mu\text{g/l}$	< 0.040	0.034	0.035	0.007		B
H2		< 0.040	0.02	0.019	0.004		B
H3		< 0.040	0.022	0.023	0.004		B
H4		< 0.040	0.036	0.039	0.004		B
H1	Cr $\mu\text{g/l}$	0.304	0.264	0.273	0.017	1.84	S
H2		0.221	0.195	0.188	0.018	1.853	S
H3		0.319	0.288	0.288	0.016	1.883	S
H4		0.404	0.36	0.363	0.022	1.858	S
H1	Cu $\mu\text{g/l}$	0.673	0.576	0.566	0.066	1.617	S
H2		0.656	0.585	0.544	0.081	1.377	S
H3		0.397	0.324	0.298	0.09	1.108	S
H4		0.587	0.495	0.487	0.053	1.893	S
H1	Ni $\mu\text{g/l}$	0.325	0.288	0.283	0.04	1.047	S
H2		0.29	0.273	0.26	0.027	1.118	S
H3		0.478	0.432	0.424	0.056	0.965	S
H4		0.397	0.36	0.353	0.032	1.357	S
H1	Pb $\mu\text{g/l}$	0.533	0.576	0.56	0.05	-0.534	S
H2		0.302	0.351	0.32	0.03	-0.601	S
H3		0.332	0.36	0.346	0.062	-0.225	S
H4		0.673	0.72	0.731	0.064	-0.91	S
H1	Zn $\mu\text{g/l}$	3.695	2.88	3.104	0.544	1.088	Q
H2		3.128	2.73	2.593	0.432	1.239	S
H3		4.138	3.42	3.594	0.552	0.984	S
H4		4.432	3.83	4.005	0.465	0.918	S

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As µg/l	0.356	0.336	0.343	0.026	0.497	S
H2		0.158	0.156	0.162	0.034	-0.114	S
H3		0.333	0.324	0.323	0.029	0.342	S
H4		0.353	0.336	0.355	0.039	-0.056	S
H1	Cd µg/l	0.033	0.034	0.035	0.007	-0.398	S
H2		0.019	0.02	0.019	0.004	-0.017	S
H3		0.023	0.022	0.023	0.004	-0.07	S
H4		0.039	0.036	0.039	0.004	0.072	S
H1	Cr µg/l	0.267	0.264	0.273	0.017	-0.358	S
H2		0.182	0.195	0.188	0.018	-0.38	S
H3		0.29	0.288	0.288	0.016	0.133	S
H4		0.358	0.36	0.363	0.022	-0.251	S
H1	Cu µg/l	0.571	0.576	0.566	0.066	0.083	S
H2		0.552	0.585	0.544	0.081	0.098	S
H3		0.331	0.324	0.298	0.09	0.368	S
H4		0.499	0.495	0.487	0.053	0.238	S
H1	Ni µg/l	0.289	0.288	0.283	0.04	0.161	S
H2		0.257	0.273	0.26	0.027	-0.099	S
H3		0.437	0.432	0.424	0.056	0.238	S
H4		0.35	0.36	0.353	0.032	-0.09	S
H1	Pb µg/l	0.582	0.576	0.56	0.05	0.447	S
H2		0.333	0.351	0.32	0.03	0.43	S
H3		0.367	0.36	0.346	0.062	0.338	S
H4		0.76	0.72	0.731	0.064	0.46	S
H1	Zn µg/l	2.994	2.88	3.104	0.544	-0.202	S
H2		2.585	2.73	2.593	0.432	-0.018	S
H3		3.485	3.42	3.594	0.552	-0.197	S
H4		3.821	3.83	4.005	0.465	-0.396	S

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Q – Questionable: Your result deviates between $\pm 25-50\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $< 1 \mu\text{g/l}$, Cd $< 0,5 \mu\text{g/l}$, Zn $< 10 \mu\text{g/l}$ and Cu $< 2 \mu\text{g/l}$ and between $\pm 15-30\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $> 1 \mu\text{g/l}$, Cd $> 0,5 \mu\text{g/l}$, Zn $> 10 \mu\text{g/l}$ and Cu $> 2 \mu\text{g/l}$

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

Laboratory 6, SGS France - EHS (France)

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	0.374	0.336	0.343	0.026	1.179	S
H2		< 0.300	0.156	0.162	0.034		B
H3		0.338	0.324	0.323	0.029	0.513	S
H4		0.358	0.336	0.355	0.039	0.08	S
H1	Cd $\mu\text{g/l}$	< 0.100	0.034	0.035	0.007		B
H2		< 0.100	0.02	0.019	0.004		B
H3		< 0.100	0.022	0.023	0.004		B
H4		< 0.100	0.036	0.039	0.004		B
H1	Cr $\mu\text{g/l}$	< 0.400	0.264	0.273	0.017		B
H2		< 0.400	0.195	0.188	0.018		B
H3		< 0.400	0.288	0.288	0.016		B
H4		< 0.400	0.36	0.363	0.022		B
H1	Cu $\mu\text{g/l}$	0.55	0.576	0.566	0.066	-0.241	S
H2		0.525	0.585	0.544	0.081	-0.237	S
H3		< 0.400	0.324	0.298	0.09		B
H4		0.465	0.495	0.487	0.053	-0.414	S
H1	Ni $\mu\text{g/l}$	< 0.400	0.288	0.283	0.04		B
H2		< 0.400	0.273	0.26	0.027		B
H3		0.415	0.432	0.424	0.056	-0.165	S
H4		< 0.400	0.36	0.353	0.032		B
H1	Pb $\mu\text{g/l}$	0.56	0.576	0.56	0.05	0.004	S
H2		0.3	0.351	0.32	0.03	-0.668	S
H3		0.33	0.36	0.346	0.062	-0.257	S
H4		0.39	0.72	0.731	0.064	-5.342	Q
H1	Zn $\mu\text{g/l}$	< 5.000	2.88	3.104	0.544		B
H2		< 5.000	2.73	2.593	0.432		B
H3		< 5.000	3.42	3.594	0.552		B
H4		< 5.000	3.83	4.005	0.465		B

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Q – Questionable: Your result deviates between $\pm 25\text{-}50\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $< 1 \mu\text{g/l}$, Cd $< 0,5 \mu\text{g/l}$, Zn $< 10 \mu\text{g/l}$ and Cu $< 2 \mu\text{g/l}$ and between $\pm 15\text{-}30\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $> 1 \mu\text{g/l}$, Cd $> 0,5 \mu\text{g/l}$, Zn $> 10 \mu\text{g/l}$ and Cu $> 2 \mu\text{g/l}$

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	0.331	0.336	0.343	0.026	-0.467	S
H2		0.134	0.156	0.162	0.034	-0.8	S
H3		0.286	0.324	0.323	0.029	-1.305	S
H4		0.336	0.336	0.355	0.039	-0.49	S
H1	Cd $\mu\text{g/l}$	0.037	0.034	0.035	0.007	0.154	S
H2		0.019	0.02	0.019	0.004	0.136	S
H3		0.022	0.022	0.023	0.004	-0.145	S
H4		0.038	0.036	0.039	0.004	-0.238	S
H1	Cr $\mu\text{g/l}$	0.281	0.264	0.273	0.017	0.469	S
H2		0.197	0.195	0.188	0.018	0.498	S
H3		0.3	0.288	0.288	0.016	0.746	S
H4		0.385	0.36	0.363	0.022	0.974	S
H1	Cu $\mu\text{g/l}$	0.6	0.576	0.566	0.066	0.512	S
H2		0.556	0.585	0.544	0.081	0.151	S
H3		0.331	0.324	0.298	0.09	0.367	S
H4		0.52	0.495	0.487	0.053	0.623	S
H1	Ni $\mu\text{g/l}$	0.279	0.288	0.283	0.04	-0.082	S
H2		0.271	0.273	0.26	0.027	0.413	S
H3		0.444	0.432	0.424	0.056	0.35	S
H4		0.372	0.36	0.353	0.032	0.592	S
H1	Pb $\mu\text{g/l}$	0.585	0.576	0.56	0.05	0.505	S
H2		0.343	0.351	0.32	0.03	0.762	S
H3		0.361	0.36	0.346	0.062	0.249	S
H4		0.78	0.72	0.731	0.064	0.774	S
H1	Zn $\mu\text{g/l}$	2.901	2.88	3.104	0.544	-0.372	S
H2		2.564	2.73	2.593	0.432	-0.066	S
H3		3.323	3.42	3.594	0.552	-0.491	S
H4		3.97	3.83	4.005	0.465	-0.076	S

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* Z score in unitless

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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 – Analytical intercomparison of heavy metals in precipitation 2021

Laboratory 8, Umweltbundesamt, Langen (Germany)

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	0.349	0.336	0.343	0.026	0.22	S
H2		0.15	0.156	0.162	0.034	-0.336	S
H3		0.331	0.324	0.323	0.029	0.27	S
H4		0.354	0.336	0.355	0.039	-0.022	S
H1	Cd $\mu\text{g/l}$	0.034	0.034	0.035	0.007	-0.21	S
H2		0.019	0.02	0.019	0.004	0.09	S
H3		0.022	0.022	0.023	0.004	-0.22	S
H4		0.038	0.036	0.039	0.004	-0.153	S
H1	Cr $\mu\text{g/l}$	0.266	0.264	0.273	0.017	-0.415	S
H2		0.182	0.195	0.188	0.018	-0.359	S
H3		0.29	0.288	0.288	0.016	0.12	S
H4		0.355	0.36	0.363	0.022	-0.374	S
H1	Cu $\mu\text{g/l}$	0.579	0.576	0.566	0.066	0.197	S
H2		0.544	0.585	0.544	0.081	-0.003	S
H3		0.322	0.324	0.298	0.09	0.272	S
H4		0.506	0.495	0.487	0.053	0.362	S
H1	Ni $\mu\text{g/l}$	0.291	0.288	0.283	0.04	0.207	S
H2		0.257	0.273	0.26	0.027	-0.113	S
H3		0.426	0.432	0.424	0.056	0.032	S
H4		0.358	0.36	0.353	0.032	0.145	S
H1	Pb $\mu\text{g/l}$	0.592	0.576	0.56	0.05	0.64	S
H2		0.333	0.351	0.32	0.03	0.432	S
H3		0.374	0.36	0.346	0.062	0.457	S
H4		0.777	0.72	0.731	0.064	0.719	S
H1	Zn $\mu\text{g/l}$	3.297	2.88	3.104	0.544	0.356	S
H2		2.53	2.73	2.593	0.432	-0.145	S
H3		3.459	3.42	3.594	0.552	-0.245	S
H4		4.375	3.83	4.005	0.465	0.796	S

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

Laboratory 10, Air Quality Reference Centre (Hungary)

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	-999	0.336	0.343	0.026		B
H2		-999	0.156	0.162	0.034		B
H3		-999	0.324	0.323	0.029		B
H4		-999	0.336	0.355	0.039		B
H1	Cd $\mu\text{g/l}$	< 0.050	0.034	0.035	0.007		B
H2		< 0.050	0.02	0.019	0.004		B
H3		< 0.050	0.022	0.023	0.004		B
H4		< 0.050	0.036	0.039	0.004		B
H1	Cr $\mu\text{g/l}$	-999	0.264	0.273	0.017		B
H2		-999	0.195	0.188	0.018		B
H3		-999	0.288	0.288	0.016		B
H4		-999	0.36	0.363	0.022		B
H1	Cu $\mu\text{g/l}$	-999	0.576	0.566	0.066		B
H2		-999	0.585	0.544	0.081		B
H3		-999	0.324	0.298	0.09		B
H4		-999	0.495	0.487	0.053		B
H1	Ni $\mu\text{g/l}$	-999	0.288	0.283	0.04		B
H2		-999	0.273	0.26	0.027		B
H3		-999	0.432	0.424	0.056		B
H4		-999	0.36	0.353	0.032		B
H1	Pb $\mu\text{g/l}$	< 0.650	0.576	0.56	0.05		B
H2		< 0.650	0.351	0.32	0.03		B
H3		< 0.650	0.36	0.346	0.062		B
H4		0.695	0.72	0.731	0.064	-0.565	S
H1	Zn $\mu\text{g/l}$	-999	2.88	3.104	0.544		B
H2		-999	2.73	2.593	0.432		B
H3		-999	3.42	3.594	0.552		B
H4		-999	3.83	4.005	0.465		B

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	0.33	0.336	0.343	0.026	-0.509	S
H2		0.14	0.156	0.162	0.034	-0.626	S
H3		0.3	0.324	0.323	0.029	-0.805	S
H4		0.32	0.336	0.355	0.039	-0.887	S
H1	Cd $\mu\text{g/l}$	0.034	0.034	0.035	0.007	-0.21	S
H2		0.019	0.02	0.019	0.004	0.09	S
H3		0.021	0.022	0.023	0.004	-0.47	S
H4		0.038	0.036	0.039	0.004	-0.153	S
H1	Cr $\mu\text{g/l}$	0.27	0.264	0.273	0.017	-0.178	S
H2		0.19	0.195	0.188	0.018	0.095	S
H3		0.28	0.288	0.288	0.016	-0.488	S
H4		0.36	0.36	0.363	0.022	-0.146	S
H1	Cu $\mu\text{g/l}$	0.57	0.576	0.566	0.066	0.061	S
H2		0.53	0.585	0.544	0.081	-0.176	S
H3		0.31	0.324	0.298	0.09	0.138	S
H4		0.48	0.495	0.487	0.053	-0.13	S
H1	Ni $\mu\text{g/l}$	0.29	0.288	0.283	0.04	0.182	S
H2		0.25	0.273	0.26	0.027	-0.374	S
H3		0.43	0.432	0.424	0.056	0.104	S
H4		0.35	0.36	0.353	0.032	-0.104	S
H1	Pb $\mu\text{g/l}$	0.59	0.576	0.56	0.05	0.601	S
H2		0.34	0.351	0.32	0.03	0.666	S
H3		0.38	0.36	0.346	0.062	0.554	S
H4		0.78	0.72	0.731	0.064	0.766	S
H1	Zn $\mu\text{g/l}$	3.22	2.88	3.104	0.544	0.214	S
H2		2.82	2.73	2.593	0.432	0.526	S
H3		3.66	3.42	3.594	0.552	0.119	S
H4		4.09	3.83	4.005	0.465	0.182	S

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As µg/l	-999	0.336	0.343	0.026		B
H2		-999	0.156	0.162	0.034		B
H3		-999	0.324	0.323	0.029		B
H4		-999	0.336	0.355	0.039		B
H1	Cd µg/l	0.032	0.034	0.035	0.007	-0.545	S
H2		0.016	0.02	0.019	0.004	-0.504	S
H3		0.021	0.022	0.023	0.004	-0.495	S
H4		0.036	0.036	0.039	0.004	-0.664	S
H1	Cr µg/l	0.256	0.264	0.273	0.017	-1.009	S
H2		0.174	0.195	0.188	0.018	-0.812	S
H3		0.277	0.288	0.288	0.016	-0.67	S
H4		0.325	0.36	0.363	0.022	-1.739	S
H1	Cu µg/l	0.412	0.576	0.566	0.066	-2.326	Q
H2		0.377	0.585	0.544	0.081	-2.062	Q
H3		0.222	0.324	0.298	0.09	-0.843	Q
H4		0.342	0.495	0.487	0.053	-2.739	Q
H1	Ni µg/l	0.27	0.288	0.283	0.04	-0.312	S
H2		0.255	0.273	0.26	0.027	-0.187	S
H3		0.468	0.432	0.424	0.056	0.785	S
H4		0.33	0.36	0.353	0.032	-0.725	S
H1	Pb µg/l	0.572	0.576	0.56	0.05	0.242	S
H2		0.321	0.351	0.32	0.03	0.032	S
H3		0.395	0.36	0.346	0.062	0.797	S
H4		0.742	0.72	0.731	0.064	0.171	S
H1	Zn µg/l	3.03	2.88	3.104	0.544	-0.135	S
H2		2.91	2.73	2.593	0.432	0.734	S
H3		3.43	3.42	3.594	0.552	-0.298	S
H4		3.76	3.83	4.005	0.465	-0.527	S

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As <i>µg/l</i>	0.375	0.336	0.343	0.026	1.218	S
H2		0.164	0.156	0.162	0.034	0.069	S
H3		0.36	0.324	0.323	0.029	1.276	S
H4		0.368	0.336	0.355	0.039	0.334	S
H1	Cd <i>µg/l</i>	0.038	0.034	0.035	0.007	0.35	S
H2		0.02	0.02	0.019	0.004	0.319	S
H3		0.025	0.022	0.023	0.004	0.529	S
H4		0.042	0.036	0.039	0.004	0.984	S
H1	Cr <i>µg/l</i>	0.278	0.264	0.273	0.017	0.297	S
H2		0.192	0.195	0.188	0.018	0.209	S
H3		0.305	0.288	0.288	0.016	1.032	S
H4		0.381	0.36	0.363	0.022	0.81	S
H1	Cu <i>µg/l</i>	0.57	0.576	0.566	0.066	0.061	S
H2		0.544	0.585	0.544	0.081	-0.003	S
H3		0.318	0.324	0.298	0.09	0.227	S
H4		0.491	0.495	0.487	0.053	0.078	S
H1	Ni <i>µg/l</i>	0.311	0.288	0.283	0.04	0.701	S
H2		0.286	0.273	0.26	0.027	0.969	S
H3		0.463	0.432	0.424	0.056	0.696	S
H4		0.385	0.36	0.353	0.032	0.984	S
H1	Pb <i>µg/l</i>	0.588	0.576	0.56	0.05	0.561	S
H2		0.316	0.351	0.32	0.03	-0.134	S
H3		0.351	0.36	0.346	0.062	0.083	S
H4		0.733	0.72	0.731	0.064	0.03	S
H1	Zn <i>µg/l</i>	3.48	2.88	3.104	0.544	0.692	S
H2		2.92	2.73	2.593	0.432	0.758	S
H3		4.13	3.42	3.594	0.552	0.97	S
H4		4.56	3.83	4.005	0.465	1.194	S

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* Z score in unitless

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S – Satisfactory: Your results deviates less than $\pm 25\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $< 1 \mu\text{g/l}$, Cd $< 0,5 \mu\text{g/l}$, Zn $< 10 \mu\text{g/l}$ and Cu $< 2 \mu\text{g/l}$ and less than $\pm 15\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $> 1 \mu\text{g/l}$, Cd $> 0,5 \mu\text{g/l}$, Zn $> 10 \mu\text{g/l}$ and Cu $> 2 \mu\text{g/l}$

Q – Questionable: Your result deviates between $\pm 25-50\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $< 1 \mu\text{g/l}$, Cd $< 0,5 \mu\text{g/l}$, Zn $< 10 \mu\text{g/l}$ and Cu $< 2 \mu\text{g/l}$ and between $\pm 15-30\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $> 1 \mu\text{g/l}$, Cd $> 0,5 \mu\text{g/l}$, Zn $> 10 \mu\text{g/l}$ and Cu $> 2 \mu\text{g/l}$

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

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

EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As <i>µg/l</i>	-999	0.336	0.343	0.026		B
H2		-999	0.156	0.162	0.034		B
H3		-999	0.324	0.323	0.029		B
H4		-999	0.336	0.355	0.039		B
H1	Cd <i>µg/l</i>	0.025	0.034	0.035	0.007	-1.469	Q
H2		0.015	0.02	0.019	0.004	-0.824	Q
H3		0.013	0.022	0.023	0.004	-2.468	Q
H4		0.024	0.036	0.039	0.004	-4.132	Q
H1	Cr <i>µg/l</i>	-999	0.264	0.273	0.017		B
H2		-999	0.195	0.188	0.018		B
H3		-999	0.288	0.288	0.016		B
H4		-999	0.36	0.363	0.022		B
H1	Cu <i>µg/l</i>	0.061	0.576	0.566	0.066	-7.629	U
H2		0.09	0.585	0.544	0.081	-5.599	U
H3		0.012	0.324	0.298	0.09	-3.183	U
H4		0.082	0.495	0.487	0.053	-7.656	U
H1	Ni <i>µg/l</i>	-999	0.288	0.283	0.04		B
H2		-999	0.273	0.26	0.027		B
H3		-999	0.432	0.424	0.056		B
H4		-999	0.36	0.353	0.032		B
H1	Pb <i>µg/l</i>	0.055	0.576	0.56	0.05	-10.046	U
H2		0.24	0.351	0.32	0.03	-2.668	Q
H3		0.15	0.36	0.346	0.062	-3.178	U
H4		0.24	0.72	0.731	0.064	-7.691	U
H1	Zn <i>µg/l</i>	-999	2.88	3.104	0.544		B
H2		-999	2.73	2.593	0.432		B
H3		-999	3.42	3.594	0.552		B
H4		-999	3.83	4.005	0.465		B

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

Laboratory 31, Slovak Hydrometeorological Institute (Slovakia)

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	0.405	0.336	0.343	0.026	2.369	S
H2		0.512	0.156	0.162	0.034	10.157	U
H3		0.297	0.324	0.323	0.029	-0.909	S
H4		0.454	0.336	0.355	0.039	2.522	Q
H1	Cd $\mu\text{g/l}$	0.063	0.034	0.035	0.007	3.847	U
H2		0.016	0.02	0.019	0.004	-0.596	S
H3		0.032	0.022	0.023	0.004	2.278	Q
H4		0.022	0.036	0.039	0.004	-4.7	Q
H1	Cr $\mu\text{g/l}$	0.302	0.264	0.273	0.017	1.722	S
H2		0.209	0.195	0.188	0.018	1.173	S
H3		0.211	0.288	0.288	0.016	-4.681	Q
H4		0.361	0.36	0.363	0.022	-0.1	S
H1	Cu $\mu\text{g/l}$	0.563	0.576	0.566	0.066	-0.044	S
H2		0.473	0.585	0.544	0.081	-0.878	S
H3		0.215	0.324	0.298	0.09	-0.921	Q
H4		0.408	0.495	0.487	0.053	-1.491	S
H1	Ni $\mu\text{g/l}$	0.524	0.288	0.283	0.04	5.963	U
H2		0.39	0.273	0.26	0.027	4.849	Q
H3		0.482	0.432	0.424	0.056	1.036	S
H4		0.592	0.36	0.353	0.032	7.415	U
H1	Pb $\mu\text{g/l}$	0.588	0.576	0.56	0.05	0.561	S
H2		0.63	0.351	0.32	0.03	10.332	U
H3		1.062	0.36	0.346	0.062	11.621	U
H4		0.823	0.72	0.731	0.064	1.439	S
H1	Zn $\mu\text{g/l}$	5.229	2.88	3.104	0.544	3.909	U
H2		3.116	2.73	2.593	0.432	1.211	S
H3		4.344	3.42	3.594	0.552	1.357	Q
H4		4.733	3.83	4.005	0.465	1.566	S

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	0.557	0.336	0.343	0.026	8.202	U
H2		0.286	0.156	0.162	0.034	3.606	U
H3		0.402	0.324	0.323	0.029	2.733	S
H4		0.354	0.336	0.355	0.039	-0.022	S
H1	Cd $\mu\text{g/l}$	0.339	0.034	0.035	0.007	42.458	U
H2		0.026	0.02	0.019	0.004	1.69	Q
H3		0.021	0.022	0.023	0.004	-0.47	S
H4		0.038	0.036	0.039	0.004	-0.153	S
H1	Cr $\mu\text{g/l}$	0.301	0.264	0.273	0.017	1.662	S
H2		0.194	0.195	0.188	0.018	0.322	S
H3		0.289	0.288	0.288	0.016	0.059	S
H4		0.36	0.36	0.363	0.022	-0.146	S
H1	Cu $\mu\text{g/l}$	0.73	0.576	0.566	0.066	2.479	Q
H2		0.687	0.585	0.544	0.081	1.76	S
H3		0.431	0.324	0.298	0.09	1.487	Q
H4		0.588	0.495	0.487	0.053	1.912	S
H1	Ni $\mu\text{g/l}$	0.36	0.288	0.283	0.04	1.912	Q
H2		0.3	0.273	0.26	0.027	1.492	S
H3		0.447	0.432	0.424	0.056	0.409	S
H4		0.364	0.36	0.353	0.032	0.331	S
H1	Pb $\mu\text{g/l}$	0.797	0.576	0.56	0.05	4.72	Q
H2		0.377	0.351	0.32	0.03	1.899	S
H3		0.389	0.36	0.346	0.062	0.7	S
H4		0.792	0.72	0.731	0.064	0.954	S
H1	Zn $\mu\text{g/l}$	3.706	2.88	3.104	0.544	1.108	Q
H2		3.05	2.73	2.593	0.432	1.058	S
H3		4.095	3.42	3.594	0.552	0.906	S
H4		4.581	3.83	4.005	0.465	1.239	S

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As <i>µg/l</i>	0.347	0.336	0.343	0.026	0.143	S
H2		0.165	0.156	0.162	0.034	0.098	S
H3		0.325	0.324	0.323	0.029	0.062	S
H4		0.322	0.336	0.355	0.039	-0.836	S
H1	Cd <i>µg/l</i>	0.041	0.034	0.035	0.007	0.77	S
H2		0.026	0.02	0.019	0.004	1.69	Q
H3		0.028	0.022	0.023	0.004	1.279	Q
H4		0.041	0.036	0.039	0.004	0.7	S
H1	Cr <i>µg/l</i>	0.263	0.264	0.273	0.017	-0.593	S
H2		0.185	0.195	0.188	0.018	-0.188	S
H3		0.274	0.288	0.288	0.016	-0.852	S
H4		0.319	0.36	0.363	0.022	-2.013	S
H1	Cu <i>µg/l</i>	0.553	0.576	0.566	0.066	-0.196	S
H2		0.523	0.585	0.544	0.081	-0.262	S
H3		0.336	0.324	0.298	0.09	0.428	S
H4		0.46	0.495	0.487	0.053	-0.508	S
H1	Ni <i>µg/l</i>	0.301	0.288	0.283	0.04	0.454	S
H2		0.274	0.273	0.26	0.027	0.522	S
H3		0.423	0.432	0.424	0.056	-0.022	S
H4		0.352	0.36	0.353	0.032	-0.042	S
H1	Pb <i>µg/l</i>	0.501	0.576	0.56	0.05	-1.17	S
H2		0.297	0.351	0.32	0.03	-0.768	S
H3		0.324	0.36	0.346	0.062	-0.355	S
H4		0.642	0.72	0.731	0.064	-1.395	S
H1	Zn <i>µg/l</i>	3.12	2.88	3.104	0.544	0.03	S
H2		2.72	2.73	2.593	0.432	0.295	S
H3		3.54	3.42	3.594	0.552	-0.098	S
H4		3.64	3.83	4.005	0.465	-0.786	S

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* Z score in unitless

☒ EMEP quality norm; letters indicate:

S – Satisfactory: Your results deviates less than $\pm 25\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $< 1 \mu\text{g/l}$, Cd $< 0,5 \mu\text{g/l}$, Zn $< 10 \mu\text{g/l}$ and Cu $< 2 \mu\text{g/l}$ and less than $\pm 15\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $> 1 \mu\text{g/l}$, Cd $> 0,5 \mu\text{g/l}$, Zn $> 10 \mu\text{g/l}$ and Cu $> 2 \mu\text{g/l}$

Q – Questionable: Your result deviates between $\pm 25-50\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $< 1 \mu\text{g/l}$, Cd $< 0,5 \mu\text{g/l}$, Zn $< 10 \mu\text{g/l}$ and Cu $< 2 \mu\text{g/l}$ and between $\pm 15-30\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $> 1 \mu\text{g/l}$, Cd $> 0,5 \mu\text{g/l}$, Zn $> 10 \mu\text{g/l}$ and Cu $> 2 \mu\text{g/l}$

U – Unsatisfactory: Your result deviates more than $\pm 50\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $< 1 \mu\text{g/l}$, Cd $< 0,5 \mu\text{g/l}$, Zn $< 10 \mu\text{g/l}$ and Cu $< 2 \mu\text{g/l}$ and more than $\pm 30\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $> 1 \mu\text{g/l}$, Cd $> 0,5 \mu\text{g/l}$, Zn $> 10 \mu\text{g/l}$ and Cu $> 2 \mu\text{g/l}$

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 – Analytical intercomparison of heavy metals in precipitation 2021

Laboratory 34, Ministry of Environment and Urbanisation (Turkey)

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
H1	As µg/l	0.348	0.336	0.343	0.026	0.181	S
H2		0.154	0.156	0.162	0.034	-0.22	S
H3		0.33	0.324	0.323	0.029	0.236	S
H4		0.351	0.336	0.355	0.039	-0.098	S
H1	Cd µg/l	0.036	0.034	0.035	0.007	0.07	S
H2		0.021	0.02	0.019	0.004	0.547	S
H3		0.023	0.022	0.023	0.004	0.03	S
H4		0.041	0.036	0.039	0.004	0.7	S
H1	Cr µg/l	0.269	0.264	0.273	0.017	-0.237	S
H2		0.187	0.195	0.188	0.018	-0.075	S
H3		0.294	0.288	0.288	0.016	0.363	S
H4		0.381	0.36	0.363	0.022	0.81	S
H1	Cu µg/l	0.363	0.576	0.566	0.066	-3.066	Q
H2		0.32	0.585	0.544	0.081	-2.764	Q
H3		0.062	0.324	0.298	0.09	-2.626	U
H4		0.255	0.495	0.487	0.053	-4.385	Q
H1	Ni µg/l	0.229	0.288	0.283	0.04	-1.325	S
H2		0.204	0.273	0.26	0.027	-2.09	Q
H3		28.614	0.432	0.424	0.056	505.579	U
H4		0.31	0.36	0.353	0.032	-1.347	S
H1	Pb µg/l	0.619	0.576	0.56	0.05	1.178	S
H2		0.365	0.351	0.32	0.03	1.499	S
H3		0.382	0.36	0.346	0.062	0.586	S
H4		0.365	0.72	0.731	0.064	-5.733	Q
H1	Zn µg/l	2.516	2.88	3.104	0.544	-1.08	S
H2		1.567	2.73	2.593	0.432	-2.373	Q
H3		2.481	3.42	3.594	0.552	-2.016	Q
H4		1.567	3.83	4.005	0.465	-5.246	U

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
H1	As µg/l	0.351	0.336	0.343	0.026	0.297	S
H2		0.159	0.156	0.162	0.034	-0.075	S
H3		0.338	0.324	0.323	0.029	0.513	S
H4		0.363	0.336	0.355	0.039	0.207	S
H1	Cd µg/l	0.038	0.034	0.035	0.007	0.35	S
H2		0.02	0.02	0.019	0.004	0.319	S
H3		0.024	0.022	0.023	0.004	0.28	S
H4		0.041	0.036	0.039	0.004	0.7	S
H1	Cr µg/l	-999	0.264	0.273	0.017		B
H2		-999	0.195	0.188	0.018		B
H3		-999	0.288	0.288	0.016		B
H4		-999	0.36	0.363	0.022		B
H1	Cu µg/l	-999	0.576	0.566	0.066		B
H2		-999	0.585	0.544	0.081		B
H3		-999	0.324	0.298	0.09		B
H4		-999	0.495	0.487	0.053		B
H1	Ni µg/l	0.294	0.288	0.283	0.04	0.281	S
H2		0.267	0.273	0.26	0.027	0.26	S
H3		0.433	0.432	0.424	0.056	0.158	S
H4		0.371	0.36	0.353	0.032	0.549	S
H1	Pb µg/l	0.555	0.576	0.56	0.05	-0.096	S
H2		0.322	0.351	0.32	0.03	0.066	S
H3		0.354	0.36	0.346	0.062	0.132	S
H4		0.743	0.72	0.731	0.064	0.186	S
H1	Zn µg/l	-999	2.88	3.104	0.544		B
H2		-999	2.73	2.593	0.432		B
H3		-999	3.42	3.594	0.552		B
H4		-999	3.83	4.005	0.465		B

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

Laboratory 36, Slovenian Environment Agency (Slovenia)

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
H1	As µg/l	0.332	0.336	0.343	0.026	-0.433	S
H2		0.145	0.156	0.162	0.034	-0.481	S
H3		0.316	0.324	0.323	0.029	-0.25	S
H4		0.334	0.336	0.355	0.039	-0.531	S
H1	Cd µg/l	0.035	0.034	0.035	0.007	-0.07	S
H2		0.02	0.02	0.019	0.004	0.319	S
H3		0.023	0.022	0.023	0.004	0.03	S
H4		0.04	0.036	0.039	0.004	0.416	S
H1	Cr µg/l	< 0.300	0.264	0.273	0.017		B
H2		< 0.300	0.195	0.188	0.018		B
H3		< 0.300	0.288	0.288	0.016		B
H4		0.358	0.36	0.363	0.022	-0.237	S
H1	Cu µg/l	0.581	0.576	0.566	0.066	0.228	S
H2		0.547	0.585	0.544	0.081	0.034	S
H3		0.323	0.324	0.298	0.09	0.283	S
H4		0.503	0.495	0.487	0.053	0.305	S
H1	Ni µg/l	< 0.300	0.288	0.283	0.04		B
H2		< 0.300	0.273	0.26	0.027		B
H3		0.429	0.432	0.424	0.056	0.086	S
H4		0.363	0.36	0.353	0.032	0.3	S
H1	Pb µg/l	0.563	0.576	0.56	0.05	0.063	S
H2		0.322	0.351	0.32	0.03	0.066	S
H3		0.397	0.36	0.346	0.062	0.83	S
H4		0.736	0.72	0.731	0.064	0.077	S
H1	Zn µg/l	2.85	2.88	3.104	0.544	-0.466	S
H2		2.54	2.73	2.593	0.432	-0.122	S
H3		3.94	3.42	3.594	0.552	0.626	S
H4		3.67	3.83	4.005	0.465	-0.721	S

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
H1	As µg/l	0.326	0.336	0.343	0.026	-0.663	S
H2		0.139	0.156	0.162	0.034	-0.655	S
H3		0.33	0.324	0.323	0.029	0.236	S
H4		0.324	0.336	0.355	0.039	-0.785	S
H1	Cd µg/l	0.022	0.034	0.035	0.007	-1.888	Q
H2		< 0.020	0.02	0.019	0.004	-1.967	Q
H3		< 0.020	0.022	0.023	0.004	-3.217	U
H4		0.035	0.036	0.039	0.004	-1.005	S
H1	Cr µg/l	< 0.500	0.264	0.273	0.017		B
H2		< 0.500	0.195	0.188	0.018		B
H3		< 0.500	0.288	0.288	0.016		B
H4		< 0.500	0.36	0.363	0.022		B
H1	Cu µg/l	< 1.000	0.576	0.566	0.066		B
H2		< 1.000	0.585	0.544	0.081		B
H3		< 1.000	0.324	0.298	0.09		B
H4		< 1.000	0.495	0.487	0.053		B
H1	Ni µg/l	0.16	0.288	0.283	0.04	-3.029	Q
H2		0.181	0.273	0.26	0.027	-2.948	Q
H3		0.333	0.432	0.424	0.056	-1.636	S
H4		0.251	0.36	0.353	0.032	-3.18	Q
H1	Pb µg/l	0.518	0.576	0.56	0.05	-0.832	S
H2		0.317	0.351	0.32	0.03	-0.101	S
H3		0.352	0.36	0.346	0.062	0.1	S
H4		0.733	0.72	0.731	0.064	0.03	S
H1	Zn µg/l	2.29	2.88	3.104	0.544	-1.496	S
H2		2.09	2.73	2.593	0.432	-1.163	S
H3		3.2	3.42	3.594	0.552	-0.714	S
H4		3.3	3.83	4.005	0.465	-1.517	S

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As <i>µg/l</i>	0.3	0.336	0.343	0.026	-1.661	S
H2		0.15	0.156	0.162	0.034	-0.336	S
H3		0.25	0.324	0.323	0.029	-2.54	S
H4		0.35	0.336	0.355	0.039	-0.124	S
H1	Cd <i>µg/l</i>	0.04	0.034	0.035	0.007	0.63	S
H2		0.028	0.02	0.019	0.004	2.148	Q
H3		0.024	0.022	0.023	0.004	0.28	S
H4		0.05	0.036	0.039	0.004	3.258	Q
H1	Cr <i>µg/l</i>	0.25	0.264	0.273	0.017	-1.365	S
H2		0.2	0.195	0.188	0.018	0.662	S
H3		0.3	0.288	0.288	0.016	0.728	S
H4		0.37	0.36	0.363	0.022	0.309	S
H1	Cu <i>µg/l</i>	0.6	0.576	0.566	0.066	0.515	S
H2		0.5	0.585	0.544	0.081	-0.545	S
H3		0.3	0.324	0.298	0.09	0.027	S
H4		0.4	0.495	0.487	0.053	-1.643	S
H1	Ni <i>µg/l</i>	0.2	0.288	0.283	0.04	-2.041	Q
H2		0.1	0.273	0.26	0.027	-5.97	U
H3		0.4	0.432	0.424	0.056	-0.434	S
H4		0.3	0.36	0.353	0.032	-1.657	S
H1	Pb <i>µg/l</i>	0.6	0.576	0.56	0.05	0.8	S
H2		0.3	0.351	0.32	0.03	-0.668	S
H3		0.4	0.36	0.346	0.062	0.879	S
H4		0.8	0.72	0.731	0.064	1.079	S
H1	Zn <i>µg/l</i>	4.7	2.88	3.104	0.544	2.936	U
H2		4.5	2.73	2.593	0.432	4.414	U
H3		4.6	3.42	3.594	0.552	1.821	Q
H4		4.4	3.83	4.005	0.465	0.849	S

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* Z score in unitless

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

Laboratory 41, Micro Pollutants Technology (France)

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As µg/l	0.364	0.336	0.343	0.026	0.795	S
H2		0.161	0.156	0.162	0.034	-0.017	S
H3		0.329	0.324	0.323	0.029	0.201	S
H4		0.349	0.336	0.355	0.039	-0.149	S
H1	Cd µg/l	< 0.100	0.034	0.035	0.007		B
H2		< 0.100	0.02	0.019	0.004		B
H3		< 0.100	0.022	0.023	0.004		B
H4		< 0.100	0.036	0.039	0.004		B
H1	Cr µg/l	< 0.500	0.264	0.273	0.017		B
H2		< 0.500	0.195	0.188	0.018		B
H3		< 0.500	0.288	0.288	0.016		B
H4		< 0.500	0.36	0.363	0.022		B
H1	Cu µg/l	0.587	0.576	0.566	0.066	0.318	S
H2		0.572	0.585	0.544	0.081	0.342	S
H3		< 0.500	0.324	0.298	0.09		B
H4		0.504	0.495	0.487	0.053	0.324	S
H1	Ni µg/l	< 0.500	0.288	0.283	0.04		B
H2		< 0.500	0.273	0.26	0.027		B
H3		< 0.500	0.432	0.424	0.056		B
H4		< 0.500	0.36	0.353	0.032		B
H1	Pb µg/l	0.571	0.576	0.56	0.05	0.223	S
H2		0.334	0.351	0.32	0.03	0.466	S
H3		0.364	0.36	0.346	0.062	0.294	S
H4		0.737	0.72	0.731	0.064	0.092	S
H1	Zn µg/l	2.09	2.88	3.104	0.544	-1.864	Q
H2		1.7	2.73	2.593	0.432	-2.065	Q
H3		2.49	3.42	3.594	0.552	-2	Q
H4		4.15	3.83	4.005	0.465	0.312	S

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

Laboratory 47, Jelenia Gora (Poland)

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
H1	As µg/l	0.325	0.336	0.343	0.026	-0.701	S
H2		0.136	0.156	0.162	0.034	-0.742	S
H3		0.305	0.324	0.323	0.029	-0.632	S
H4		0.326	0.336	0.355	0.039	-0.734	S
H1	Cd µg/l	0.029	0.034	0.035	0.007	-0.909	S
H2		0.011	0.02	0.019	0.004	-1.739	Q
H3		0.011	0.022	0.023	0.004	-2.967	Q
H4		0.031	0.036	0.039	0.004	-2.142	S
H1	Cr µg/l	0.263	0.264	0.273	0.017	-0.593	S
H2		0.188	0.195	0.188	0.018	-0.018	S
H3		0.294	0.288	0.288	0.016	0.363	S
H4		0.388	0.36	0.363	0.022	1.129	S
H1	Cu µg/l	0.467	0.576	0.566	0.066	-1.495	S
H2		0.462	0.585	0.544	0.081	-1.014	S
H3		0.214	0.324	0.298	0.09	-0.932	Q
H4		0.411	0.495	0.487	0.053	-1.435	S
H1	Ni µg/l	0.28	0.288	0.283	0.04	-0.065	S
H2		0.266	0.273	0.26	0.027	0.223	S
H3		0.419	0.432	0.424	0.056	-0.093	S
H4		0.357	0.36	0.353	0.032	0.114	S
H1	Pb µg/l	0.495	0.576	0.56	0.05	-1.29	S
H2		0.249	0.351	0.32	0.03	-2.368	Q
H3		0.279	0.36	0.346	0.062	-1.085	S
H4		0.668	0.72	0.731	0.064	-0.988	S
H1	Zn µg/l	3	2.88	3.104	0.544	-0.19	S
H2		2.55	2.73	2.593	0.432	-0.099	S
H3		3.45	3.42	3.594	0.552	-0.261	S
H4		3.8	3.83	4.005	0.465	-0.441	S

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

Laboratory 48, Afdeling Rapportering Water Labovestiging Gent, VMM (Belgium)

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As µg/l	0.338	0.336	0.343	0.026	-0.202	S
H2		0.161	0.156	0.162	0.034	-0.017	S
H3		0.331	0.324	0.323	0.029	0.27	S
H4		0.343	0.336	0.355	0.039	-0.302	S
H1	Cd µg/l	0.036	0.034	0.035	0.007	0.07	S
H2		0.02	0.02	0.019	0.004	0.319	S
H3		0.023	0.022	0.023	0.004	0.03	S
H4		0.039	0.036	0.039	0.004	0.132	S
H1	Cr µg/l	0.26	0.264	0.273	0.017	-0.771	S
H2		0.18	0.195	0.188	0.018	-0.472	S
H3		0.281	0.288	0.288	0.016	-0.427	S
H4		0.363	0.36	0.363	0.022	-0.009	S
H1	Cu µg/l	0.588	0.576	0.566	0.066	0.333	S
H2		0.589	0.585	0.544	0.081	0.552	S
H3		0.353	0.324	0.298	0.09	0.617	S
H4		0.512	0.495	0.487	0.053	0.475	S
H1	Ni µg/l	0.326	0.288	0.283	0.04	1.072	S
H2		0.294	0.273	0.26	0.027	1.268	S
H3		0.445	0.432	0.424	0.056	0.373	S
H4		0.403	0.36	0.353	0.032	1.543	S
H1	Pb µg/l	0.607	0.576	0.56	0.05	0.939	S
H2		0.35	0.351	0.32	0.03	0.999	S
H3		0.389	0.36	0.346	0.062	0.7	S
H4		0.786	0.72	0.731	0.064	0.86	S
H1	Zn µg/l	2.923	2.88	3.104	0.544	-0.332	S
H2		2.406	2.73	2.593	0.432	-0.432	S
H3		3.328	3.42	3.594	0.552	-0.482	S
H4		3.892	3.83	4.005	0.465	-0.243	S

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	0.483	0.336	0.343	0.026	5.362	Q
H2		0.206	0.156	0.162	0.034	1.287	Q
H3		0.457	0.324	0.323	0.029	4.641	Q
H4		0.477	0.336	0.355	0.039	3.107	Q
H1	Cd $\mu\text{g/l}$	0.035	0.034	0.035	0.007	-0.07	S
H2		0.014	0.02	0.019	0.004	-1.053	Q
H3		0.019	0.022	0.023	0.004	-0.969	S
H4		0.039	0.036	0.039	0.004	0.132	S
H1	Cr $\mu\text{g/l}$	0.229	0.264	0.273	0.017	-2.611	S
H2		0.152	0.195	0.188	0.018	-2.06	S
H3		0.252	0.288	0.288	0.016	-2.189	S
H4		0.325	0.36	0.363	0.022	-1.739	S
H1	Cu $\mu\text{g/l}$	0.599	0.576	0.566	0.066	0.499	S
H2		0.579	0.585	0.544	0.081	0.428	S
H3		0.31	0.324	0.298	0.09	0.138	S
H4		0.505	0.495	0.487	0.053	0.343	S
H1	Ni $\mu\text{g/l}$	0.033	0.288	0.283	0.04	-6.167	U
H2		0.009	0.273	0.26	0.027	-9.365	U
H3		0.193	0.432	0.424	0.056	-4.147	U
H4		0.134	0.36	0.353	0.032	-6.815	U
H1	Pb $\mu\text{g/l}$	0.352	0.576	0.56	0.05	-4.135	Q
H2		0.109	0.351	0.32	0.03	-7.034	U
H3		0.137	0.36	0.346	0.062	-3.389	U
H4		0.531	0.72	0.731	0.064	-3.134	Q
H1	Zn $\mu\text{g/l}$	5.148	2.88	3.104	0.544	3.76	U
H2		4.428	2.73	2.593	0.432	4.247	U
H3		5.837	3.42	3.594	0.552	4.061	U
H4		6.611	3.83	4.005	0.465	5.606	U

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* Z score in unitless

☒ EMEP quality norm; letters indicate:

S – Satisfactory: Your results deviates less than $\pm 25\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $< 1 \mu\text{g/l}$, Cd $< 0,5 \mu\text{g/l}$, Zn $< 10 \mu\text{g/l}$ and Cu $< 2 \mu\text{g/l}$ and less than $\pm 15\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $> 1 \mu\text{g/l}$, Cd $> 0,5 \mu\text{g/l}$, Zn $> 10 \mu\text{g/l}$ and Cu $> 2 \mu\text{g/l}$

Q – Questionable: Your result deviates between $\pm 25-50\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $< 1 \mu\text{g/l}$, Cd $< 0,5 \mu\text{g/l}$, Zn $< 10 \mu\text{g/l}$ and Cu $< 2 \mu\text{g/l}$ and between $\pm 15-30\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $> 1 \mu\text{g/l}$, Cd $> 0,5 \mu\text{g/l}$, Zn $> 10 \mu\text{g/l}$ and Cu $> 2 \mu\text{g/l}$

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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 – Analytical intercomparison of heavy metals in precipitation 2021

Laboratory 51, TERA Environnement (France)

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	0.328	0.336	0.343	0.026	-0.586	S
H2		0.139	0.156	0.162	0.034	-0.655	S
H3		0.307	0.324	0.323	0.029	-0.562	S
H4		0.323	0.336	0.355	0.039	-0.811	S
H1	Cd $\mu\text{g/l}$	0.041	0.034	0.035	0.007	0.77	S
H2		0.022	0.02	0.019	0.004	0.776	S
H3		0.026	0.022	0.023	0.004	0.779	S
H4		0.045	0.036	0.039	0.004	1.837	Q
H1	Cr $\mu\text{g/l}$	< 0.500	0.264	0.273	0.017		B
H2		< 0.500	0.195	0.188	0.018		B
H3		< 0.500	0.288	0.288	0.016		B
H4		< 0.500	0.36	0.363	0.022		B
H1	Cu $\mu\text{g/l}$	0.561	0.576	0.566	0.066	-0.075	S
H2		0.531	0.585	0.544	0.081	-0.163	S
H3		< 0.500	0.324	0.298	0.09		B
H4		< 0.500	0.495	0.487	0.053		B
H1	Ni $\mu\text{g/l}$	0.297	0.288	0.283	0.04	0.355	S
H2		0.266	0.273	0.26	0.027	0.223	S
H3		0.43	0.432	0.424	0.056	0.104	S
H4		0.354	0.36	0.353	0.032	0.021	S
H1	Pb $\mu\text{g/l}$	0.62	0.576	0.56	0.05	1.198	S
H2		0.359	0.351	0.32	0.03	1.299	S
H3		0.39	0.36	0.346	0.062	0.716	S
H4		0.79	0.72	0.731	0.064	0.922	S
H1	Zn $\mu\text{g/l}$	2.812	2.88	3.104	0.544	-0.536	S
H2		2.433	2.73	2.593	0.432	-0.369	S
H3		3.123	3.42	3.594	0.552	-0.854	S
H4		3.708	3.83	4.005	0.465	-0.639	S

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As µg/l	0.32	0.336	0.343	0.026	-0.893	S
H2		0.13	0.156	0.162	0.034	-0.916	S
H3		0.3	0.324	0.323	0.029	-0.805	S
H4		0.33	0.336	0.355	0.039	-0.633	S
H1	Cd µg/l	0.029	0.034	0.035	0.007	-0.909	S
H2		0.012	0.02	0.019	0.004	-1.51	Q
H3		0.016	0.022	0.023	0.004	-1.718	Q
H4		0.032	0.036	0.039	0.004	-1.858	S
H1	Cr µg/l	0.27	0.264	0.273	0.017	-0.178	S
H2		0.19	0.195	0.188	0.018	0.095	S
H3		0.29	0.288	0.288	0.016	0.12	S
H4		0.36	0.36	0.363	0.022	-0.146	S
H1	Cu µg/l	0.53	0.576	0.566	0.066	-0.543	S
H2		0.48	0.585	0.544	0.081	-0.792	S
H3		0.3	0.324	0.298	0.09	0.027	S
H4		0.42	0.495	0.487	0.053	-1.265	S
H1	Ni µg/l	0.3	0.288	0.283	0.04	0.429	S
H2		0.27	0.273	0.26	0.027	0.372	S
H3		0.47	0.432	0.424	0.056	0.821	S
H4		0.37	0.36	0.353	0.032	0.518	S
H1	Pb µg/l	0.56	0.576	0.56	0.05	0.004	S
H2		0.31	0.351	0.32	0.03	-0.334	S
H3		0.34	0.36	0.346	0.062	-0.095	S
H4		0.76	0.72	0.731	0.064	0.453	S
H1	Zn µg/l	2.5	2.88	3.104	0.544	-1.11	S
H2		2.1	2.73	2.593	0.432	-1.14	S
H3		3.1	3.42	3.594	0.552	-0.895	S
H4		3.1	3.83	4.005	0.465	-1.947	S

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As µg/l	-999	0.336	0.343	0.026		B
H2		-999	0.156	0.162	0.034		B
H3		-999	0.324	0.323	0.029		B
H4		-999	0.336	0.355	0.039		B
H1	Cd µg/l	0.038	0.034	0.035	0.007	0.294	S
H2		0.021	0.02	0.019	0.004	0.456	S
H3		0.023	0.022	0.023	0.004	0.08	S
H4		0.041	0.036	0.039	0.004	0.672	S
H1	Cr µg/l	0.262	0.264	0.273	0.017	-0.653	S
H2		0.181	0.195	0.188	0.018	-0.415	S
H3		0.283	0.288	0.288	0.016	-0.305	S
H4		0.358	0.36	0.363	0.022	-0.237	S
H1	Cu µg/l	0.603	0.576	0.566	0.066	0.56	S
H2		0.575	0.585	0.544	0.081	0.379	S
H3		0.335	0.324	0.298	0.09	0.417	S
H4		0.515	0.495	0.487	0.053	0.532	S
H1	Ni µg/l	0.277	0.288	0.283	0.04	-0.139	S
H2		0.241	0.273	0.26	0.027	-0.71	S
H3		0.414	0.432	0.424	0.056	-0.183	S
H4		0.341	0.36	0.353	0.032	-0.383	S
H1	Pb µg/l	0.585	0.576	0.56	0.05	0.501	S
H2		0.328	0.351	0.32	0.03	0.266	S
H3		0.362	0.36	0.346	0.062	0.262	S
H4		0.768	0.72	0.731	0.064	0.578	S
H1	Zn µg/l	3.71	2.88	3.104	0.544	1.115	Q
H2		3.13	2.73	2.593	0.432	1.243	S
H3		4.16	3.42	3.594	0.552	1.024	S
H4		4.95	3.83	4.005	0.465	2.033	Q

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	< 4.000	0.336	0.343	0.026		B
H2		< 4.000	0.156	0.162	0.034		B
H3		< 4.000	0.324	0.323	0.029		B
H4		< 4.000	0.336	0.355	0.039		B
H1	Cd $\mu\text{g/l}$	< 0.100	0.034	0.035	0.007		B
H2		< 0.100	0.02	0.019	0.004		B
H3		< 0.100	0.022	0.023	0.004		B
H4		< 0.100	0.036	0.039	0.004		B
H1	Cr $\mu\text{g/l}$	0.3	0.264	0.273	0.017	1.603	S
H2		0.4	0.195	0.188	0.018	12.006	U
H3		0.3	0.288	0.288	0.016	0.728	S
H4		0.5	0.36	0.363	0.022	6.229	Q
H1	Cu $\mu\text{g/l}$	< 1.000	0.576	0.566	0.066		B
H2		< 1.000	0.585	0.544	0.081		B
H3		< 1.000	0.324	0.298	0.09		B
H4		< 1.000	0.495	0.487	0.053		B
H1	Ni $\mu\text{g/l}$	< 0.500	0.288	0.283	0.04		B
H2		< 0.500	0.273	0.26	0.027		B
H3		0.5	0.432	0.424	0.056	1.359	S
H4		0.6	0.36	0.353	0.032	7.664	U
H1	Pb $\mu\text{g/l}$	< 0.700	0.576	0.56	0.05		B
H2		< 0.700	0.351	0.32	0.03		B
H3		< 0.700	0.36	0.346	0.062		B
H4		< 0.700	0.72	0.731	0.064	-5.968	U
H1	Zn $\mu\text{g/l}$	3.2	2.88	3.104	0.544	0.177	S
H2		2.7	2.73	2.593	0.432	0.248	S
H3		3.5	3.42	3.594	0.552	-0.171	S
H4		4.1	3.83	4.005	0.465	0.204	S

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* Z score in unitless

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

Laboratory 117, SBS Standortserkundung/Bodenmonitoring (Germany)

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	-999	0.336	0.343	0.026		B
H2		-999	0.156	0.162	0.034		B
H3		-999	0.324	0.323	0.029		B
H4		-999	0.336	0.355	0.039		B
H1	Cd $\mu\text{g/l}$	< 0.050	0.034	0.035	0.007		B
H2		< 0.050	0.02	0.019	0.004		B
H3		< 0.050	0.022	0.023	0.004		B
H4		< 0.050	0.036	0.039	0.004		B
H1	Cr $\mu\text{g/l}$	< 0.400	0.264	0.273	0.017		B
H2		< 0.400	0.195	0.188	0.018		B
H3		< 0.400	0.288	0.288	0.016		B
H4		< 0.400	0.36	0.363	0.022		B
H1	Cu $\mu\text{g/l}$	0.53	0.576	0.566	0.066	-0.543	S
H2		0.49	0.585	0.544	0.081	-0.669	S
H3		0.28	0.324	0.298	0.09	-0.196	S
H4		0.48	0.495	0.487	0.053	-0.13	S
H1	Ni $\mu\text{g/l}$	< 0.700	0.288	0.283	0.04		B
H2		< 0.700	0.273	0.26	0.027		B
H3		< 0.700	0.432	0.424	0.056		B
H4		< 0.700	0.36	0.353	0.032		B
H1	Pb $\mu\text{g/l}$	0.56	0.576	0.56	0.05	0.004	S
H2		0.28	0.351	0.32	0.03	-1.334	S
H3		0.32	0.36	0.346	0.062	-0.42	S
H4		0.7	0.72	0.731	0.064	-0.487	S
H1	Zn $\mu\text{g/l}$	4.3	2.88	3.104	0.544	2.2	Q
H2		4.3	2.73	2.593	0.432	3.951	U
H3		5	3.42	3.594	0.552	2.545	Q
H4		5	3.83	4.005	0.465	2.14	Q

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* Z score in unitless

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

EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As µg/l	0.326	0.336	0.343	0.026	-0.663	S
H2		0.172	0.156	0.162	0.034	0.301	S
H3		0.359	0.324	0.323	0.029	1.242	S
H4		0.377	0.336	0.355	0.039	0.563	S
H1	Cd µg/l	0.035	0.034	0.035	0.007	-0.14	S
H2		0.017	0.02	0.019	0.004	-0.276	S
H3		0.022	0.022	0.023	0.004	-0.22	S
H4		0.037	0.036	0.039	0.004	-0.465	S
H1	Cr µg/l	0.253	0.264	0.273	0.017	-1.187	S
H2		0.175	0.195	0.188	0.018	-0.756	S
H3		0.28	0.288	0.288	0.016	-0.488	S
H4		0.358	0.36	0.363	0.022	-0.237	S
H1	Cu µg/l	0.603	0.576	0.566	0.066	0.56	S
H2		0.574	0.585	0.544	0.081	0.367	S
H3		0.344	0.324	0.298	0.09	0.517	S
H4		0.508	0.495	0.487	0.053	0.4	S
H1	Ni µg/l	0.296	0.288	0.283	0.04	0.331	S
H2		0.257	0.273	0.26	0.027	-0.113	S
H3		0.45	0.432	0.424	0.056	0.462	S
H4		0.365	0.36	0.353	0.032	0.362	S
H1	Pb µg/l	0.538	0.576	0.56	0.05	-0.434	S
H2		0.308	0.351	0.32	0.03	-0.401	S
H3		0.332	0.36	0.346	0.062	-0.225	S
H4		0.711	0.72	0.731	0.064	-0.315	S
H1	Zn µg/l	2.88	2.88	3.104	0.544	-0.411	S
H2		2.5	2.73	2.593	0.432	-0.214	S
H3		3.22	3.42	3.594	0.552	-0.678	S
H4		3.67	3.83	4.005	0.465	-0.721	S

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

Laboratory 146, Luxembourg Institute of Science and Technology (LIST) (Luxembourg)

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	0.346	0.336	0.343	0.026	0.105	S
H2		< 0.251	0.156	0.162	0.034		B
H3		0.332	0.324	0.323	0.029	0.305	S
H4		0.346	0.336	0.355	0.039	-0.226	S
H1	Cd $\mu\text{g/l}$	0.034	0.034	0.035	0.007	-0.21	S
H2		< 0.025	0.02	0.019	0.004		B
H3		0.026	0.022	0.023	0.004	0.779	S
H4		0.041	0.036	0.039	0.004	0.7	S
H1	Cr $\mu\text{g/l}$	0.279	0.264	0.273	0.017	0.356	S
H2		0.197	0.195	0.188	0.018	0.492	S
H3		0.297	0.288	0.288	0.016	0.546	S
H4		0.374	0.36	0.363	0.022	0.492	S
H1	Cu $\mu\text{g/l}$	0.587	0.576	0.566	0.066	0.318	S
H2		0.562	0.585	0.544	0.081	0.219	S
H3		0.321	0.324	0.298	0.09	0.261	S
H4		0.501	0.495	0.487	0.053	0.267	S
H1	Ni $\mu\text{g/l}$	0.324	0.288	0.283	0.04	1.022	S
H2		0.256	0.273	0.26	0.027	-0.15	S
H3		0.433	0.432	0.424	0.056	0.158	S
H4		0.386	0.36	0.353	0.032	1.015	S
H1	Pb $\mu\text{g/l}$	0.58	0.576	0.56	0.05	0.402	S
H2		0.33	0.351	0.32	0.03	0.332	S
H3		0.398	0.36	0.346	0.062	0.846	S
H4		0.747	0.72	0.731	0.064	0.249	S
H1	Zn $\mu\text{g/l}$	3.067	2.88	3.104	0.544	-0.067	S
H2		2.638	2.73	2.593	0.432	0.105	S
H3		4.056	3.42	3.594	0.552	0.836	S
H4		3.958	3.83	4.005	0.465	-0.101	S

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As µg/l	-999	0.336	0.343	0.026		B
H2		-999	0.156	0.162	0.034		B
H3		-999	0.324	0.323	0.029		B
H4		-999	0.336	0.355	0.039		B
H1	Cd µg/l	-999	0.034	0.035	0.007		B
H2		-999	0.02	0.019	0.004		B
H3		-999	0.022	0.023	0.004		B
H4		-999	0.036	0.039	0.004		B
H1	Cr µg/l	-999	0.264	0.273	0.017		B
H2		-999	0.195	0.188	0.018		B
H3		-999	0.288	0.288	0.016		B
H4		-999	0.36	0.363	0.022		B
H1	Cu µg/l	-999	0.576	0.566	0.066		B
H2		-999	0.585	0.544	0.081		B
H3		-999	0.324	0.298	0.09		B
H4		-999	0.495	0.487	0.053		B
H1	Ni µg/l	-999	0.288	0.283	0.04		B
H2		-999	0.273	0.26	0.027		B
H3		-999	0.432	0.424	0.056		B
H4		-999	0.36	0.353	0.032		B
H1	Pb µg/l	-999	0.576	0.56	0.05		B
H2		-999	0.351	0.32	0.03		B
H3		-999	0.36	0.346	0.062		B
H4		-999	0.72	0.731	0.064		B
H1	Zn µg/l	3.05	2.88	3.104	0.544	-0.098	S
H2		2.57	2.73	2.593	0.432	-0.052	S
H3		3.39	3.42	3.594	0.552	-0.37	S
H4		3.86	3.83	4.005	0.465	-0.312	S

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

Laboratory 171, IMT Nord Europe (France)

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	0.305	0.336	0.343	0.026	-1.469	S
H2		0.136	0.156	0.162	0.034	-0.742	S
H3		0.294	0.324	0.323	0.029	-1.013	S
H4		0.31	0.336	0.355	0.039	-1.141	S
H1	Cd $\mu\text{g/l}$	0.032	0.034	0.035	0.007	-0.489	S
H2		0.016	0.02	0.019	0.004	-0.596	S
H3		0.022	0.022	0.023	0.004	-0.22	S
H4		0.035	0.036	0.039	0.004	-1.005	S
H1	Cr $\mu\text{g/l}$	0.252	0.264	0.273	0.017	-1.246	S
H2		0.176	0.195	0.188	0.018	-0.699	S
H3		0.272	0.288	0.288	0.016	-0.974	S
H4		0.35	0.36	0.363	0.022	-0.601	S
H1	Cu $\mu\text{g/l}$	0.556	0.576	0.566	0.066	-0.15	S
H2		0.534	0.585	0.544	0.081	-0.126	S
H3		0.316	0.324	0.298	0.09	0.205	S
H4		0.487	0.495	0.487	0.053	0.002	S
H1	Ni $\mu\text{g/l}$	0.278	0.288	0.283	0.04	-0.114	S
H2		0.249	0.273	0.26	0.027	-0.411	S
H3		0.417	0.432	0.424	0.056	-0.129	S
H4		0.37	0.36	0.353	0.032	0.518	S
H1	Pb $\mu\text{g/l}$	0.553	0.576	0.56	0.05	-0.136	S
H2		0.313	0.351	0.32	0.03	-0.234	S
H3		0.349	0.36	0.346	0.062	0.051	S
H4		0.715	0.72	0.731	0.064	-0.252	S
H1	Zn $\mu\text{g/l}$	2.978	2.88	3.104	0.544	-0.231	S
H2		2.413	2.73	2.593	0.432	-0.416	S
H3		3.611	3.42	3.594	0.552	0.03	S
H4		3.5	3.83	4.005	0.465	-1.087	S

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S – Satisfactory: Your results deviates less than $\pm 25\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $< 1 \mu\text{g/l}$, Cd $< 0,5 \mu\text{g/l}$, Zn $< 10 \mu\text{g/l}$ and Cu $< 2 \mu\text{g/l}$ and less than $\pm 15\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $> 1 \mu\text{g/l}$, Cd $> 0,5 \mu\text{g/l}$, Zn $> 10 \mu\text{g/l}$ and Cu $> 2 \mu\text{g/l}$

Q – Questionable: Your result deviates between $\pm 25-50\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $< 1 \mu\text{g/l}$, Cd $< 0,5 \mu\text{g/l}$, Zn $< 10 \mu\text{g/l}$ and Cu $< 2 \mu\text{g/l}$ and between $\pm 15-30\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $> 1 \mu\text{g/l}$, Cd $> 0,5 \mu\text{g/l}$, Zn $> 10 \mu\text{g/l}$ and Cu $> 2 \mu\text{g/l}$

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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 – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	0.34	0.336	0.343	0.026	-0.126	S
H2		0.149	0.156	0.162	0.034	-0.365	S
H3		0.334	0.324	0.323	0.029	0.374	S
H4		0.355	0.336	0.355	0.039	0.003	S
H1	Cd $\mu\text{g/l}$	0.031	0.034	0.035	0.007	-0.629	S
H2		0.02	0.02	0.019	0.004	0.319	S
H3		0.022	0.022	0.023	0.004	-0.22	S
H4		0.034	0.036	0.039	0.004	-1.29	S
H1	Cr $\mu\text{g/l}$	0.285	0.264	0.273	0.017	0.713	S
H2		0.207	0.195	0.188	0.018	1.059	S
H3		0.315	0.288	0.288	0.016	1.64	S
H4		0.381	0.36	0.363	0.022	0.81	S
H1	Cu $\mu\text{g/l}$	0.568	0.576	0.566	0.066	0.031	S
H2		0.519	0.585	0.544	0.081	-0.311	S
H3		0.375	0.324	0.298	0.09	0.863	S
H4		0.509	0.495	0.487	0.053	0.418	S
H1	Ni $\mu\text{g/l}$	0.274	0.288	0.283	0.04	-0.213	S
H2		0.272	0.273	0.26	0.027	0.447	S
H3		0.409	0.432	0.424	0.056	-0.273	S
H4		0.349	0.36	0.353	0.032	-0.135	S
H1	Pb $\mu\text{g/l}$	0.576	0.576	0.56	0.05	0.322	S
H2		0.34	0.351	0.32	0.03	0.666	S
H3		0.362	0.36	0.346	0.062	0.262	S
H4		0.751	0.72	0.731	0.064	0.312	S
H1	Zn $\mu\text{g/l}$	3.14	2.88	3.104	0.544	0.067	S
H2		2.62	2.73	2.593	0.432	0.063	S
H3		3.64	3.42	3.594	0.552	0.083	S
H4		3.99	3.83	4.005	0.465	-0.033	S

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U – Unsatisfactory: Your result deviates more than $\pm 50\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $< 1 \mu\text{g/l}$, Cd $< 0,5 \mu\text{g/l}$, Zn $< 10 \mu\text{g/l}$ and Cu $< 2 \mu\text{g/l}$ and more than $\pm 30\%$ of the expected value for theoretical values of Pb, Ni, Cr and As $> 1 \mu\text{g/l}$, Cd $> 0,5 \mu\text{g/l}$, Zn $> 10 \mu\text{g/l}$ and Cu $> 2 \mu\text{g/l}$

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

Laboratory 179, Environmental Pollution Monitoring Center (Russian Federation)

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As µg/l	-999	0.336	0.343	0.026		B
H2		-999	0.156	0.162	0.034		B
H3		-999	0.324	0.323	0.029		B
H4		-999	0.336	0.355	0.039		B
H1	Cd µg/l	< 0.200	0.034	0.035	0.007		B
H2		< 0.200	0.02	0.019	0.004		B
H3		< 0.200	0.022	0.023	0.004		B
H4		< 0.200	0.036	0.039	0.004		B
H1	Cr µg/l	< 1.000	0.264	0.273	0.017		B
H2		< 1.000	0.195	0.188	0.018		B
H3		< 1.000	0.288	0.288	0.016		B
H4		< 1.000	0.36	0.363	0.022		B
H1	Cu µg/l	< 1.000	0.576	0.566	0.066		B
H2		< 1.000	0.585	0.544	0.081		B
H3		< 1.000	0.324	0.298	0.09		B
H4		< 1.000	0.495	0.487	0.053		B
H1	Ni µg/l	< 5.000	0.288	0.283	0.04		B
H2		< 5.000	0.273	0.26	0.027		B
H3		< 5.000	0.432	0.424	0.056		B
H4		< 5.000	0.36	0.353	0.032		B
H1	Pb µg/l	< 2.000	0.576	0.56	0.05		B
H2		< 2.000	0.351	0.32	0.03		B
H3		< 2.000	0.36	0.346	0.062		B
H4		< 2.000	0.72	0.731	0.064		B
H1	Zn µg/l	< 4.000	2.88	3.104	0.544		B
H2		< 4.000	2.73	2.593	0.432		B
H3		< 4.000	3.42	3.594	0.552		B
H4		< 4.000	3.83	4.005	0.465		B

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

Laboratory 181, TNO innovation for life (The Netherlands)

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	0.34	0.336	0.343	0.026	-0.126	S
H2		0.14	0.156	0.162	0.034	-0.626	S
H3		0.33	0.324	0.323	0.029	0.236	S
H4		0.035	0.336	0.355	0.039	-8.137	U
H1	Cd $\mu\text{g/l}$	0.037	0.034	0.035	0.007	0.21	S
H2		0.018	0.02	0.019	0.004	-0.138	S
H3		0.02	0.022	0.023	0.004	-0.719	S
H4		0.039	0.036	0.039	0.004	0.132	S
H1	Cr $\mu\text{g/l}$	0.26	0.264	0.273	0.017	-0.771	S
H2		0.18	0.195	0.188	0.018	-0.472	S
H3		0.29	0.288	0.288	0.016	0.12	S
H4		0.38	0.36	0.363	0.022	0.765	S
H1	Cu $\mu\text{g/l}$	0.55	0.576	0.566	0.066	-0.241	S
H2		0.54	0.585	0.544	0.081	-0.052	S
H3		0.33	0.324	0.298	0.09	0.361	S
H4		0.5	0.495	0.487	0.053	0.248	S
H1	Ni $\mu\text{g/l}$	0.26	0.288	0.283	0.04	-0.559	S
H2		0.29	0.273	0.26	0.027	1.118	S
H3		0.44	0.432	0.424	0.056	0.283	S
H4		0.38	0.36	0.353	0.032	0.828	S
H1	Pb $\mu\text{g/l}$	0.58	0.576	0.56	0.05	0.402	S
H2		0.34	0.351	0.32	0.03	0.666	S
H3		0.37	0.36	0.346	0.062	0.392	S
H4		0.77	0.72	0.731	0.064	0.609	S
H1	Zn $\mu\text{g/l}$	2.43	2.88	3.104	0.544	-1.239	S
H2		2.07	2.73	2.593	0.432	-1.209	S
H3		2.91	3.42	3.594	0.552	-1.239	S
H4		3.42	3.83	4.005	0.465	-1.259	S

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

EMEP – Analytical intercomparison of heavy metals in precipitation 2021

Laboratory 183, Public health institute Uzice (Republic of Serbia)

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
H1	As $\mu\text{g/l}$	0.376	0.336	0.343	0.026	1.256	S
H2		0.155	0.156	0.162	0.034	-0.191	S
H3		0.455	0.324	0.323	0.029	4.572	Q
H4		0.314	0.336	0.355	0.039	-1.04	S
H1	Cd $\mu\text{g/l}$	0.033	0.034	0.035	0.007	-0.35	S
H2		0.086	0.02	0.019	0.004	15.521	U
H3		-999	0.022	0.023	0.004		B
H4		0.036	0.036	0.039	0.004	-0.721	S
H1	Cr $\mu\text{g/l}$	0.288	0.264	0.273	0.017	0.891	S
H2		0.228	0.195	0.188	0.018	2.25	S
H3		0.219	0.288	0.288	0.016	-4.195	S
H4		0.363	0.36	0.363	0.022	-0.009	S
H1	Cu $\mu\text{g/l}$	0.594	0.576	0.566	0.066	0.424	S
H2		0.559	0.585	0.544	0.081	0.182	S
H3		0.252	0.324	0.298	0.09	-0.508	S
H4		0.474	0.495	0.487	0.053	-0.243	S
H1	Ni $\mu\text{g/l}$	0.267	0.288	0.283	0.04	-0.386	S
H2		0.239	0.273	0.26	0.027	-0.784	S
H3		0.362	0.432	0.424	0.056	-1.116	S
H4		0.326	0.36	0.353	0.032	-0.849	S
H1	Pb $\mu\text{g/l}$	0.519	0.576	0.56	0.05	-0.812	S
H2		0.653	0.351	0.32	0.03	11.099	U
H3		-999	0.36	0.346	0.062		B
H4		0.577	0.72	0.731	0.064	-2.413	S
H1	Zn $\mu\text{g/l}$	3.25	2.88	3.104	0.544	0.269	S
H2		2.87	2.73	2.593	0.432	0.642	S
H3		3.54	3.42	3.594	0.552	-0.098	S
H4		3.84	3.83	4.005	0.465	-0.355	S

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* Z score in unitless

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

Laboratory 185, Public Health Centre - Cacak, Department for Sanitary Chemistry and Ecotoxicology (Republic of Serbia)

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	< 2.000	0.336	0.343	0.026		B
H2		< 2.000	0.156	0.162	0.034		B
H3		< 2.000	0.324	0.323	0.029		B
H4		< 2.000	0.336	0.355	0.039		B
H1	Cd $\mu\text{g/l}$	< 0.100	0.034	0.035	0.007		B
H2		< 0.100	0.02	0.019	0.004		B
H3		< 0.100	0.022	0.023	0.004		B
H4		< 0.100	0.036	0.039	0.004		B
H1	Cr $\mu\text{g/l}$	-999	0.264	0.273	0.017		B
H2		-999	0.195	0.188	0.018		B
H3		-999	0.288	0.288	0.016		B
H4		-999	0.36	0.363	0.022		B
H1	Cu $\mu\text{g/l}$	-999	0.576	0.566	0.066		B
H2		-999	0.585	0.544	0.081		B
H3		-999	0.324	0.298	0.09		B
H4		-999	0.495	0.487	0.053		B
H1	Ni $\mu\text{g/l}$	< 4.000	0.288	0.283	0.04		B
H2		< 4.000	0.273	0.26	0.027		B
H3		< 4.000	0.432	0.424	0.056		B
H4		< 4.000	0.36	0.353	0.032		B
H1	Pb $\mu\text{g/l}$	< 3.000	0.576	0.56	0.05		B
H2		< 3.000	0.351	0.32	0.03		B
H3		< 3.000	0.36	0.346	0.062		B
H4		< 3.000	0.72	0.731	0.064		B
H1	Zn $\mu\text{g/l}$	-999	2.88	3.104	0.544		B
H2		-999	2.73	2.593	0.432		B
H3		-999	3.42	3.594	0.552		B
H4		-999	3.83	4.005	0.465		B

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm *
H1	As µg/l	0.4	0.336	0.343	0.026	2.177	S
H2		0.2	0.156	0.162	0.034	1.113	Q
H3		0.3	0.324	0.323	0.029	-0.805	S
H4		0.4	0.336	0.355	0.039	1.148	S
H1	Cd µg/l	< 0.040	0.034	0.035	0.007		B
H2		< 0.040	0.02	0.019	0.004		B
H3		< 0.040	0.022	0.023	0.004		B
H4		0.04	0.036	0.039	0.004	0.416	S
H1	Cr µg/l	< 0.400	0.264	0.273	0.017		B
H2		< 0.400	0.195	0.188	0.018		B
H3		< 0.400	0.288	0.288	0.016		B
H4		0.4	0.36	0.363	0.022	1.675	S
H1	Cu µg/l	0.6	0.576	0.566	0.066	0.515	S
H2		0.7	0.585	0.544	0.081	1.92	S
H3		0.4	0.324	0.298	0.09	1.141	S
H4		0.55	0.495	0.487	0.053	1.194	S
H1	Ni µg/l	< 2.000	0.288	0.283	0.04		B
H2		< 2.000	0.273	0.26	0.027		B
H3		< 2.000	0.432	0.424	0.056		B
H4		< 2.000	0.36	0.353	0.032		B
H1	Pb µg/l	< 1.000	0.576	0.56	0.05		B
H2		< 1.000	0.351	0.32	0.03		B
H3		< 1.000	0.36	0.346	0.062		B
H4		< 1.000	0.72	0.731	0.064		B
H1	Zn µg/l	3.2	2.88	3.104	0.544	0.177	S
H2		3.6	2.73	2.593	0.432	2.331	Q
H3		3.8	3.42	3.594	0.552	0.372	S
H4		4.2	3.83	4.005	0.465	0.419	S

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As $\mu\text{g/l}$	-999	0.336	0.343	0.026		B
H2		-999	0.156	0.162	0.034		B
H3		-999	0.324	0.323	0.029		B
H4		-999	0.336	0.355	0.039		B
H1	Cd $\mu\text{g/l}$	-999	0.034	0.035	0.007		B
H2		-999	0.02	0.019	0.004		B
H3		-999	0.022	0.023	0.004		B
H4		-999	0.036	0.039	0.004		B
H1	Cr $\mu\text{g/l}$	-999	0.264	0.273	0.017		B
H2		-999	0.195	0.188	0.018		B
H3		-999	0.288	0.288	0.016		B
H4		-999	0.36	0.363	0.022		B
H1	Cu $\mu\text{g/l}$	-999	0.576	0.566	0.066		B
H2		-999	0.585	0.544	0.081		B
H3		-999	0.324	0.298	0.09		B
H4		-999	0.495	0.487	0.053		B
H1	Ni $\mu\text{g/l}$	-999	0.288	0.283	0.04		B
H2		-999	0.273	0.26	0.027		B
H3		-999	0.432	0.424	0.056		B
H4		-999	0.36	0.353	0.032		B
H1	Pb $\mu\text{g/l}$	-999	0.576	0.56	0.05		B
H2		-999	0.351	0.32	0.03		B
H3		-999	0.36	0.346	0.062		B
H4		-999	0.72	0.731	0.064		B
H1	Zn $\mu\text{g/l}$	< 11.000	2.88	3.104	0.544		B
H2		< 11.000	2.73	2.593	0.432		B
H3		< 11.000	3.42	3.594	0.552		B
H4		< 11.000	3.83	4.005	0.465		B

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EMEP – Analytical intercomparison of heavy metals in precipitation 2021

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

Heavy metals in precipitation (H-samples)

Sample name	Determinand	Reported value	Expected value	Mean value	Standard deviation	Z score *	EMEP quality norm ^x
H1	As µg/l	< 1.000	0.336	0.343	0.026		B
H2		< 1.000	0.156	0.162	0.034		B
H3		< 1.000	0.324	0.323	0.029		B
H4		< 1.000	0.336	0.355	0.039		B
H1	Cd µg/l	0.044	0.034	0.035	0.007	1.189	Q
H2		0.077	0.02	0.019	0.004	13.349	U
H3		0.031	0.022	0.023	0.004	2.028	Q
H4		0.047	0.036	0.039	0.004	2.406	Q
H1	Cr µg/l	< 1.000	0.264	0.273	0.017		B
H2		< 1.000	0.195	0.188	0.018		B
H3		< 1.000	0.288	0.288	0.016		B
H4		< 1.000	0.36	0.363	0.022		B
H1	Cu µg/l	0.87	0.576	0.566	0.066	4.594	U
H2		0.725	0.585	0.544	0.081	2.228	S
H3		1.17	0.324	0.298	0.09	9.724	U
H4		0.53	0.495	0.487	0.053	0.816	S
H1	Ni µg/l	< 0.500	0.288	0.283	0.04		B
H2		< 0.500	0.273	0.26	0.027		B
H3		< 0.500	0.432	0.424	0.056		B
H4		< 0.500	0.36	0.353	0.032		B
H1	Pb µg/l	< 1.000	0.576	0.56	0.05		B
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H1	Zn µg/l	< 10.000	2.88	3.104	0.544		B
H2		< 10.000	2.73	2.593	0.432		B
H3		< 10.000	3.42	3.594	0.552		B
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