

Mercury in selected catchments within Czech Republic



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INTRODUCTION

Five catchments with different levels of historical deposition were selected within the area of the Czech Republic (CR) for quantification of legacy Hg pools and fluxes.

Three of the selected catchments (LYS, PLB and JEZ) are found in the area known as the Black Triangle (Fig.1) with extreme levels of S and N deposition in 70's and 80's of the 20th century. Relatively low levels of historical deposition were typical in the southern part of CR, where catchment LIZ served as a reference site. Catchment LES was selected with respect to its position in a Hg contamination hot-spot in central Bohemia (Fig.1).

SITE DESCRIPTIONS

Table 1 Basic information on five Czech catchments. Data on deposition chemistry from Skořepová and Fottová (1998) and data on soil Hg from Navratil et al (in prep).

Catchment name	Jezeří	Lesní potok	Liz	Lysina	Pluhův Bor
Abbreviation	JEZ	LES	LIZ	LYS	PLB
Catchment area (km ²)	2.61	0.7	0.99	0.27	0.22
Outlet elevation (m)	475	400	828	829	690
Highest elevation (m)	924	495	1024	949	804
Mean temperature (°C)	6.0	7.0	4.9	5.0	6.0
Mean annual precipitation (mm)	773	625	894	972	913
Thr. S deposition (1994) kg.ha ⁻¹	66.7	27.3	9.0	31.6	25.7
Thr. N deposition (1994) kg.ha ⁻¹	25.7	13.0	6.8	10.4	7.8
Mean annual runoff (mm)	412	117	367	474	281
Alkalinity (µeq.L ⁻¹)	19.9	3.3	123.1	-93.1	475.7
Mean stream water pH	5.55	4.92	6.32	4.08	6.95
Bedrock	gneiss	granite	Spodo-dystric Cambisol	Spodo-dystric Cambisol	Magnesian Regosol
Soil	Spodo-dystric Cambisol	Eutric Cambisol	Spodo-dystric Cambisol	Spodo-dystric Cambisol	Magnesian Regosol
Cover area (%)					
Open:	40	-	-	18	5
Spruce:	18	44	100	82	95
Beech:	15	56	-	-	-
Birch:	27	-	-	-	-
Organic soil mean Hg (µg.kg ⁻¹)	392	393	277	375	287
Mineral soil mean Hg (µg.kg ⁻¹)	100	54	95	79	24
Organic pool Hg (mg.m ⁻²)	5.7	10.1	6.8	7.4	5.3
Mineral soil pool Hg (mg.m ⁻²)	25.8	37.0	130.0	63.1	16.6
Organic pool Hg/SOC (µg.g ⁻¹)	1.3	1.8	1.5	1.3	0.9
Mineral pool Hg/SOC (µg.g ⁻¹)	3.3	8.9	6.3	4.3	2.7

STREAM WATER Hg vs DOC

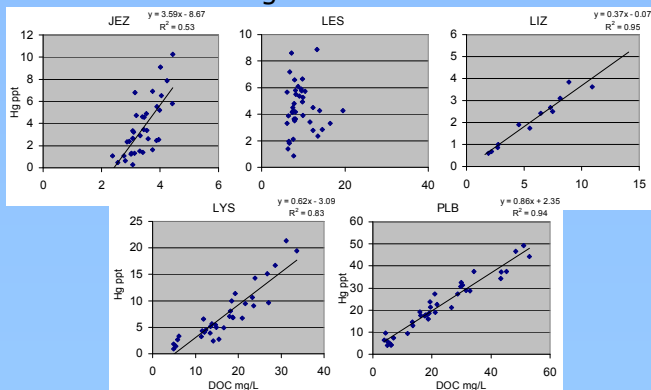


Fig. 3 Filtered total mercury (Hg) concentration (ng L⁻¹) as a function of DOC concentration (mg C L⁻¹) for all stream water samples collected across individual catchments.

SUMMARY

The results from selected catchments indicate that the main driver of Hg output is DOC output. The highest filtered total Hg concentration occurred at the well-buffered serpentinite catchment PLB, where we suspect relatively fast forest litter turnover. The greatest variation in Hg/DOC ratio occurred at catchment JEZ which received the highest historical deposition of S and N (and possibly of Hg). No relation was found between the concentration or pools of Hg and Hg output flux from the individual catchments. The total filtered Hg concentration in stream water at all catchments was correlated with DOC except at catchment LES. Reasons for the absence of a Hg to DOC relationship remain unexplained...

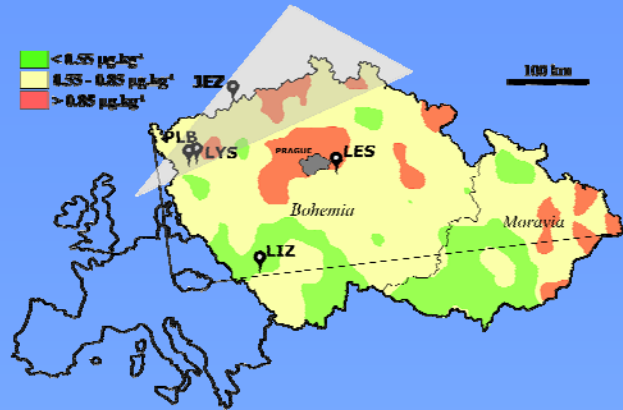


Fig. 1 Location of 5 catchments within the Czech Republic and position of the Czech Republic in Europe. Isolines within the perimeter of the Czech Republic denote the concentrations of Hg in forest humus modified after Suchara and Sucharová (2000). The shaded triangle denotes the area known as the Black Triangle.

STREAM WATER

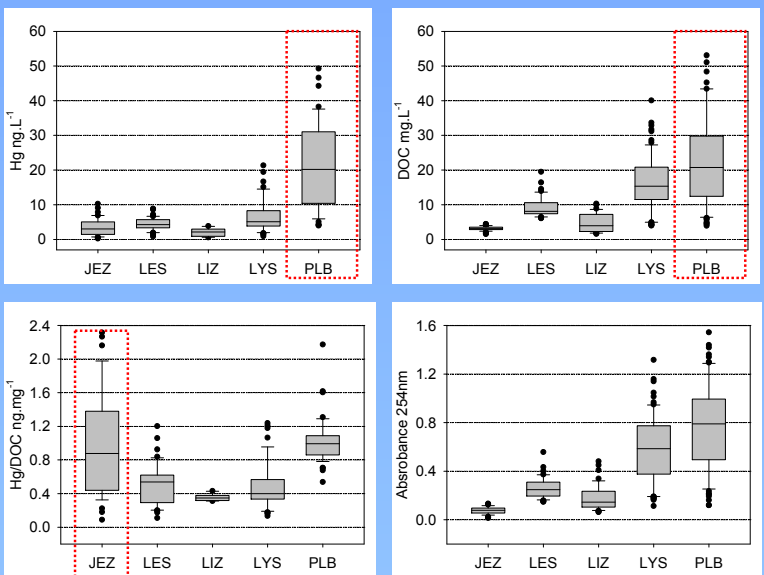


Fig. 2 Boxplots of Hg, DOC, Hg/DOC and absorbance 254nm at the individual study sites. The box boundaries represent 25th and 75th percentiles, solid line in the box represents median value. Error bars indicate 5th and 95th percentiles. Dots represent outliers.

Catchment output fluxes

Table 2 Mean data on Hg, DOC at the individual catchments and calculated output flux

Catchment name	Jezeří	Lesní potok	Liz	Lysina	Pluhův Bor
Abbreviation	JEZ	LES	LIZ	LYS	PLB
Streamwater					
Mean concentration Hg (ng.L ⁻¹)	3.5	3.8	2.1	7.2	21.6
Mean concentration DOC (mg.L ⁻¹)	3.2	9.4	5.7	16.0	22.7
Mean Hg/DOC (ng.mg ⁻¹)	1.08	0.40	0.36	0.45	0.95
Annual water output year 2012 (mm)					
Annual output flux Hg (µg.m ⁻²)	1.1	0.3	0.6	2.9	5.9
Annual output flux DOC (mg.m ⁻²)	1014	651	1683	6444	6174



Acknowledgments

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