EXPORT OF MERCURY FROM A CENTRAL EUROPEAN CATCHMENT, CZECH REPUBLIC

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INTRODUCTION

Atmospheric deposition of Hg in Europe has declined in the past three decades but few studies concerning Hg have been made in the Czech Republic. The sulfur (S) emission history from coal burning in the Czech Republic has been an exceptional example by European or world standards. The annual emission of S reached up to 1.2 x 10^6 tons in the 1980s, but has since declined sharply. A few studies indicated a relationship between S and Hg in deposition.

The understanding of Hg export from forested ecosystems is essential to estimate the potential for Hg transformation processes and to evaluate the environmental risks. The snowmelt period is the most important part of the hydrological year in central European forested ecosystems. Therefore, knowledge of changes in export of Hg and other solutes during snowmelt is of a vital importance.

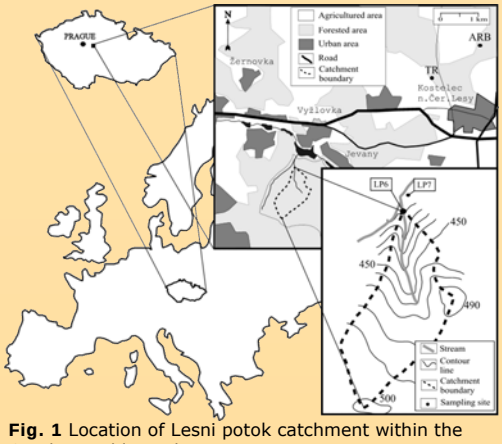


Fig. 1 Location of Lesni potok catchment within the Czech Republic and Europe.

SITE DESCRIPTION

• area	0.765 km²
• elevation	406 - 505 m
• average annual precipitation	~680 mm
• average annual stream runoff	~90 mm
• evapotranspiration	~85%
• average annual air temperature	+9°C
• forested area	99% (46% *coniferous*, 53% *deciduous*)
• granite bedrock, Cambisols	
• range of Hg concentrations in organic soils	118-679 µg.kg^{-1}
• range of Hg concentrations in mineral soils	14-129 µg.kg^{-1}
• mean Hg pool in organic soil	15 mg.m^{-2}
• mean Hg pool in mineral soil	39 mg.m^{-2}
• concentration of Hg in *coniferous* foliage	22 → 58 µg.kg^{-1}
• concentration of Hg in *deciduous* foliage	19 → 94 µg.kg^{-1}
• annual litterfall flux *coniferous*, *deciduous*	19, 23 µg.m^{-2}

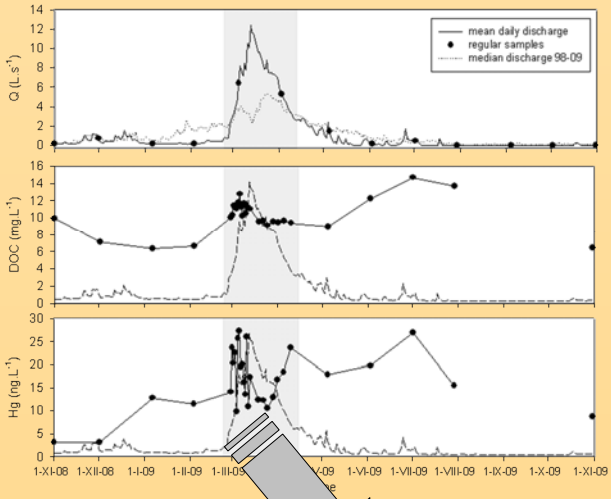


Fig. 2
Top panel - changes of mean daily discharge and sampling scheme of REGULAR monthly samples.

Middle panel – changes of DOC concentrations in REGULAR and snowmelt samples.

Bottom panel – changes of Hg concentrations in REGULAR and snowmelt samples.

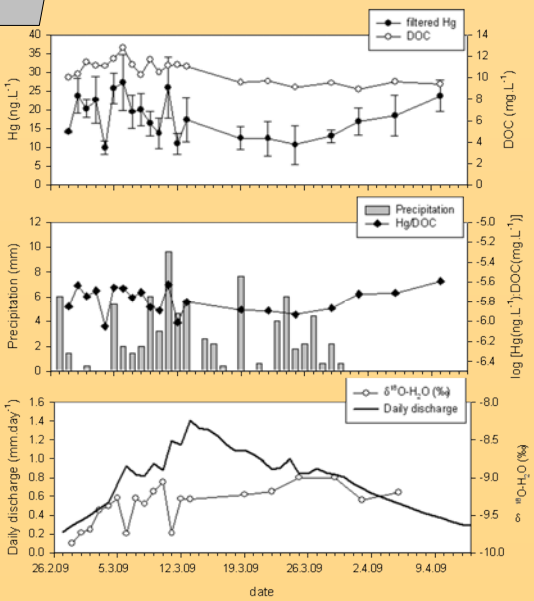


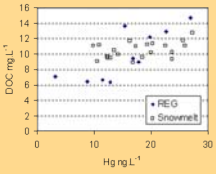
Fig. 3 Changes of selected parameters during the frequently sampled period of SNOWMELT at LP.

Top panel - (left axis) filtered Hg concentrations, (right axis) DOC concentrations;

Middle panel - (left axis) daily precipitation, (right axis) log of ratio Hg/DOC (both in mg.L^{-1});

Bottom panel - (left axis) daily discharge, (right axis) isotopic signatures of ^{18}O-H_2O (‰).

Fig. 4 Relationship of filtered Hg and DOC concentrations during the hydrological year 2009



CALCULATION OF Hg RUNOFF

• runoff during the snowmelt period: 0.533 µg.m^{-2}
>60% of total annual runoff

• annual runoff - using 12 monthly samples according to a GEOMON network protocol: 0.798 µg.m^{-2}

±10%

• annual runoff - using 12 monthly samples and frequent samples from snowmelt period: 0.873 µg.m^{-2}

CONCLUSIONS

Over snowmelt period occurred over 70% of the annual water runoff. The runoff flux calculated according to the GEOMON network protocol using 12 monthly samples was 10% lower than the annual flux including the snowmelt frequent sampling data. The difference between the two fluxes would be greater if two of the 12 monthly regular samples would fall outside of the snowmelt period.

Acknowledgments
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