

Name of research institute or organization:

**Paul Scherrer Institut, Laboratory of Radio and Environmental
Chemistry**

Title of project:

Palaeo atmospheric chemistry studies using high-altitude glacier ice cores and snow samples

Project leader and team:

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Short project description:

The study of mercury (Hg) concentrations in snow and ice samples from high-mountain glaciers allows assessing long-range atmospheric transport and reconstructing past and recent changes in the global biogeochemical cycle of this element. In order to develop sampling and analysis methods for determination of Hg concentrations in snow and ice, snow samples were collected from a 1.3 m snow pit at the high-alpine research station Jungfraujoch (3450 m asl, Swiss Alps) on 31 January 2001. All samplings were carried out following recommendation of a protocol for ultra-clean work. Precautions have been taken to avoid mercury losses/contamination on each stage from sampling to analysis. Mercury was analysed by Inductively Coupled Plasma Mass Spectrometry (ICP-MS ELEMENT, Finnigan MAT) equipped with a Hydrogen Generator having a membrane gas-liquid separator (Cold Vapour technique). The detection limit of the method, calculated as 3 times the standard deviation of the blank, is 0.4 ng L^{-1} (for 20 blank samples). The results obtained by this method, using SnCl_2 as reducing agent, are operationally defined as “reactive mercury”, that is Hg in ionic or weakly bonded form.

The snow samples from the Jungfraujoch showed a comparatively constant Hg level of $2.3\text{-}2.9 \text{ ng L}^{-1}$, which is higher than that observed in snow from the Belukha glacier in the Siberian Altai ($49^\circ 48' 49''\text{N}$, $86^\circ 32' 29''\text{E}$, 3895 m asl), but lower than in Aktru snow ($50^\circ 05' 26''\text{N}$, $87^\circ 42' 08''\text{O}$, 3150 m asl), also in the Siberian Altai (Figure 1).

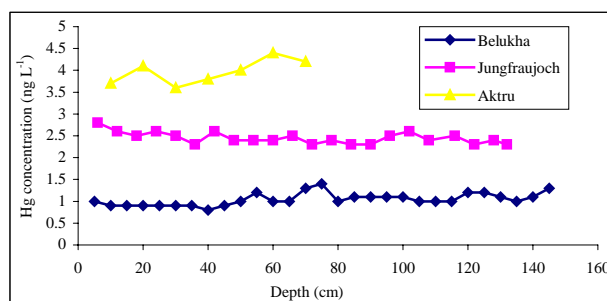


Fig. 1: Hg concentrations in snow pits from different sites.

These are the first data on concentrations of Hg in snow from the Swiss Alps and the Siberian Altai mountains. This project will continue with analyses of Hg concentrations in an ice core from the Belukha glacier, in order to reconstruct past atmospheric concentration levels of the toxic element Hg in the Siberian Altai. For the

interpretation of the data, further experiments on the Jungfrauoch are needed to investigate the atmosphere/snow transfer of Hg and its preservation in the snow cover.

Key words:

Mercury, snow, air pollution, ice core record

Collaborating partners/networks:

S. Eyrikh, T. Papina, Institute for Water and Environmental Problems, Siberian Branch of the Russian Academy of Sciences, 105 Papanintsev Str., Barnaul. 656099, Russia

Scientific publications and public outreach 2001:

Ehrman, S.H., M. Schwikowski, U. Baltensperger, and H.W. Gäggeler, Sampling and analysis of ice crystals as a function of size, *Atmospheric Environment, Atmospheric Environment* 35, 5371-5376 (2001).

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