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Highlights of Analytical Chemistry in Switzerland

Increase of ^{129}I in the European Environment

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^{129}I is a long-lived (half-life = 15.7 Ma) radionuclide with a natural abundance of ^{129}I/^{127}I of about 6.5×10^{-13}. Its main sources are the spontaneous fission of uranium in the lithosphere and the interaction of cosmic ray particles with xenon in the upper atmosphere. The prenuclear abundance has been drastically enhanced due to anthropogenic emissions from atmospheric nuclear weapon tests and nuclear fuel reprocessing. In Europe nuclear fuel processing plants have been operated in Sellafield (Great Britain), Marcoule, and La Hague (both France). While reliable data on ^{129}I releases from La Hague exist for the whole period of operation, less is known about contributions from Sellafield and Marcoule. Emissions of the latter two were estimated based on the amount of fuel reprocessed, indicating that Marcoule was the major European source of airborne ^{129}I, contributing about 45% to the total gaseous releases.

The estimated total emissions were compared with the ^{129}I deposition fluxes for the time period 1970–2002, obtained from the analysis of an ice core from the Fiescherhorn glacier, Swiss Alps (46°33'N, 8°04'E, 3900 m asl). The temporal evolution of the ^{129}I deposition agrees well with the total ^{129}I releases into the atmosphere from the European reprocessing facilities and from atmospheric nuclear weapons tests, supporting our estimated release rates. ^{129}I was analyzed in the ice samples by means of accelerator mass spectrometry at the Maier-Leibnitz laboratory in Garching, after extraction and purification of total iodine using a carbon tetrachloride method and precipitation as silver iodide.

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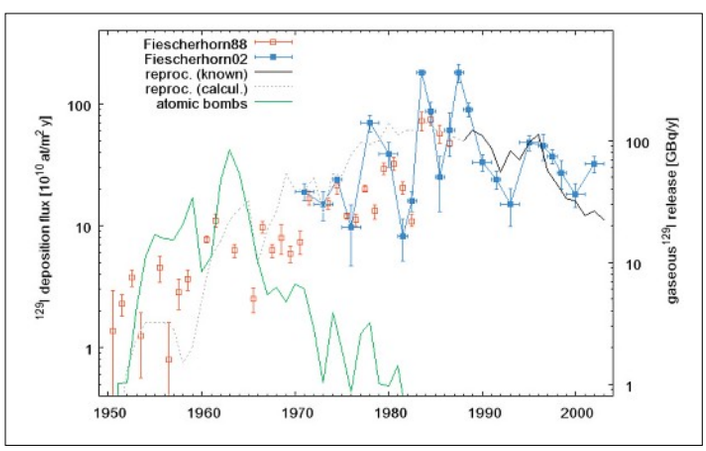
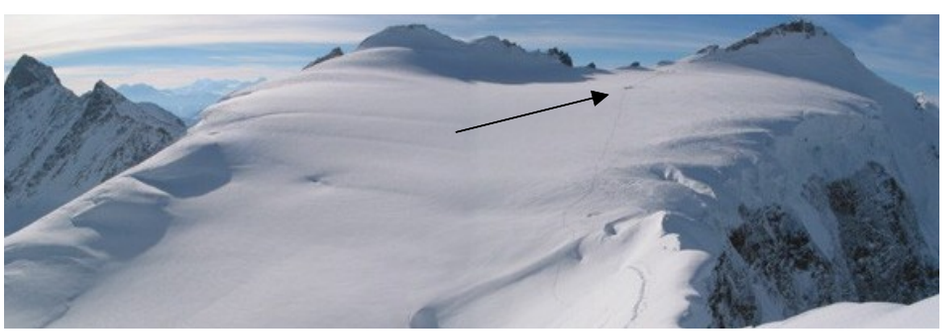
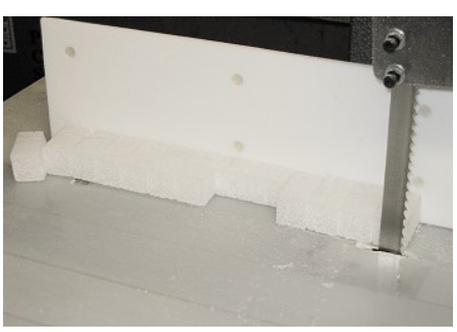


^{129}I deposition fluxes determined at the Fiescherhorn glacier (■), and those based on data published by Wagner *et al.* 1996 (□). For this comparison, the latter data were scaled with the ratio of the mean net accumulation rates of the period 1950–1974. In addition, airborne emissions of ^{129}I from the European reprocessing facilities (black lines) and the total ^{129}I which was deposited in the northern hemisphere as a result of the atmospheric atomic bomb explosions (green line) are shown. ^{129}I releases before 1988, which had to be estimated, are dashed.



View of the Fiescherhorn glacier from the Northeast with ice core drilling site (photo: A. Schwerzmann)



Ice core sample cutting with a band saw (photo: A. Ciric).

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