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¹²⁹I in Finnish waters

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¹²⁹I is a long-lived beta-emitting (E_{max} 154,4 keV) radioisotope of iodine. Its half-life is 15,7 million years. ¹²⁹I is produced mainly by human nuclear activities and especially it has been released to the environment from the spent nuclear fuel reprocessing plants. In the pre-nuclear era ¹²⁹I/¹²⁷I ratios in the environment were approximately 10^{-12} . Nowadays ¹²⁹I/¹²⁷I ratios have reached values from 10^{-10} to 10^{-4} .

In this study, activity concentrations of ¹²⁹I and its distribution into various chemical species (iodide I⁻, iodate IO₃⁻ and bound in organics) were analyzed from four different lakes in Finland and from four different sea locations on the Gulf of Finland, the Bothnian Sea and the Bothnian Bay. ¹²⁹I was also analyzed from four rainwater samples. Samples were taken in the summer of 2009.

After filtering the 0.3 l water samples, separation of various iodine species was done by anion exchange chromatography: IO₃⁻ passes through an anion exchange resin bed in NO₃⁻ form while ¹²⁹I⁻ absorbs into the bed. ¹²⁹I⁻ is eluted from resin with NaClO. Finally samples were precipitated by AgNO₃ to form AgI and ¹²⁹I was measured by accelerator mass spectrometry (AMS). Stable iodine (¹²⁷I) was analyzed by inductively coupled plasma mass spectrometry (ICP-MS).

First results from a lake in the southern Finland and from water taken from the Finnish Bay in front of Helsinki show that levels of ¹²⁹I in lake water are around 1×10^9 atoms per litre while in sea water the levels are 4-5 times higher. ¹²⁹I occurs both in lake and sea water mainly in iodide form and the fraction of iodate form is only about 5%. The ¹²⁹I/¹²⁷I ratio has clearly elevated compared to natural levels, and are approximately the same in sea and in lake, 14×10^{-8} and 8×10^{-8} , respectively. These results are only preliminary and a better picture of the situation will be obtained after finalizing the project. The results obtained so far are, however, at the same level as obtained in Swedish studies at the same latitudes.

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