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Riverine ^{129}I in the Baltic region

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The concentration and distribution pathways of the radioactive isotope ^{129}I in the fresh water systems of the Baltic region are of interest for several reasons including: 1) the element is an essential nutrient for animals and humans, and its concentration in many foodstuffs is presently unknown, 2) data about distribution of ^{129}I in the rivers of North Europe are scarce, even though this isotope is a common fission product in nuclear reactors, 3) the biophilic nature, long half-life ($T_{1/2}$ ≈ 15.7 Ma) and short (2-3 weeks) atmospheric residence time make ^{129}I an excellent tracer for studying dynamics of atmospheric and watershed processes and biogeochemical cycling of iodine in general. In this study, ^{129}I was measured in water of 54 major rivers in the Baltic region sampled during June-July 1999. The data indicate about 3-5 orders of magnitude higher concentration level than the expected natural background value. Rivers draining dominantly forested landscape show less ^{129}I than those draining cultivated landscape. Concentration of ^{129}I in the rivers generally decreases with distance from the North Sea. Strong positive correlation between ^{129}I and Cl suggests that the source of ^{129}I to the rivers is evidently seawater evaporation from the North Sea and Skagerrak-Kattegat basin.

4.64.22

Radionuclides (^{3}H, ^{85}Kr,) for evaluation of flow dynamics and temporal chemical trends in groundwater and surface water

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A thirty-year record of tritium in precipitation, groundwater and surface water is used together with ^{85}Kr and other environmental tracers (CFCs, SF_6) to evaluate the dynamics of groundwater/surface water interaction and the historical trends of nutrient loads and other contaminants in groundwater and streams in the Odense Pilot River Basin. Results demonstrate quantitative and qualitative effects of both agricultural and urban practices on groundwater and surface water systems including streams and coastal waters. The radionuclides and the other environmental tracers, which are used as tracers and groundwater dating tools, demonstrate by themselves and when compared to hydrological model simulations, that groundwater abstraction for e.g. the water supply of the city of Odense affects the flow system and deteriorate the groundwater quality e.g. where the water table is lowered significantly. Groundwater dating by the radionuclides and SF_6 also demonstrate that CFC-12, which is generally not considered to degrade in similar geochemical environments, is degraded in the investigated anaerobic aquifer leaving the CFCs unable to estimate absolute groundwater ages at this site.