

The Importance of Organic Colloids for the Transport of Uranium and other Decay Chain Elements in a Boreal Stream Network.

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Krycklan is a 68 km² catchment in northern Sweden, where hydrological, hydrochemical and biogeochemical research has been carried out for more than 30 years. Hence, the area has a well developed sampling infrastructure and long time-series, which has led to a good understanding of the hydrological processes. During two years uranium activities in streams from 10 sub-catchments in the area were followed, which has resulted in more than 400 measurements. The material was then analyzed from a geo-statistical perspective, and it could be shown the forest and wetland percentage was the single most important factor for explaining the spatial and temporal variability in uranium transport within the catchment.

The objective of the research has been to relate the large-scale landscape fate of uranium and other decay chain elements to specific biogeochemical processes, and therefore the connection between groundwater and surface water has been emphasized. Streams in the boreal region are typically characterized by a high content of dissolved organic carbon (DOC), and it has been found that uranium almost entirely is bound to DOC both in surface water and ground water in the Krycklan catchment. Therefore, Field-Flow Fractionation coupled to ICP-MS was used to investigate the size distribution of these organic carries and its variation throughout the spring flood, which is the main hydrological event in this area. A certain kind of 0.5-5 nm big organic colloids were found to play a very important role in the migration of uranium in from both mineral soils and wetlands to the streams.

The material is now being completed with measurements of uranium, thorium and radium isotopes. In many cases considerable disequilibria have been observed throughout the decay chains, which has provided additional information on the dynamics of the processes governing the migration of uranium, thorium and radium in the boreal region.