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CFC concentrations in fresh groundwater in Latvia

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One of the main issues in groundwater studies is groundwater age, also known as residence time. This is important for investigating the groundwater filtration rate and to solve variety issues of groundwater use, management and protection. Groundwater age studies in Latvia have been rare, and the latest study, which defined the new results of age of groundwater using CFC dating method, was during years 2002 - 2006 and it was carried out by Denmark and Greenland Geological Survey (GEUS) and the Latvian State Geological Survey as a joint study on the impact of agriculture on groundwater quality in Latvia.

Within the project "Interdisciplinary research groups and model system for groundwater studies" (PUMA) the studies of groundwater age by CFCs and ^{3}H methods is continued.

The concentration of tritium will be determined in about 60 samples, but the CFC concentration is now analyzed in 39 samples because previous studies have shown that Latvian CFC method is appropriate for aquifers to an average depth of 30-50 m. CFCs concentrations were analyzed in the laboratory at GEUS after Busenberg and Plummer described method by gas chromatography equipped with an EDC detector. Interpretation of the results was carried out by laboratory expert Troels Laier.

Samples are taken on both from the unconfined aquifer and the first confined aquifer, the sampling interval varies from 5-10 m up to 120-130 m for tritium analysis and up to 80 m depth for most CFC analysis except one sample that comes from 128 m depth. It is stated that most of determined groundwater from both - confined and unconfined aquifer - has residence time of 35-55 years.

So far, the results suggest that groundwater movement is fairly rapid in places where fractured dolomite forms the aquifer as the water residence time at 60-70 m depth is only 35-55 years. On the other hand, the composition of overlying Quaternary deposits (clay, glacial till loam or sand, sand – gravel sediments) has great importance on variations of groundwater residence time. One example of slow residence time is in borehole Virane-36, where groundwater age at 13-16 m depth is 60 years because of presence of clay on the land surface. The current results shows that groundwater residence time in aquifers in Latvia varies a lot and more studies are needed to understand the importance of composition of confining sediments.

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