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Anthropogenic groundwater contamination by selenium at Suchomasty Village (Prague Basin, Czech Republic)

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The aim of the project is to clarify and characterize the probable sources of increased selenium contamination in groundwater at Suchomasty Village located 35 km SW of Prague. The village is supplied by drinking water from a 25 m deep bore-hole with catchment formed by Ordovician to Devonian mostly sedimentary rocks of the Prague Basin. The selenium concentrations have suddenly exceeded limit 10 µg/l up to 123 µg/l since 2007. Several possible selenium sources were predicted in the bore-hole catchment: (i) Paleozoic bedrock, (ii) ash from coal power stations used for arable soil improvement, (iii) selenium-accumulating plants used as manure and (iv) an old rubbish dump. Samples of bedrock, soil and anthropogenic deposits were collected for selenium concentration analyses from five excavated test-holes up to 2.5 m deep. Concentration of selenium was analyzed in month intervals in the water from the bore-hole and from a shallow well. Groundwater residence time was determined using tritium and SF6. Oxygen isotopic composition could help us to better understanding of groundwater dynamics.

The AAS and ICP-OES analyses of bedrock and soils revealed no distinct increased selenium concentrations. Devonian limestone contains 5 mg/kg, field soil with ash up to 25 mg/kg and selenium-accumulating plants 6 mg/kg. The highest selenium concentration was found in material from the dump (up to 45 mg/kg) stored in abandoned quarry located 1 km away from the bore-hole.

We assume the dump is a main potential source of selenium contamination. Although the average groundwater residence time is up to 20 years, the selenium contamination has reached the bore-hole in 18 month since dump reclamation. It is possible that the fast groundwater circulation has been using more karstified rock. Based on obtained data the selenium is hold in suspension transported by groundwater. Filtration of drinking water should help in a case of continuing long-term increase of selenium contamination.

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