

**FLURY Virginie** (2016): Biogeochemical Study of Uranium Accumulation in an Alpine HISTOSOL (Davos, Switzerland)

**Abstract**

In 2005, some hotspots containing high concentrations of uranium (more than 4000 ppm) were discovered in the Dischma Valley (Davos, Switzerland) (FROIDEVAUX *et al.*, 2006; REGENSPURG *et al.*, 2010). To better understand the mobility of uranium and its accumulation mechanism, a core of a uranium-rich HISTOSOL was transferred in 2011 to a large laboratory lysimeter maintained under semi-natural conditions. Previous solute flux on this core revealed the activity of anaerobic sulfate- and iron-reducing bacteria (REGENSPURG *et al.*, 2010). In the current study, an amendment of depleted U<sup>6+</sup> (U-238/U-234 = 2.38), Fe<sup>3+</sup> and SO<sub>4</sub><sup>2-</sup> was made and the species in pore water were studied over a 4-month period, in order to test the hypothesis that uranium co-precipitates with mackinawite (FeS(s)), a byproduct mineral of sulfate- and iron-reducing bacteria. U<sup>6+</sup> was analysed by  $\alpha$  Spectrometry. This experiment failed to confirm the uranium co-precipitation with mackinawite. Indeed, SO<sub>4</sub><sup>2-</sup> was measured in the pore water indicating no reduction of SO<sub>4</sub><sup>2-</sup>, whereas the reduction of NO<sub>3</sub><sup>-</sup> was observed. These observations indicate a possible shift in the bacteria population from the previous amendment to the current one. After the 4-month column experiment, a sub-core was taken. The measurements of the soil samples by  $\gamma$  Spectrometry revealed the precipitation of fresh uranium in the upper layer of the soil. Some significant correlations were observed between uranium, calcium and sulfur after analysing the soil samples by X-ray Fluorescence Spectrometry. Also, LEZAMA-PACHECO *et al.* (2015) have shown that Ca<sup>2+</sup> was present at the surface of uraninite nanoparticules and might decrease the dissolution rate of uraninite. After several years of multiple amendments, the Dischma's core still contains high uranium content and is not significantly disturbed. The study of LEZAMA-PACHECO *et al.* (2015) might explain partially the accumulation of U in this anoxic environment.