Dynamic of Ni in the Environment seen by the isotopes

CLOQUET C.[1], ZELANO I.[1,2], MESTROT A.[3]

[1]CRPG/CNRS/UMR 7358, 54500 Vandoeuvre les Nancy, France; cloquet@crpg.cnrs-nancy.fr
[2]LIEC/CNRS/UMR 7360, 54500 vandoueuvre les Nancy, France, Zelano@crpg.cnrs-nancy.fr
[3]Institute of Geography,Univ.Bern, 3012 Bern, Switzerland; adrien.mestrot@giub.unibe.ch

Biogeochemical cycle of both major and trace elements is strongly influenced by Humans, but also by change in environmental (including climatic) conditions. Therefore, the actual but also the past environmental changes at the Earth's surface have certainly been recorded by element cycles. Among them, trace elements, which are mobilized during rock weathering, can be used to understand and quantify these changes. The Ni continental contribution of river to the ocean is 30.10^6kg/y corresponding to ca. 50% of total Ni flux to the ocean; Ni can be used to understand and quantify the impact of primitive microbial metabolisms on the modern and ancient Earth; Ni can be considered as "the industrial metal", with a growing industrial use [4] and therefore is a widespread contaminant, as well as a health hazard.

In the upper Valais, Switzerland, high values of mercury (Hg) and nickel (Ni) have been found on agricultural sites situated between Raron and Visp. The Hg pollution originated from the chemical plant Lonza. The Hg was used by the chemical plant as a catalyst to produce acetaldehyde and there is a distinct possibility that Ni was also used as a catalyst to convert paraldehyde to acetaldehyde. However, the area also contains Ni-rich rocks (serpentines and Ni-Cr mines) and the Ni could also have a geogenic origin. In order to document the dynamic of Ni and trace its source, we collected surface and underground waters (bulk and filtrated), soils and serpentine rocks from the watershed, and we analysed the Ni concentration as well as the Ni isotope ratios.

The first results obtained from waters revealed a large variation depending on the sampling site and reflected in δ^{60}Ni values varying from 0.10‰ up to 2‰, which is consistent with previous published values. In addition, filtrated waters are systematically heavier than bulk waters, suggesting that lighter isotopes are carried by SPM. This observation is supported by literature data. Nowadays, the chemical plant do not impact the water in term of Ni. Analysis of soils impacted with older sediments will reveal if the same conclusion can be drawn for the past. The quantification of serpentine-rock contribution will also help to understand the Ni dynamic in environment at the scale of few km.