U and Sr isotopic ratios in surface and deep waters of the Strengbach catchment (Vosges Massif, France)

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The localization and the characterization of the different hydrological compartments controling the weathering of the critical zone (CZ) is an important issue to evaluate and model properly the evolution of Earth surface in response to natural and anthropogenic forcings. In this study, we propose to better constrain the water rock interactions involved in the deeper part of the critical zone. Major and trace element concentrations, as well as $^{87}Sr/^{86}Sr$ isotope and ($^{234}U/^{238}U$) activity ratios have been analysed in water samples collected from boreholes drilled in the Strengbach watershed down to a depth of 50 to 100m on the both slopes of the watershed.

The preliminary results obtained on these samples confirm the existence of contrasted geochemical and isotopic compositions between the deep borehole waters and the spring waters collected on the watershed. They also indicate for the borehole waters a clear geochemical distinction between "surface waters" (until 15m deep) circulating in hypodermic area, which have geochemical characteristics very close to those analysed in spring waters, and deep waters (30 to 100m deep) flowing along fractures in the deeper part of the bedrock. Such a disctinction is also well apparent when looking at Sr and U isotope ratios: surface waters are systematically marked by higher Sr isotope ratios and much smaller (^{234}U-^{238}U) disequilibrium, than deep borehole waters which have ($^{234}U/^{238}U$) activity ratios between 1.3 and 2 depending on the considered borehole. Such contrasted U data suggest contrasted residence times of waters within the watershed and hence different circulation histories between surface and deep waters, but also between the deep waters of the two slopes of the watershed.