Water characterization from the Strengbach CZO: major element concentrations, isotope ratios (U, Sr, Nd) and CFC and ^{4}He concentrations

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In order to better constrain weathering processes in the critical zone, we propose to localize and characterize the nature and property of the water flow within the Strengbach watershed. Water samples from the different springs emerging on the watershed and from piezometers (2 to 15m deep) and boreholes drilled in the catchment (between 50 and 80 m deep) were collected and analyzed in major and trace element concentrations, as well as in Sr, Nd and U isotopic ratios. CFC and ^{4}He gas concentrations have been also analyzed in several of these samples for estimating the water residence time.

These data indicate a clear geochemical distinction between the deep borehole waters and the more "surface samples" i.e. waters from the upper part of the boreholes, from the piezometers and springs, with much higher conductivity and cationic loads for the deep water samples. These latter are also marked by lower Sr isotopic ratios and higher U activity ratios. The water typology that the data highlight lead us to propose that the surface water pertain to a same hypodermic water flow while deep borehole waters belong to a deeper and independent circulation system, which flow path is controlled by the bedrock inherited fracture network. The CFC data shows that these two different circulation systems are marked by contrast transfer/residence time, with short residence of a few months to a few years for the surface waters, and much higher residence time of several 10s years or more for the deep borehole waters. The ^{4}He analyses confirm an old residence time for deep waters, with possibly a contribution of much older waters (>1000y or more). These data confirm a different circulation history in the deeper parts of the catchment with specific alteration, which does not seem to affect the hydrological budget of the Strengbach stream at the outlet of the experimental watershed.