

## ***Interactive comment on “Chemical and U-Sr isotopic variations of stream and source waters at a small catchment scale (the Strengbach case; Vosges mountains; France)” by M. C. Pierret et al.***

**Anonymous Referee #2**

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### General comments

The authors presented a very comprehensive geochemical and isotopic dataset for stream and spring waters in the small Strengbach catchment in France. The reviewer was amazed by the amount of time and work involved in sample collections (~10 springs and streams for over two years) and measurements (general water chemistry, major elements, and U and Sr isotope ratios). The authors provided a sound and reasonable interpretation on the variability of geochemical and isotopic signatures of the source waters in this small catchment. The authors suggested that the different flow paths, intensity of water-rock interactions, and involvement of secondary minerals/clay

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minerals are the main controlling factors for stream and spring water chemistry in the Strengbach catchment. Furthermore, the new U isotope data show great promise in tracking water flow path/residence time in the subsurface, as compared to other traditional solute tracers (major elements and Sr isotopes). This work highlights the use of multi-tracer approaches in catchment studies. The manuscript is generally well written. The length of the paper (e.g. number of figures/tables) may be reduced. Below the reviewers indicates some specific comments for the authors to consider.

Overall, the manuscript will be of great interest to the readers of HESS and should be considered for publication by HESS.

Specific comments: 1) Abstract/introduction: although this study is intended to be a case study, the reviewer would like to see how the gained insights from this study help to understand the impact of such as vegetation cover and soils on evolution of surface waters at a small catchment scale and what are the global implications of these findings. 2) Chemistry comparison of northern vs. southern slopes: in addition to the difference in mineralogy/hydrothermal alteration of the bedrock, the reviewer wonders whether the landscape positions (e.g., sun-facing vs. shade-facing) play a role in the soil development and water chemistry evolution. The effects of landscape aspect on micro-climate conditions at the catchment scale have been commonly observed and may be relevant here. For example, it has been shown that for mid-latitude regions, different soil temperature and moisture content could be generated by aspect through controls on the amount of solar radiation at the catchment scale [e.g., Cooper, 1960, Soil Sci., 90, 109–120; Churchill, 1982, Earth Surf. Processes Landforms, 7, 171–182.; Carter and Ciolkosz, 1991, Geoderma, 49, 199–213; Egli et al., 2007, Clay Minerals, 42, 373–398; 2010; Geomorphology, 114, 466–482.] 3) The reviewer would also like to see some saturation index (SI) values calculated based on the measured chemistry data of the streams and springs to back up the arguments of processes involved clay mineral precipitation/dissolution. Also, it may be necessary to present the mineralogy of the soils and bedrock and to compare/discuss with the SI values of the waters. The

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SI values may help to elucidate the water-rock interaction processes 4) The correlation presented in Figs. 4a and 4b, is somehow subjective. The information presented in Figs. 6 is not very clear.

Technical corrections: Page 3544 line 24-27: please be specific on how  $^{234}\text{U}/^{238}\text{U}$  ratios changes along river flows and hydrological mixing. Page 3535 line 4-6: this sentence is not very clear to the reviewer. Page 3535 line 15-18: again, this sentence is not clear to the reviewer, what are the controlling factors? Page 3545 line 26: 80 ha: please use SI units Page 3547 line 19-25: the description on spring locations is confusing: are CS3 and CS4 on southern side or northern side? Page 3553 line line 3-18: is the difference caused by different bedrock mineralogy (including different types of bedrock and hydrothermal alteration), or different degrees of water-rock interactions, or N. vs. S landscape locations? Page 3554: line 26-27: the northern slope samples are more radiogenic?? Typo here? Page 3556 line 18-21: it is not clear to the reviewer that why this argument is supportive or against that  $U < 1$  ratios are or not derived from the weathering of soils? Please elaborate. Page 3558 line 21-24: SI values may reveal more information about the evolution of water chemistry here. Page 3559 line 10-12: why smectite? What about the SI values for smectite in these waters. Page 3560 line 1-3: samples plotted in Fig 3 are not grouped with time, so it is hard to assess the temporal variations. Page 3563: line 5 to 12: all of these factors are related to the parent material/bedrock mineralogy. They can be combined as in one factor rather than the three factors here.

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