Geophysical Research Abstracts
Vol. 14, EGU2012-14372, 2012
EGU General Assembly 2012

^{238}U-^{234}U activity ratio as tracer of waterpathway within the watershed substratum: evidence of U data from the Strengbach and Ringelbach research catchments (Vosges , France)

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U activity ratios were measured in spring and source waters collected in two small research watersheds developed on granitic bedrocks in Vosges Mountains (Eastern France), i.e., the Strengbach (http://ohge.u-strasbg.fr) and the Ringelbach catchments. The data indicates a clear relationship between the emerging altitude of sources/springs in each slope of the watersheds, and the intensity of ^{234}U-^{238}U activity ratios in the waters. Such a relationship can be readily explained through a scenario assuming that U mobilization in these waters and their ^{234}U enrichment (consequence of the alpha recoil process) are controlled by the duration of the water-pathway within the substratum of the watershed: longer water pathway within the watershed, longer duration of water-rock interaction and hence higher ^{234}U enrichment in the source/spring waters. The immediate consequence of such an interpretation is that (^{234}U/^{238}U) activity ratio in surface waters, at least at the scale of such small and elemental watersheds, might be a geochemical tracer useful to constrain a key hydrological parameter which controls, at least partly, the nature and the intensity of water-rock interactions in the watershed, namely the water pathway within the watershed substratum. The data also suggests that U activity ratios could be also very relevant to constrain the contribution of deep waters within surface waters. Future developments in this domain will certainly confirm the interest of U activity ratio as hydrological tracer of the water-rock interactions.