Modifications over the last 20 years of weathering reactions in the granitic Strengbach catchment: evidence from geochemical and U-Sr isotope data in soils, soil solutions and vegetation samples

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The characterization of the present-day weathering processes controlling the chemical composition of waters and soils and of their past evolution in natural ecosystems is important to predict and hence to model the response of the ecosystem to recent environmental changes. Here, we present the elemental and U and Sr isotopic composition of vegetation, soil solutions and soil samples collected within two soil profiles located in the small granitic watershed of the Strengbach creek in the Vosges Mountain (France). One soil profile is developed under spruces and the other one under beeches. The depth variation of elemental concentration in soil solutions confirms the important influence of the vegetation cycling on the budget of Ca, K, Rb and Sr, whereas Mg and Si budget in soil solutions are quasi exclusively controlled by weathering processes. Variation of Sr, and U isotopic ratios with depth also demonstrates that the sources and biogeochemical processes controlling the Sr budget of soil solutions is different in the uppermost soil horizons and in the deeper ones.

The comparison of elemental concentrations and Sr isotope ratios in recent soil solutions with data obtained for soil solutions over the last 20 years, confirm that the Strengbach watershed is in a transient state of weathering - with an important loss of nutriments such as Ca in soils solutions. Such a comparison also demonstrates that the source of elements in soil solutions has changed over this time period. Such a variation cannot be related to diminution of dissolution processes nor to declining of atmospheric input. It has to be related to a modification of the intensity and/or the nature of the weathering reactions occurring within the weathering profile. The data clearly suggest that under the spruce plot there was a recent change in the nature of the mineralogical phases controlling the weathering fluxes carried by the soil solutions, whereas under beech plot such a modification is yet not clearly evidenced. Such a difference in the recent evolution of the geochemical characteristics of the soil solutions in the two experimental plots will be discussed.