Present-day and long-term weathering rates in elementary watersheds: principle and example of application.

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The impact of human activity on the current weathering and erosion rates requires to compare present day values of these parameters, often obtained by environmental monitoring, with pre-anthropic ones. The characterization of such pre-anthropic values is often difficult to recover, especially for systems that do not contain recorders of weathering process with a sufficiently fine time resolution over the last millennia. We propose in this work to exemplify how the comparison of current weathering and erosion rates deduced from the analysis of riverine dissolved and solid loads with the long-term values, estimated from geochemical analyses of weathering profiles, can bring relevant information for characterizing the human activity impact on the critical zone functions/functioning. This interest is illustrated with the results of recent works performed on the Strengbach catchment (Viville et al., 2012; Ackerer et al., 2016; Ackerer, 2017). The analysis along a weathering profile of in situ 10Be concentration, U-Th-Ra radioactive disequilibria and major element concentrations makes it possible to retrieve the long-term weathering and erosion history of the watershed at the location of the profile. With such an approach it is therefore possible to estimate the average long-term, i.e. over the last one hundred thousand years, of the weathering rate. The comparison of this value with the values deduced from the hydro-geochemical monitoring of the Strengbach stream at its outlet and of small springs emerging on the watershed point out that the total, as well as the Si weathering fluxes are relatively similar to the long-term ones. Only the cationic weathering flux show significant differences. These results provide the theoretical framework for the use of this approach for the study of other sites.

Ackerer et al., 2016, EPSL 453, 33–43. Ackerer J., Ph.D. Thesis , Université de Strasbourg, France, 200 pp. Viville et al., 2012 Catena 92, 122–129.