

Evaluation of fluxes of suspended matters and bedload in the small granitic Strengbach catchment (Vosges massif, France)

Solenn Cotel, Daniel Viville, Marie Claire Pierret, Sylvain Benarioumlil, and François Chabaux
LHyGeS, UMR 7517, Université de Strasbourg - CNRS, 1 rue Blessig, 67084 Strasbourg, France

Transport of suspended matters (SM) and bedload in river controls the erosion process and elements export of a catchment. Furthermore, the SM are heavily involved in the migration of organic matter, metals and pollutants. The knowledge of the dynamics of the SM export is also essential to better understand the hydrogeochemical functioning of natural ecosystem. We investigated this question at the scale of a catchment; the Strengbach basin (site of OHGE - Observatoire Hydro-Géochimique de l'Environnement) where meteorological and hydrological data are monitored since 30 years. This small granitic basin (0,8km²) is located in the Vosges massif at altitudes between 883m and 1146m with 1400mm mean annual precipitations. A first evaluation of the solid fluxes exported at the Strengbach catchment was carried out on the basis of fortnightly sampling and measurement (Viville et al., 2012).

Two automatic water samplers have been set up at the outlet of the basin in december 2012, in order to 1) evaluate the potential bias generated by the sampling frequency and 2) improve the SM flux calculation accuracy especially by taking into account the high flow events. These two samplers allowed regular sampling at 16h time step as well as high flow events sampling. At the same time, the bedload flux was estimated fortnightly by measuring the volume of sediments accumulated in a flume. However, the characteristics of the small Strengbach catchment (low water level, low SM concentration and mountainous winter climatic conditions) required to adapt the conventionally used systems.

In this way, the SM annual flux estimated with the data from the two samplers varied between 7,5T and 8,8T during the three years of the study. By comparison, the SM annual flux obtained with previous method (only fortnightly sampling) was significantly different with values ranging from 2,8T to 16,6T. The contribution from each sampler and thus each sampling strategy to the improvement of the SM flux estimation has been calculated and is discussed below. When the SM flux due to high flow events is added to the SM flux based on 16h time step samples, the annual SM flux was improved of only 3% to 12% depending on the year, which can be surprising. During the three years of the study, the annual bedload flux was estimated between 1,3T and 5,0T, indicating that the solid export is dominated by SM transport in this catchment. Between 2004 and 2010, the mean weathering net flux (exports at the outlet corrected by atmospheric inputs) was of 1,6T/yr for the basic cations and of 2,3T/yr for the silica (Viville et al., 2012). Thus, in the Strengbach catchment, the SM and bedload exports represent a significant portion of the global chemical elements export. In such catchments, these solid fluxes can not be neglected.