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Uncertainties and spatiotemporal variations of suspended sediment flux in the Bleone river basin (Southern French Alps)

O. Navratil (1), M. Esteves (1), S. Willmore (1), J. Nemery (1), C. Legout (1), A. Poirel (2), N. Gratiot (1), and P. Belleudy (1)

(1) Laboratoire d'Etude des Transferts en Hydrologie et Environnement, Grenoble, France (oldrich.navratil@hmg.inpg.fr), (2) EDF-DTG, Grenoble, France

The STREAMS project (Sediment TRansport and Erosion Across MountainS) aims to improve the knowledge of suspended sediment dynamics in mountainous area using a nested sub-basins approach. Indeed, in mountainous areas, especially in the French Alps, a reduced number of Suspended Sediment Concentration (SSC) data are available to evaluate properly annual sediment flux and their spatiotemporal variability. This lack of high temporal resolution data is very restrictive for scientific studies as well as for river management such as hydraulics works or water resources and ecological requirements. In this context, the Bleone river basin (Southern French Alps; 960km^2) was equipped in 2007 with six hydrometric stations with high frequency water discharge and SSC acquisition. Their basin area ranges from 20 km^2 up to 870 km^2, with various geology and land use. At each station, SSC is estimated with turbidity measurement, calibrated with water samples collected by an automatic turbidity-controlled sampler. First, this study describes the methodology to estimate the sediment flux from turbidity measurements. Biunivocal turbidity-SSC relationships are generally found, but a particular attention must be paid to the problem of hysteresis relationships that we can observe for specific flood events. Next, the suspended sediment flux uncertainties are considered. They can be attributed to a combination of the discharge and the SSC time-series uncertainties: (a) the water level and the turbidity measurement errors, their variability during each cycle of data acquisition (2 min.); (b) the field and laboratory uncertainties for the estimation of discharge and SSC; (c) the quality of the turbidity-SSC and the water level-discharge relationships. Last, this study presents the spatiotemporal variability of the sediment flux with statistical indicators classically used in the literature.