Geophysical Research Abstracts
Vol. 20, EGU2018-9148, 2018
EGU General Assembly 2018

Annual cycles of suspended sediment in German upland rivers

Jan Henrik Blöthe (1), Thomas Hoffmann (2), and Gudrun Hillebrand (2)

(1) University of Bonn, Department of Geography, Bonn, Germany (jan.bloethe@uni-bonn.de), (2) Federal Institute of Hydrology, Koblenz, Germany

Suspended sediment load dominates the sediment export from most lowland rivers around the world, also constituting a significant transport medium for pollutants and contaminants. This has important implications for the management of river systems that aims at achieving a good ecological and chemical status, as required for instance by the European Water Frame directive. A thorough understanding of the sources, transport mechanisms and sinks of suspended sediment is therefore a crucial prerequisite for successful management. However, sources and sinks of suspended sediment and the resulting concentration in the river water are highly variable throughout the year and in between years.

Here we present an analysis of the spatiotemporal variability of suspended sediment concentrations (SSC) in major rivers draining the German upland. We take advantage of the long-term suspended sediment monitoring network of the Federal Waterways and Shipping Administration (Wasserstraßen- und Schifffahrtsverwaltung des Bundes, WSV) that monitors daily water flux and SSC at ~70 stations in Germany, some for more than 50 years. Using the data of >10 stations, we analyze the variability of rating curves with annual climate and land cover changes, and assess the annual behavior of discharge and SSC.

All stations analyzed show a consistent counterclockwise hysteresis effect between SSC and discharge on an annual basis. For a given discharge, SSC values are significantly higher during summer months (> factor two) as compared to the winter months. Preliminary results suggest that this effect might partly be induced by rainfall intensity that adds the necessary energy to mobilize sediments in intensive summer storms. Alternatively, or in combination with this, land use practices, exhaustion effects and the activation of different sediment sources and sinks are amongst the possible explanatory variables. The selective activation of distinct sediment sources is further supported by a sharp kink in the sediment rating curves of all rivers, where the linear relationship (in a log-log scale) suddenly shows significantly increased slopes. Our results suggest that for most of the stations, this sharp change in slope centers around to the geometric mean of the long-term discharge.