Geophysical Research Abstracts
Vol. 18, EGU2016-17509, 2016
EGU General Assembly 2016

Sediment residence time and connectivity in non-equilibrium and transient geomorphic systems

Thomas Hoffmann and Gudrun Hillebrand
Federal Institute of Hydrology

Growing empirical evidence shows that sediment delivery in many geomorphic systems is in transient state or out of equilibrium with respect to the external driving forces. The transient state is often related to the (dis)connectivity of the many constituent parts of geomorphic systems as a result of sediment storage along the sediment flow path from its source to the final sink. The response time of geomorphic systems to external changes is thus dependent on the residence time of sediment in various storage compartments.

Here, a mathematical concept based on reservoir theory to model residence time of sediment in various depositional environments is presented. The concept allows to reinterpret millennial scale sediment budges, but can be also applied to decal sediment storage in reservoirs and aids sediment management practices in river systems. The framework sheds light on the limitation of the sediment delivery ratio, which is often used as a measure of sediment connectivity in geomorphic systems, and provides analytical information on process type, pace of sediment flux and connectivity of storage compartments along the sediment cascade. Examples will be given using Postglacial sediment budgets from the Canadian Rocky mountains on the one hand and short-term ($\sim$15 yrs.) sediment dynamics in the Iffezheim barrage in the Upper Rhine (Germany).