

## Suspended Sediment Transport Dynamics in Rivers: Multi-scale drivers of temporal variation

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This paper is aimed to understand about the factors affecting (drivers) suspended sediment transport. There are 2 keys will be strengthened on this paper:

1. The choice of timescale in many sediment studies limits the SS transport explanation
2. Common methods to analyse and quantify SS transport and source are often applied without consideration of the different timescale

This paper will be discussed at 6 sections, in which section 1 is an introduction and section 6 is conclusion. Section 2 is about spatiotemporal complexity of SS transport. In this section, the definition of soil erosion, why we need to understand how SS transport can vary spatially within a catchment and also temporal variability un SS transport are explained.

Section 3 is about empirical approaches to analyse SS transport and source. Sediment Rating Curve, hysteresis models, sediment fingerprinting and another multivariate data-mining technique are explained in this section. Section 4 is about the interpretation of suspended sediment transport dynamics. In this section, factors affecting SS transport are explained. A lack of understanding about of these factors and the interaction between will make a less accurate equation. The drivers are:

a. Inter-annual variation

SS loads vary over long timescale (decade or centuries) due to natural and anthropogenic forces. Over long timescale, discharge is often a good predictor of mean loads. However, rainfall patterns and amount changes can cause significant changes in long-term SS loads. Moreover, a shift in sediment sources can cause variable sediment loads under similar hydrometeorological condition (can be seen from hysteresis models). So, a long-term observation is essentials to demonstrate the interaction between the catchment and river.

b. Seasonal variation

SS loads vary significantly throughout the year and it is related to seasonal pattern in rainfall, snowmelt and storm events. On the other hand, interaction between land use, rainfall patterns, soil moisture and hydrology cause variation in SS transport. Changes in rainfall often cause marked variation in SS transport in rivers, for which the impact os often magnified by land cover changes in both natural and agricultural.

c. Event based variation

High flow events generate a large proportion of the total annual SS loads in river. Sediment source can also change over short timescale. Persistent high discharge can cause banks to collapse resulting a sudden increase in sediment supply. That condition can be explained by using hysteresis loop.

Section 5 is about a guideline for a multi-timescale approach to sediment regime characterization. The summary can be seen in Table 1.

Finally, over the past decades, research on estimating and evaluating SS transport dynamics has shifted from single SRC to complex data-mining techniques and sediment fingerprinting methods. However, these methods have often been applied without consideration of the temporal scale of the process. Future research will be better able to identify the factors affecting SS transport in rivers, improve SS transport modelling and propose effective, sustainable solution to sediment management problems.