Why connectivity indices and models are sometimes valuable - and sometimes not

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Considering connectivity in water and sediment research is important from both a more academic point of view (to answer questions such as ‘what is the residence time of sediments in a catchment?’) and from a more practical perspective (to answer questions such as ‘how wide does a buffer strip need to be to retain most sediments on the field?’). It is therefore not surprising that considerable efforts have been devoted towards the development of connectivity indices and of models accounting for connectivity. Several studies have shown that accounting for connectivity can indeed greatly improve predictions of sediment (and water) yield at different spatial and temporal scales. Especially in Western and Central Europe examples can be found where sediment yield is much better predicted by models accounting for connectivity. Yet there are also cases where the same (type of) models fail miserably, with predictions that are not better than those of a simple, lumped model: this seems to be the case in many Mediterranean regions, among others. In this presentation I will discuss why these differences occur and why we may need approaches complementary to the modelling of the familiar water and sediment cascade if we want to better understand landscape dynamics over different time scales. One of the pathways that may be fruitful to explore is the use of models that explicitly account for the impact of river dynamics, the consequences of which often propagate upslope, counter to the direction of the sediment cascade.