



Dryland River Modelling of Water and Sediment Fluxes using a representative River Stretch Approach

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The study investigates process-based modelling of sediment transport in dryland rivers within a meso-scale watershed of the Pre-Pyrenean region in NE Spain. The modelling study is carried out to enable the quantification of sediment fluxes that erode mainly from local badland areas during high-intensity rainstorm events, resulting in sediment torrents in the river system and severe sedimentation of a down-stream large reservoir thus threatening future water supply. The study reach is characterised by a heterogeneous spatial distribution of river forms and properties, which makes the parameterisation of state-of-the-art river models a difficult task. Steep, narrow, deep incised mountain torrents with rocky, gravely riverbeds in the upper parts of the catchment alternate with shallow, plain and very wide riverbeds and large floodplains with silty riverbed materials in the lower catchment area, with parts of the river system having an ephemeral flow regime. To enable model parameterisation, representative river stretches were derived from the results of a field campaign that investigated central model parameters such as the cross-sectional profile, slope, roughness and the gradation of the riverbed material. The flow regimes of the representative river stretches were then assessed for different high and low flow conditions and a thorough sensitivity analysis was carried out to investigate model parameter uncertainty. Subsequently, the sediment load from the badland areas and the sediment transport in the river's main stem was modelled using a composition of representative river stretches. The modelling framework thus enabled a detailed spatial and temporal examination of complex deposition and erosion patterns in the riverbed and their floodplains along the entire river flow path.