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Thirteen years of hindsight into hydrological and sediment dynamics of a humid badlands catchment

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Sediment transport is the major driver of changes in most catchments systems. Beyond landscape evolution and river geomorphology, sediment dynamics are an important component of a number of physical, chemical and biological processes in river basins. Sediments thus impact the ecology of rivers, sustainability of human infrastructure and basin level fluxes of nutrients and carbon. For this reason, it is important to understand the temporal sediment response of mountain catchments regarding precipitation and run-off. This response is not unique and features intra-annual, annual and multi-year scales components. In this research, we analyse a humid mountain badland area located in the Central Spanish Pyrenees. This typology of badlands is characterized by its non-linearity and non-stationary precipitation and run-off cycles, which ultimately lead to complex sediment dynamics and yields. Based on spectral frequency analysis and wavelet decomposition we were able to determine the dominant time scales of the local hydrological and sediment dynamics. Intra-annual and annual time scales were linked with the climatological characteristics of the catchment site. The multi-year response in the sediment yields reveals the importance of the sediment storage/depletion cycle of the catchment. The frequency and amplitude of precipitation, run-off and sediment yields fluctuations were accurately predicted with the spectral frequency analysis and wavelet decomposition technique used.