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Hydrological regime and sediment transport in two Mediterranean intermittent rivers and ephemeral streams (IRESs)

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In intermittent rivers and ephemeral streams (IRES), the hydrological regime is the primary driving force controlling the sediment transfer from the upland to the lowland catchment compartment, ergo the river geomorphology. The general objective of this study is to investigate the processes and the relationships between flow regime and suspended sediment (SS) transport in two IRESs with a different degree of intermittency, the Búger River (Spain) and the Carapelle River (Italy). The specific objectives are to (i) identify the drivers of SS transport, (ii) analyse and quantify the temporal variability of the SS transport in response to the hydrological regime. High-resolution data of streamflow and SS concentration (SSC) were used in this analysis and a set of hydrological indicators were computed to characterize and classify the flow regime.

In the Búger River, the high degree of intermittency and the low runoff coefficient were mainly due to the presence of carbonate lithology in headwaters and the specific SS yield (SSY: 0.5-46 t km^{-2} yr^{-1}) was strongly influenced by the flow regime. In the Carapelle River, the high values of the annual runoff coefficient (14-35%) and SSY (89-745 t km^{-2} yr^{-1}) were related to clay and limestone lithology. Most of the annual SSY was transported during floods. In the Búger River, SSY and maximum SSC (SSCmax) were correlated with the runoff, peak discharge, and antecedent rainfall. In the Carapelle River, SSY and SSCmax were correlated to the amount and intensity of rainfall. The catchment size played an important role in the hysteretic behavior since it had an influence on the spatial rainfall and sediment sources distribution. Búger River showed predominant clockwise loops as SS sources were close to the outlet. In the Carapelle River basin, clockwise and counter-clockwise were generated as the larger agricultural area promoted a huge sediment availability.

Lithology and geological characteristics resulted in the most relevant drivers controlling the hydrological regime and river type classification, meanwhile, rainfall was a less relevant factor. Land use and management practices were also relevant factors in SSY, determining the availability of suspended sediment material. At the event scale, a non-linearity in the rainfall-runoff relationship was found for both catchments, as runoff response can be due to different processes (i.e., saturation or infiltration excess).

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