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Suspended-sediment fluxes at the hillslope and catchment scale during a season of monitoring erosion hot spots in the Isábena catchment (Central Spanish Pyrenees)

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The Barasona reservoir at the foothills of the Central Spanish Pyrenees experiences massive siltation since decades. Large amounts of suspended sediment are transported into the reservoir by the Isábena River with very high suspended sediment concentrations (SSCs) reaching frequently 300 g/l during flood events. Badland formations of easily erodible marls, concentrated in the central parts of the catchment, are the major source for these silty sediments. Water and sediment fluxes have been measured from the two most important subcatchments in the Isábena basin (440 km^2):Villacarli (41 km, which hosts large badland areas) and Cabecera (145 km^2, draining forested areas underlayed by more cohesive upland rocks). In addition, a nested representative elementary badland catchment B1 (8 ha) has been monitored. Measurements were taken during a 3.5 months field campaign in autumn 2006. This talk presents the results on runoff and sediment transport during a series of flood events, proposes a method for the calculation of a continuous sedigraph from intermittent measurements and discusses the sediment fluxes at the field monitoring sites.

The observed SSCs demonstrate the role of the badlands as main sediment sources: SSC of up to 280 g/l were measured in the Villacarli torrent during individual rainstorm events, while SSC at the adjacent Cabecera catchment hardly exceeded 30 g/l. SSCs directly at the sediment source (B1) were comparable to those at the downstream

Villacarli section, suggesting a close connection in terms of runoff and sediment export. For all the three sites, SSC displayed only a loose correlation ($r2 \sim 0.4$) with discharge, inhibiting the derivation of a simple sediment rating curve. This fact suggest that processes such as temporary sediment storage within the river channel and the exhaustion of sediment supply from the hillslopes and the river may act as important controls affecting SSC dynamics. To account for these effects, additional physical variables presumably acting as driving forces or proxies for the processes (i.e. rainfall energy, cumulated discharge, rising/falling limb information) were included within a multivariate linear model to improve the explanation of the SSC variability

The subsequent flood-based calculation of sediment yields shows that the greatest part of the sediment load of the entire season is exported from the Villacarli subcatchment during the first heavy thunderstorms of late summer. Later flood events yielded successively less sediment because of lower flood magnitude and, especially, much lower SSC (1-2 orders of magnitude), a fact that can be mostly related to sediment depletion at hillslopes and exhaustion of sedimentary stocks within the riverchannel. These findings contribute to an improved understanding of the water and sediments dynamics within this catchment of extremely high sediment yield and are integrated in the development of a meso-scale water- and sediment model.