



Measurement of infilling rate in a small reservoir in a Mediterranean semi-arid area

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The catchment of the Granadino dam, Southern Spain, encloses 480 km², with important presence of snow in the summits 3000 m on its right margin, and semiarid low range hills with very erodible soils on its left margin. Gully erosion, landslides and stream bed-load processes, extremely active in this area, are responsible of important soil loss and desertification problem with a high associated cost. The National Inventory of Soil Erosion, carried out by the Spanish Ministry of Environment, assigns to this watershed potential soil losses up to 200 Tn/ha/year in certain areas according to RUSLE model simulations.

This hydraulic structure, a small dam with 12 m height from foundation, 100 m wide and gravity type, is located 2 Km upstream of the Rules reservoir, a water body for regulation, supply and irrigation purposes in the Mediterranean coast of Granada. It was set into service in September 2002, with the aim of preventing transported sediments by Guadaleo River producing, therefore, the silting of Rules reservoir.

Several works developed through monitoring this structure since 2003 with topographic and bathymetric surveys, report about the sedimentation rates and the high speed of infilling showing the importance of these full-scale sediment traps in Mediterranean areas. Also these works allows the study of erosion dynamics by identifying the key associated processes, related in this case with episodic rainstorms and intense snowmelt cycles combined with a high rate of sediment availability.

Different pulse events, either induced by rainfall or snowmelt events, have forced during the last 6 years the complete infilling of this reservoir, with an estimated volume of 3.3·10⁵ m³. Two storm events occurred during April-May 2004 caused 6000 m³ of sediment retained by the dam; each event lasted no more than four days, and the associated rainfall was not greater than 40 mm in any case. Another significant increase is observed in June-September 2006, during which both snowmelt and storms episodes induced the deposition of 7000 m³ of sediment associated to hillsides areas. Finally, the intense and continuous precipitation in December 2009 contributed with a total of 50.000 m³ of sediment, most of them coming from stream as bed-load processes.

Accordingly to the field data and simulations, an average sediment transport rate close to 150 m³/day is to be expected which results in a reduction of useful-life of Rules reservoir in terms of capacity if the system is left to its normal evolution. On the other hand, this work shows an important contrast between channel and overland erosion allowing the establishment of relationships between different types of events produced by forcing agents.