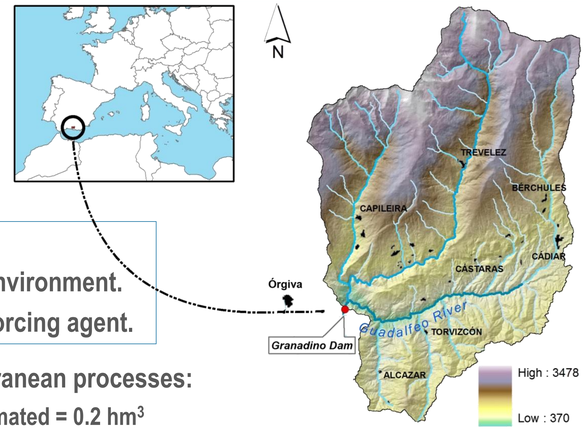
Measurement of infilling rate in a small reservoir in a Mediterranean semi-arid area

A. Moñino [1], A. Millares [2], J. Herrero [2], M. J. Polo [3], and M. A. Losada [1]

(1) Environmental Flow Dynamics Research Group. CEAMA. University of Granada. Avda. del Mediterráneo s/n 18006. Granada, Spain. amonino@ugr.es
(2) Fluvial Dynamics and Hydrology Research Group, CEAMA. University of Granada. Avda. del Mediterráneo s/n. 18006. Granada, Spain. mivalag@ugr.es
(3) Fluvial Dynamics and Hydrology Research Group. University of Córdoba, Campus de Rabanales Edificio Leonardo Da Vinci 14071. Córdoba, Spain. mjpolo@uco.es

INTRODUCTION AND OBJETIVES

- The catchment of the Granadino dam, Southern Spain, encloses 480 km², with important presence of snow in the summits and very erodible soils on its left margin.
- Gully erosion, landslides and bed-load processes, extremely actives in this area, are responsible for important soil loss with a high associated costs.



OBJETIVES:

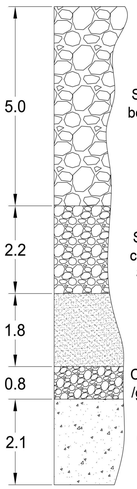
- Characterization of sediment dynamics in semi-arid environment.
- Identify relationship between erosion processes and forcing agent.

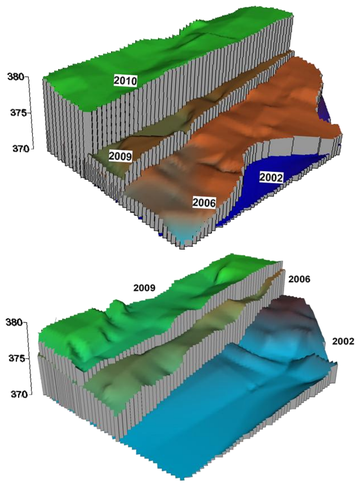
Control point as a full-scale sediment trap for Mediterranean processes:

Small dam 12 m height , 100 m wide and gravity type. V_T estimated = 0.2 hm³

METHODOLOGY

Monitoring works since 2004 through; 1) detailed topographical surveys (11 campaigns), 2) characterization of grain size distribution and 3) mineralogical composition of sediments.

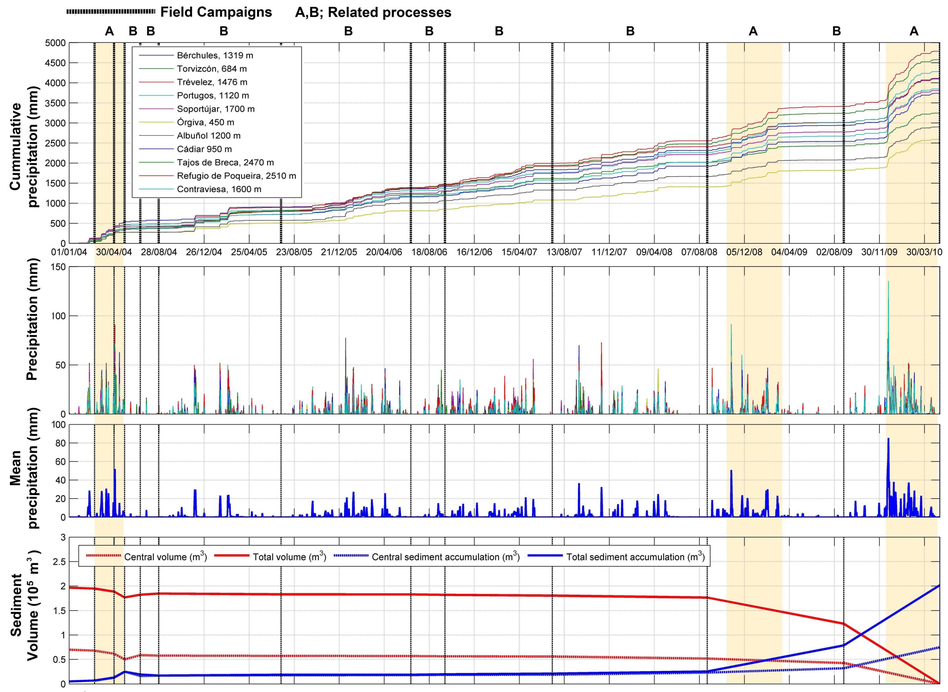


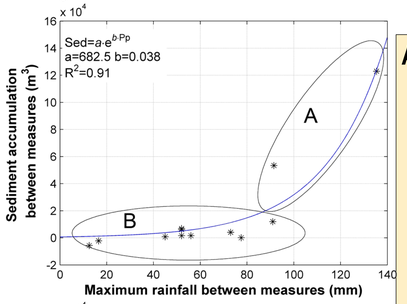


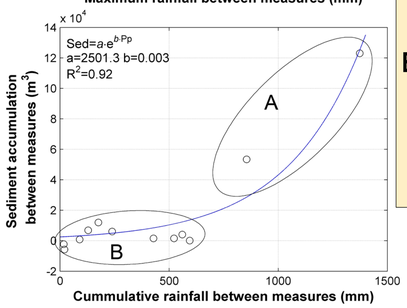
11 meteorological stations with different altitude range were used to characterize the forcing agents.

Topographical surveys and sediment characterization at the Granadino Dam (2004-2010).

RESULTS







Relationship between recorded precipitation data, volume of sediment and associated process were found.

Different pulse events have forced during the last 6 years the complete infilling of the reservoir.

A) Channel erosion processes: Storm events occurred during April-May 2004 caused 12.000 m³. In November 2008 a higher intensity event was registered with an amount of 53.400 m³ of sediment. The intense and continuous precipitation in December 2009 contributed with a total of 123.000 m³ of boulder and coarse gravel.

B) Diffusive hillslope, shallow land-sliding and overland flow erosion: From June 2004 to December 2008, snowmelt and storm episodes induced the deposition of a total of 5700 m³ with several loss/washed periods.

Two clusters of maximum and cumulative precipitation during measurement periods were identified (90 and 600 mm respectively) with a strong relationship with the volume and origin of sediments.

CONCLUSIONS AND ONGOING WORK

- 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.
- Accordingly to the field data and the developed studies, the amount of material available in the channel can provide huge amounts of sediments related with the intensity and duration of the event, difficult to quantify with universal predictive models. These pulses results in an important reservoir useful-life reduction in terms of capacity for Mediterranean semi-arid environments.
- Washing processes and the drainage of Dam limit this methodology to asses sediments coming from hillslopes.
- Currently the developing and implementing of a sediment transport models for alluvial rivers is being carried out in order to predict the total volume of detached material in Mediterranean environments.

ACKNOWLEDGEMENTS

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