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1 Analysis of the River Tagus bed variation during the last 20 years

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River Tagus basin is one of the largest basins in the Iberia Peninsula. It cuts longitudinally the Peninsula with a dominant East-West orientation covering an area of 80,629 km^2, 69% being in Spain and 31% in Portugal. The 827 km length in Spain is followed by a reach of 43 km at the border of Spain with Portugal and 230 km in Portugal.

After the border, River Tagus enters in a strong rock reach. Afterwards it reaches a movable river bed with rocky banks and then about 50 km of alluvial bed. After that begins the 70 km estuary.

The construction of dams to control the river discharges changed the river regime after 1943, being stabilized after 1983. Presently, there are higher low flow discharges and lower high flow discharges than the natural regime. The annual discharge module is about 360 m^3/s, but it may vary between about 1000 m^3/s in wet years and 90 m^3/s in dry years.

In Portugal, the hydrological monitoring system of River Tagus consists in three hydrometric gauges:

1. Tramagal (100 km from the downstream reference, Vila Franca de Xira),
2. Almourol (85 km),

3. Ómnias (45 km).

In order to calibrate the stage/discharge curves in the hydrometric stations, the river beds were surveyed when velocity measurements were done. In the first two stations, the analysed data were collected between the hydrological years 1986/1987 and 2004/2005, i.e., a total of 18 years. In the Ómnias station, the analysed data were collected between the hydrological years 1977/1978 and 1998/199, i.e., a total of 21 years. Consequently, since 1977 the batimetric variations (a total of more than 600 bed profiles) are available. This information is continuous and it includes important flood periods.

Presenting the batimetric and the river discharge variation during the past 30 years in the same plot allow us to know the relationship between this two variables for each hydrometric station.

This type of indirect measurement leads us to some conclusions about the variation of the river bed and consequently the general erosion with the river discharge. During extreme events the river bed can decrease about 3 m or even more in one day. Among other issues this is extremely important for the bridge piers design.

Analyzing the available data, we can characterize the behavior of the river bed as elastic. After the erosion caused by a flood event a slower process of deposition restores the previous river bed level in the following months.