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A 500-year history of floods in the semi arid basins of south-eastern Spain

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Floods are one of the natural hazards with higher incidence in the south-eastern Spain, the driest region in Europe, causing fatalities, damage of infrastructure and economic losses. Flash-floods in semi arid environments are related to intensive rainfall which can last from few hours to days. These floods are violent and destructive because of their high discharges, sediment transport and aggradation processes in the flood plain. Also during historical times floods affected the population in the south-eastern Spain causing sever damage or in some cases the complete destruction of towns.

Our studies focus on the flood reconstruction from historical sources of the Almanzora, Aguas and Antas river basins, which have a surface between 260-2600 km2. We have also compiled information from the Andarax river and compared the flood series with the Guadalentín and Segura basins from previous studies (Benito et. al., 2010 y Machado et al., 2011). Flood intensities have been classified in four levels according to the type of damage: 1) ordinary floods that only affect agriculture plots; 2) extraordinary floods which produce some damage to buildings and hydraulic infrastructure; 3) catastrophic floods which caused sever damage, fatalities and partial or complete destruction of towns. A higher damage intensity of +1 magnitude was assigned when the event is recorded from more than one major sub-basin (stretches and tributaries such as Huércal-Overa basin) or catchment (e.g. Antas River).

In total 102 incidences of damages and 89 floods were reconstructed in the Almanzora (2.611 km2), Aguas (539 km2), Antas (261 km2) and Andarax (2.100 km2) catchments. The Almanzora River was affected by 36 floods (1550-2012). The highest events for the Almanzora River were in 1580, 1879, 1973 and 2012 producing many fatalities and destruction of several towns. In addition, we identified four flood-clusters 1750-1780, 1870-1900, 1960-1977 and 1989-2012 which coincides with the periods of increased flood frequencies in the Andarax catchment. However, only the 1870-1900 flood-cluster is synchronic with the Guadalentín and Segura flood-periods, whereas the rest of flood-episodes are non-synchronic.

The 2012 event, the largest flood in the Almanzora river since the 1973 event, produced in the lower stretch less damage than in the middle stretch because of structural mitigation measures such as reservoir and artificial river channelling. However, in the lower Antas and Aguas rivers the situation is different. The damages increased in 2012 as a result from the increased exposure of tourism infrastructure in the floodplain near the coastline during the last two decades. Traditional settlements of rural societies were located also in the lower river stretches at a higher elevation (e.g. fluvial terraces, glacis, slopes) like today in the higher and middle catchments.