



Multidisciplinary reconstruction of 1874 Santa Tecla flash-floods in the Ebro river basin (NE Iberian Peninsula)

Josep Lluís Ruiz-Bellet (1), Mariano Barriendos (2), J. Carles Balasch (1), Jordi Tuset (3,4), Jordi Mazón (5), and David Pino (5)

(1) University of Lleida, ETSEA, Environment and Soil Sciences, Lleida, Spain (cbalasch@macs.udl.cat, 0034-973.70.26.13), (2) Department of Modern History. University of Barcelona, Barcelona, Spain (mbarriendos@ub.edu), (3) Forest Science Centre of Catalonia, Solsona, Spain (jordi.tuset@ctfc.cat), (4) RIUS Fluvial Dynamics Research Group, University of Lleida, Lleida, Spain, (5) Department of Applied Physics, Polytechnic University of Catalonia, Barcelona, Spain

Flash floods are among the most life-threatening natural hazards in the Western Mediterranean basin. Unfortunately, their study has only recently begun and, therefore, information is scarce and limited to contemporary events. This is a drawback when trying to analyze and classify this kind of events in a climatic change context, because important data belonging to past events is missing.

However, historical archives keep raw data –such as maximum water depths, rainfall durations, channel morphologies, atmospheric variables– which, after proper collecting and processing, can enlarge present day records on flash floods.

This research is a step more in the development of a multidisciplinary (hydrological, hydraulic and meteorological) methodology on historical flash floods reconstruction based on the analysis of a case study: 1874 Santa Tecla floods.

The night of 22-23 September 1874 several flash floods occurred in many catchments throughout the central and eastern parts of the Ebro River basin. These floods –known as Santa Tecla floods– caused at least 600 casualties and are considered, as a whole, one of the heaviest events in the area in the last 500 years.

Luckily, there is a lot of information on these floods, namely, water depths in many locations. Some of this information has already been used to calculate the peak flows of the floods in nine spots located in five catchments so far; the highest modelled specific peak flow is $10 \text{ m}^3 \cdot \text{s}^{-1} \cdot \text{km}^{-1}$, that is, among the highest ever measured in similar sized catchments in the Western Mediterranean region. Moreover, in one location the quality of the data even allowed the estimation of the hyetograph which caused the flood. Although a lot of this information has not yet been used in peak flow reconstruction, the raw water depth data can give a rough estimation of the total area affected, of the flood's magnitude and of the storm's movement.

On the other hand, atmospheric pressure daily data are available for Early Instrumental Period (1780-1950) from different previous research projects and institutional databases (NCEP and NCAR). These data, in spite of being outside the area affected by the floods, can be used to draw small scale atmospheric pressure maps which can help to understand the synoptic situation –that is, the general movements of the air masses– the days prior to the Santa Tecla floods.

Hydrological, hydraulic and meteorological reconstructed data will be used to:

- Describe the atmospheric situation during 1874 Santa Tecla floods: low pressure areas and their duration, course, magnitude, and possible associated weather fronts.
- Assess the possibility of rainfall in the weeks before the floods in order to estimate the soil moisture antecedent condition, instrumental in understanding the hydrological response of the catchments.
- Compare the above results to Santa Tecla floods' data (area affected, magnitude and storm's path) in order to look for a causality link between the atmospheric situation and the floods.

The methods developed and the results obtained in this research will contribute to the analysis of the heaviest floods occurred in NE Iberian Peninsula in the last 500 years.

