Analysis of the convective timescale during the major floods in the NE Iberian Peninsula since 1871

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INTRODUCTION

- **Our objective** is, for the most important floods occurred in NE Iberian Peninsula since **1874**, to relate CAPE to other meteorological and hydrological variables and to calculate the timescale.
- **21** episodes classified by Pino et al. (2016) were selected according to the area and number of basins affected and damages caused.
- **NCEP Reanalysis V2** (Compo et al., 2011) available since 1851 is used to calculate CAPE and to infer the timescale.

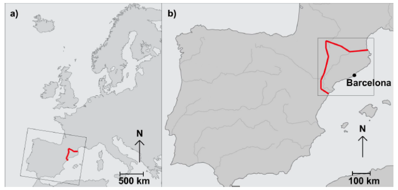

Figure 1. Location of the study area within Europe (a) and within the Iberian Peninsula (b).

References

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METHODOLOGY

The floods to be analyzed were selected in the study area (Fig. 1) from the PREDIFLOOD database (Barriendos et al., 2014) with a selection procedure (Pino et al., 2015). For each hydrological unit up to number 10, and in the order given in Fig. 2, the two floods with more flooding records classified as catastrophic were selected. We obtain 24 episodes.

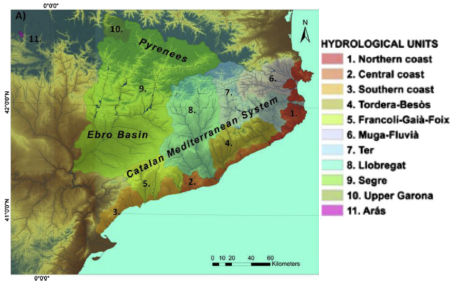

Fig.2: Study area with its eleven hydrological units

CAPE, for each episode is obtained from the 20th Century Reanalysis. However, CAPE is a poor predictor of convective properties of the atmosphere. Convective timescale (Dorne et al. 2006; Molini et al., 2011) compares large scale and local processes related with CAPE.

$$\tau_c = \frac{CAPE}{\left|\frac{dCAPE}{dt}\right|}$$

Equilibrium (CAPE ~ constant) → τ_c **< 6 h**

Non-equlibrium (CAPE variable) → τ_c **> 6 h**

RESULTS

CAPE vs rainfall duration

- Fig. 3 CAPE values are not extreme.
- Differences depending on the seasons.
- Summer floods: inverse dependence between CAPE and duration of the episode.

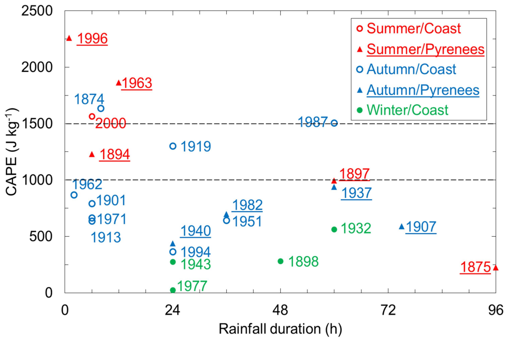

Fig.3: Max. CAPE of each episode at 42ºN-2ºE vs. rain event duration depending on season and area

CAPE vs specific peak flow

In general no correlation except for autumn Pyrenean floods (Fig. 4).

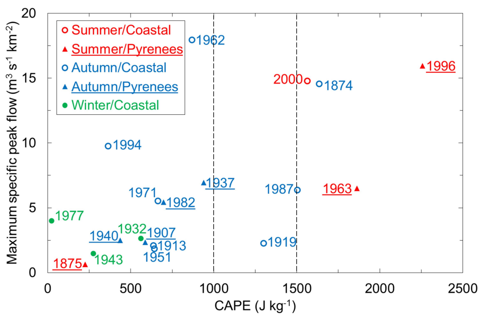

Fig.4: Max. CAPE of each episode at 42ºN-2ºE vs. max. specific peak flow depending on season and area

RESULTS

CAPE and the convective time scale (τ_c)

We have selected 5 representative episodes. Fig.5 shows the distribution of CAPE for one of the analyzed episodes.

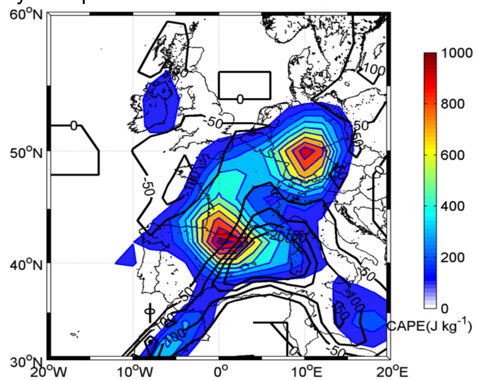

Fig 5:Distribution of CAPE on 3 August 1963 at 18 UTC

Convective index evolution (Fig. 6):

- January 1977, CAPE low constant values, τ_c < 6 h.
- Other selected episodes: CAPE not constant, τ_c > 6 h.

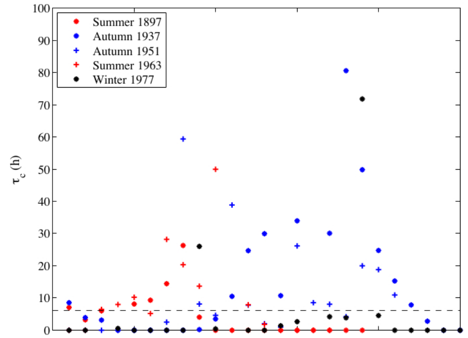

Fig 6:Timescale evolution calculated for five selected episodes. Clear differences between summer and winter floods

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