SYNOPTIC CONDITIONS RESPONSIBLE FOR AN EXTREME PRECIPITATION EVENT IN THE DANUBE RIVER BASIN

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Extreme precipitation events in the latest few decades show increasing trend all around the world, including the areas in central Europe where are recorded a few catastrophic extreme hydrological events happened in the last 10 years resulting in human causalities, economic losses and other accompanying disasters. The Danube River Basin is one of the major catchment basin in Europe and the only river in the world specific for that receiving water from 18 countries and flowing through 10 countries. Extreme precipitation events in the area of the Danube River Basin are not homogeneous in the timing and locations. Their intensity and frequency strongly depend on locations and present cyclones responsible for generation of precipitation. The characteristic of the cyclones such as orography, sea-surface temperature and availability of moisture has a huge impact on heavy precipitation in the Danube area. In this work, we show the synoptic conditions that end in the major extreme precipitation event over the Danube River Basin.

Using a ranking method to detect the extreme wet spells (Ramos et al., 2014; 2017) from 1981 to 2015 we found that 23 September of 1996 reaches the first position of the ranking. It was the first one for the event with 1 day of duration, and it is also detected within the top 10 position for wet spells with a duration of 3, 5 and 7 days (Ciric et al., 2017). The daily data used to calculate this ranking was CHIRPS data-set (Funk et al., 2015) which has a high resolution (0.05º) and a large temporal domain (starting in 1981 to near-present).

This study was focused on the top1 extreme precipitation event, 23 September 1996, and we investigated the responsible synoptic conditions that caused it. This anomalous and extreme precipitation event was a consequence of several and concatenated synoptic conditions: a) the occurrence of the hurricane Hortense during the days before the event, between 3 and 16 of September 1996; b) an anticyclone positioned over the Atlantic and, c) a low-level pressure system that occurred immediately after this hurricane. These three synoptic factors produced a situation that brings the perfect conditions for this extreme precipitation event. But, as it is know, if there is not enough moisture in the atmosphere available the precipitation does not occur.

So, a deeply analysis of the moisture sources thought a Lagrangian dispersion model FLEXPART confirmed that the Danube River Basin was affected by the support of a high anomalous quantity of moisture, during the day of the event and during the previous 10 days (Ciric et al., 2017), coming from (see Fig. 1): the western and southern-central Mediterranean Sea, the western Black Sea, and the northern Atlantic Ocean.

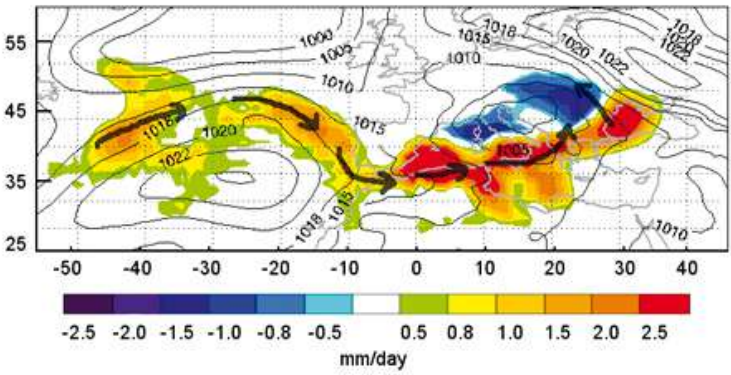

Fig. 1.- Anomalies of moisture sources (E - P > 0) obtained from the backward analysis during 10 days for the 23 September 1996 wet spell. SLP in black contours for 23 September 1996. Grey arrows indicate schematically the flow of the moisture from the Northern Atlantic Ocean to the DRB crossing the Mediterranean basin.

References

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