

AIR-MASS CHANGE ALONG TRAJECTORIES IN THE WESTERN MEDITERRANEAN BASIN IN TORRENTIAL RAIN EVENTS IN THE VALENCIA REGION

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Torrentiality is the main meteorological risk in the Valencian region. Damages produced by torrential rains are always high, sometimes including human casualties, and mainly due to the flooding of the main river valleys. The authors analyze the genetics of these heavy rains within the Back-door Cold Front concept. The main factors or causes in the onset of precipitation are: 1) a strong high pushing cold air from central and eastern Europe towards the Mediterranean Sea, reinforced by a low over northern Africa; 2) the vigorous exchange of heat and humidity within the sea surface-air mass system leading to the formation of a potentially unstable air mass (temperature contrast between sea surface and air is a key factor in these processes); and 3) the activation of mechanisms that can trigger the onset of precipitation, such as the orographic updraft of the unstable air mass arriving at the Valencian coast. These processes can be strengthened by the presence of a cold pool aloft. In our framework, the eastern flow of cold air pushed by a high located over central Europe towards a warmer Mediterranean is of central importance in the genetics of floods in our region. This is based on the possibility that the advected air mass can become potentially unstable along its path over a warmer sea, depending on the amount of moisture and energy (heat) the air-mass absorbs.

In this paper, the authors have analyzed the exchanges of heat and moisture between the colder air and the warmer sea by means of three different types of data sources. First we studied sea surface temperatures derived from NOAA satellite images. Then, data from rawinsonde in different points across the Mediterranean were collected and, finally, air-mass trajectories were calculated.

On all the events related to synoptic situations causing heavy rains in the Valencian region, vertical profiles and cross-sections show the inflow of cold continental polar air into the Mediterranean basin. The results of this analysis show that the air mass rises in temperature along its path towards the Western Mediterranean; registering an increasing moisture content and layer thickness. Most of the cases we have analyzed show the typical patterns of the Back-door cold front