ANALYSIS OF THE METEOROLOGICAL SITUATION OF 16 AUGUST 2004: A CASE OF EXTREME HAILFALL

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ABSTRACT

The occurrence of extreme precipitation events causes important economic losses and serious social impacts. It is not an easy task to forecast these events, and the models used may either not foresee them or lead to false alarms. Because of this, once such an event has taken place, it is advisable to establish a diagnosis of the meteorological situation that produced this extreme phenomenon, as this improves our knowledge of the processes involved.
On August 16th 2003 a number of storms caused hail precipitation in large areas of Aragón, especially in the Central Ebro Valley, one of the regions where hailfalls are very frequent. Serious damages were caused by one of these hailfalls in the town of Alcañiz, where some of the dents revealed that the hailstones had reached a diameter of up to 9 cm.
Images provided by Meteosat and by a C-band radar offered information every 3.5 minutes. This information was used to study the origin and development of the storms that occurred that day, from a spatial as well as from a temporal perspective.
This study focuses on the use of a mesoscale model to simulate the origin and development of the storm cells formed on that day. The MM5 mesoscale model was used. The simulation was carried out in four nested domains with a horizontal mesh size of 18, 6, 2 and 0.67 km respectively, and 23 vertical sigma-levels. Each of these domains was defined by a grid of 151x151 dots. The simulation started at 00 UTC of the study day and stopped at 12 UTC of the following day.
The results of the simulation show a good relationship between the images obtained by the radar and the ones simulated by the MM5 model. The diagnosis of the situation allows us to observe the presence of some mechanisms that played an important role in originating severe storms that cause extreme precipitation events. The following two mechanisms are particularly important:

- The formation of a thermal mesolow that affects the study zone.
- A surface air flow from the Mediterranean which provides water vapour, contrasting with the SW altitude wind.

These conditions are similar to others that have occasionally led to important hail precipitation in Aragón.