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Flash blizzards: two cases in the mountains of Madrid

E. Gascón, J.L. Sánchez, R. Posada, E. García-Ortega, J.L. Marcos, and L. López
UNIVERSITY OF LEÓN, GROUP FOR ATMOSPHERIC PHYSIC, LEÓN, Spain (llopc@unileon.es)

The sudden appearance of a blizzard is an open theme from the point of view of forecasting. When fallen precipitation greatly exceeds normal limits, it can produce problems in urban areas that are densely populated as well as their surrounding areas. In the last few years, Madrid has been experiencing at least one of these situations in the winter season. From these, we found two cases in which sudden snowfall affected transportation in the area. The vertical profile of temperature and humidity present using a microwave multichannel radiometer (MMR) shows abrupt changes when convection starts, with vertical creation of cloud ceilings superior to 10km in height. In both cases, a strong inversion of temperature of approximately 700 hPa was seen. By using the MM5, we also observed some common factors: the onset of precipitation is produced when the air masses that affect the various levels change abruptly, a strong advection of humidity in high and low levels, reaching as much as 80% humidity relative to 500 hPa and always coming from southwest winds.
The re-analyses of the surface show us that this coming together of masses along with the entrance of an occluded front from the southwest of the peninsula. We can eliminate the presence of mountainous waves as a mechanism of onset in both cases, not observed in images of MSG nor using the calculation with the Froude number.
The stability indices analyzed, such as the LI, TT, or KI, do not indicate any significant sign of instability in the atmosphere, calculated using the fifteen-minute measurements of data obtained using the MWR.
The exits of the MM5 were analyzed in the areas of temperature, wind, IWV, LWP, LWC at different levels and the two situations found were characterized using mesoscales. Similarly, they were compared to data observed by the MWR and the MSGs. In both cases, we saw where there is an abrupt change in the air mass that affects every level.

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