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Analysis of a snowfall event produced by mountains waves in Guadarrama Mountains (Spain)

Estíbaliz Gascón, José Luis Sánchez, Sergio Fernández-González, Andrés Merino, Laura López, and Eduardo García-Ortega

University of León, Química y Física aplicadas, León, Spain (egass@unileon.es)

Heavy snowfall events are fairly uncommon precipitation processes in the Iberian Peninsula. When large amounts of snow accumulate in large cities with populations that are unaccustomed to or unprepared for heavy snow, these events have a major impact on their daily activities.

On 16 January 2013, an extreme snowstorm occurred in Guadarrama Mountains (Madrid, Spain) during an experimental winter campaign as a part of the TECOAGUA Project. Strong northwesterly winds, high precipitation and temperatures close to 0°C were detected throughout the whole day. During this episode, it was possible to continuously take measurements of different variables involved in the development of the convection using a multichannel microwave radiometer (MMWR). The significant increase in the cloud thickness observed vertically by the MMWR and registered precipitation of 43 mm in 24 hours at the station of Navacerrada (Madrid) led us to consider that we were facing an episode of strong winter convection. Images from the Meteosat Second Generation (MSG) satellite suggested that the main source of the convection was the formation of mountain waves on the south face of the Guadarrama Mountains.

The event was simulated in high resolution using the WRF mesoscale model, an analysis of which is based on the observational simulations and data. Finally, the continuous measurements obtained with the MMWR allowed us to monitor the vertical situation above the Guadarrama Mountains with temporal resolution of 2 minutes. This instrument has a clear advantage in monitoring short-term episodes of this kind in comparison to radiosondes, which usually produce data at 0000 and 1200 UTC.

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