Geophysical Research Abstracts
Vol. 15, EGU2013-4197-1, 2013
EGU General Assembly 2013

Evaluating some indicators for identifying mountain waves situations in snow days by means of numerical modeling and continuous data

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Madrid – Barajas airport is placed at 70 km away from the Central System and snow days and mountains waves are considered as risks days for landing operations. This motivated the study of mesoscale factors affecting this type of situations.
The availability of observational data gathered during three consecutives winter campaigns in the Central System along with data from high-resolution numerical models, have allowed the evaluation of the environmental conditions necessary for mountain waves formations in snow days and were characterized from observational data and numerical simulations.
By means of Meteosat Second Generation satellite images, lee clouds were observed in 25 days corresponding to the 2008-2011 winter seasons. Six of them, which also presented NW low level flow over the mountain range, were analyzed. Necessary conditions for oscillations as well as vertical wave propagation were studied from radiometer data and MM5 model simulations.
From radiometer data the presence of stable environment in the six selected events is confirmed. From MM5 model, dynamic conditions allowing the flow to cross the mountain range were evaluated in three different locations around the mountain range.
Simulations of vertical velocity show that MM5 model is able to detect mountain waves. The waves present in the six selected events are examined. Tropospheric were able to forecast energy release associated with the mountain waves. The vertical wavelength presented a high variability due to intense background winds at high tropospheric levels. The average values estimated for λz were between 3 and 12 km. The intrinsic period estimated was around 30 and 12 km.
The simulations were able to forecast energy release associated with mountain waves.

Acknowledgments: This study was supported by the Plan Nacional de I+D of Spain, through the grants CGL2010-15930, Micrometeo IPT-310000-2010-022 and the Junta de Castilla y León through the grant LE220A11-2.