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Characterization of favourable conditions for gravity wave generation during snow precipitation events using remote sensing and modelling

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Experimental field campaigns have been carried out in the Central Range of Spain since winter 2008-2009 to gain better knowledge of the processes involved in snowfall for this area. Among other aspects, mesoscale gravity waves (referred to as "GWs") are being studied, because of their potential to transfer significant amounts of energy and momentum (Holton, 1990), which can influence the weather of a specific area. Such mesoscale GWs can be generated by different physical mechanisms, such as convection, density impulses and cross-frontal geostrophic accelerations, shear instability, topographic forcing, and geostrophic adjustment related to jets, fronts, and/or sources of strong diabatic heating (Zhang, 2004). There are several references which document the conditions for GW generation in summertime and, more specifically, during strong convective events (e.g. Kaplan et al., 1997; Zhang and Koch, 2000). However, few references are focused on GWs during winter snowfall events. The intention of this work is to characterize the conditions by which GWs are generated in the Central Range.
The characterization is based on a mesoscale stability analysis. In order to that, static and dynamic analyses are being carried out. Radiometric data are used for the static analysis, while MM5 data are used for the dynamic analysis. Combining both, it is possible to point out which conditions are favourable for GW formation. The database consists of a total of 60 days of snow precipitation detected in our Weather Observatory, placed in Navalmedio, Madrid (at 1300 msl) during two winter campaigns (2008-2009 and 2009-2010). For the identification of days where GWs were present, the visible channel of MSG was checked using the NUBES software (PRAPRO, 2009). Thus, the database is restricted to the diurnal period, (from 08 UTC to 16 UTC). Nineteen days with GWs were found and, therefore, 41 with no GWs.

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