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Sensitivity experiments for the simulations of a heavy rainfall event in Epirus, NW Greece

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In this work, a case of winter precipitation over Epirus, NW Greece, is simulated, by using the meteorological model MM5. For the model simulations, three domains are used: the “coarse”, which covers Europe (24 Km grid spacing) the “inner”, which covers Greece (8 Km grid spacing) and a third one, which covers Epirus, with a fine grid of 2 Km horizontal resolution. For this process, a one-way nesting technique is adopted, while Grell convective parameterization scheme (CPS) is utilized, for all the domains. In order to test the model set-up, two experimental runs are performed by using different initialization times. The results of these runs are compared with the corresponding 6-hourly observations by estimating the Mean Absolute Error. By using the optimum initialization time, at first, the Kain-Fritsch_2 CPS is employed, instead of Grell, for all domains, and then, Grell CPS is used in the two coarser grids but no CPS for the finest grid. Thus, the necessity of the usage of a CPS in the high resolution grid (2 Km) is examined and the comparison of two different CPS is achieved. Finally, the role of topography in the rainfall regime of this case is studied, by reducing the height of the mountains located southwest of an axis passing from Ioannina city and being parallel to the Pindus mountain range. This simulation is carried out by using the initialization time and the CPS which gave the best results in the previous stages of the study. The results show that the phenomenon is simulated best for initialization time 6 hours before the beginning of the event and by using Grell CPS even in the domain with the finest grid (Epirus). As far as its concerns the spatial distribution of precipitation after the modification of topography, it was found that rainfall decreases in the windward sides and over the tops of mountains with reduced height and increases in the lee sides, as was expected. In general, the modification of the coastal topography, results to a displacement of precipitation towards the flow of the prevailing wind.
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