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Mesoscale numerical simulation of severe rainfall episode in Tenerife Island

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During the afternoon of March 31st 2002 it took place in and around the city of Santa Cruz de Tenerife (Canary Islands, Spain) the most severe rainfall episode ever registered since the observatory started operating (1943). Torrential rains left 8 deads and considerable material damage affecting much more intensely a reduced area surrounding the capital city. The exceptional nature of this downpour is made evident by both the acummulated totals (more than 200 mm in 24h, equivalent to the expected yearly average) and the persistence of high intensities (60 mm/h during an hour and 100 mm/h during 50 minutes). The history record revealed that the daily accumulated precipitation only exceeded 100 mm in four occasions since 1943. Larger values have been recorded in other parts of the island but in the analyzed cases of study there is no evidence for such an intense and persistent precipitation rate as observed in this event.

This extreme rainfall was associated with a multi-cellular convective structure highly efficient in producing precipitation which remained in a quasi-stationary regime, affecting in a continuous way the same sector NE of the island. Many factors favoured the evolution of those *anchored* developments being the most remarkable the cold air pool at high levels, the low level convergence enhanced by the orography and the dynamic forcings associated to a jet-streak.

The National Institute of Meteorology (INM, Spain) carried out several experiments on the basis of the operational hydrostatic model (Hirlam, 0.5º resolution at that time) and increasing the spatial resolution to 0.2º and 0.1º. It was observed that although surface fields were more accurately simulated in 0.2º they were not in 0.1º unless more observational data were added. The study concluded the difficulty of simulating

meso-gamma scale phenomena with the operational model.

The aim of this study is to examine the capabilities of next generation mesoscale models in simulating extreme precipitation episodes as the one described above. The latest version of the publicly available mesoscale model *Water Research and Forecasting Model (WRF/ARW)* is used with some different configuration settings. Initial and boundary conditions were taken from European Center global model (ECMWF) analysis and integrations ran over high spatial resolution domains (1-3 Km). The simulation results show a remarkable dependency on the choice of parametrizations for physical processes which take place in scales unsolved by the model. Sensibility to grid step was also notable which supports the thesis of a decisive role of the orography in the development of convective structures, its feedback mechanism and the stationary character observed in satellite and radar imagery.