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Sensitive Analysis of several WRF Model Parametrizations to Simulate Weather Extremes over Eastern Spain

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The role of land cover changes in the development of extreme weather events in the Mediterranean basin still remains uncertain. Some evidences recorded along the eastern Spanish regions suggest that changes in land use can modify the water vapour mixing ratio within the tropospheric mesoscale circulations and hence affect some regional rainfall patterns. The main goal of this research (currently in development) is to analyse to what extent rainfall patterns are influenced by changes in land use at local and regional scales. To this end, the Weather Research and Forecasting (WRF) model is used to simulate meteorological conditions under different weather extreme scenarios.

On one hand, this study shows the validation performed for different parametrizations implemented in the mesoscale model. The RRTMG (radiation), the KF-CuP (cumulus) and the GCE (microphysics) schemes were finally selected to carry out the simulations of two periods associated to two different (but very recurrent in the region) meteorological extremes: (i) a situation of heavy precipitation, and (ii) a heat wave, over the whole eastern Spain.

On the other hand, several planetary boundary layer (PBL), surface layer (SL) and land surface model (LSM) parametrizations are used to perform a sensitive analysis among them when modelling the two selected meteorological extreme events. Specifically, the intercomparison is being performed using the following schemes: ACM2 and YSU (PBL), Revised MM5 Monin-Obukhov and Pleim-Xiu (SL), and Pleim-Xiu and Noah-MP (LSM).

Qualitative analyses highlight significant changes in the spatial distribution and temporal evolution of precipitation associated to differences of the simulated convergence zones over the region under study. Moreover, maximum accumulated precipitation values generally exceed measurements. In addition to qualitative analyses, the results obtained in the quantitative analyses will be considered to determine the WRF model surface configuration that more accurately captures the behaviour of the near-surface parameters.

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