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Study of the precipitation evolution in Catalonia using a mesoscale model (1971–2000)

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Abstract. In this work the MM5 mesoscale model is used in order to analyse the temporal evolution of the precipitation for the period 1971–2000 in Catalonia (NE Iberian Peninsula). Three one-way nested domains with 135, 45 and 15 km horizontal grid resolution and 23 vertical levels have been used. The simulation is performed nesting MM5 into the ERA40 reanalyses. Dynamical nudging is applied to the first domain. However, nudging is not applied in the second and third domains. In order to assess the performance of the developed methodology (main spatio-temporal precipitation characteristics), the results obtained in each simulation are compared with those obtained from ERA40 and observational data.

The results show a climatologically reliable distribution of the simulated precipitation spatial patterns for annual, semi-annual, spring and summer precipitation compared to those obtained from 1100 rain gauges covering the whole study area. For winter and autumn the goodness of the results is much lower. Furthermore, the results for 15-km outputs are better than the 45-km ones. The simulations also reproduce well the evolution of annual anomalies for Catalonia and the probability density function (PDF) of monthly mean precipitation. They also improve the precipitation outputs from ERA40, which present an important negative trend and a drier PDF for the period 1971–2000. On the other hand, extreme values are not well reproduced by the simulation. Despite this fact, hydric extremes derived from extreme values (i.e. extreme rainy days and flood records) are well captured by the model.

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