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

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Unlike temperature, precipitation modelling by means of climatic global circulation models (GCM) presents great inaccuracies. They increases in regions such as the Mediterranean zone, which is located in between the polar and tropical air mass influences. Many studies on precipitation modelling are just focused on winter and summer, while the other seasons keep out from larger and deeper analyses. However, spring and autumn are crucial for the knowledge of water resources and hydric extremes in the westerly leeward Mediterranean places. These seasons are the most rainy ones in this area. Moreover, difficulties raise when analysing floods and droughts in which other factors under GCM resolution are involved: orographic, mesoscale processes and anthropic factors as well.

In this contribution the MM5 mesoscale model is used to analyse the precipitation evolution for 1971-2000 period. Three one-way nested domains with 135, 45 and 15 km horizontal grid resolution and 23 vertical levels have been designed. The simulation is applied nesting the MM5 to the ERA-40 Reanalyses. Dynamical nudging is applied to the first domain while no nudging is performed in the second and third domains.

Results show a climatologically reliable distribution of precipitation simulated patterns for annual, semi-annual, spring and summer precipitation compared to those obtained from 1,100 observatories covering the whole study area. For winter and autumn the goodness of the results are much lower. Furthermore, the results for 15-km outputs are better than the 45-km ones. Simulations also well reproduce the evolution of annual anomalies for the entire country. On other hand, extreme values are not well obtained by the simulation. Despite of this fact, hydric extremes derived from extreme values (i.e. extreme rainy days and flood records) are well captured by the model. This work has been done with the aim of developing future climatic regionalised scenarios for Catalonia using the MM5 model nested to ECHAM5 GCM.