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High resolution climate scenarios by dynamic downscaling modelling techniques over the Northwestern Mediterranean Basin.

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Complex topography regions, such as Catalonia, located in the Northwestern Mediterranean Basin, require high resolution simulations in order to provide comprehensive temperature and precipitation trends in future climate scenarios.
Dynamic downscaling techniques are used in this study to estimate temperature and precipitation during the 2011-2050 period, according to three different emissions scenarios: A1B, B1 and A2 (IPCC; 2000). WRF-ARW mesoscale model is applied at high resolution, 10 km and 33 vertical sigma levels up to 10 hPa, to the final domain of study covering the Catalonian region, forced by the global climate model ECHAM5/MPI-OM runs 1 and 3 from the Fourth IPCC assessment report. A nested domain over Europe with coarser resolution, 30 km, is defined in order to minimise the boundary effects. The high computational costs are assumable thanks to the computational capacity of the MareNostrum Supercomputer, from the Barcelona Supercomputing Centre.
The modelling system is assessed for the 20th century (1971-2000) against observational data from the Meteorological Service of Catalonia. WRF-ARW predictions forced by ERA40 reanalyses provide correlations up to 0.92 for annual mean temperature and 0.65 for annual mean accumulated precipitation.
Future scenarios show increases of annual mean temperature ranging from 0.6 to 2.2 ºC, depending on the location and scenario and a slight general decrease in annual mean precipitation. Seasonal accumulated precipitation might increase in coastal areas during winter and summertime, up to 40 %, while decrease in inland mountain ranges, especially in autumn, up to 30 %.
This work shows that high resolution dynamical downscaling allows defining geographical patterns of temperature and precipitation change in future scenarios, providing fundamental information for mitigation and adaptation to climate change impacts.

IPCC (2000). IPCC Special Report Emissions Scenarios. Summary for policymakers. 27 p. ISBN: 92-9169-113-5