



Climate change scenarios for precipitation extremes in Portugal based on COSMO-CLM ensemble simulations

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The frequency of occurrence and strength of the precipitation extremes are often assessed by computing suitable indices of extremes. Four CLIVAR-recommended indices (Rx5day, R95T, R95pTOT and CDD) are applied to assess possible changes in the precipitation extremes over Portugal under future human-driven climate change scenarios. For this regional climate change assessment, precipitation data from the regional climate model COSMO-CLM (CCLM) ensemble simulations, with ECHAM5/MPI-OM1 boundary conditions, is used. For a recent-past period (1961-2000), the medians and the probability density functions of the CCLM-based indices are validated against station-based indices, providing an additional validation of the CCLM data. Results highlight the skilfulness of the model in reproducing not only precipitation, but also its four extreme indices. Climate change projections for 2071–2100, under the A1B and B1 SRES scenarios, reveal significant decreases in total precipitation, particularly in autumn over northwestern and southern Portugal. As expected, these changes present distinct local and seasonal patterns and are typically stronger for A1B than for B1 (with lower anthropogenic forcing). Contributions of extreme precipitation to total precipitation are expected to increase, particularly in winter and spring over northeastern Portugal. An extension of the dry season from summer to spring and autumn is also suggested by the significant increases in the dry spell lengths in autumn and spring. Further, most of these changes can be linked to adjustments in the large-scale atmospheric flow within the Euro-Atlantic sector, most importantly to shifts in the position of the Azores High pressure system and in the associated large-scale pressure gradients.