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Regression-based downscaling of extremes temperatures for the Spanish meteorological stations

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The climate change projections supplied by coupled atmosphere-ocean general circulation models (AOGCMs) do not have the spatial resolution required by the different impact models. Therefore, downscaling techniques are needed to apply over AOGCM outputs to increase their spatial resolution. Within the frame of the Spanish National Plan of Adaptation to Climate Change (PNACC), the Instituto Nacional de Meteorología (INM) has generated and compiled regional projections for Spain based on different emission scenarios, different AOGCMs and different downscaling techniques.

This contribution presents the application of the SDSM linear regression technique to downscale extreme temperatures. 373 stations distributed over the whole Spanish territory are used to link large-scale atmospheric variables (predictors) and local extreme temperatures (predictands). This collection of stations was previously selected using criteria of completeness and homogeneity. The HadCM3 model has supplied an extensive set of predictors for the SRES IPCC emission scenarios A2 and B2. Once adjusted, the regression models are able to explain in some cases up to 90% of extreme temperature variance. Using the regression models calibrated in a control period, downscaled projections were computed for the period 2011-2099. A mean trends of 0.077 ± 0.003 ºC/year and of 0.054 ± 0.002 ºC/year were obtained for maximum and minimum temperatures, respectively, under the A2 emission scenario and averaged over all stations in Peninsular Spain. The corresponding trends for the B2 emission scenario were 0.054 ± 0.002 ºC/year for maximum temperature and 0.029 ± 0.002 for minimum temperature. Special attention has been paid to the interpretation of seasonal and geographical features. Comparison with results from other AOGCMs and

other downscaling techniques are shown in a companion contribution.