

Climate change scenarios for surface temperature in Emilia-Romagna (Italy) obtained using statistical downscaling models

R.Tomozeiu, C.Cacciamani, V.Pavan, A.Morgillo, A.Busuioac

ARPA-SIM

Possible climatic changes of mean values and frequency of extreme temperature events in Emilia-Romagna region, over the period 2070-2100 against 1960-1990, are assessed. A statistical downscaling technique, applied to the HadAM3P experiments (A2 and B2 scenarios) performed at the Hadley Centre, is used to reach this objective. The method consists of a multivariate regression based on Canonical Correlation Analysis (CCA), using as possible predictors mean sea level pressure (MSLP), geopotential height at 500hPa (Z500) and temperature at 850hPa (T850) and as predictands the seasonal mean values of minimum and maximum air temperature (Tmin and Tmax), 90th percentile of maximum temperature (Tmax90), 10th percentile of minimum temperature (Tmin10), number of frost days (Tnfd) and heat wave duration (HWD) at station level. First, the statistical model is optimised and calibrated using NCEP/NCAR reanalysis to establish the large-scale predictors. The observational data at 32 stations uniformly distributed over Emilia-Romagna region are used to compute the local predictands. The results of the optimisation procedure reveal that T850 is the best predictor in most cases. T850 combined with MSLP is an optimum predictor for winter Tmax90 and autumn Tmin10. Finally, MSLP is the best predictor for spring Tmin while Z500 is the best predictor for spring Tmax90 and heat wave duration index, except autumn season. The HadAM3P ability to simulate the present day spatial and temporal variability of the chosen predictors is tested, using the control experiments. Finally, the downscaling model is applied to all model output experiments so as to obtain simulated present day and A2 and B2 scenario results at local scale. Results show that significant increases can be expected to occur under scenario conditions in both maximum and minimum temperature, associated with a decrease in the number of frost days and an increase in the heat wave duration index. The magnitude of the changes is more significant for A2 scenario than for B2 scenario.