Geophysical Research Abstracts, Vol. 7, 07615, 2005
SRef-ID: 1607-7962/gra/EGU05-A-07615

Downscaled temperature and precipitation extremes in Emilia - Romagna based on HadAm3P output for the period 2070-2100

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Climatic changes of seasonal extreme temperature and precipitation at eight stations from Emilia-Romagna, a region in Northern Italy, are assessed applying a statistical downscaling technique to CGCM experiments. The method consists of a multivariate regression based on Canonical Correlation Analysis (CCA). The potential predictors include mean sea level pressure, geopotential height at 500hPa and temperature at 850 hPa. The predictands are the seasonal values of 90th percentile of maximum temperature, 10th percentile of minimum temperature, number of frost days, heat wave duration, 90th percentile of precipitation, number of events greater of long term 90th percentile of rain days.

First, a set-up of the statistical model has been made using predictors from NCEP reanalysis. The model has been calibrated on the period 1958-1978 & 1994-2000 and validated on the period 1979-1993. The Pearson correlation coefficient, BIAS and RMSE were used as skill measures. The results reveals that in general mean sea level pressure and temperature at 850 hPa are the best predictors. Then, the HadAm3P model ability to simulate the predictors has been tested, using a present day experiment. Finally, the downscaling model has been applied to the output of a run of the same model with increasing concentration of greenhouse gases, for the period 2070-2100, in order to obtain scenario predictions at station level for seasonal temperature and precipitation, extreme and mean values, over Emilia-Romagna.

Changes in the frequency of temperature and precipitation extreme events has been estimated for the period 2070-2100 with respect to the present day. Significant changes has been detected especially in winter and summer temperature extremes, while precipitation extremes undergo significant changes in spring, summer and autumn.