Geophysical Research Abstracts,
Vol. 11, EGU2009-8117, 2009
EGU General Assembly 2009

Climate change scenarios of temperature and precipitation in Northern Italy for the 21st century obtained using statistical downscaling models

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Climate changes of seasonal minimum, maximum temperature and precipitation in N-Italy, over the period 2021-2050 and 2071-2099 against 1961-1990, are assessed. A statistical downscaling technique, applied to the ENSEMBLES experiments (A1B scenario), is used to reach this objective. The method consists of a multivariate regression based on Canonical Correlation Analysis using as possible predictors mean sea level pressure, geopotential height at 500hPa, and temperature at 850 hPa. The set-up of the statistical models is done using predictors from ERA40 reanalysis (1961-2002). The observational data of 45 stations for temperature and 55 stations for precipitation, uniformly distributed over northern Italy, are used to compute the local predictands.
The model ability to simulate the present day spatial and temporal variability of the chosen predictors is tested using the control run experiments. The downscaling model is then applied to obtain simulated present day and A1B scenario of seasonal temperature and precipitation at local scale. The significance of changes is tested from the statistical point of view.
The projections show that significant increases could be expected to occur under scenario conditions in all seasons, in both minimum and maximum temperature. The magnitude of changes is more intense during summer and in the second period, 2071-2099, when the changes could reach values around 3.5°C for minimum and maximum temperature (mean values over all stations). In the other seasons, the changes in minimum and maximum temperature will be around 1°C for the period 2021-2050 and 2.5°C for the period 2071-2099 (mean values over all stations).
The results emphasise also a significant change in seasonal precipitation, especially in the period 2071-2099. In this case, the pattern of changes is more complex, different from season to season and over the region. During summer, precipitation reductions up to 60% could be expected.