Geophysical Research Abstracts
Vol. 16, EGU2014-1790, 2014
EGU General Assembly 2014

Assessing climate change over the Marche Region (central Italy) from 1961 to 2100: projected changes in mean and severe precipitation (with a statistical evaluation of RCMs local performance).

Lorenzo Sangelantoni, Alessandro Coluccelli, and Aniello Russo
Polytechnic University of Marche, department of Life and Environmental Sciences, Ancona, Italy (l.sangelantoni@univpm.it)

Considering the 21st century projected precipitation over the Mediterranean basin, Marche region (central Italy, facing the Adriatic Sea) climate represents an interesting case of study, being located on a transition area between positive and negative change sign. Multi-model projections of daily mean precipitation over Marche region, have been extracted from the outputs of a set of 7 Regional Climate Models (RCMs) over Europe run by several research Institutes participating to the EU ENSEMBLE project. These climate simulations from 1961 to 2100 refer to the boundary conditions of the IPCC A1B emission scenario, with a horizontal resolution of 25km $\times$ 25km. Furthermore, two RCMs outputs from Med-CORDEX project, with a higher horizontal resolution (12km x 12km) and boundary conditions provided by the new Representative Concentration Pathway (RCP) 4.5 and 8.5, are analyzed. Observed daily mean precipitation over Marche region domain have been extracted from E-OBS gridded data set (Version 9.0) covering the period 1970-2004. Concise statistical summary of how well employed RCMs reproduce past observed Marche region precipitation (1970-2004) in term of correlation, root-mean-square difference, and the ratio of variances are graphically displayed on 2D-Taylor diagram. This multi-statistical model performance evaluation easily allows:
- to compare the agreement with observation of the 9 individual RCMs
- to compare RCMs with different horizontal resolution (12 km and 25 km)
- to evaluate the improvement provided by the RCMs ensemble.
Results indicate that the best performance is obtained by the 9 RCMs ensemble. Differently than temperature (not shown), RCMs showed a lower capability in reproducing observed mean interannual precipitation distribution, and the increase in RCMs horizontal resolution (from 25 km to 12 km) did not provide evident performance improvements. Considering that alteration in hydrologic cycle is one of the most worrying climate change outcomes at regional/local level, we brought out the hydro-climatic intensity index (HY-INT; Giorgi et al. 2011) for the Marche region. HY-INT integrates metrics of mean annual precipitation intensity and dry spell length, viewing the response of this two metrics to global warming as deeply interconnected. HY-INT shows an overall statistically significant increase (especially of dry spell length), more relevant after 2050. Taking cue from HY-INT index results, we investigated not only projected changes of mean precipitation, but also the key aspect of modification of extreme tails of the precipitation distribution. Projected percentage changes in mean and 90th percentile precipitation by comparison between 2071-2100 and 1961-1990 time slice values over Marche region were obtained. Results show two remarkable aspects linked with large scale circulation (northward shift of storm track) and thermodynamic processes (Clausius-Clapeyron relation):
• summer with heavily negative anomaly in mean precipitation amount followed by spring, respectively -30% and -25%. Cold semester shows trivial decrease (about -5%, mainly on western mountainous area);
• contrasting with the mean precipitation anomaly, an increase in severe precipitation events (90th percentile) is projected, especially in autumn (+25%).
Future research step will be devoted to investigate regional hydrological climate change impacts, involving multi climate bias corrected variables from RCMs in combination with hydrological models.