Geophysical Research Abstracts
Vol. 15, EGU2013-5200, 2013
EGU General Assembly 2013

Comparison between different downscaling methods by using ERA-40 re-analysis data in central Italy

Stefania Camici (1), Antonello Provenzale (2), Luca Brocca (1), and Tommaso Moramarco (1)

(1) National Research Council, Institute for Geo-Hydrological Protection, Perugia, Italy (s.camici@irpi.cnr.it), (2) National Research Council, Institute of Atmospheric Sciences and Climate, Torino, Italy

Global climate models (GCMs) are the primary tool to assess future climate change. However, most GCMs currently do not provide reliable information on scales below about 100 km and, hence, cannot be used as a direct input of hydrological models for climate change impact assessments. Therefore, a wide range of statistical and dynamical downscaling methods, trying to overcome the scale discrepancy between the climatic scenarios and the resolution required for impact assessment, have been developed. In this context, the selection of a suitable downscaling method is an important issue. Indeed, the use of different spatial domains, predictor variables, predictands and assessment criteria makes the comparison of the relative performance of different methods difficult to achieve and general rules to a priori select the best downscaling method are not available. Additionally, many studies have showed that, depending on the hydrological variables, dynamical and statistical downscaling methods significantly contribute to the overall uncertainty related to the hydrological impact assessment studies. Therefore, it is strongly recommended to test different downscaling methods by using verification data before applying them to climate model data.

The main purpose of this study is the comparison of different statistical downscaling approaches (e.g. delta change method, quantile mapping method, local scaling…) applied to rainfall time series. Specifically, the daily rainfall data derived from the ERA-40 re-analysis database (provided by the European Centre for Medium-Range Weather Forecasts, ECMWF, with resolution of about $\sim$120 km), from September 1957 to August 2002, are used for testing the different downscaling methods.

This dataset is used in place of the scenarios provided by the GCMs with the significant added-value that also the temporal agreement with ground observations can be tested. The ERA-40 re-analysis rainfall data are downscaled with different downscaling techniques and their ability to reproduce the statistical properties and the temporal pattern of the observed time series is analyzed. For this purpose, high quality rainfall observations obtained by a dense rainfall network in central Italy are used as benchmark. For the evaluation of the downscaling methods, a split sample test is applied: the time period 1987-2002 is used for validate the different methods, which are calibrated in the period 1957-1986.

The results of this analysis will provide useful guidelines for the selection of the best performing statistical downscaling approach applied to rainfall data.