Geophysical Research Abstracts
Vol. 14, EGU2012-5404-1, 2012
EGU General Assembly 2012

Use of a Weather Generator for analysis of projections of future daily temperature and its validation with climate change indices

A. Di Piazza, E. Cordano, and E. Eccel

IASMA Research and Innovation Centre, Fondazione Edmund Mach, Sustainable Agro-ecosystems and Bioresources Department, Italy (annalisadipiazza79@gmail.com)

The issue of climate change detection is considered a major challenge. In particular, high temporal resolution climate change scenarios are required in the evaluation of the effects of climate change on agricultural management (crop suitability, yields, risk assessment, etc.) energy production and water management.
In this work, a "Weather Generator" technique was used for downscaling climate change scenarios for temperature. An R package (RMAWGEN, Cordano and Eccel, 2011 – available on http://cran.r-project.org) was developed aiming to generate synthetic daily weather conditions by using the theory of vectorial auto-regressive models (VAR). The VAR model was chosen for its ability in maintaining the temporal and spatial correlations among variables. In particular, observed time series of daily maximum and minimum temperature are transformed into "new" normally-distributed variable time series which are used to calibrate the parameters of a VAR model by using ordinary least square methods. Therefore the implemented algorithm, applied to monthly mean climatic values downscaled by Global Climate Model predictions, can generate several stochastic daily scenarios where the statistical consistency among series is saved. Further details are present in RMAWGEN documentation.
An application is presented here by using a dataset with daily temperature time series recorded in 41 different sites of Trentino region for the period 1958-2010. Temperature time series were pre-processed to fill missing values (by a site-specific calibrated Inverse Distance Weighting algorithm, corrected with elevation) and to remove inhomogeneities.
Several climatic indices were taken into account, useful for several impact assessment applications, and their time trends within the time series were analyzed. The indices go from the more classical ones, as annual mean temperatures, seasonal mean temperatures and their anomalies (from the reference period 1961-1990) to the climate change indices selected from the list recommended by the World Meteorological Organization Commission for Climatology (WMO-CCL) and the Research Programme on Climate Variability and Predictability (CLIVAR) project's Expert Team on Climate Change Detection, Monitoring and Indices (ETCCDMI).
Each index was applied to both observed (and processed) data and to synthetic time series produced by the Weather Generator, over the thirty year reference period 1981-2010, in order to validate the procedure. Climate projections were statistically downscaled for a selection of sites for the two 30-year periods 2021-2050 and 2071-2099 of the European project "Ensembles" multi-model output (scenario A1B).
The use of several climatic indices strengthens the trend analysis of both the generated synthetic series and future climate projections.