Geophysical Research Abstracts
Vol. 14, EGU2012-11754, 2012
EGU General Assembly 2012

Stochastic rainfall downscaling of the PROTHEUS regional climate model

D. D'Onofrio (1), V. Artale (2), S. Calmanti (2), J. von Hardenberg (1), E. Palazzi (1), and A. Provenzale (1)
(1) ISAC-CNR, Torino, Italy , (2) ENEA, UTMEA-CLIM, C.R. Casaccia, S. Maria di Galeria, Rome, Italy

Regional climate models have a temporal resolution which is often adequate for the application in climate change impact studies, but a spatial resolution which can be insufficient to resolve precipitation extremes and small-scale variability, particularly in the presence of complex terrain and heterogeneous orography. In the absence of fully deterministic models of small-scale rainfall, this scale gap can be bridged using stochastic downscaling techniques to generate ensembles of high-resolution scenarios of rainfall patterns.

The aim of this work is to investigate whether precipitation produced by a regional climate model, and downscaled stochastically, is able to reproduce the main properties of precipitation observed by a network of rain gauges. We use a version the stochastic downscaling procedure RainFarm (Rainfall Filtered Auto Regressive Model), optimized for climatic applications, to downscale the rainfall field produced by the atmospheric-ocean regional climate model PROTHEUS. The statistics of the downscaled rainfall fields are compared with rainfall data from a network of 122 rain gauges located in the Piemonte region, North-West of Italy, for the time period from 1958 to 2001.

We find that the high-resolution precipitation fields obtained downscaling the PROTHEUS model outputs reproduce well the seasonality and the amplitude distributions of observed rain gauge precipitation during most of the year. Of course, a stochastic downscaling procedure cannot correct the model outputs at large-scales, as evidenced by a the presence of a bias in average precipitation and a disagreement in the frequency of precipitation events, particularly during the winter season.