Geophysical Research Abstracts
Vol. 12, EGU2010-6893-1, 2010
EGU General Assembly 2010

Statistical downscaling of daily temperatures in northwestern Spain from an ensemble of AR4-GCMs

Swen Brands (1), Juan Taboada (2), Antonio Santiago Cofiño (3), Christoph Schneider (4), and Tobias Sauter (4)

(1) Instituto de Física de Cantabria, CSIC-UC, Santander, Spain (brandssf@unican.es), (2) MeteoGalicia, CINAM, Xunta de Galicia, Santiago de Compostela, Spain, (3) Department of Applied Mathematics and Computer Science, UC, Santander, Spain, (4) Department of Geography, Physical Geography and Climatology Group, RWTH Aachen University, Aachen, Germany

The analog method (AN) ist used to generate ensemble-projections of local daily mean, maximum and minimum air temperatures in northwestern Spain (Galicia). A three-step method is followed:

First, from air temperatures at 850 hPa and mean sea level pressure (T850MSLP), chosen to be the best predictor combination for the purpose of this study, the error of the AN under optimal conditions is estimated. Besides a negative bias found for the maximum temperatures in spring the statistical properties of all predictands are reproduced well in every season of the year.
In a second step, the T850MSLP-fields of 5 AR4-GCM control-runs of a multi-model, multi-initial conditions ensemble (MMMICE) are used to downscale the predictands, thus obtaining the total uncertainty. Neither the predictor data nor the downscaled series are corrected by bias adjusting, variance inflation or randomisation. While the individual downscaled series cannot reproduce the CDFs of local observations, their combination performs quite well during summer and autumn.
In a third step 14 scenario-runs of the MMMICE are used to generate summer (JJA) projections until 2050. Downscaled series from JJA 2021-2050 (scenario period) are compared to observations from JJA 1973-2002 (reference period) in order to detect local climate change:
In addition to the mean relative warming it can be shown that the relationship between the relative frequency of daytime heat-events in the reference period and its frequency increase in the scenario period is described by a descending exponential function. For nighttime warm-events a linear relationship can be assumed. Model uncertainties rather than forcing or initial conditions uncertainties dominate the spread in the scenario period.

We conclude that climate projections downscaled from only one GCM should be treated with caution, particularly if they refer to the probability of future extreme events. This especially holds in case their corresponding control-run versions are not validated and/or the projections are given relatively to the control-period. By increasing the number of GCM-ensemble members and optimizing the domain as a function of each member´s skillfull scale local CDFs may be reliably reproduced throughout every season of the year.