Geophysical Research Abstracts,
Vol. 11, EGU2009-8118, 2009
EGU General Assembly 2009

A comprehensive sensitivity analysis of high resolution regional climate simulations with WRF in the European Alpine region

N.K. Awan and A. Gobiet

Wegener Center for Climate and Global Change (WegCenter), Institute for Geophysics, Astrophysics, and Meteorology (IGAM), University of Graz, Austria (nauman.awan@edu.uni-graz.at / Fax: 0043 316 380 9830)

A high resolution (10km grid–spacing) mixed–physics ensemble is analyzed to investigate the errors associated with the choice of physical parameterization and its impact on the downscaling ability of a non-hydrostatic mesoscale-scale regional climate model in the European Alpine region.

The National Center for Environmental Prediction /National Center for Atmospheric Research (NCEP/NCAR) next generation Weather Research and Forecasting (WRF) mesoscale model is applied in a two–step nesting setup to dynamically downscale the ERA–40 re-analysis dataset of European Center for Medium-Range Weather Forecasts (ECMWF). A total of sixteen one year simulations with varying physical parameterization were carried out. The analysis is focused on the near–surface air–temperature and precipitation over land. The precipitation is compared with a daily precipitation dataset provided by the Swiss Federal Institute of Technology Zürich (ETH Zürich). The near–surface air–temperature is compared with a recently published daily dataset by the European Climate Assessment & Dataset (ECA& D). The seasonal model error–characteristics are analyzed in nine climatological sub–regions defined by applying a clustering method on the ETH dataset.

The analysis is focused on the ensemble's range of errors, on temporal correlation, normalized standard deviation and median deviation. The annual errors were found to be in the range of 1.3 °C to -1.1 °C and 1.4 mm/day to 0.1 mm/day for temperature and surface precipitation amount respectively. The results presented in this study provide an insight into the model errors associated with physical parameterization and its consequent impact on the model's downscaling ability on regional and subregional scale. The analysis indicates that the WRF model has a strong sensitivity to the choice of physical parameterization schemes and significant improvements can be achieved by a suitable model configuration. This study can be used as a guideline for setting up long term regional climate simulations with WRF.