Geophysical Research Abstracts
Vol. 21, EGU2019-17919-2, 2019
EGU General Assembly 2019

Analysis of daily cycles in the Greater Alpine Region using convection-permitting climate simulations

Ronny Petrik (1), Ivonne Anders (2), and Merja Tölle (3)

(1) Helmholtz-Zentrum Geesthacht, Institute for Coastal Research, Geesthacht, Germany (ronny.petrik@hzg.de), (2) Zentralanstalt für Meteorologie und Geodynamik, Climate Research Section, Wien, Austria (ivonne.anders@zmag.ac.at), (3) Justus-Liebig Universität Giessen, Department of Geography, Giessen, Germany (merja.toelle@geogr.uni-giessen.de)

Large uncertainties still exist in climate simulations in estimating climate change signals and cloud-radiative feedbacks on small spatial scales and in topographical structured regions. One issue is the insufficient resolution for long-term integrations, but end users and stakeholders force to be provided with high-resolved information for climate adaptation strategies among others. Therefore, the CLM-community established an ensemble of high-resolution, convection-permitting hindcast simulations within the framework of CORDEX FPS Convective Phenomena, and prepared it in close cooperation with the COSMO-community (Consortium for Small-scale Modeling). The simulations were carried out over the Greater Alpine Region in Europe and for the year 2008. The forcing is done using the most recent highly-resolved regional reanalysis COSMO-REA6.
The objective of our investigation were:
a) to understand how sensitive the simulation results are to changes in physical parameterization and numerics and
b) to what extend can an increase in performance be seen by changing the resolution and allowing climate models to resolve deep convection.
Using newly combined rain-gauge and radar datasets it is shown that the daily cycle of precipitation is improved for the convection-permitting simulations. In addition, satellite datasets allow us to demonstrate to which degree the observed spatio-temporal fields of clouds and radiation are represented in high resolution climate simulations. Furthermore, the precipitation analysis for the highlands is very likely deteriorated by the missing undercatch correction of precipitation in complex terrain. In general, we found only a small sensitivity of model configuration on the simulation results. However, strong changes appear with different aerosol climatology, which influenced the model ability to generate realistic day-to-day correlations. Finally, vertical soundings are referred to analyze model performance regarding planetary boundary layers.
We expect our study to be a motivation for the climate community to investigate in detail the atmospheric processes using highly-resolved reference data and vertical resolved information. Moreover, we note that the reference data sets should be analyzed for limitations and shortcomings prior to analysis to prevent from misleading conclusions.