EMS Annual Meeting Abstracts
Vol. 12, EMS2015-447, 2015
15th EMS / 12th ECAM

Good surface performance of GCMs, good driving data for RCMs? Towards a clarification

Martin W. Jury (1), Andreas F. Prein (2), Heimo Truhetz (1), and Andreas Gobiet (3)

(1) University of Graz, Wegener Center for Climate and Global Change, Graz, Austria (martinwolfgang.jury@edu.uni-graz.at), (2) Current affiliation: National Center for Atmospheric Research, Boulder, Colorado, (3) Current affiliation: Central Institute for Meteorology and Geodynamics (ZAMG), Graz, Austria

The quality of regional climate model (RCM) simulations is strongly dependent on the quality of data provided as lateral boundary conditions (LBCs). This data typically comes from general circulation models (GCMs) like those from the Coupled Model Intercomparison Project 5 (CMIP5). Frequently, the quality of near-surface variables (e.g., temperature or precipitation) of general circulation model (GCM) simulations like those from phase 5 of the Coupled Model Intercomparison Project (CMIP5) is analyzed in the region of interest. However, such analysis does not necessarily lead to the selection of high-quality LBCs, as demonstrated in this study.

The study region is the European domain of the Coordinated Regional Climate Downscaling Experiment (EURO-CORDEX). A squared error model performance index (MPI) is used to evaluate the skill of the CMIP5 GCMs to reproduce near surface conditions within the domain and free atmosphere parameters along the EURO-CORDEX lateral boundaries as a proxy for LBCs used in regional climate modeling. To show any kind of connectedness between the MPIs of the different parameters investigated Spearman rank correlations coefficients have been calculated.

The results suggest that a GCM's skill in simulating near-surface variables is correlated with 0.62 (Spearman's r) to its skill in simulating LBCs for regional climate simulations. However, there is hardly any correlation between the performances of different variables. Also the upper air parameters over the lateral boundary zone show only a weak inter-variable consistency being strongest for the same parameters on adjacent pressure levels. However, the major implications for model evaluations in the context for RCM studies is that a GCM evaluation solely based on surface parameters or a few variables is inadequate to select suitable driving data for regional climate models. The selection should include the evaluation of all variables passed to the RCM as LBCs on at least one midtropospheric level.