Geophysical Research Abstracts
Vol. 17, EGU2015-11841, 2015
EGU General Assembly 2015

Selecting climate simulations for impact studies based on multivariate patterns of climate change

Thomas Mendlik (1) and Andreas Gobiet (2)

(1) University of Graz, Wegener Center for Climate and Global Change, ReLoClim, Graz, Austria (thomas.mendlik@uni-graz.at), (2) Central Institute for Meteorology and Geodynamics (ZAMG)

In climate change impact research it is crucial to carefully select the meteorological input for impact models. On the one hand, the number of feasible impact simulations is often restricted by practical constraints, which necessitates the selection of few climate simulations out of a larger ensemble without underestimating the spread of the entire ensemble. On the other hand, model selection should consider the fact that ensembles of climate simulations are often ensembles of opportunity, which may be subject to model inter-dependencies and biases.

Bearing this in mind, we introduce an approach for model selection consisting of three steps: First, using principal component analysis for a multitude of meteorological parameters, to find common patterns of climate change within the multi-model ensemble. Second, detecting model similarities regarding these multivariate patterns using cluster analysis. And third, sampling models from each cluster, leading to a subset of representative simulations.

We present an application based on the ENSEMBLES regional multi-model ensemble with the aim to provide input for a variety of climate impact studies. For meteorological parameters based on daily average values, we find that the two most dominating patterns of climate change relate to temperature and humidity patterns. For this specific set of parameters, the ensemble can be reduced from 20 to 5 simulations, still maintaining the essential climate change patterns of the whole ensemble.

The proposed method enables the user to shrink the ensemble to a few representative members, conserving the model spread and accounting for model similarity. This reduces computational costs for climate impact modeling and enhances the quality of the ensemble at the same time, as it prevents double-counting of dependent simulations which would lead to biased statistics.