Project title

Long-term simulations with extended versions of the new REMO regional Earth system model

Abstract

During the last four years, the climate modelling group at the University of Würzburg (Prof. Heiko Paeth) has tested and further developed a series of extensions and improvements within the regional climate model REMO that are dedicated to provide a regional Earth system model. The improvements comprise

- an interactive vegetation scheme
- a five-layer soil hydrology scheme
- more diverse and higher-resolution land surface parameters
- new methods soil temperature computation
- an irrigation scheme
- an inland-lake scheme
- a wildfire scheme with carbon cycle
- a non-hydrostatic version
- a coupled atmosphere-ocean version (work has just started)
- a new land use scheme (work has just started)

These modelling efforts have been undertaken in close collaboration with other REMO modeller groups, especially at GERICS. The work has been and is still funded in the framework of several third-party funded projects (BMBF, DFG, EU, Helmholtz Association). So far, the sensitivity studies and some shorter-term reanalysis-driven simulations could be managed on the basis of the computing facilities available at the University of Würzburg.

The computing and storage resources applied for at DKRZ are now meant to conduct longer-term simulations with input data from the ERA-Interim reanalysis and from the MPI-ESM global climate model, using the historical period and several emission scenarios until 2100. The objective is to test the various new versions of REMO over climatological time scales and to identify the effects of the modified modelling setup on the model performance and climate change signals.

The overall aim consists in developing a regional Earth system model that synergizes the advantages of high-resolution climate modelling and provides a new instrument of improving our understanding of the Earth's climate system and of assessing the regional dimension of man-made climate change. Only a few of the listed improvements have been tested before in a systematic way. The combination

of several or all of the improvements is unprecedented and of particular interest for the regional modeller community worldwide. The planned simulations do not overlap with other current modelling efforts on HLRE-4.

The HLRE-4 environment is particularly suitable for the planned simulations because the REMO model has been adapted to this computing and storage system. In addition, the required input data from reanalyses and global climate models is already available at DKRZ.

After thorough validation of systematic model biases, detailed statistical model data analysis and multilateral comparisons among the various REMO versions, it is planned to publish the results and gained insights in a series of scientific papers for peer review in international journals.