CESM1 (Community Earth System Model) as a new MESSy basemodel: Evaluation based on ESCiMo simulations with ECHAM5/MESSy

Abstract

The implementation of the Modular Earth Submodel System (MESSy) into the atmospheric component of the Community Earth System Models (CESM1) started in 2013. The new combined system gives the MESSy user group more and advanced options in selecting the appropriate model components for their scientific questions. Most importantly, this development now allows to choose from several dynamical cores. Especially the HOMME (Higher order modelling environment) spectral element (SE) core has shown to be scientifically and technically a major improvement over other dynamical cores (no need for polar filters, local conservation of energy and mass, scales up to 10^5 compute cores), see *Dennis et al., 2012*. The first development steps were published by *Baumgaertner et al. (GMD, 2016)*. Further technical developments and short-term tests continued in 2017 within the DKRZ project 882. These short-term tests showed a good performance of the model on the 1-year time scale. Anyhow, for a more thorough evaluation of the system, long-term simulations are required. Therefore, with this project we intend to perform several simulations spanning the time periods of 1950 to 2010, and 1990 to 2010, respectively. The simulations will be set up as the corresponding ESCiMo (Earth System Chemistry Integrated Modeling) simulations in which the EMAC (ECHAM5/MESSy for Atmospheric Chemistry) model has been used (DKRZ consortial project 853, *Jöckel et al., GMD, 2016)*. In this way, the results of the two different basemodels CESM1 and ECHAM5 can be directly compared.