CESM1 (Community Earth System Model) as a new MESSy basemodel: Evaluation and further development

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Abstract
The Modular Earth Submodel System (MESSy) has been significantly enhanced by incorporation of the Community Earth System Model (CESM1, developed by NCAR). At the current development stage, the CESM1(CAM5) dynamical cores are provided to MESSy. Also, the CESM1 models of the other earth system domains are used, using the CESM online coupler. With this development, the most significant new features of the increasingly popular MESSy framework will be the following:
1. The HOMME spectral element core, a new dynamical core in CESM1(CAM5), does not need polar filters (the grid is quasi-uniform), advects the surface pressure rather then the logarithm of pressure, which leads to the local conservation of energy and mass. Also, the spectral element core has the possibility to scale to up to 10^5 compute cores, which is useful for current and future computing architectures.
2. MESSy, which is already powerful for comparing parameterizations, can then also be used to compare dynamical cores, including ECHAM5, the HOMME spectral element, finite volume, and the other CESM1(CAM5) cores. Currently, ECHAM5 is the only global GCM core available in MESSy.
3. Models for all other domains from CESM1 (including ocean, ice, land, and river) can be used in MESSy. The coupling between the components currently uses the CESM1 coupler, but could in future development stages be replaced by the MESSy online model coupler. In this project, feasibility of using the MESSy coupler will be explored.
The main aspect of this proposal is an initial scientific evaluation of the model, with emphasis on the HOMME spectral element core. Statistical comparison for dynamical variables and atmospheric chemical composition between ECHAM5/MESSy and CESM1/MESSy, both setups using identical and already evaluated physics and chemistry submodels of MESSy, will be performed.