Two-way coupling of the global EMAC and the regional COSMO model using the Modular Earth Submodel System (MESSy)

Astrid Kerkweg (1), Christiane Hofmann (1), Gregor Glaeser (2), and Patrick Joeckel (3)

(1) Institute for Atmospheric Physics, Johannes Gutenberg University, Mainz, Germany (kerkweg@uni-mainz.de), (2) Institute for Meteorology and Climate Research, Karlsruhe Institute of Technology (KIT), 76128 Karlsruhe, Germany, (3) Deutsches Zentrum fuer Luft- und Raumfahrt (DLR), Institut fuer Physik der Atmosphaere, 82234 Oberpfaffenhofen, Germany

Based on the well established one-way on-line coupling of the regional chemistry climate model COSMO/MESSy to the global EMAC (ECHAM5/MESSy for Atmospheric Chemistry) model, a two-way coupling of these two models is developed within the MiKlip (decadal predictions) subproject FLAGSHIP (Feedback of a Limited-Area model to the Global Scale implemented for HIndcasts and Projections). By means of the two-way coupling, smaller scale processes resolved in the COSMO model are fed back to the global scale. Expectably, this improves the representation of processes on the global scale.

The technical implementation of the two-way coupling includes a number of challenges, especially the ECHAM and the COSMO model are models of different types: The global ECHAM model has a spectral core and solves the hydrostatic equations of motion, while the regional COSMO model is a non-hydrostatic grid point model. While the coupling of passive tracers and the humidity fields functions well in our test cases, the dynamical coupling proves to be an extra challenge, especially due to the pressure based vertical grid and the spectral core of the model. Here, we report the current status of the two-way coupling and show first results for idealised test cases.