Towards a high resolution stratosphere in ICON

Elisa MANZINI[1], Sebastian MÜLLER[1], Marco GIORGETTA[1], Tobias HAUFSCHILD[1], Hauke SCHMIDT[1] and Guidi ZHOU[1].

[1]Max-Planck-Institut für Meteorologie, Hamburg, Germany

Reliable predictions of the large-scale stratospheric circulation are critical to reduce uncertainty in the response of the regional tropospheric circulations to climate variability and change and improve the representation of the connection between the stratosphere and the Earth climate. Yet, current models used for weather and climate predictions still relay on parameterizations of such fundamental small-scale processes as deep convection and gravity waves. In turn, gravity waves are known to impact and condition the response to variability and external forcing of the large-scale stratospheric circulation, thus their parameterization provides for an uncertainty factor in stratospheric predictions.

Here we present current efforts based on the global atmosphere ICON model to reach a satisfactory representation of such small-scale processes. The ICON model (developed jointly by the Max-Planck-Institut für Meteorologie and the Deutsche Wetterdienst) is a non-hydrostatic atmosphere model on a triangular grid derived from the spherical projection of an icosahedron. Results are presented to demonstrate the capabilities and dependencies on resolution and parameterized convection of the modeled gravity waves, for a hierarchy of models. The ICON configurations considered include AMIP-type, Aqua planet, and spherical limited area models, spanning nominal horizontal resolutions from 40 km to 2.5 km.

Key words: stratosphere, climate, convection, and gravity waves.