Geophysical Research Abstracts
Vol. 16, EGU2014-7213, 2014
EGU General Assembly 2014


# Examination of the vertical-only propagation assumption for gravity wave parameterizations using ray-tracing simulations

Silvio Kalisch (1), Peter Preusse (1), Manfred Ern (1), Steven D. Eckermann (2), and Martin Riese (1)
(1) Forschungszentrum Jülich GmbH, IEK-7, Jülich, Germany (s.kalisch@fz-juelich.de), (2) Naval Research Laboratory, U.S.

Gravity wave (GW) parameterizations of general circulation models (GCMs) commonly reduce the propagation of GWs to the vertical direction. The influence of this vertical-only propagation assumption on the distribution of GW drag patterns has not yet been investigated. Thus, we present the results of two global gravity wave ray-tracing simulations, one with full three-dimensional propagation (referred to as GWDO) and a second one with vertical-only propagation (referred to as GWDV) of gravity waves for January and July of 2008. The Gravity wave Regional Or Global RAy-Tracer (GROGRAT) is used to perform these simulations with a globally homogeneous and isotropic launch distribution which is commonly used in GW parameterizations. The atmospheric background is provided by NOGAPS-ALPHA (Navy Operational Global Atmospheric Prediction System-Advanced Level Physics and High Altitude) data with an altitude coverage of up to 90km. Both simulations, GWDO and GWDV, are analyzed with respect to GW drag deposition in zonal and meridional direction. Differences are found in the distribution of zonal GW drag. GWDO simulations show in contrast to GWDV simulations a poleward shift of zonal GW drag patterns in both seasons with an increased GW drag around the summer stratopause. Further, the meridional GW drag component of GWDO run is found stronger and, regardless of the season, poleward directed. We used additional simplified simulations to investigate the major contributions to this poleward directed GW drag: the Coriolis effect and wind filtering in the upper troposphere lower stratosphere (UTLS) region allows more GWs at lower latitudes to propagate into the middle atmosphere. We infer that GWs of different horizontal wavelengths and phase speeds cause the main drag patterns and drag differences in different regions of the atmosphere. The possible impact on the general circulation and the interaction with waves of planetary scale are discussed.