Geophysical Research Abstracts
Vol. 16, EGU2014-6125, 2014
EGU General Assembly 2014

Sensitivity of a middle atmosphere GCM to consistent scale-interaction of parameterized orographic gravity waves

Benjamin Wolf and Erich Becker
Leibniz Institute of Atmospheric Physics at the University of Rostock, Kuehlungsborn, Germany (wolf@iap-kborn.de)

Simulation of the middle atmosphere in the framework of a global climate model requires to take the effect orographic gravity waves (OGWs) into account. This is usually done in terms of a parametrization of the OGW drag. Current parametrizations handle this problem independently from boundary-layer turbulence, and neglect the turbulent diffusion and energy deposition associated with the OGW drag. Therefore, we have revisited the classical scheme for OGWs by N. McFarlane and studied the consequences of a consistent scale interaction between parameterized OGWs and all other scales (resolved large-scale flow, boundary layer diffusion, and parameterized non-orographic GWs, NGWs) using a mechanistic GCM. We find that the circulation in the middle atmosphere is quite sensitive to these details of the OGW scheme. In particular, the vertical diffusion induced by saturation of OGWs has a considerable impact on the polar night jet, both by the diffusivity itself and by the secondary effect due to an upward shift of the breaking levels of NGWs. In turn, these changes affect the summer mesopause region by the Interhemispheric Coupling mechanism. The damping of OGWs by boundary layer turbulence and the energy deposition by OGWs are found to be of minor importance for the simulated climatology.