Geophysical Research Abstracts
Vol. 18, EGU2016-14662-1, 2016
EGU General Assembly 2016
© Author(s) 2016. CC Attribution 3.0 License.

Impact of the Gravity Wave Parameterization on the Transport of Nitrogen Oxides in the Middle Atmosphere

Katharina Meraner, Hauke Schmidt, and Elisa Manzini
Max Planck Institute for Meteorology, Hamburg, Germany (katharina.meraner@mpimet.mpg.de)

Gravity waves strongly influence the mesospheric circulation and hence, the transport processes in the middle atmosphere. After particularly strong sudden stratospheric warming (SSW) event as in January 2009, satellite observations measured an up to 50 times higher amount of nitrogen oxides in the stratosphere descended from the thermosphere than under undisturbed conditions (Randall et al., 2009; GRL). However, the international working group on High Energy Particle Precipitation in the Atmosphere (HEPPA) stated that the mesospheric descent of nitrogen oxides in models is in general too weak after the SSW in 2009. McLandress et al., (2013; JAS) showed that the non-orographic gravity wave drag determines the strength of the downward transport of atmospheric tracers after a sudden stratospheric warming. It also controls the descent of the elevated stratopause, which is known to be too quick in the Hamburg Model of Neutral and Ionized Atmosphere (HAMMONIA) and in other models covering this altitude region (Pedatella et al., 2014; JGR).

Here, we discuss how sensitive the dynamics of the middle atmosphere in HAMMONIA are to changes of the parameterized gravity wave sources. Discussed are both, changes in a homogeneous background source and a source related to frontal activity. We concentrate on the descent of nitrogen oxides and of the elevated stratopause for the winter 2009 including the major stratospheric warming in January 2009. We will show that the strength of the downward transport depends on the wave amplitude, which is partly defined by the source parameters, and on the breaking height