Geophysical Research Abstracts, Vol. 8, 04609, 2006
SRef-ID: 1607-7962/gra/EGU06-A-04609

A high-resolution short-wave heating parameterisation for the middle atmosphere

K. M. Nissen (1), K. Matthes (1,2) and **U. Langematz** (1)

(1) Institut für Meteorologie, Freie Universität Berlin, Germany, (katrin.nissen@met.fu-berlin.de)

(2) National Center for Atmospheric Research, Boulder, USA

For computational efficiency most general circulation models (GCMs) use radiation schemes with only few spectral intervals to calculate short-wave heating rates. This is, however, not sufficient for studies of the effect of solar variability on climate, as the changes in solar irradiance are wavelength dependent and increase towards shorter wavelengths. For these studies it is essential to resolve the solar spectrum in more detail. In this paper we introduce a high-resolution short-wave heating parameterisation for use in middle atmosphere GCMs up to the mesopause.

The new Freie Universität Berlin (FUB) radiation scheme has been updated from the version described in Matthes et al. (2004). It resolves 52 spectral intervals in the UV and visible part of the spectrum (121.56 - 680 nm). Absorption and scattering due to ozone and molecular oxygen are taken into account. Absorption by ozone is calculated based on Shine and Rickaby (1989) and WMO (1986). Heating by molecular oxygen in the Schumann-Runge bands and continuum are calculated using the approach of Strobel (1978), while the contribution of the Lyman-α line is parameterised following the method of Chabrillat and Kockarts (1997). Energy losses due to airglow are accounted for by using the efficiency factors of Mlynczak and Solomon (1993). The FUB radiation scheme can be run both as off-line model and as interactive module of the MA-ECHAM5 climate model.

Short-wave heating rates calculated off-line for standard input data will be presented and compared to results obtained by the standard ECHAM5 short-wave radiation scheme. The effect of the enhanced spectral resolution on the short-wave heating rates for conditions of solar minimum and maximum irradiance will be discussed.