



The modified band approach: online calculation of photolysis frequencies in a 3D CTM taking account of spherical geometry

J.E. Williams (1), J. Landgraf (2), A. Bregman (1) and H.H. Walter (2)

(1) Royal Netherlands Meteorological Institute, De Bilt, The Netherlands. (2) SRON National Institute for Space Research, Utrecht, The Netherlands.

Here we present an accurate and efficient method for the online calculation of photolysis frequencies in a stratospheric-tropospheric 3D Chemistry Transport Model. We introduce a number of modifications to the original band method of Landgraf and Crutzen (1988) for high solar zenith angles ($\text{sza} > 75$ deg.) in order to reduce the associated errors in the resulting photolysis rates. These modifications are namely: (1) the definition of two additional sets of band parameters (for 75-85 and 85-93 deg, respectively), (2) the application of a scaling ratio (for wavelengths $< 202\text{nm}$), (3) the introduction of thresholds for the scaling ratios for selected bands and (4) the introduction of a pseudo-sphericity term into the 2-stream radiative transfer solver PIFM for > 85 deg. We will show that these modifications result in a substantial improvement in accuracy for many important chemical species which are photolytically relevant for both the troposphere and stratosphere. Moreover, the application of the method in the state-of-the-art CTM TM5 will subsequently be discussed.

Landgraf, J. and Crutzen, P.J., An Efficient Method for online calculations of Photolysis and Heating Rates, *J.Atms.Sci.*, 55,863-878, 1998.