Geosci. Model Dev. Discuss., 7, C1039–C1041, 2014
www.geosci-model-dev-discuss.net/7/C1039/2014/

Geoscientific Model Development Discussions

Interactive comment on "The photolysis module JVAL-13.99gmdd, compatible with the MESSy standard, and the JVal PreProcessor (JVPP)" *by* R. Sander et al.

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Received and published: 3 July 2014

This is a useful paper describing an important module in chemistry-transport models (CTMs), the calculation of photolysis coefficients. The module described here, JVAL, was described initially by Landgraf and Crutzen (1998) and is used in various CTMs including MATCH and ECHAM/MESSy. It is certainly worthwhile publishing this updated description of the module. It may be useful to expand the discussion of a few items, which now are described very lightly or not at all.

1. Which radiative transfer scheme is used for (a) the high-resolution calculation of the lookup tables, and (b) the lower-resolution on-line calculations?

2. The absorption cross section data are from the MPI spectral data base (Keller-Rudeck et al. 2013). That data base contains multiple spectra measured by different groups, and it is not clear which spectra have been evaluated critically. How were the spectra selected for use in JVAL? Has a critical evaluation been done?

3. How good is the spherical parameterization? The paper by Lamago et al. is mostly for the stratosphere, where photolysis switches rapidly on/off, while in the troposphere one would expect lingering twilight effects. Depending on the radiative scheme, it may be quite easy to put in a pseudo-spherical calculation.

4. Is pressure dependence included, and if not, should it be planned for future improvements? It is significant for aldehydes and probably other organics (lower pressure -> less quenching -> larger quantum yields -> faster photolysis).

5. Are wavelengths specified in air or vacuum? Related: Table 1 gives band boundaries to 6 significant figures, yet no data (O3 cross section, or extraterrestrial flux) is available with such wavelength accuracy.

Very minor and technical comments:

P.2504/L.15-16: The statement that "Absorption by aerosol and cloud particles and other gases play only a minor role..." is potentially misleading. Obviously scattering is very important, and the emphasis here is on absorption, which indeed is usually unimportant for clouds. But absorption can be significant for aerosols, esp. at UV wavelengths, and for gases in some specific situations, e.g. SO2 volcanic plumes.

2504/15-16: Absorption ... play -> Absorption ... plays

2504/20: adsorption -> absorption

2504/21-22: The aerosol single scattering albedo is said to be from Table 1 of Slingo (1989) but that table refers to clouds, not aerosols. Can you explain?

2509/20-21: atmosphere well buffered against J changes?! I doubt that there is any

evidence for that. There is a lot of evidence to the contrary, e.g. urban O3 production scales linearly with J values, while in cleaner atmospheres HOx scales with the square root of J (due to the HO2+HO2 quadratic termination), which is also hardly "buffered". I suggest putting in a citation or removing.

Table 2: is there a cleaner way of citing S.P. Sander et al., e.g. with footnote?

Interactive comment on Geosci. Model Dev. Discuss., 7, 2501, 2014.