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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Impact of the new HNO_3-forming channel ofthe HO_2+NO reaction on tropospheric HNO_3, NO_x, HO_x and ozone" *by* D. Cariolle et al.

Anonymous Referee #4

Received and published: 19 May 2008

1 General Comments

The short paper demonstrates again the importance of precise laboratory studies on the products of key reactions in atmospheric chemistry, including branches to products in a fraction of a percent. The model studies show large consequences for tropospheric OH and the lifetime of pollutants. Unfortunately, in some parts the description of the models is too short. For example, it would be important to have information on the meteorological forcing of the CTM, the boundary conditions, and assumptions on the NO_x source by lightning and the sink by scavenging.

I recommend publication in ACP after revision.

2 Specific Comments

2.1 Introduction:

Reaction R1 is the key reaction of tropospheric chemistry and also important in the lower stratosphere since it interferes with the HO_x and NO_x catalytic ozone destruction cycles. There are several references on that from the seventies.

The uncertainty due to the quantum yields of acetone photolysis in the upper troposphere might be mentioned too.

2.2 Section 3.1:

Please repeat the reference for "the latest compilation". Include also a reference for the used acetone photolysis.

I wonder why 2D models have to be always in steady state. They can provide also useful results with time-dependent boundary conditions.

Some information on the meteorological forcing of the GEOS-CHEM CTM should be included. Is this a climatology (re-analysis?) or time-dependent? Also some more details on the model (e.g. NO_x sources and sinks) would be useful, additionally to the given references. It is good that the update of the N_2O_5 conversion rate on aerosol is mentioned.

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2.3 Section 3.1.1:

Concerning the results for the upper atmosphere (Figure 3), a recent MIPAS-paper in ACP points to better agreement with satellite data when the new reaction pathway is included.

It would be better to use a similar style for Figures 3 and 4. Annual means are difficult to interpret because of compensating effects and averaging out. I would prefer to see March for both models.

2.4 Section 3.1.2:

There are also more recent references on the global OH and τ_{CH_4} for a wider range. I'm not aware, however, of a study using the most recent JPL recommendation, but Stevenson et al (2006) might be cited here too.

2.5 Section 3.2:

Here the information on the meteorology and/or the kind of temporal averaging would be important. What is the problem at the tropopause for NH NO_x and ozone everywhere in the upper troposphere? Too low ozone in the upper troposphere usually implies too low OH there and causes also a bias in the tropospheric integral. The model deficiency appears to be independent of the new reaction and needs to be discussed (Figure 6).

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3 Technical Corrections

Figures 3 and 4 should be the same style and both with color bars.

Figures 5 and 6: The dark blue curves are difficult to distinguish from the black ones (except if you zoom in).

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 2695, 2008.