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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The role of transition metal ions on HO_x radicals in clouds: a numerical evaluation of its impact on multiphase chemistry" *by* L. Deguillaume et al.

L. Deguillaume et al.

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Answer to general reviewer comment:

We took the option of rather focusing on the urban scenario since in that case TMI concentrations are the highest and have the maximum effect on multiphase chemistry. However, Figure 4 provides a comparison for sinks and sources of aqueous OH for the three scenarios than is directly comparable with CAPRAM 2.4 results.

In Section 3, Line 7, we will indicate in the revised version that: the pH conditions are calculated at each time step by solving the electro-neutrality equation, which contains the main ionic species such as carbonates, ammoniac, sulfate, nitrate, TMI and chlorine.

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In the urban scenario, pH values are looking low because, in our simulation, there is a sulfate production due to high H2O2 production as discussed in section 3.4, last paragraph.

In the conclusion, line 10, some guidelines concerning future field measurements and future laboratory experiments will be added in the revised version: In the field, more measurements on iron speciation are needed as a function of light conditions (night and day), together with H2O2, oxalate concentrations. Future laboratory experiments should include irradiation tests on real cloud water samples to complement the field experiments with controlled temperature, concentration levels and light conditions. Also, the Fenton reaction, still subject to many controversies (Gozzo, 2001, Dunford, 2002, Kremer, 2003) needs some more investigations.

Specific comments of the reviewer will be considered in the revised paper and are listed below:

1) Introduction, line 22:

First sentence will be changed as follows: TMI are incorporated into tropospheric liquid phase via aerosols, which often contain metal oxide, oxo-hydroxide and silicate particles.

2) Section 3.1, line 10-17:

For more clarity, and concerning the initial chemical concentrations and species, a new table (Table 7) will be added in the revised version of the paper. This Table will be reproduced in the revised version of the paper.

Also, the sentences in lines 10-17 will be replaced by: Table 7 presents the initialization of transition metal ions used for the three scenarios (urban, remote, marine).

The transition metals are initialized as Fe3+, Mn3+ and Cu+. Initial concentrations of transition metal ions are the highest in the urban case and iron is the dominant species. The initial concentrations of manganese and copper are the same and the

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ratio between iron and manganese (or copper) is equal to 20 in the two continental cases and to 50 in the marine scenario. All these conditions are similar to the scenarios described by Ervens et al. (2003).

3) Technical corrections in tables:

Degree K will be changed to K in all tables, all brackets will be deleted. Table 5: the double arrow will be removed. In the revised version, equilibrium will be indicated by an equal sign.

4) Figures

Figure 1: As suggested by the reviewer, ratio Fe(II)/Fe(III) has been replaced by the percentage of Fe(II) out of dissolved Fe in order to be consistent with Table 7 (now Table 8 in the revised version). This new figure will be in the new version of the manuscript with a new legend: Time evolution of Fe(III) and Fe(II) concentrations and of the percentage of Fe(II) out of dissolved Fe for the urban scenario. Shaded areas correspond to night-time periods.

Figure 4 and Figure 5 will be enlarged in the revised version of the paper as recommended by the reviewer.

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 5019, 2003.