

Interactive comment on “Simulation of polar stratospheric clouds in the chemistry-climate-model EMAC via the submodel PSC” by O. Kirner et al.

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Dear Referee,

thank you very much for your efforts performing your review of our manuscript. Moreover we want to thank you for your recommendation to publish this paper after some minor revisions.

Here are our answers to all your comments:

- *Page 2078, line 6: The submodel CVTRANS is described in Tost et al., 2010. C774*

As you cite all other submodels of which a documentation is available it would be nice to also cite this article: Tost, H., Lawrence, M. G., Brühl, C., Jöckel, P., Team, T. G., and Team, T. S.-O.-D.: Uncertainties in atmospheric chemistry modelling due to convection parameterisations and subsequent scavenging, Atmos. Chem. Phys., 10, 1931–1951, 2010.

We are adding this article in our paper.

- *Page 2079: I suggest to indicate the first to third step by bullet points to enhance the readability of this passage*

We are adding here items.

- *Page 2079, line 24, the unit mol mol^{-1} : This is a question of correct understanding: Is this unit more precisely written: $\text{mol}(\text{substance})/\text{mol}(\text{H}_2\text{SO}_4(\text{liq}))$*

Maybe this is unclear in our manuscript. The unit is $\text{mol}(\text{substance})/\text{mol}(\text{dry air})$. This is mixing ratio of the liquid fraction of the substance to dry air. We will try to make this more clearly.

- *Page 2083, line 13-21: It is not clear to me, how you deduced the listed maximum number densities for the individual bins from the cited measurements*

The total number density of measured NAT particles is 2.3×10^{-4} . We divided this number through 7 and get 3.28×10^{-5} . For sizebin 7 and 8 we use only the half of 3.28×10^{-5} . The measured distribution of the NAT particles is considered via the definition of the minimum and maximum radii. We will add the calculation in brackets and write a short sentence about the NAT distribution.

- *Page 2084: use bullet points here as well for the first and second step*

We are adding here items.

- *Page 2089, line 7ff.: How does γ depend on the radius of the liquid aerosols and the mixing ratios of the substance in the gas phase?*

Unfortunately the dependency of γ on the radius of the liquid aerosols and the mixing ratios of the substances in gas phase is not simple. There are several equations involved and not the same equations are used for every heterogeneous reaction on liquid aerosol. A detailed description of these equations would be very comprehensive. Therefore we would prefer only to mention the references (Carslaw et al., 1995a, 1995b; Luo et al., 1995; Hanson and Ravishankara, 1994; Hanson et al., 1995). But we will improve the sentences on Page 2089, Line 8 to 10.

- *Page 2095, last paragraph: You could mention, that the first order sedimentation scheme implemented in the SEDI submodel (Kerkweg et al., 2006a) is identical to the Trapezoid Scheme. Thus Kerkweg et al. (2006a) contains a documentation of the Trapezoid Scheme.*

We will mention this and add the citation.

- *Page 2077, line 1: "form chlorine monoxide dimer" → "form a chlorine monoxide dimer"*

OK

- *Page 2081, line 18: delete the space before the 4 in the brackets.*

OK

- *Page 2083, line 23: "containing in NAT" → "contained in NAT"*

OK

- *Page 2089, line 18: "divide κ^I through" → "divide κ^I by"*

OK

- *Page 2089, line 18: "the gases phase concentration" → "the gas phase concentration"*

C776

OK

- *Page 2091, line 16: "divide κ^I through" → "divide κ^I by"*

OK

- *Page 2097, line 26: The abbreviation psc within the brackets should also be written in capital letters.*

OK

C777