**Geoscientific
Model Development
Discussions**

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

Anonymous Referee #1

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The authors describe the ECHAM5/MESSy Atmospheric Chemistry (EMAC) submodel PSC which is used to simulate polar stratospheric clouds. The PSC submodel exists already for a while, but was undocumented so far. Former versions of this submodel have been extended by the authors to simulate PSCs following different theories about PSC formation. This is necessary as the "true" PSC forming mechanism is still under discussion.

As I expect from a model documentation, this article provides all important equations and the sources of these equations. I strongly recomment this article for publication after (very) minor revisions.

The revisions concern the following content-related questions, suggestions and/or additions ...

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

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

- page 2079, line 24, the unit $mol\ mol^{-1}$: This is a question of correct understanding: Is this unit -more precisely written-: $mol(substance)/mol(H_2SO_4(liq))$?

- 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.

- page 2084: use bullet points here as well for the first and second step.

- 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?

- 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.

.. and some typos:

- page 2077, line 1: "form chlorine monoxide dimer" $->$ "form a chlorine monoxide dimer"

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

- page 2083, line 23: "containing in NAT" $->$ "contained in NAT"

- page 2089, line 18: "divide κ' through" $->$ "divide κ' by"

- page 2089, line 18: "the gases phase concentration" $->$ "the gas phase concentration"

- page 2091, line 16: "divide κ' (..) through" $->$ "divide κ' (..) by"

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