

Interactive comment on “The MIPAS/Envisat climatology (2002–2012) of polar stratospheric cloud (PSC) volume density profiles” by Michael Höpfner et al.

Anonymous Referee #2

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Review of "The MIPAS/Envisat climatology (2002-2012) of polar stratospheric cloud (PSC) volume density profiles" by M. Höpfner et al.

General comments

In this new study, Höpfner et al. introduce a new retrieval scheme for PSC volume densities from the Envisat MIPAS instrument. The scheme is based on a number of simplifying assumptions, e.g., use of NAT refractive indices for all PSC types and neglecting of scattering effects in the radiative transfer calculations. However, the implications of these approximations are thoroughly discussed and seem to be justified. The scheme is used to process retrievals for the entire Envisat mission, and the MIPAS PSC volume

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density climatology for the years 2002-2012 is presented.

Overall, this is an interesting study and the paper fits in the scope of AMT. The manuscript is mostly well written and concise. I would recommend it for publication in AMT subject to fixing of some minor comments listed below.

Specific comments

p2, l2-4: Please consider adding a reference for the denitrification process.

p3, l6-7: You are listing the global number of MIPAS vertical scans per day, but how many profiles are measured in the polar regions (which are relevant for PSC observations)?

p4, l17-18: Maybe add reference to Rodgers (2000) for retrieval theory?

p4, l20: I was wondering if you applied a constant Jacobian K or if you considered variations with the state, i.e., K_i ?

p5, l21: The link to the ECMWF data is pointing to surface data rather than profiles?

p5, l27-30: Why did you specifically select top altitudes of 6 and 8 km for the low-level clouds?

p7, l9: Which trace gases have been considered in the radiative transfer calculations? Where did their concentrations come from?

p7, l19.23: Why did you not consider using a classification scheme for PSC types (e.g., Spang et al., 2016) instead of selecting the NAT refractive indices for all PSC types?

Spang, R., Hoffmann, L., Höpfner, M., Griessbach, S., Müller, R., Pitts, M. C., Orr, A. M. W., and Riese, M.: A multi-wavelength classification method for polar stratospheric cloud types using infrared limb spectra, *Atmos. Meas. Tech.*, 9, 3619-3639, <https://doi.org/10.5194/amt-9-3619-2016>, 2016.

p9, Fig. 3: The third plot in the upper row seems to show a rather poor retrieval result,

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considering that it refers to a NAT case?

p11, Fig. 4: The caption refers to "PSC volume densities in case of equilibrium". What is this?

p14, Fig. 6: What about the other PSC types, i.e., NAT and ice?

p15, l14-19: Are cirrus clouds really a likely explanation for the enhanced background values in the polar regions? I would not expect to see cirrus clouds up to 15 km of altitude in the polar winter hemisphere.

p15, l24-26: I was wondering how limited the computer resources really are? How many CPU hours were needed to process the entire mission?

p16, l9-10: The new PSC data did not seem to be available at the given web site when I checked the link?

Technical corrections

p8, Fig. 2: x-axis labels have been cropped/clipped.

p13, l15: fix "shows values of than about"

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