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Geoscientific Model Development Discussions

# *Interactive comment on* "Evaluation of polar stratospheric clouds in the global chemistry-climate model SOCOLv3.1 by comparison with CALIPSO spaceborne lidar measurements" *by* Michael Steiner et al.

**Anonymous Referee #1**

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The authors present an interesting study of comparison of the model outputs of the SOCOL model with observations by the satellite-borne lidar CALIOP. The approach is to test if a CCM without a detailed microphysical model for the formation of PSCs can be used to calculate PSCs in the polar regions. The advantage of such an approach is the reduced time for calculations wrt more sofisticated models including microphysical schemes. To demonstrate the merits and deficits of such an approach the model output is processed to obtain optical parameters which allow PSC classification similar to that used by CALIOP. The authors compare the optical constants measured by CALIOP



with those obtained from the SOCOL model. How are these optical parameters obtained? The authors state "From the simulated SADs and the assumed microphysical parameters, we calculate the number density and/or radius for each particle type.". They also state that the radius of the NAT and STS particles is fixed (5 micron for NAT but we don't know for STS), and that ice has a variable radius, but we don't know how this is obtained. ("The variable radius of ice particles results in a variable _aerosol-value."). Since the conversion of SAD to particle size distribution and number density has an important impact on the results, the authors should dedicate a paragraph on how this is done. Why don't they use a size distribution for all particles, instead of applying observational uncertainties to the results of the Mie calculations? This is of course an artificial way to obtain some scattering of the results but it is not equivalent to using a size distribution. Also by fixing the radius for NAT, the sedimentation velocity is the same for all NAT particles, while for a size distribution the sedimentation velocity would be also a distribution. . .. So to my opinion, the inclusion of a size distribution for all PSC particles would give a more realistic approach and would not make the calculations much more time consuming. I don't understand "but at the end of each chemical time step all condensed HNO3 and H2O evaporates back to the gas phase."

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