**Geoscientific
Model Development
Discussions**

Interactive comment on "Supersaturation calculation in large eddy simulation models for prediction of the droplet number concentration" by O. Thouron et al.

O. Thouron et al.

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Dear S. Ghan,

Find below our response:

1) "Which aerosol activation scheme is used? There are differences, and those differences could explain some of the differences between the results of Scheme A, B and C."

The same scheme for CCN activation Nact(S), with the same CCN activation spectrum, is used throughout the paper, only the way S is derived changes. In supersaturation

scheme A, the Cohart Pinty scheme is used that diagnose the supersaturation maximum from vertical velocity, while in supersaturation schemes B and C, S is diagnosed and prognosed, respectively based on thermodynamics.

2) "Why do you treat in-cloud activation with scheme A? It was never designed for that, and is certainly not done in my applications to large-scale models. Why not just treat activation at cloud base? See Ovchinnikov and Ghan, JGR 2005."/ "It is possible to apply a different diagnostic treatment of supersaturation for secondary nucleation within the interior of clouds. See Ghan et al., J. Advances Modeling Earth Systems (2011)."

We agree with your comment, but today the Cohart-Pinty scheme is implemented in Meso-NH by the authors, without any additional condition on where activation occurs, nor a limitation to cloud base.

The scheme thought works fine when the vertical resolution is coarse and supersaturation only originates from vertical motion. We have implemented the new scheme to improve simulations when the vertical resolution is refined and specifically for cases where activation originates from radiative cooling (radiative fog) at the surface and cases where activation occurs at cloud top because of mixing without vertical velocity. The issue is quite different from those raised by general circulation models with coarse vertical resolution.

By the way, I have not been able to find the two references listed, are you sure about the year. Would you please send me the complete reference (odile.thouron@cerfacs.fr).

Interactive comment on Geosci. Model Dev. Discuss., 4, 3313, 2011.