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Geoscientific Model Development Discussions

Interactive comment on "LIMA (v1.0): a two-moment microphysical scheme driven by a multimodal population of cloud condensation and ice freezing nuclei" *by* B. Vié et al.

Anonymous Referee #3

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The authors present the development of the two-moment microphysical scheme, called LIMA (Liquid Ice Multiple Aerosols), with a detailed description of the representation of aerosols, the CCN activation process and the heterogeneous IN process. Two 2D-idealized simulations (orographic ice cloud and squall line cases), using the cloud-resolving mesoscale model Meso-NH, were performed to test the LIMA scheme through sensitivity experiments using different background of the aerosol population (chemical composition and number concentration). I believe that the subject matter is suitable for GMD and should be of interest for the aerosol-cloud interactions modeling community. Minor concerns with the manuscript are documented below.

Page 7768, Line 2: The "three-dimensional (3-D) aerosol population" term suggest that

the LIMA scheme uses aerosols information from an air quality and chemistry model or from a 3D aerosols climatology. This term does not seem appropriate to this study. The scheme was tested on 2D-idealized simulations with prescribed aerosol concentration.

Page 7771, Line 6-9: Thompson and Eidhammer (2014) should be added as a reference. They proposed a new "aerosol-aware" microphysics scheme in the WRF model. The scheme nucleates water and ice from a monthly climatology of CCN and IN and fully tracks and predicts the number of available aerosols.

Page 7780, Line 3: It seems that the air density is missing in the equation of the term "L"?

Page 7780, Lines 12-13: It's written that accretion and raindrop self-collection are activated once the raindrop mixing ratio reaches 1.2XL (characteristic water content). I do not understand this threshold, cloud droplets should not be a condition for accretion and rain self-collection?

Page 7787, Lines 20-21: This sentence is not clear. How long the simulations were? What was the time step?

Page 7790, Line 14: The type of dust (small or large dust particles) is not specified.

Page 7792, Lines 8-12: Some references would be useful to support this conclusion. Many recent studies focused on the effects of aerosols on mixed-phase convective clouds (convective storms, squall line, supercell, etc...) using cloud resolving models. The results emphasize the importance of interactions between microphysics and thermodynamics in explaining the system response (type of cloud system, environmental factors, ...) and the complexity of the microphysical system with many possible paths in cloud development. Results which are in good agreement with this sensitivity test.

Interactive comment on Geosci. Model Dev. Discuss., 8, 7767, 2015.