

Review of “Assessing glaciogenic seeding impacts in Australia’s Snowy Mountains: an ensemble modeling approach” by Chen et al. (egusphere-2025-1434)

This study uses ensemble numerical simulations to assess glaciogenic cloud seeding over Australia’s Snowy Mountains. The study convincingly shows that certain meteorological conditions benefit seeding while others do not. Moreover, the impact of further physical parameters (CCN concentration) and modeling choices (boundary layer scheme, ice nucleation scheme, large-scale drivers/initial conditions) is addressed. While I generally agree with the simulation results presented, I miss a more quantitative assessment of the impact modeling choices can have, as I will detail below.

Major Comments

Quantifying Differences. The study shows nicely how physical parameters and modeling choices affect the results (e.g., Figs. 3 and 8). However, I am wondering how to interpret the presented differences. I believe that the use of different large-scale drivers (ERA5, CFS2, BARRA) is a step in the right direction, as they represent “perturbed” initial states. I suggest creating initial data sets that are systematically perturbed to represent the natural variability expected in this region. This will enable the reader to assess if differences in the boundary layer scheme, ice nucleation scheme, or CCN concentration are significant, i.e., visible beyond the natural variability.

Minor Comments

LI. 43 – 47: Is there a reasonable argument to assume that cloud microphysical processes and their parameterization are different for the Northern and Southern hemispheres?

L. 91: This should be the geometric mean diameter.

L. 91: State diameter in microns?

L. 93: Why only turbulent collection?

LI. 99 – 102: 20.6 g/h seems to be very small. For a particle diameter of 40 μm , this results in an injection rate of roughly 10^8 particles per hour, which is not a lot considering the dispersion of the plume.

Sec. 2.2.1: Is the model also nudged to the large-scale conditions?

L. 150: A “range of CCN concentrations” is not analyzed. Only one smaller concentration is addressed.

LI. 160 – 162: How did the authors consider the extent of uncertainties in constructing their ensemble? The outlined approach feels very subjective.

Tab. 1: Highlight the changed parameters, e.g., by bold characters.

L. 236: How do you determine how much the aerosol concentration contributes to the spread?

Fig. 6, LI. 272 – 273: Why use gigalitres, not mm?

Figs. 12 and 13: The contours for qice, qsnow, qgraup, and ice are very hard to distinguish from each other and the temperature contours in the background.

Technical Comments

L. 8: Define BARRA.

L. 9: Define PBL.

LI. 18 ff.: SLW has already been defined.

L. 52: Define LWP.

LI. 91 ff.: Use non-italic characters for units.

LI. 160 – 170: This paragraph should become its own subsection (2.2.5).