



Supplement of

Synergistic radar and radiometer retrievals of ice hydrometeors

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1 Introduction

This digital supplement complements the analysis of the retrieval results presented in the main article. Due to the large size and quantity of figures, only the most relevant results were included in the main article. For completeness, the figures that were left out are included in this supplement.

5 2 Test scene one

2.1 IWC



Figure S1. IWC retrieval results for the GEM Cloud Ice particle model. Panels are similar to Fig. 7 in the main article.



Figure S2. IWC retrieval results for the GEM Snow particle model. Panels are similar to Fig. 7 in the main article.



Figure S3. IWC retrieval results for the GEM Graupel particle model. Panels are similar to Fig. 7 in the main article.



Figure S4. IWC retrieval results for the Large Column Aggregate particle model. Panels are similar to Fig. 7 in the main article.

2.2 Number concentrations



Figure S5. Reference and retrieved number concentrations of frozen hydrometeors for the GEM Cloud Ice particle model. Panels are similar to Fig. 10 in the main article.



Figure S6. Reference and retrieved number concentrations of frozen hydrometeors for the GEM Snow particle model. Panels are similar to Fig. 10 in the main article.



Figure S7. Reference and retrieved number concentrations of frozen hydrometeors for the GEM Graupel particle model. Panels are similar to Fig. 10 in the main article.



Figure S8. Reference and retrieved number concentrations of frozen hydrometeors for the Large Column Aggregate particle model. Panels are similar to Fig. 10 in the main article.



Figure S9. Scatter plots of retrieved number concentrations for all particle models. Panels are similar to Fig. 11 in the main article.

2.3 CLWC



Figure S10. Reference and retrieved liquid water content for the GEM Cloud Ice particle model. Panels are similar to Fig. 15 in the main article.



Figure S11. Reference and retrieved liquid water content for the GEM Snow particle model. Panels are similar to Fig. 15 in the main article.



Figure S12. Reference and retrieved liquid water content for the GEM Graupel particle model. Panels are similar to Fig. 15 in the main article.



Figure S13. Reference and retrieved liquid water content for the Large Column Aggregate particle model. Panels are similar to Fig. 15 in the main article.



Figure S14. Reference and retrieved liquid water content for the Large Plate Aggregate particle model. Panels are similar to Fig. 15 in the main article.

3 Test scene two



Figure S15. Total hydrometeor content (HMC) and simulated observations for the second test scene. Panel (a) displays the total hydrometeor content in the scene, i.e. the sum of the mass densities of all hydrometeor species of the GEM model. Panel (b) shows the simulated radar reflectivities. Panel (c) displays the simulated brightness temperatures for a selection of the channels of the MWI and ICI radiometers.

3.2 IWC



Figure S16. IWC retrieval results for the GEM Cloud Ice particle model. Panels are similar to Fig. 6 in the main article.



Figure S17. IWC retrieval results for the GEM Snow particle model. Panels are similar to Fig. 6 in the main article.



Figure S18. IWC retrieval results for the GEM Graupel particle model. Panels are similar to Fig. 6 in the main article.



Figure S19. IWC retrieval results for the Large Column Aggregate particle model. Panels are similar to Fig. 8 in the main article.

3.3 Number concentrations



Figure S20. Reference and retrieved number concentrations of frozen hydrometeors for the GEM Cloud Ice particle model. Panels are similar Fig. 11 in the main article.



Figure S21. Reference and retrieved number concentrations of frozen hydrometeors for the GEM Snow particle model. Panels are similar to Fig. 11 in the main article.



Figure S22. Reference and retrieved number concentrations of frozen hydrometeors for the GEM Graupel particle model. Panels are similar Fig. 11 in the main article.



Figure S23. Reference and retrieved number concentrations of frozen hydrometeors for the Large Column Aggregate particle model. Panels are similar to Fig. 11 in the main article.



Figure S24. Reference and retrieved number concentrations of frozen hydrometeors for the Large Plate Aggregate particle model. Panels are similar to Fig. 11 in the main article.



Figure S25. Scatter plots of retrieved number concentrations for all particle models. Panels are similar to Fig. 11 in the main article.

3.4 CLWC



Figure S26. Reference and retrieved liquid water content for the GEM Cloud Ice particle model. Panels are similar to Fig. 15 in the main article.



Figure S27. Reference and retrieved liquid water content for the GEM Snow particle model. Panels are similar to Fig. 15 in the main article.



Figure S28. Reference and retrieved liquid water content for the GEM Graupel particle model. Panels are similar to Fig. 15 in the main article.



Figure S29. Reference and retrieved liquid water content for the Large Column Aggregate particle model. Panels are similar to Fig. 15 in the main article.