Atmospheric
Chemistry
and Physics

Supplement of

A model intercomparison of CCN-limited tenuous clouds in the high Arctic

Robin G. Stevens et al.

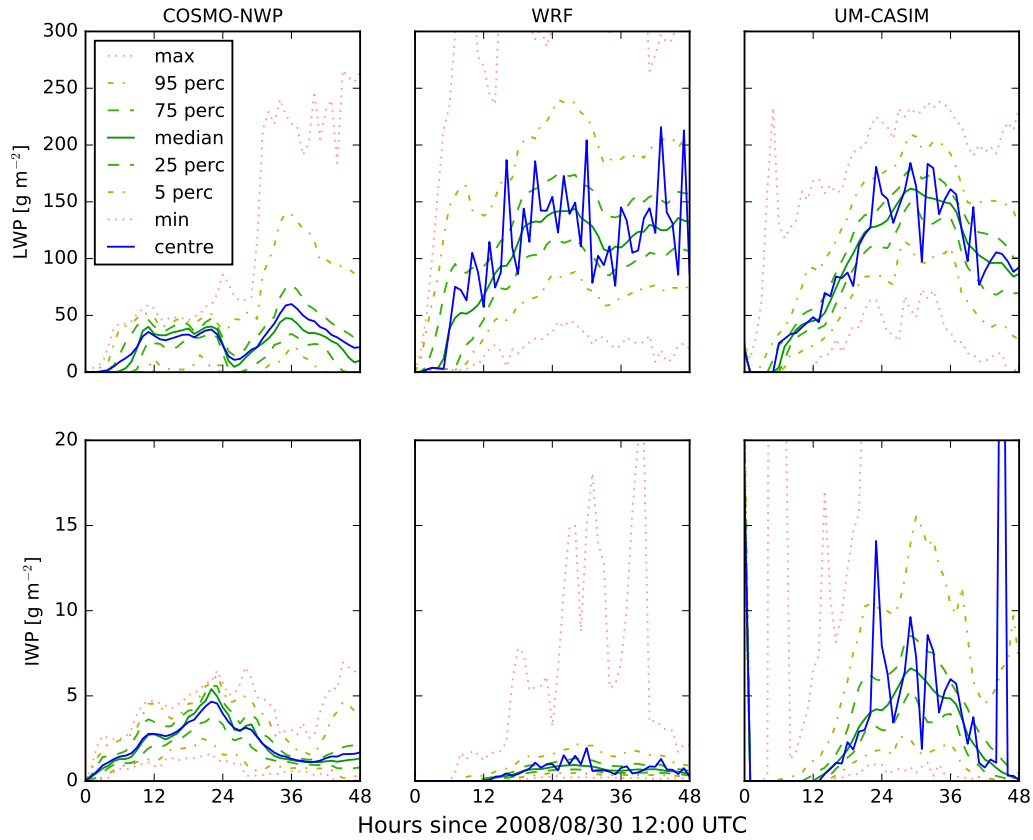*Correspondence to:* Robin G. Stevens (robin.stevens@canada.ca)

Figure S1. Time-varying distributions of liquid water paths and ice water paths from COSMO-NWP, WRF, and UM-CASIM for the case with a prescribed CDNC of 30 cm^{-3} and ICNC of 0.2 L^{-1} (CDNC30_ICNC0p20). All values are shown for a 100 km^2 area in the centre of the domain. Red dotted lines give the area maximum and minimum values, orange dash-dotted lines give the 95th and 5th percentile values, green dashed lines give the 75th and 25th percentile values, green solid lines give the median values, and blue solid lines give the centre-of-domain values.
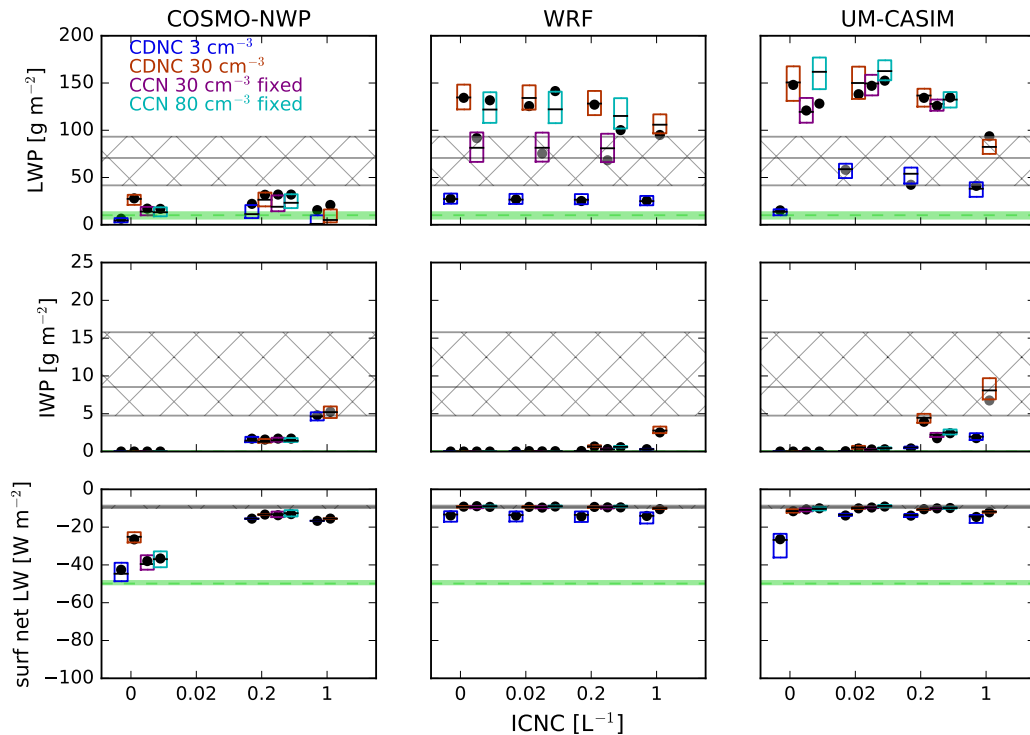
Figure S2. Water paths and net longwave radiation for all simulations without aerosol processing. Top row: liquid water path, middle row: ice water path, bottom row: surface net longwave radiation. Each subplot shows results from a single model. From left to right: COSMO-NWP, WRF, and UM-CASIM. Simulations with prescribed CDNCs of 3 cm^{-3} (CDNC03) and 30 cm^{-3} (CDNC30) are shown as blue and red boxes, respectively, and simulations with prescribed CCN concentrations of 30 cm^{-3} (CCN30fixed) and 80 cm^{-3} (CCN80fixed) are shown as purple and turquoise boxes, respectively. Within each subplot, the ICNC is increased from left to right as 0 L^{-1}, 0.02 L^{-1}, 0.2 L^{-1}, and 1 L^{-1}. Boxes show the interquartile range over a 100 km^2 area in the centre of the domain, and the black horizontal lines denote the medians. Black dots show the centre-of-domain values (same as the black horizontal lines in Fig. 15). For all values, the median over model results after Aug. 31st 1200 UTC is shown. Hatched regions indicate observed interquartile range for the "cloudy" period, and the green shaded regions indicate the range for the "nearly-cloud-free" period.
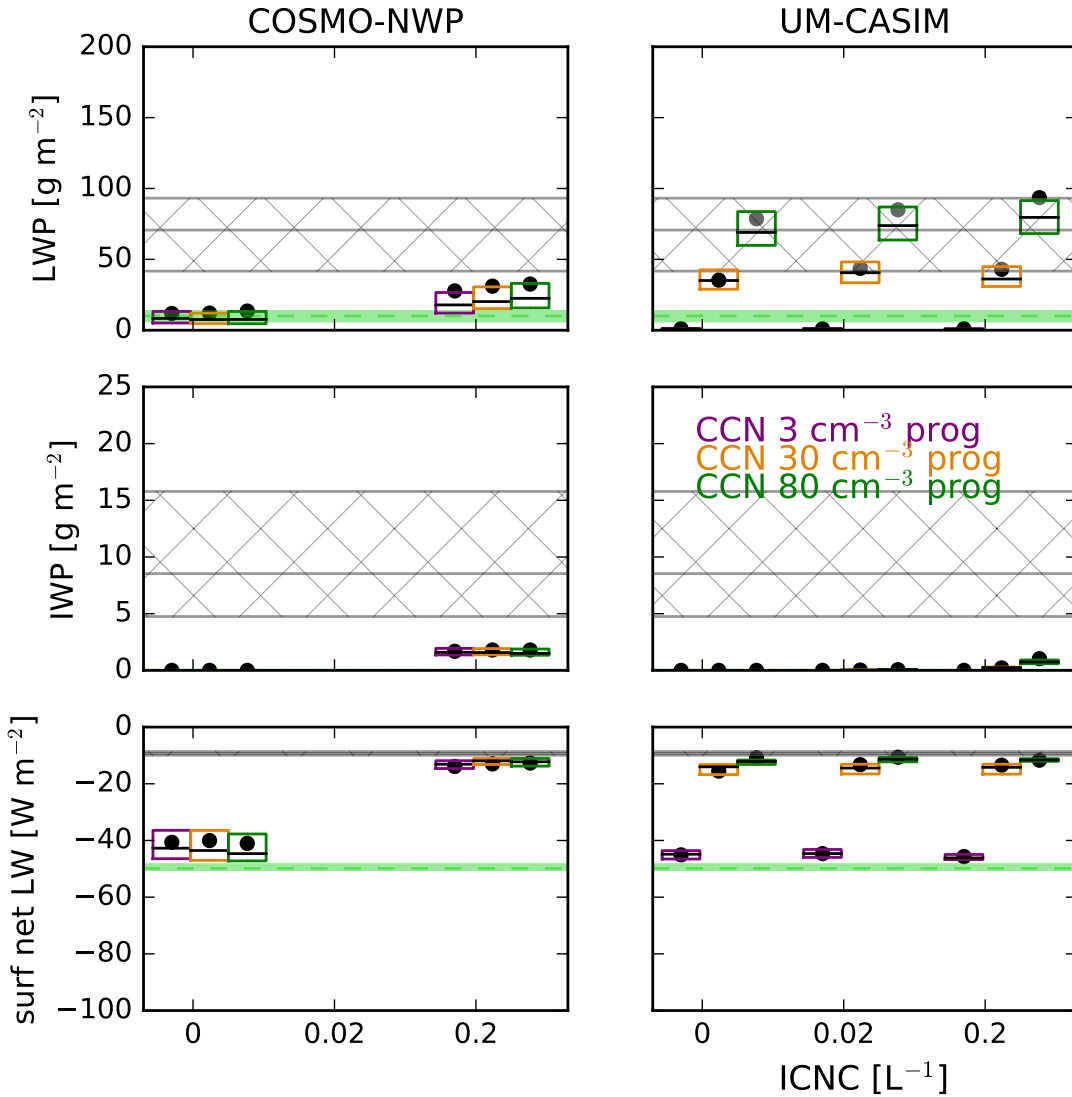
Figure S3. Water paths and net longwave radiation for all simulations with aerosol processing. Top row: liquid water path, middle row: ice water path, bottom row: surface net longwave radiation. Each subplot shows results from a single model. Left column: COSMO-NWP. Right column: UM-CASIM. Simulations with an initial CCN concentration of 3 cm^{-3} (CCN03prog), 30 cm^{-3} (CCN30prog) and 80 cm^{-3} (CCN80prog) are shown as purple, orange and green boxes, respectively. Within each subplot, the ICNC is increased from left to right as 0 L^{-1}, 0.02 L^{-1}, 0.2 L^{-1}, and 1 L^{-1}. Boxes show the interquartile range over a 100 km^2 area in the centre of the domain, and the black horizontal lines denote the medians. Black dots show the centre-of-domain values (same as the black horizontal lines in Fig. 15). For all values, the median over model results after Aug. 31$^{\mathrm{st}}$ 1200 UTC is shown. Hatched regions indicate observed interquartile range for the "cloudy" period, and the green shaded regions indicate the range for the "nearly-cloud-free" period.