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Single-Column Evaluation of Convection Parameterizations

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Objective, Method, and Progress

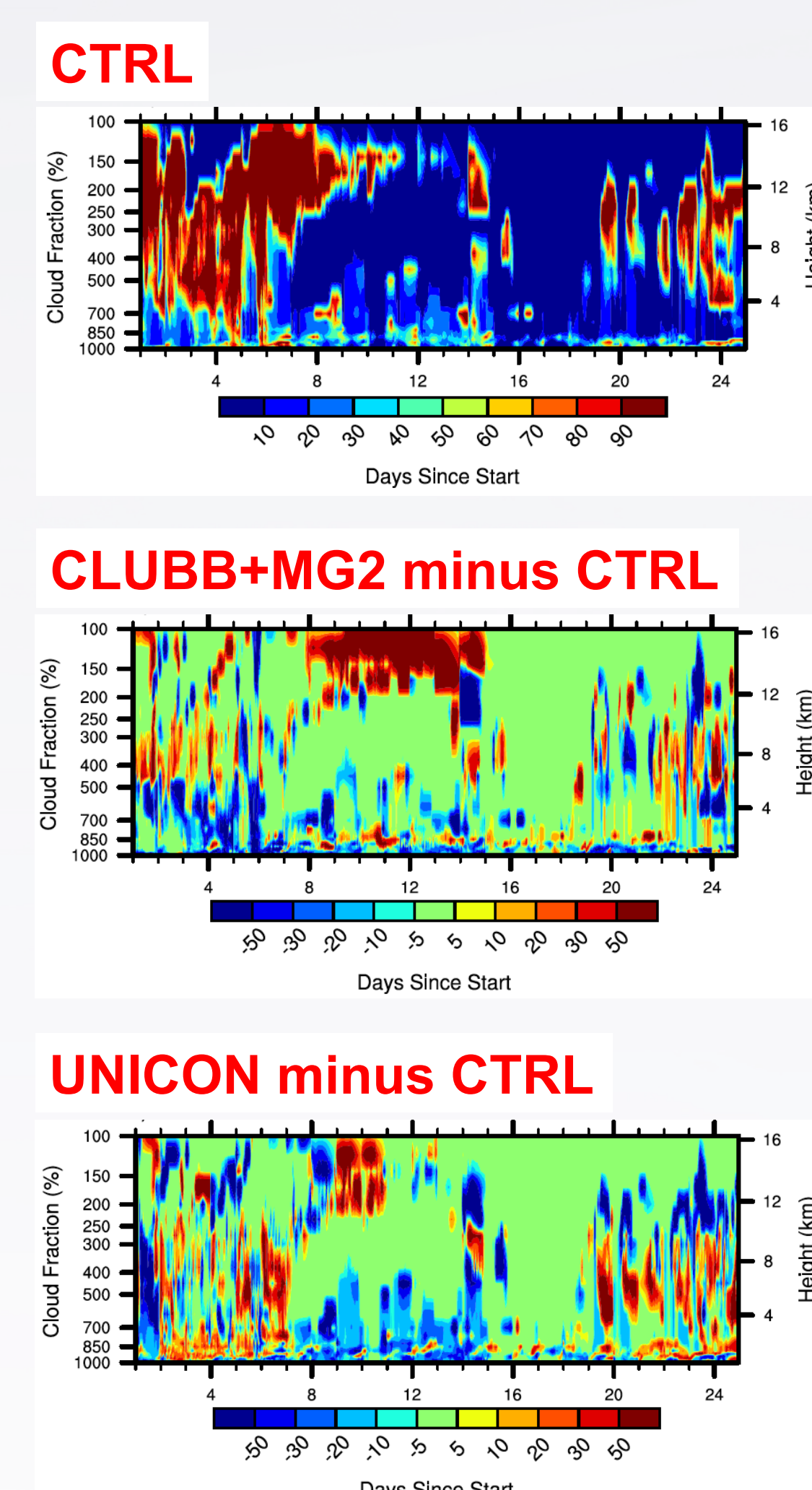
The single-column version of ACME (**ACME-SC**) was used to evaluate candidate convection parameterizations in various IOP cases. Four candidate parameterizations were tested. Here we focus on comparing **CLUBB+MG2** and **UNICON** against the reference model and observation. The results shown in this poster are **day 2 forecast**, unless described otherwise.

Sensitivity simulations were also conducted to investigate the impact of various details in the experimental design, e.g., **specification of boundary conditions, nudging, and periodic re-initialization**.

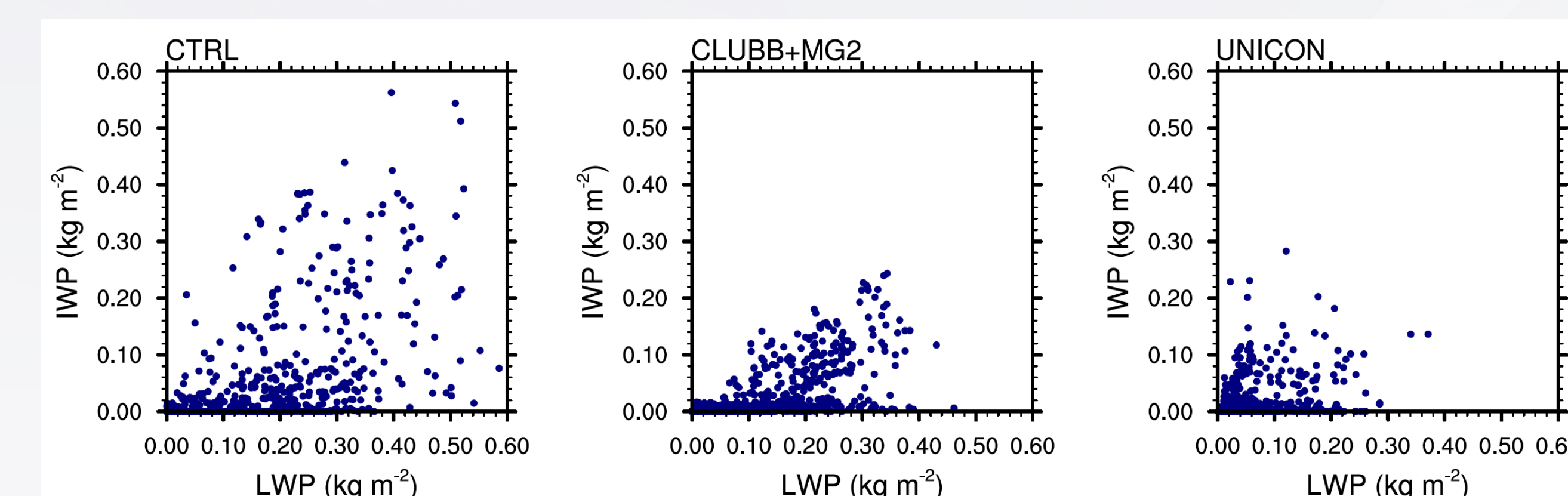
The analysis focused on **cloud and precipitation statistics**, diurnal cycle, frequency distributions of **convective events** and precipitation fluxes, and the mass/number budget of cloud hydrometeors. Budget analysis was performed to help understand these differences.

Cloud Properties (TWP-ICE)

Cloud fraction



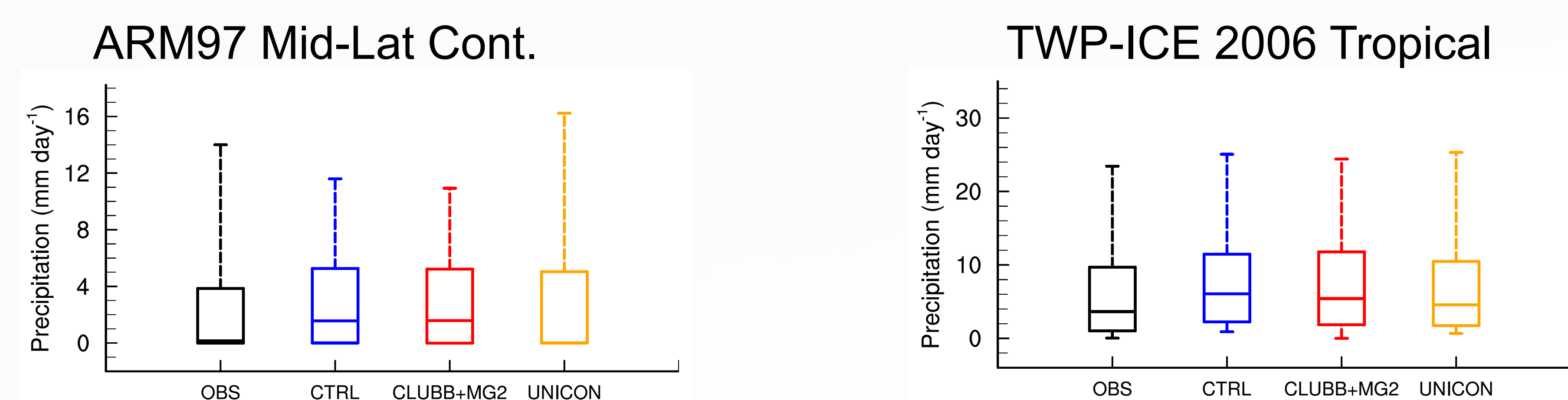
Liquid Water versus Ice Water Path



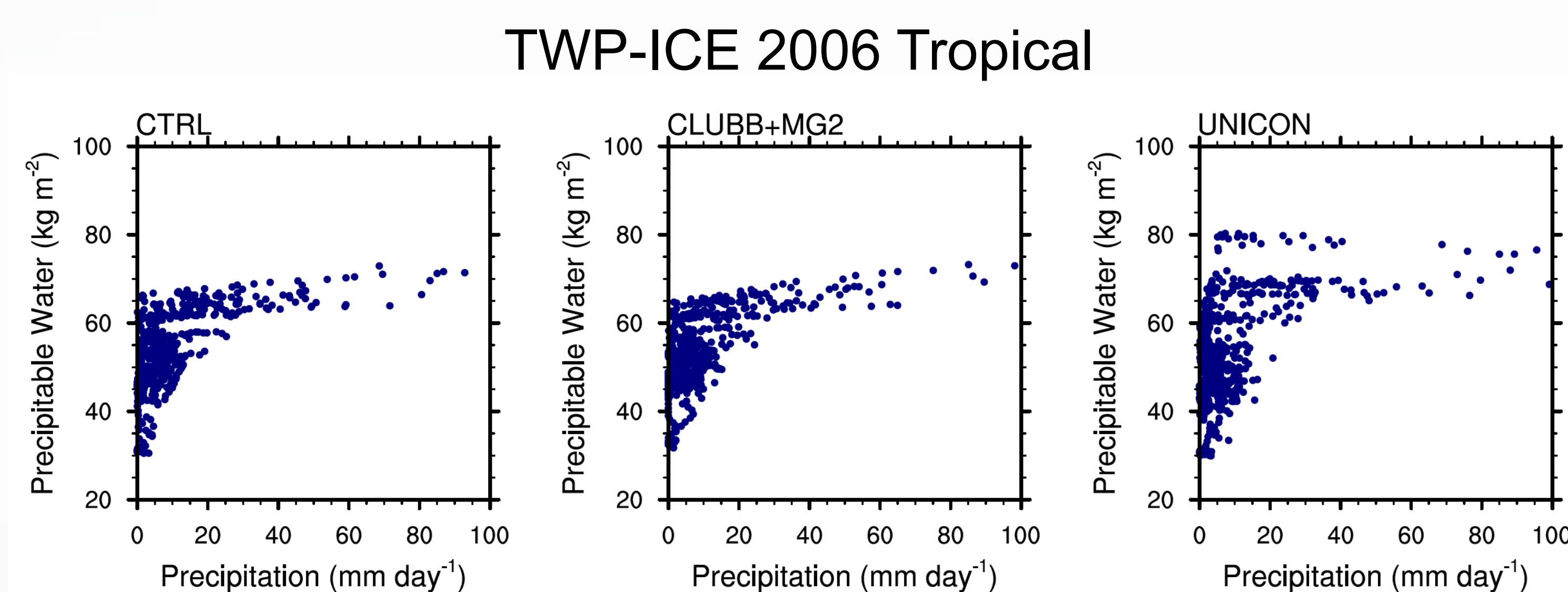
- Simulated **cloud properties differ substantially**.
- Both CLUBB+MG2 and UNICON predict smaller cloud liquid and ice water content than the default model. Similar results were obtained for ARM97.
- **Updraft velocity** simulated by CLUBB+MG2 is very different from CTRL and UNICON. More frequent homogeneous ice nucleation is observed (not shown). Further investigation is needed.

Precipitation Statistics

Precipitation Flux



Precipitation versus Precipitable Water



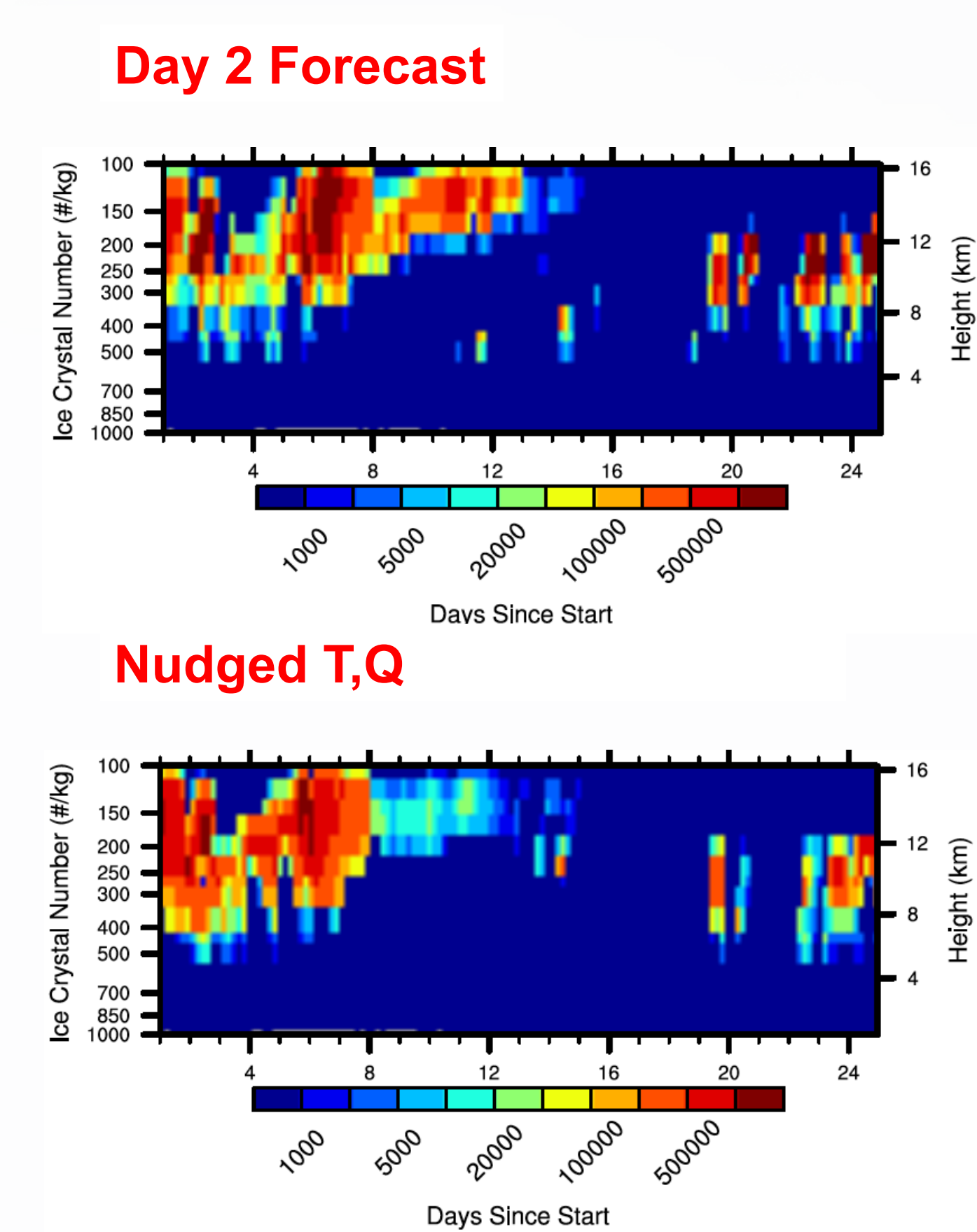
Idea courtesy of David Randall

All candidate schemes did a good job in simulating the prep statistics.

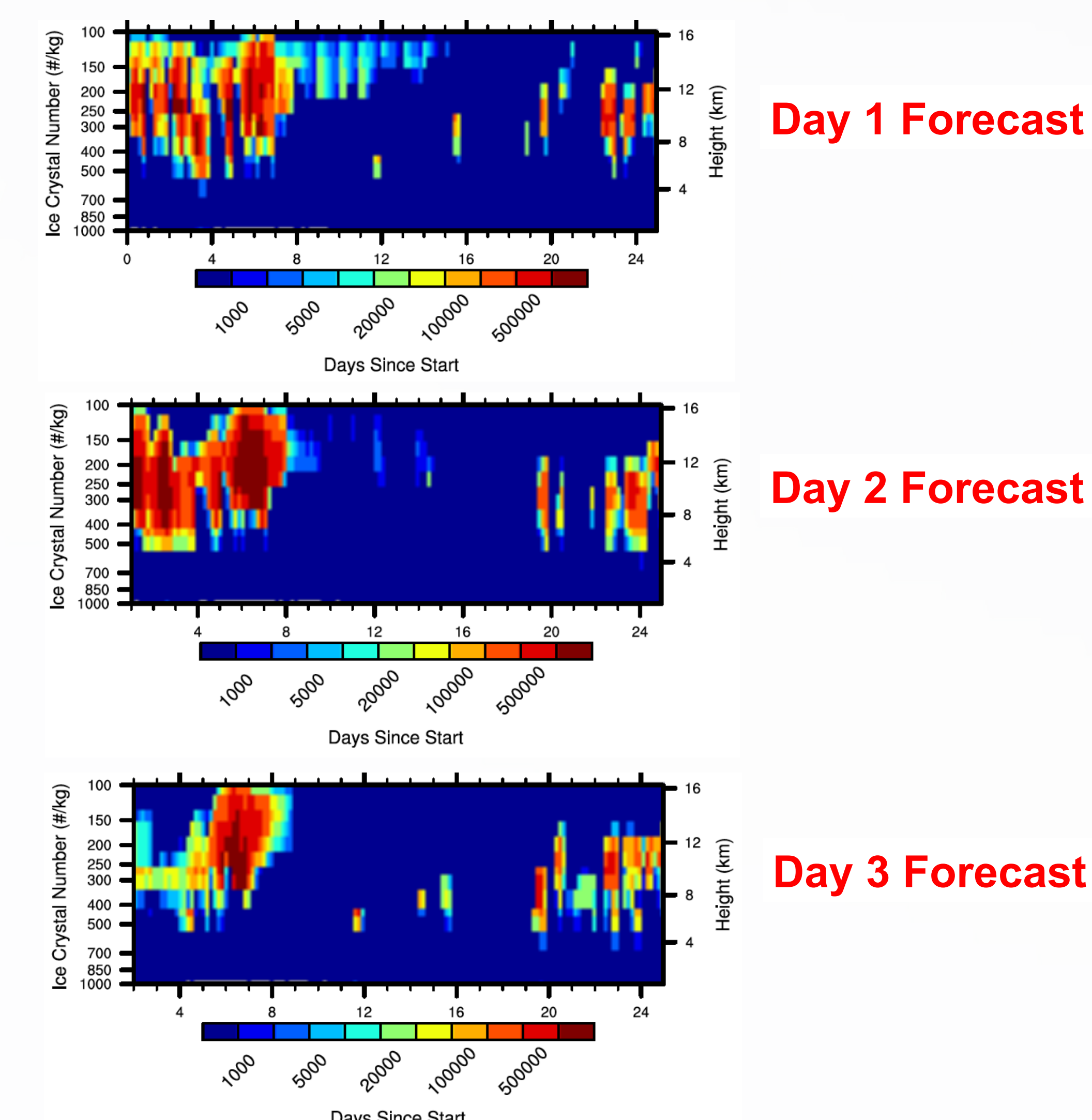
UNICON seems to hold more water vapor in the air during TWPICE.

Impact of Nudging and Re-initialization

Ice Crystal Number (CLUBB+MG2)



Ice Crystal Number (CTRL)



Nudging and forecast lead time both have significant impacts on the simulated ice cloud properties.