

Microphysical sensitivities in global storm-resolving simulations

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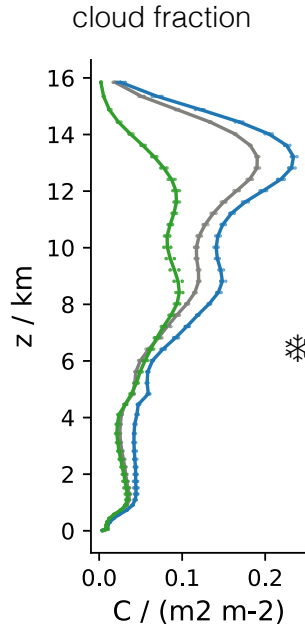
In global storm-resolving models microphysical processes are fundamentally linked to their controlling factors.

Main scientific question:

How much of the heat budget of the tropics is controlled by circulations and dynamics as compared to by microphysical processes?

- ICON with ~5 km grid spacing
- global domain with fixed SST
- one-moment microphysics (Baldauf et al., 2011)

→ perform sensitivity runs, each varying one parameter of a particular particle category in its range of uncertainty

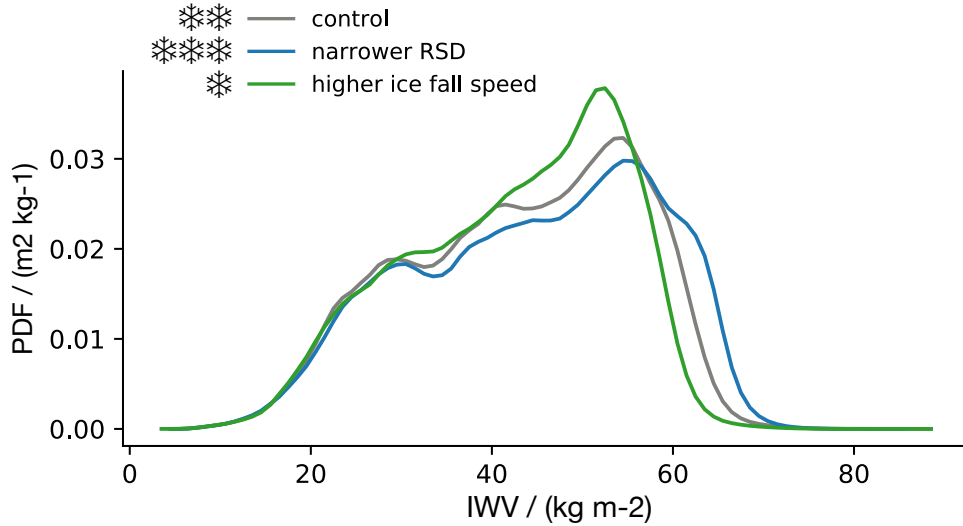


- control
- narrower RSD
- higher ice fall speed

→ wetter lower troposphere → more cloud water & cloud ice
→ less cloud ice → higher OLR

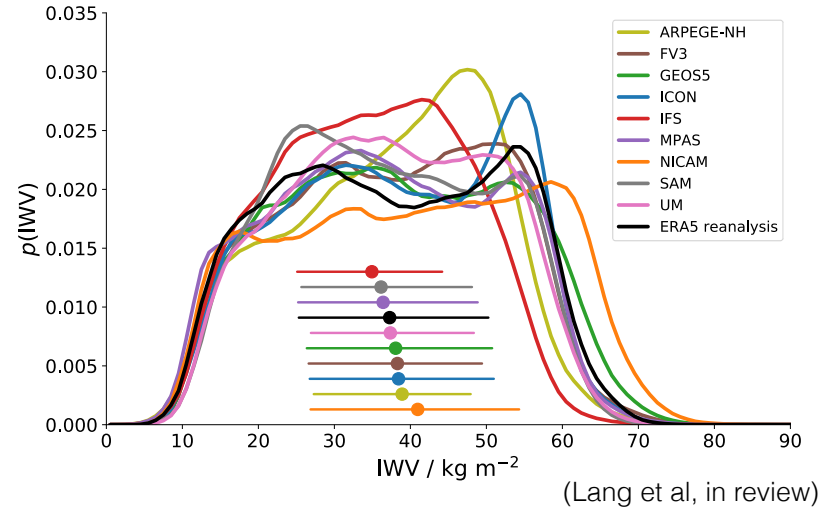
How do microphysical choices affect the distribution of water vapor?

Tropics over the ocean:



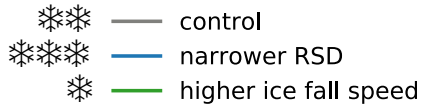
Differences in integrated water vapor are largest in moist regions.

Multi-model ensemble DYAMOND

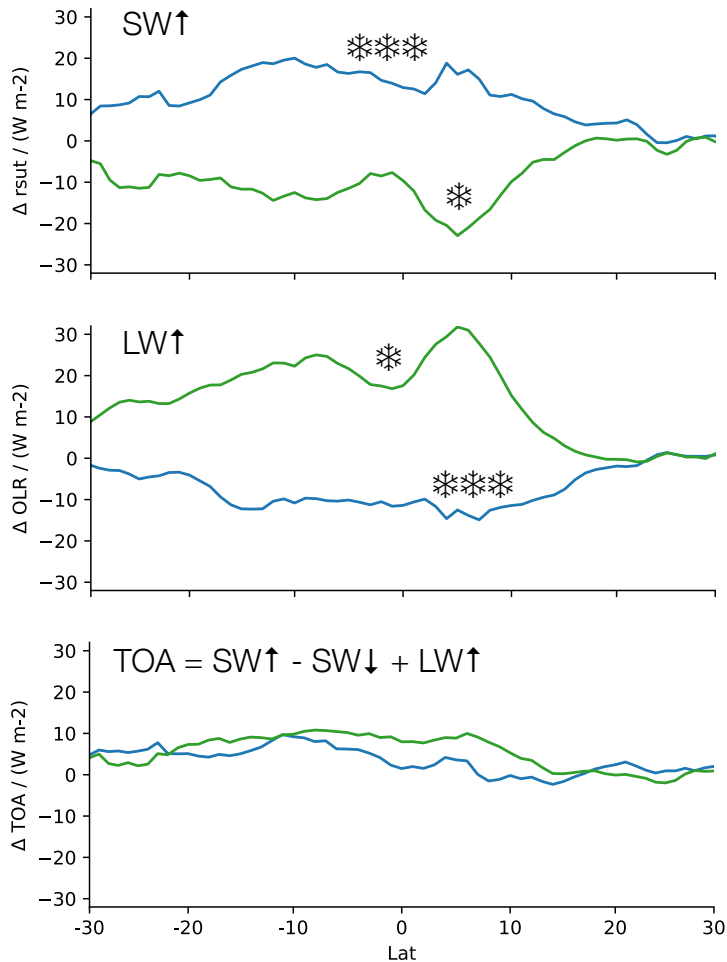


Differences in a single perturbed model are similar to differences in the multi-model ensemble DYAMOND.

How do microphysical choices affect radiative fluxes and heat budget?



Radiative fluxes strongly depend on microphysical choices but their effects largely balance for the net TOA flux.



Summary

A perturbed-microphysics single model ensemble shows a similar spread as a multi-model ensemble.

Changing microphysical parameters in their range of uncertainty affects radiative fluxes by $O(10) \text{ W/m}^2$.