



Understanding the diurnal cycle of local convection from LES simulations

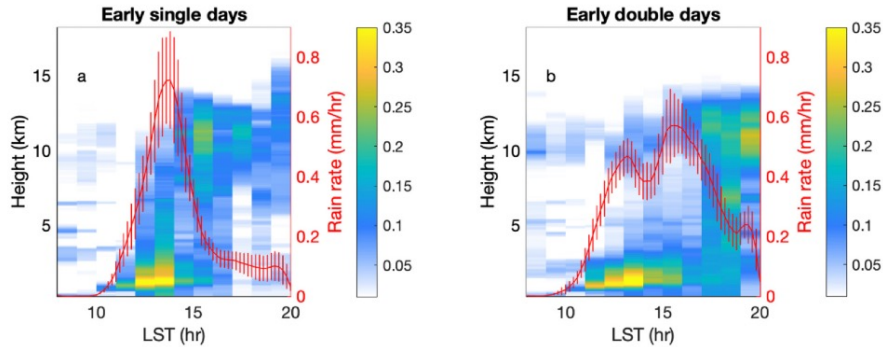
Yang Tian

NCAR, Scientist I

NCAR
UCAR

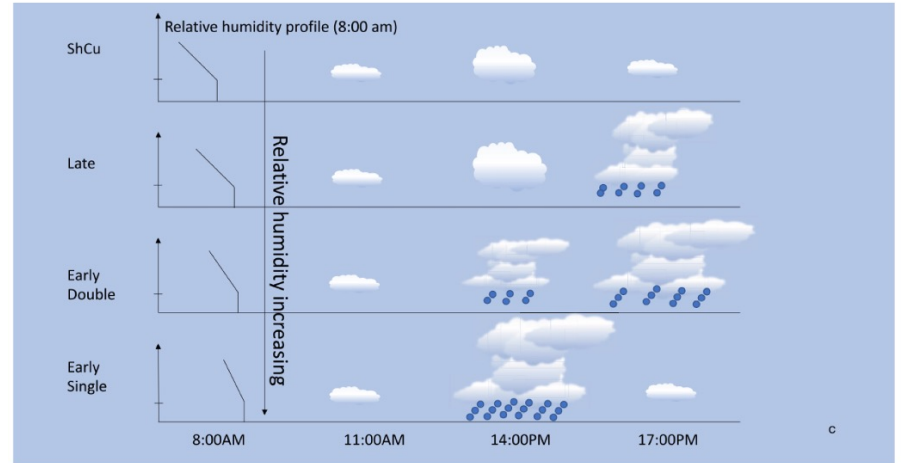
08/09/2023, ARM/ASR PI meeting

Previous findings from GoAmazon observations



Early onset of precipitation before 2pm

Existence of multiple precipitation pulses in diurnal cycle over Amazon



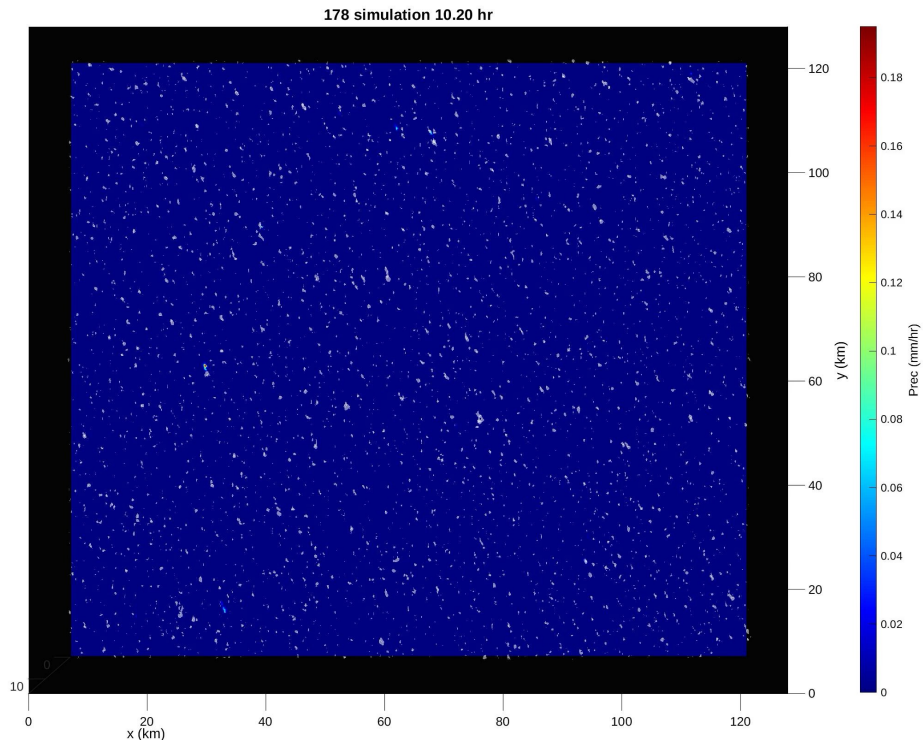
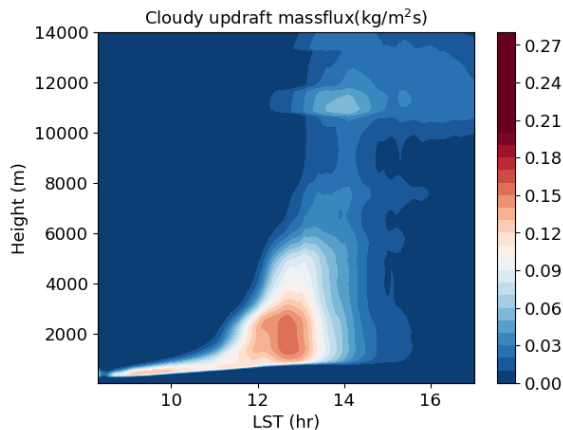
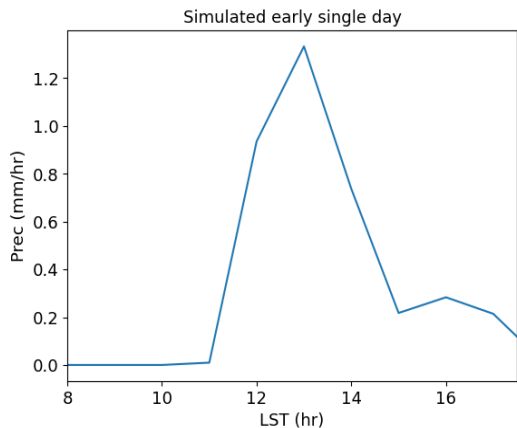
The number and timing of pulses are closely related to early morning relative humidity and convective aggregation

Motivations and model configurations

- Use LES simulations to validate a few previous hypotheses
 - The role of wind shear, early morning relative humidity, and surface fluxes in determining the vertical extent of convection, number and timing of precipitation pulses
 - Use LES simulations as benchmarks for high-res DP-scream and RRM convection diagnostics
- LES model setup and configurations
 - System for Atmospheric Modeling, 250m horizontal resolution, stretched vertical grids, 3s temporal resolution, 128 x 128 km
 - Initial sounding, large-scale forcing and surface fluxes are all from DOE ARM GoAmazon observations, no T and q nudging to allow for free convective development

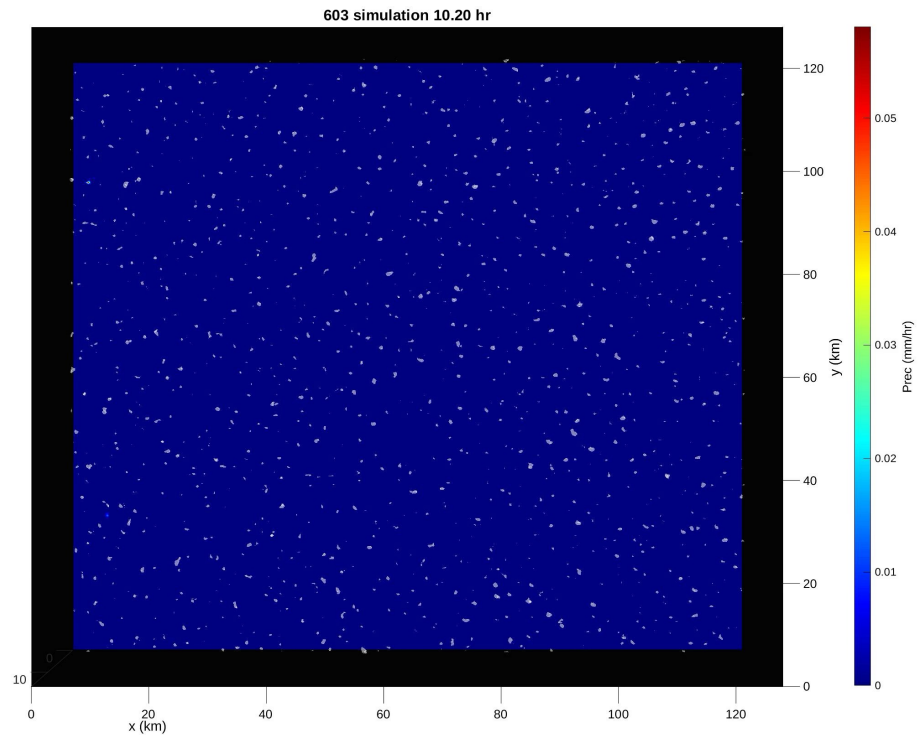
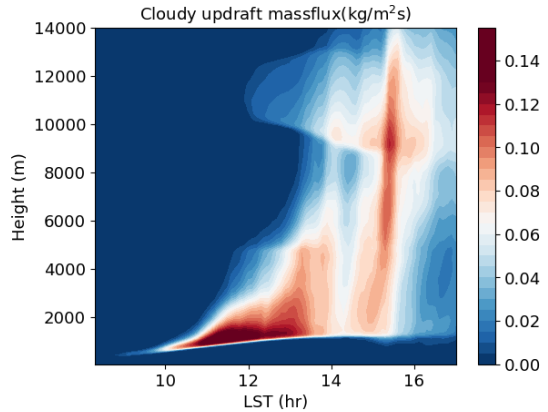
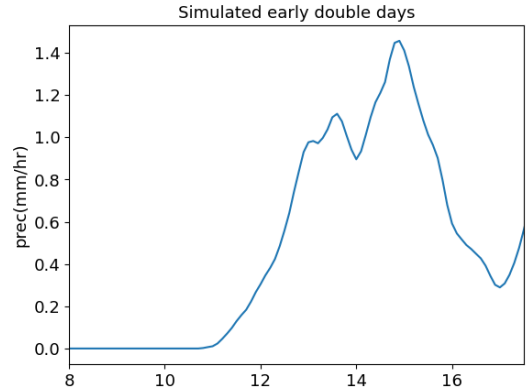
Prelim results from LES simulations (early single example)

Simulated results



Prelim results from LES simulations (early double example)

Simulated results



Thoughts for discussions

- How to objectively evaluate the performance of a model? What are good metrics? (e.g. precip)
- How to enable apple-to-apple comparison between model and observations? (e.g. cloud fraction)
- How can we best use model results to guide the observational activities (e.g. field campaigns)?
- What is considered a “good” resolution to resolve local convection?
- What is the future direction of convection parameterization? Ultra-high resolution?