Study Aerosol Impacts on Clouds with GoAmazon Data and Model Simulations

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1. Impact of Manaus plume on deep convective clouds downwind (on-going)
2. Aerosol impact on the transition of shallow to deep clouds (planned)

For discussion in GoAmazon breakout session at 2017 ARM/ASR PI meeting

1. Impact of Manaus plume on deep convective clouds downwind

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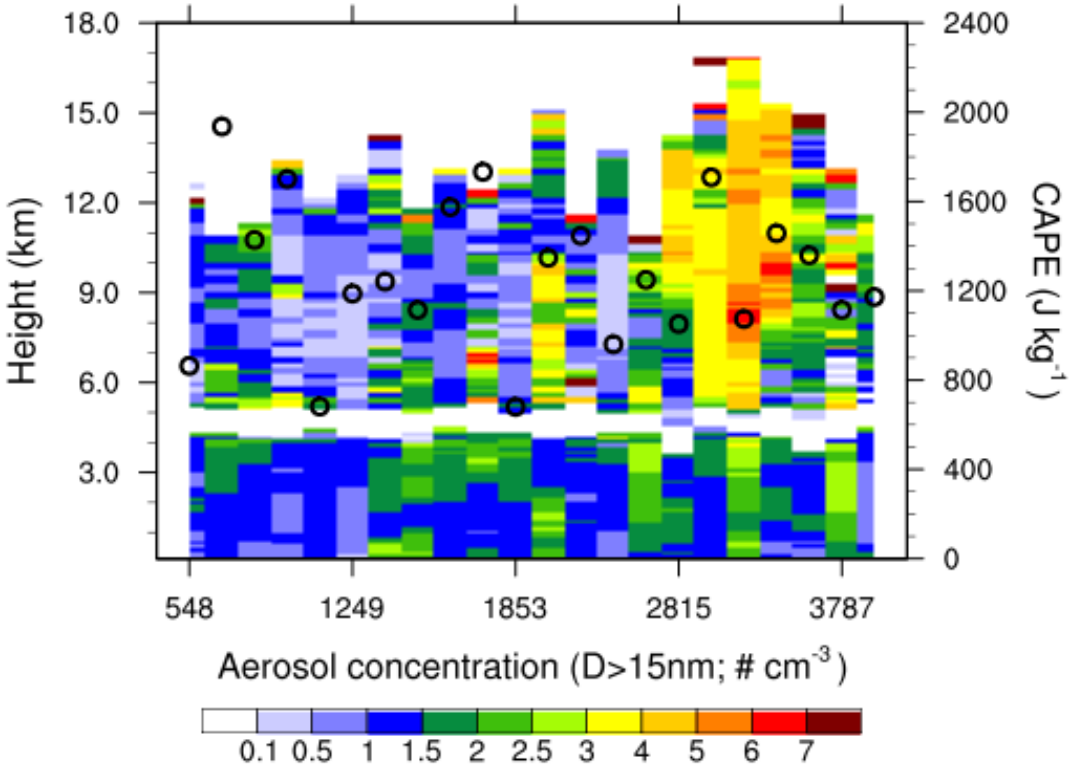
Observational analysis

- Select all the local convective systems based on Tang et al. (2016) during 2014 wet season (March-May) with the observations that have valid measurements from ARM UHF Radar Wind Profiler (RWP)
- Aerosol concentration for each case is the 30-min average of the surface UHSAS measurements right before cloud.
- CAPE is calculated from the available sounding at T3 before each convective event.

Color contour: updraft velocity
Circles: CAPE



Model simulations

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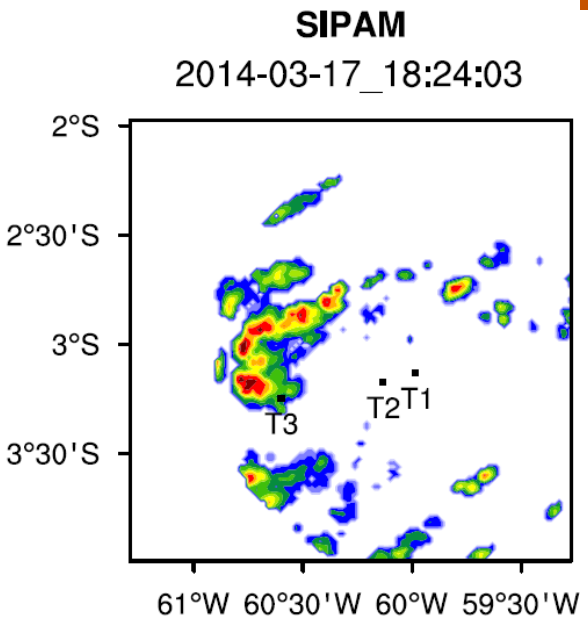
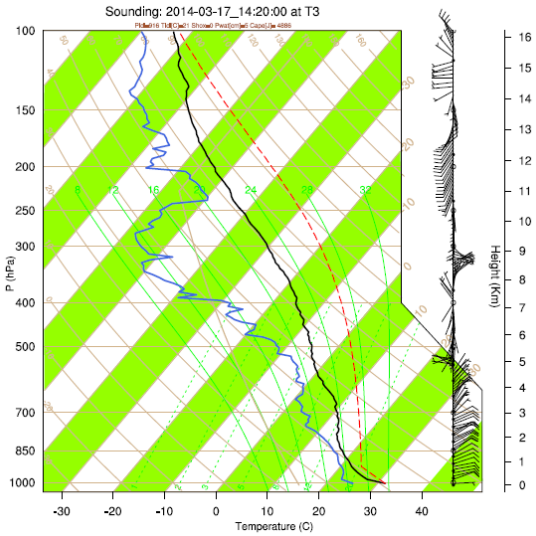
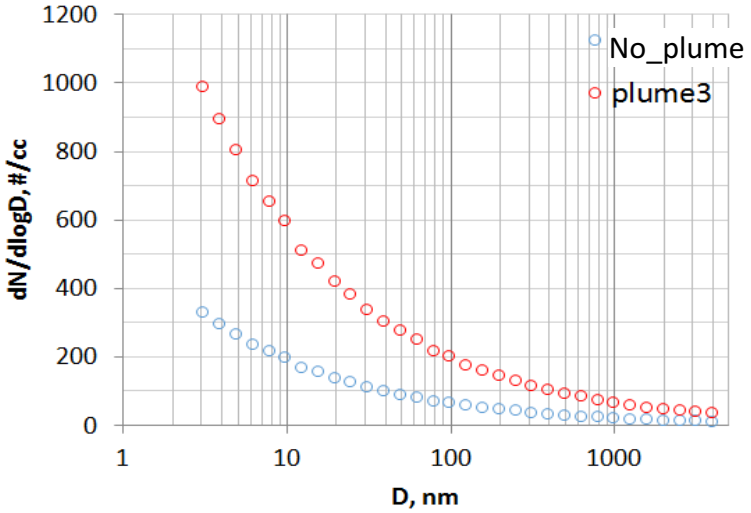
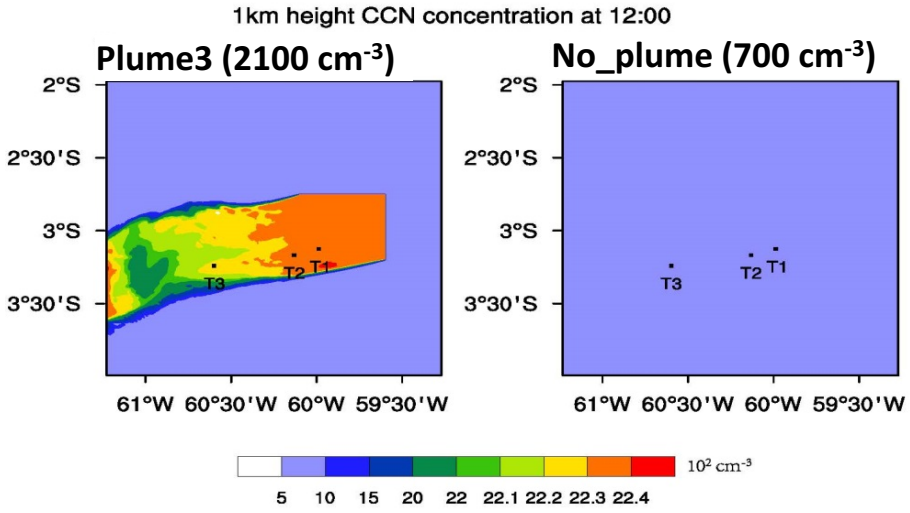


March 17 2014

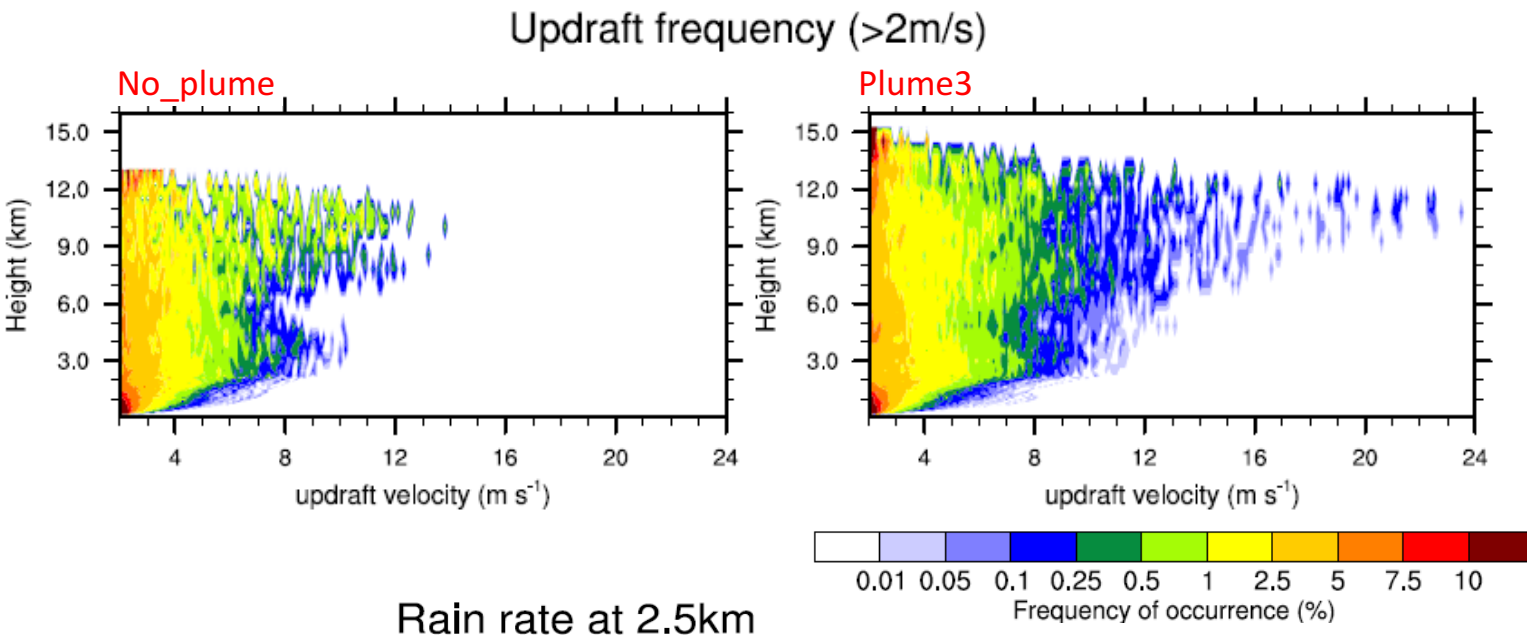


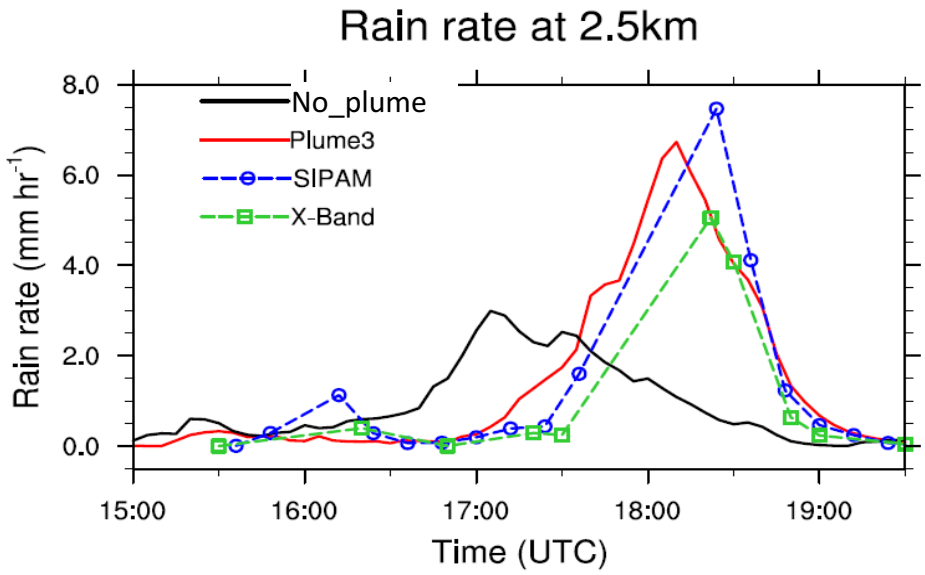
Model aerosol SD (on log10)





Convection and precipitation





- The Manaus plume aerosols enhance convective intensity above 6 km significantly (with the maximum increase of updraft by 8 m/s
- Precipitation increases by 40%, with over a one hour delay

2. Aerosol impact on the transition of shallow to deep clouds

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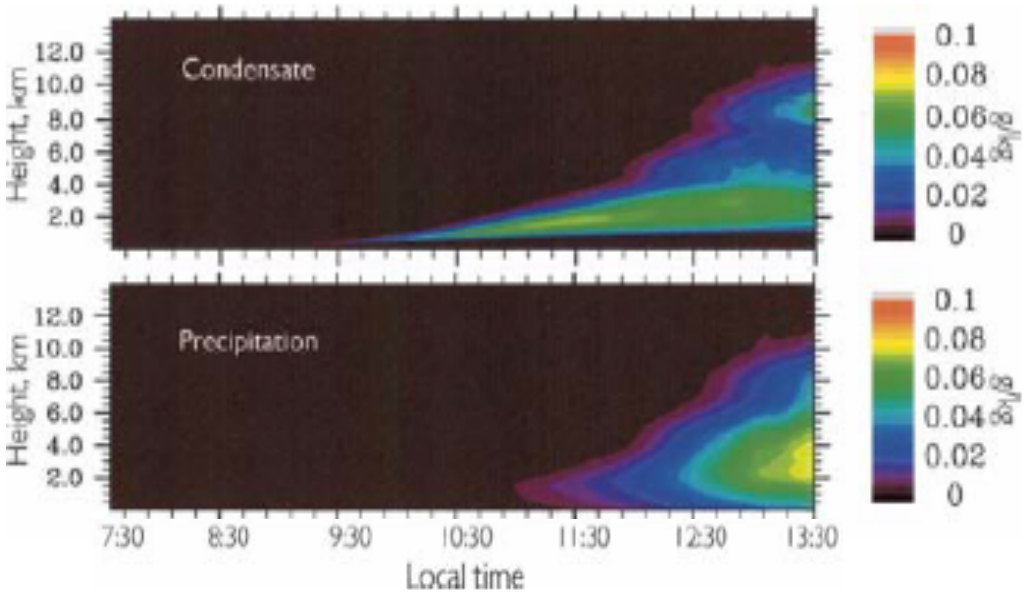
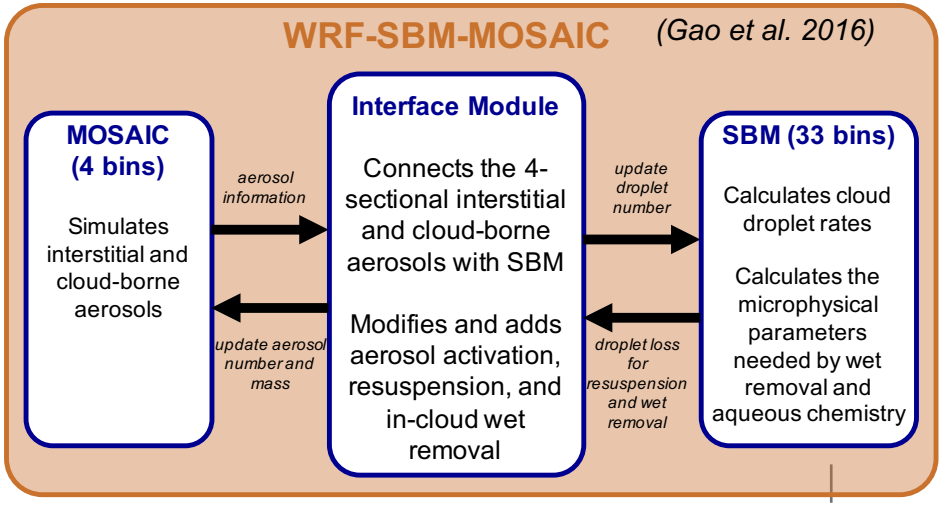


LBA case (Khairoutdinov and Randall 2006)

Typically shallow cumulus clouds in the morning, and transit to deep convective clouds and heavy precipitation events in the afternoon.

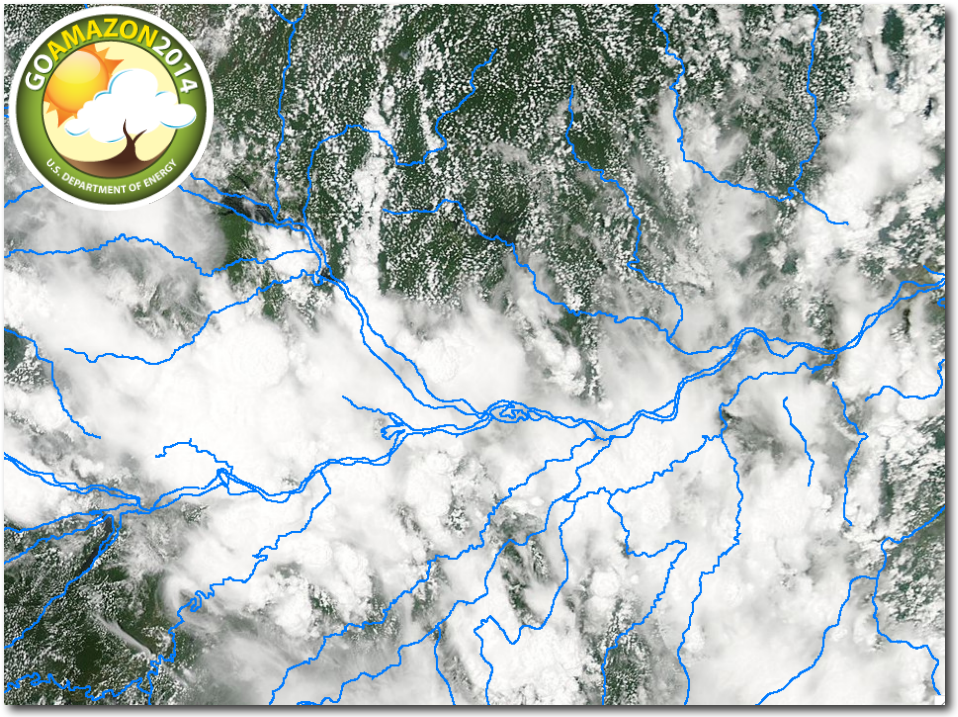
- Aerosol could impact shallow to deep transition through aerosol radiative effect and indirect effect, depending on aerosol properties.

Modeling



2. Aerosol impact on the transition of shallow to deep clouds

Observational analysis



- Aerosol properties
- Evolution of dynamics and thermodynamics, and cloud properties

Seek for collaboration on observational data and analysis of shallow to deep transition.