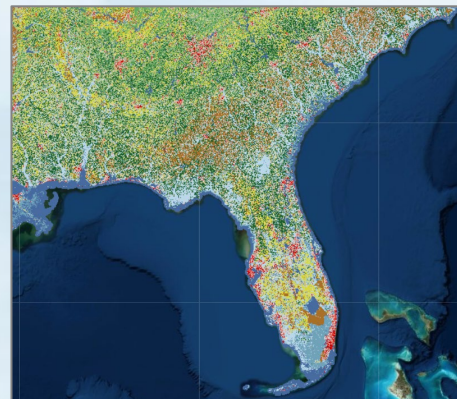


# Science and Deployment Plan of the 3rd ARM Mobile Facility:

## *SOA Measurements in the Southeast US*

Chongai Kuang, Shawn P. Serbin, Scott E. Giangrande, and contributions from the Site Science Team (Gregory Elsaesser, Pierre Gentine, Thijs Heus, Mariko Oue, John Peters, James Smith, Allison Steiner)

Brookhaven National Laboratory, USA



# Relocation of the 3rd ARM Mobile Facility to the Southeastern U.S. - AMF3 SEUS



- Motivators for going to the SEUS:
  - Large amount of vegetative-driven biogenic emissions
  - Abundant locally-forced shallow to deep convection
  - Strong local coupling of land surface with atmospheric processes
- Expected **5 year** deployment, with operations beginning March 2023.
- Specifics on site location, configuration, instrumentation to be determined in part through a DOE supported **Site Science Team**:
  - Chongai Kuang (aerosol)
  - Scott Giangrande (convection)
  - Shawn Serbin (land-atmosphere interactions)

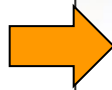


# AMF3 SEUS: Aerosol Science Drivers



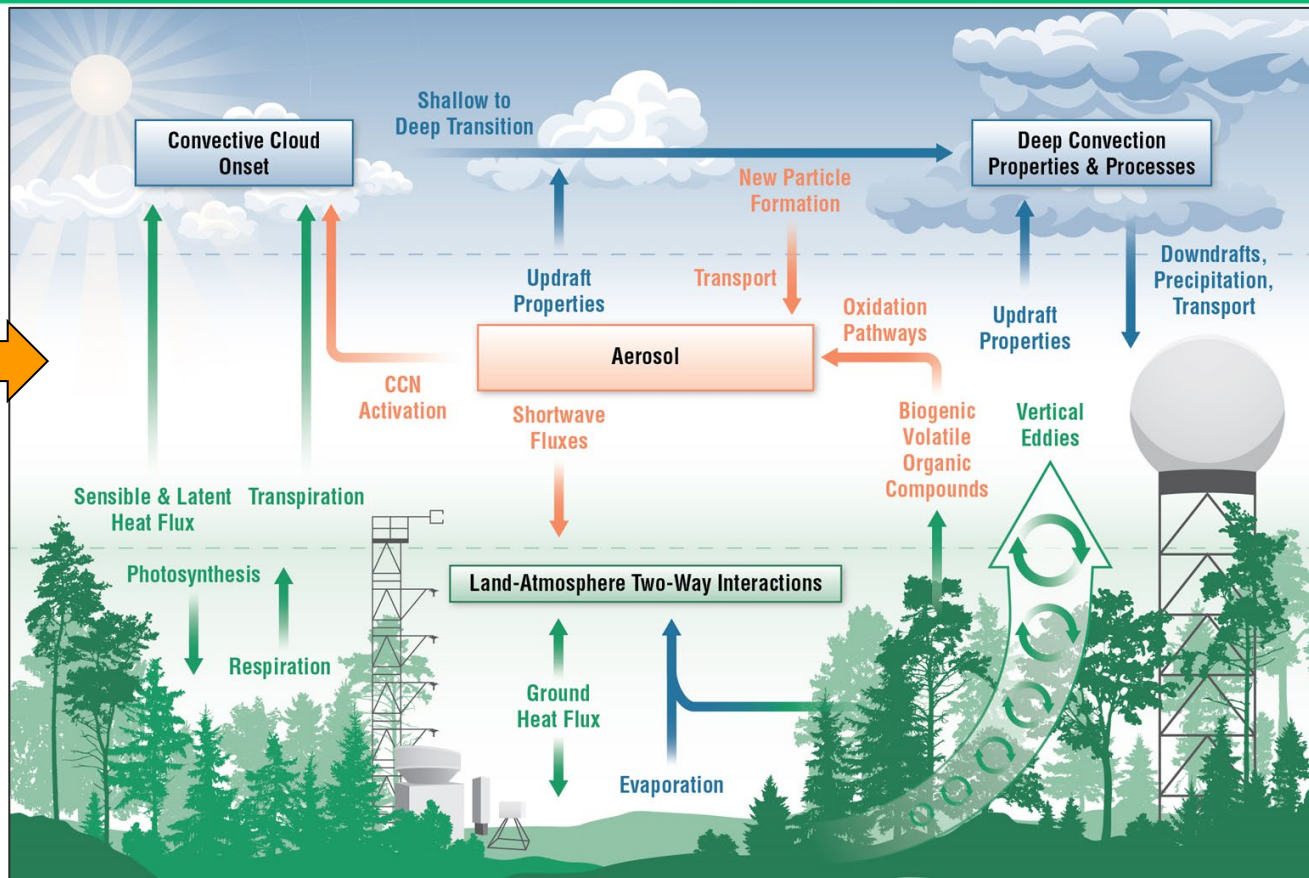
- **Properties/processes that control the cloud condensation nuclei budget:**

- New particle formation and transport
- Secondary organic aerosol
- Spatio-temporal variability in aerosol hygroscopicity



- **Aerosol optical properties:**

- Particle water uptake
- Biomass burning
- Brown carbon



# Current Timeline and Anticipated Deliverables



- March 2021: Siting/measurement guide delivered.
- **June – August 2021: Site evaluations/visits.**
- September 2021: Site identified.
- March 2023: Site operational with ~ 5-year deployment.
- Still soliciting feedback on measurement priorities (and their science drivers) and site configurations...

# AMF3 SEUS: Aerosol-centric Measurements (Instruments)



## Aerosol Observing System (AOS):

- number ( $>3$  nm,  $>10$  nm), size distribution (10 nm – 35  $\mu$ m)
- water-uptake (HTDMA), activation (CCN)
- chemical composition (ACSM)
- trace gas (CO, N<sub>2</sub>O, H<sub>2</sub>O, CO<sub>2</sub>, CH<sub>4</sub>, O<sub>3</sub>)
- optical (CAPS, NEPH, PSAP)



## Requested Measurements (so far):

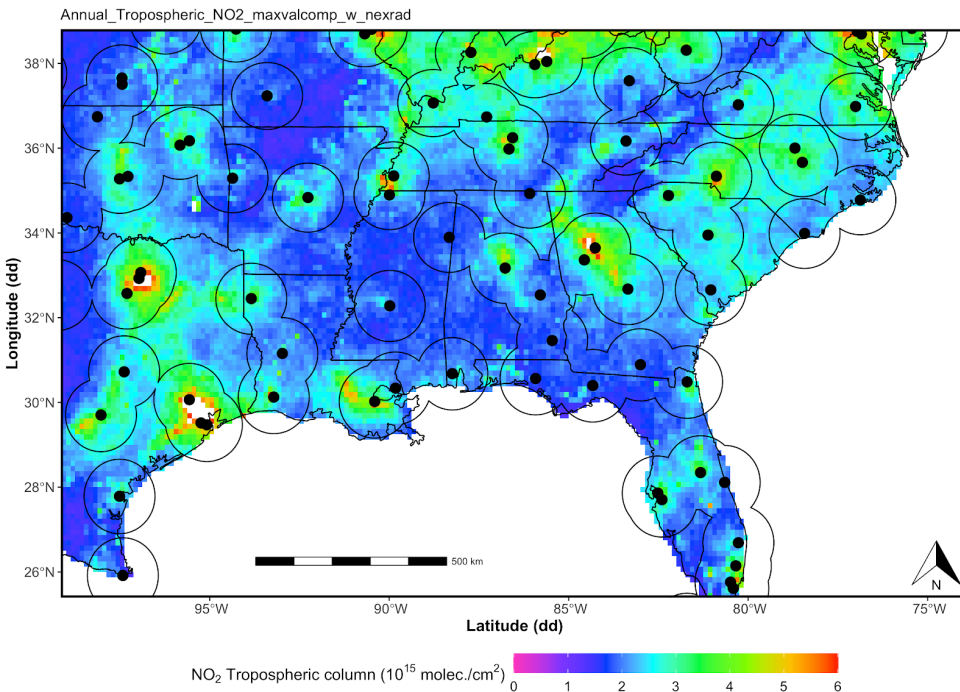
- $< 10$  nm size distribution (Nano-SMPS)
- size-resolved activation (SMPS+CCN)
- VOCs (and fluxes) (e.g., PTRMS, GC-FID)
- SO<sub>2</sub>
- “miniature” AOS (supplemental sites, TBS/UAS)
- PBL temperature + H<sub>2</sub>O (Raman lidar)
- PBL aerosol (HSRL)
- aerosol fluxes (ECOR + CPC)
- Black carbon (SP2)



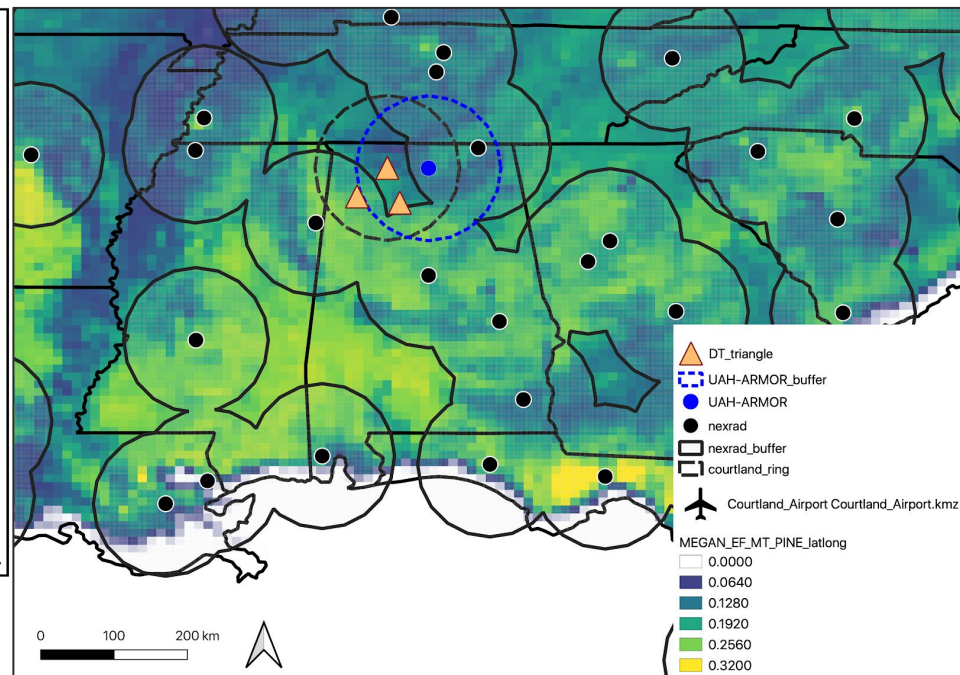
# AMF3 SEUS: (Some) Aerosol-centric Siting Considerations



“anthropogenic” influence



“biogenic” influence



# (Some) *Persistent* Pre-deployment Considerations/Questions



## Observational considerations:

- How can we connect local (co-located) measurements of BVOCs (short lifetime, ~ hours) and SOA (long lifetime, ~days)?
- How can we balance tension between flux measurements (at one location), while capturing regional-scale heterogeneity (e.g., 100 km x 100 km)?
- VOC measurement: How to balance targeting speciation, temporal resolution, and/or spatial extent?

## Intensive Observation Periods (IOPs):

- Given the “baseline” set of AOS measurements (long-term, continuous), what chemistry-intensive IOPs (and associated measurements) can we design?

