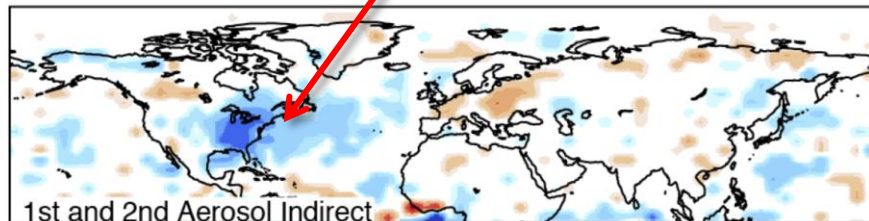
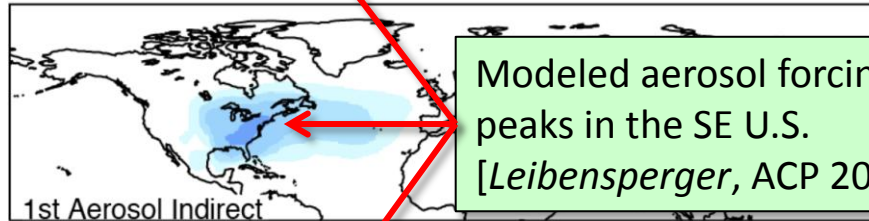
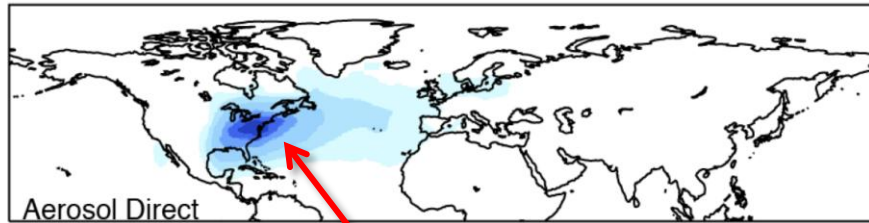


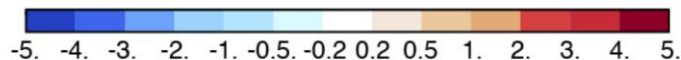
Southeast Nexus (SENEX)

Studying the Interactions Between Natural and Anthropogenic Emissions at the Nexus of Air Quality and Climate Change

Radiative Forcing of US Anthropogenic Aerosols (W m^{-2}) - 1980



Modeled aerosol forcing peaks in the SE U.S.
[Leibensperger, ACP 2011]



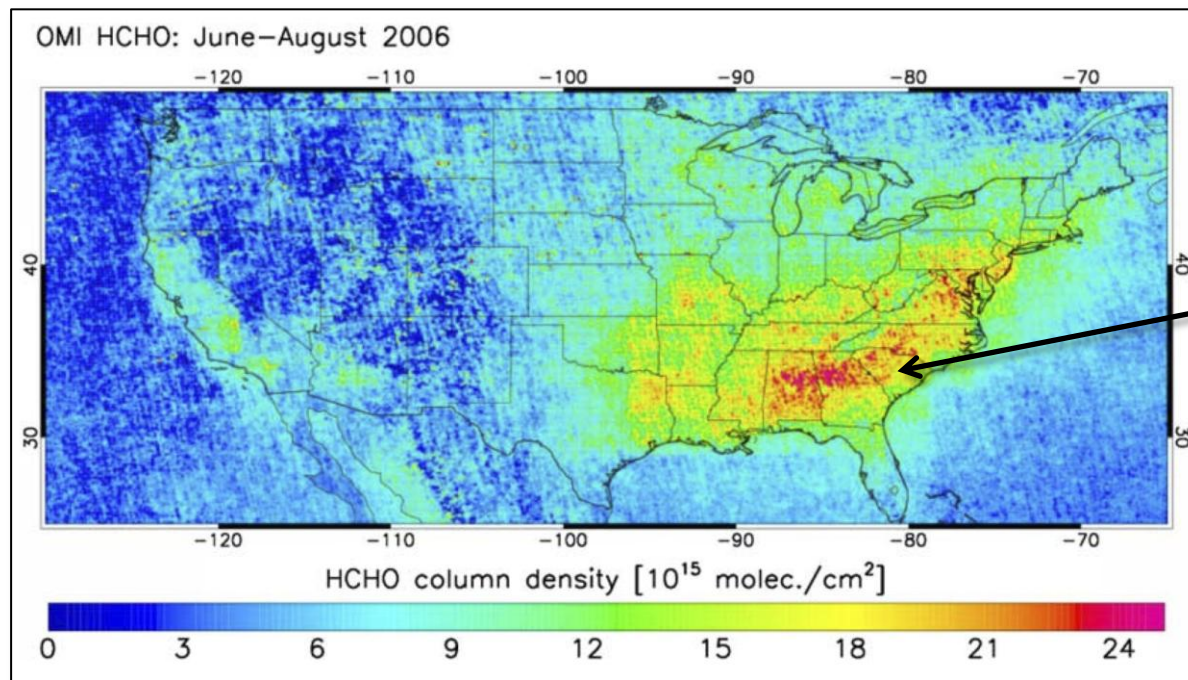
- Southeast U.S. has high anthropogenic and biogenic emissions, humidity, and photochemistry
- How do the emissions react to form aerosol and oxidants?
- What are the climate-relevant properties of the aerosol?

A NOAA Field Study in the Southeast U.S. in Summer 2013

Scientific Motivation

Southeast U.S.:

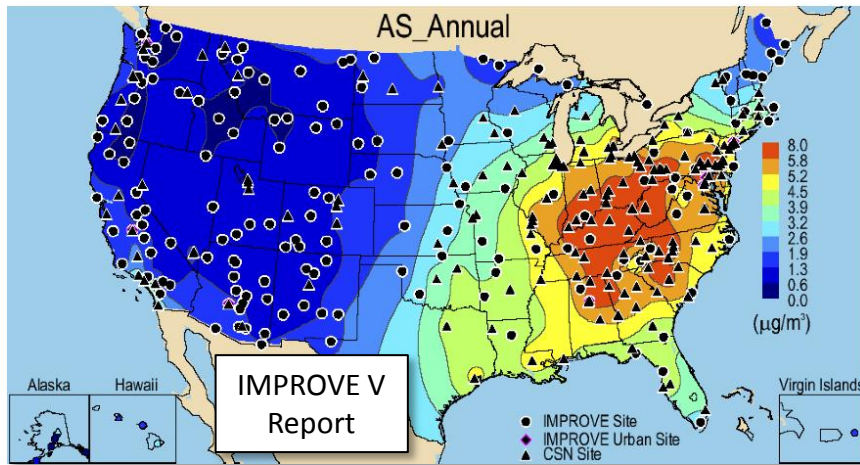
- Many secondary pollutants and radiative forcings are higher than elsewhere in the Nation



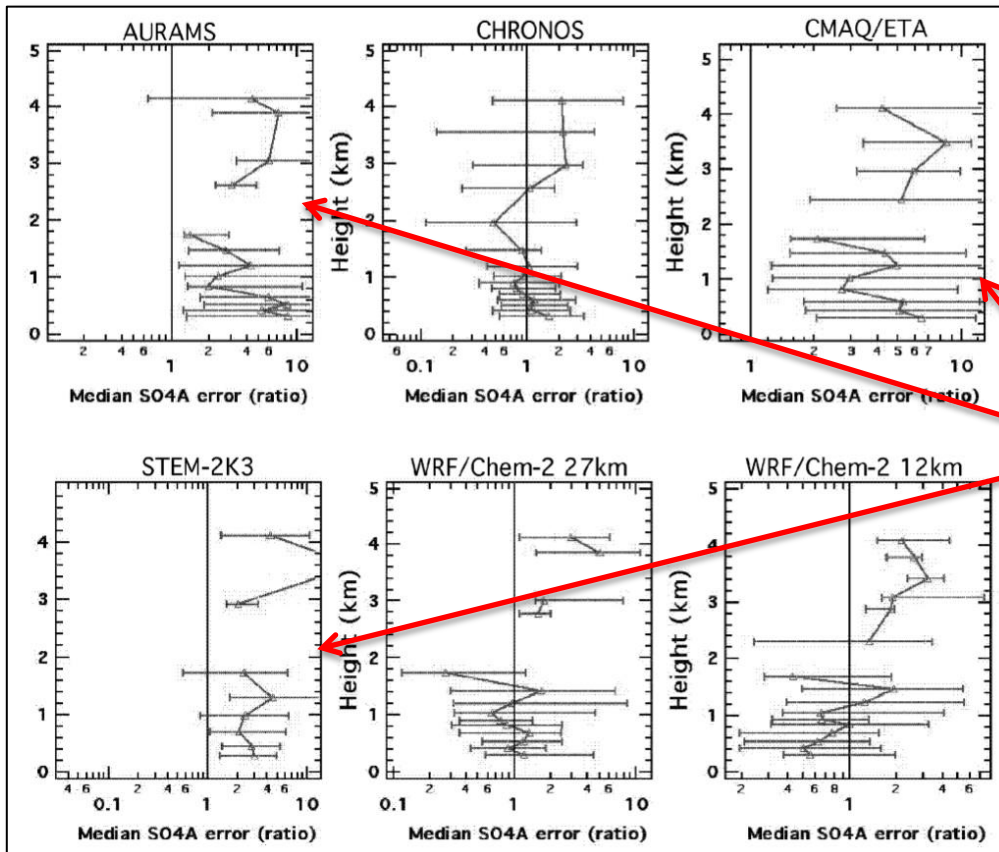
OMI HCHO column peaks in summer SE U.S. [*Millet, 2008*]

How do anthropogenic and biogenic emissions interact and affect air quality and climate?

Sulfate Aerosol

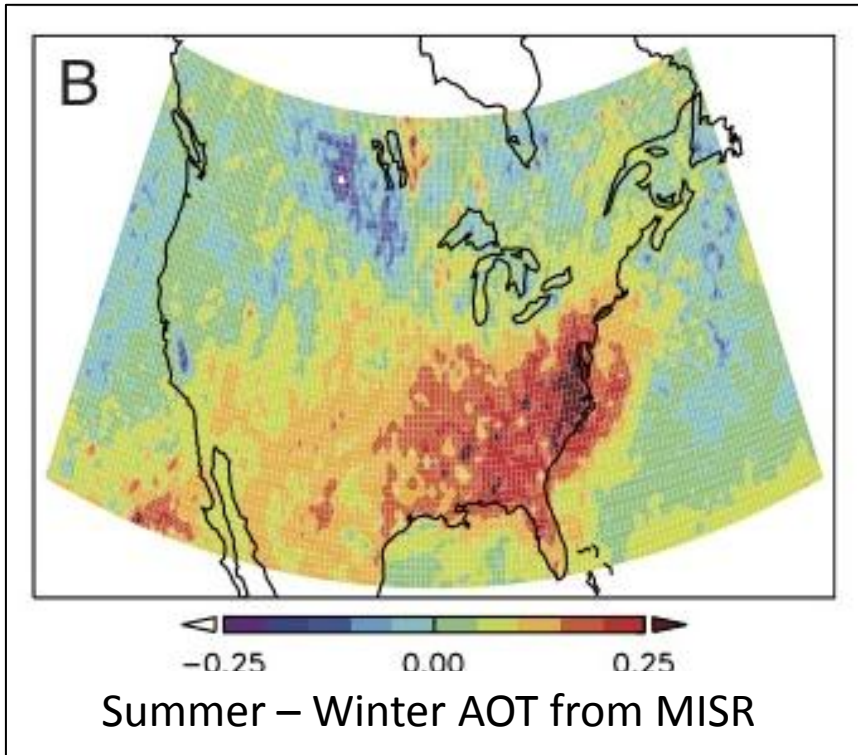
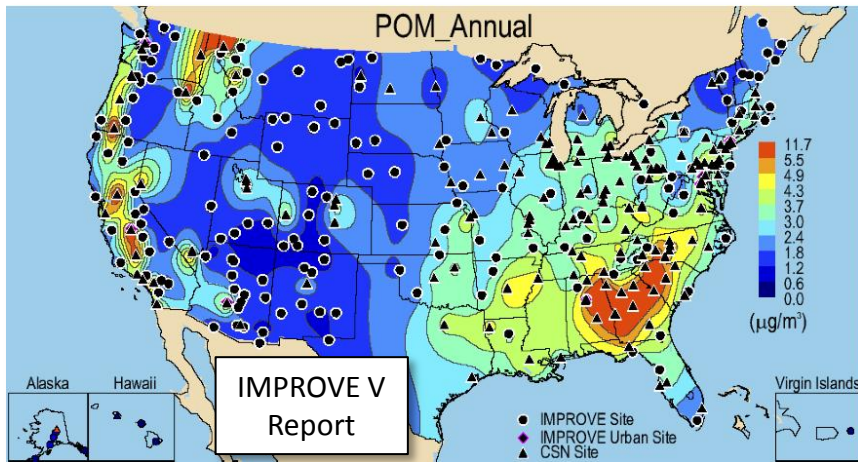


- Sulfate still represents a major fraction of submicron aerosol in the East and Southeast
- Formation in gas phase vs. clouds poorly understood



Models that include cloud oxidation overestimate sulfate [McKeen, 2007]

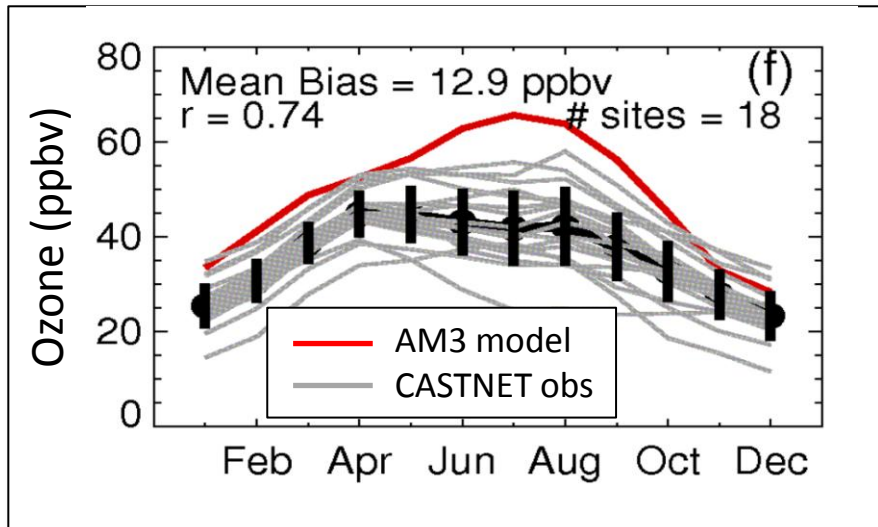
Organic Aerosol



Goldstein [2009]

- Observations show highest organics in Southeast
- Satellite AOT shows strong seasonal cycle: biogenic SOA? (But: IMPROVE shows larger cycle for sulfate)
- Role of aqueous-phase processing?
- Role of nighttime oxidation of biogenic VOCs?
- What fraction of SOA is controllable?

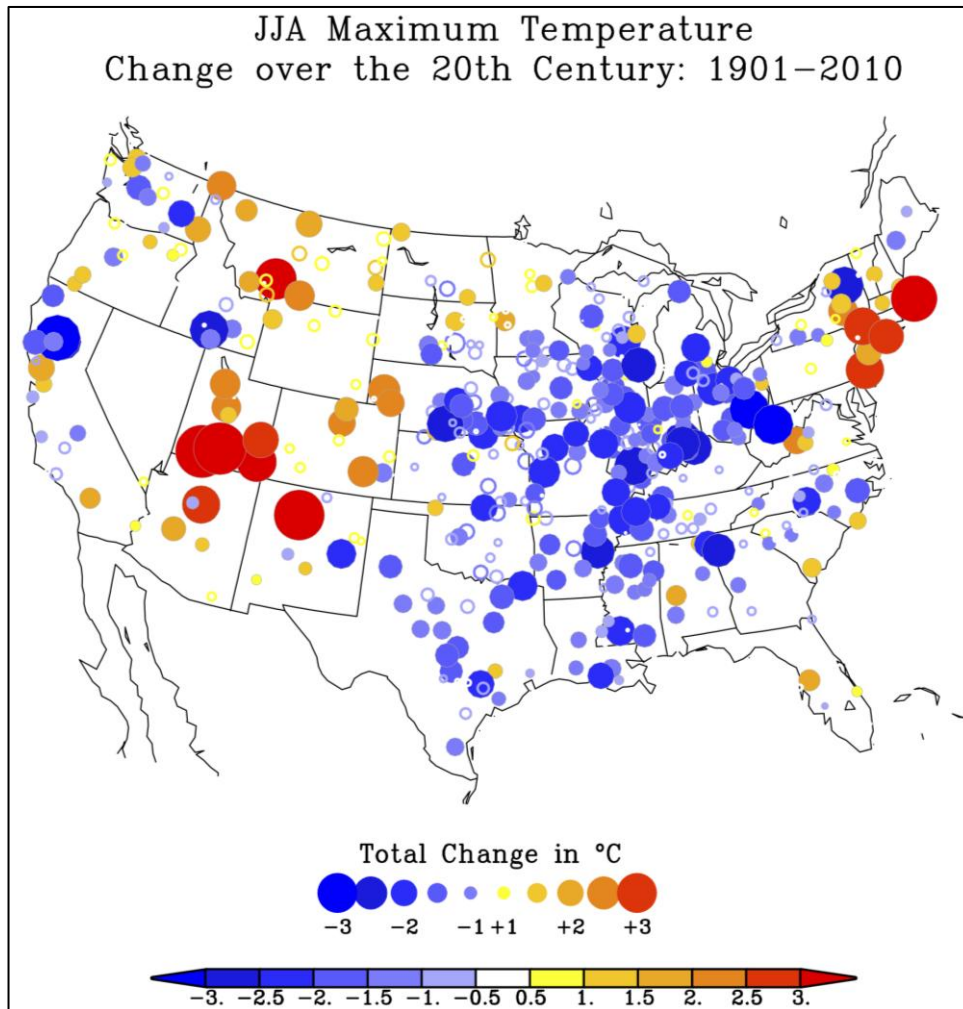
Tropospheric Ozone



Fiore [2009]

- Many models are biased high in the Summertime SE U.S.
- Yield and fate of isoprene nitrates?
- Nighttime chemistry and removal of NO_x ?
- Difficulty in modeling the structure of the nighttime boundary layer?

Part of the motivation: Regional Climate Change and its causes



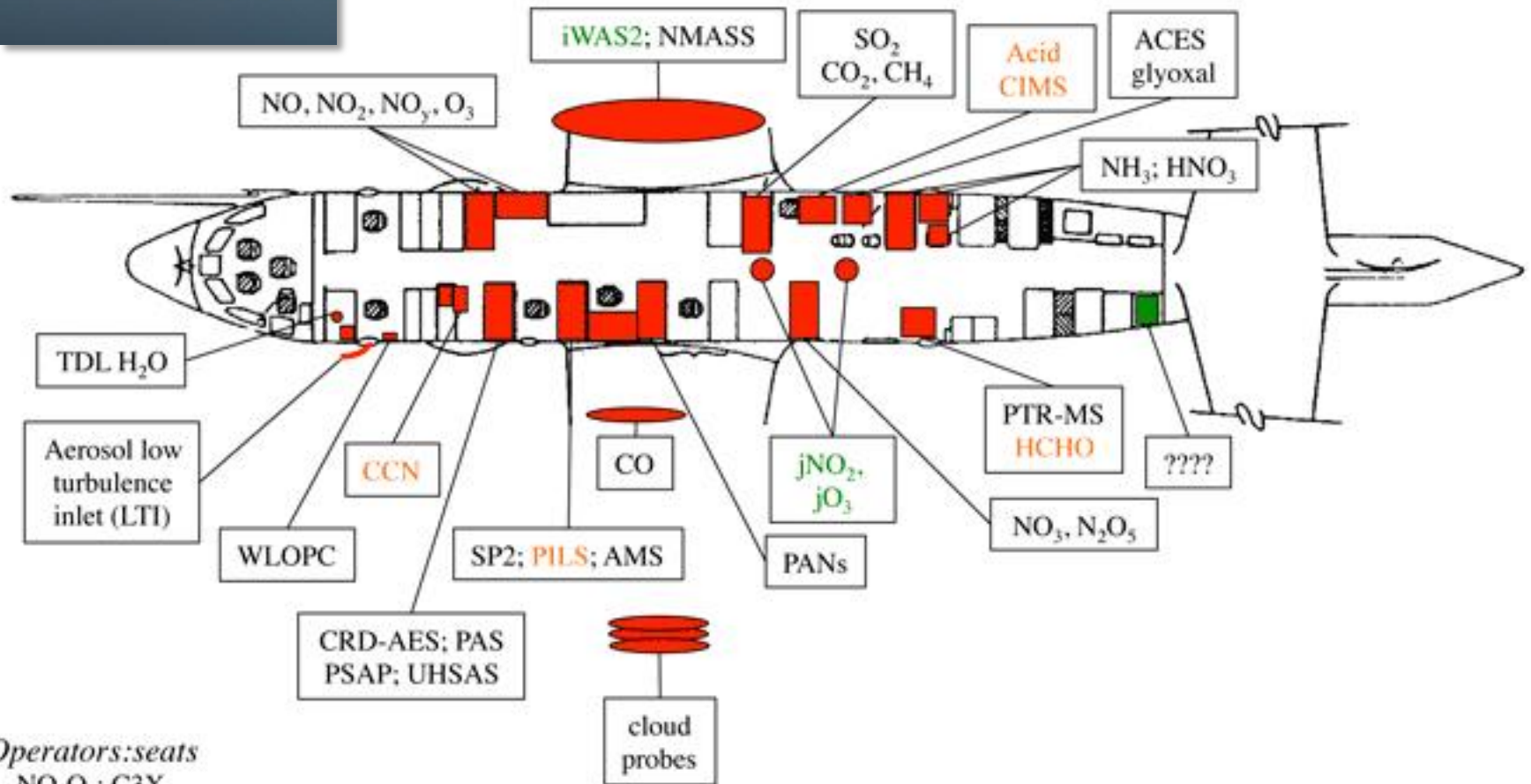
NOAA Science Challenge Workshop [2011]

- Eastern U.S. has not warmed since 1950 and has received more precipitation [*Portmann, PNAS 2009*]
- Connection with aerosol distribution?
- SENEX contribution:
 1. Describe and improve understanding of aerosol distribution
 2. Describe climate-relevant properties of aerosol

Main Science Questions

1. What are the emissions of aerosol, aerosol precursors and greenhouse gases in the SE U.S.?
2. What is the composition and distribution of aerosol in the SE U.S.?
3. What are the formation mechanisms of secondary species (ozone, sulfate and organics) in the SE U.S.?
4. Which deposition processes are critical for determining atmospheric concentrations of aerosol, ozone and NO_y?
5. What are the climate-relevant properties of aerosol in the SE U.S.?

NOAA WP-3D Instrument Payload



Operators:seats

NO_yO₃: C3X

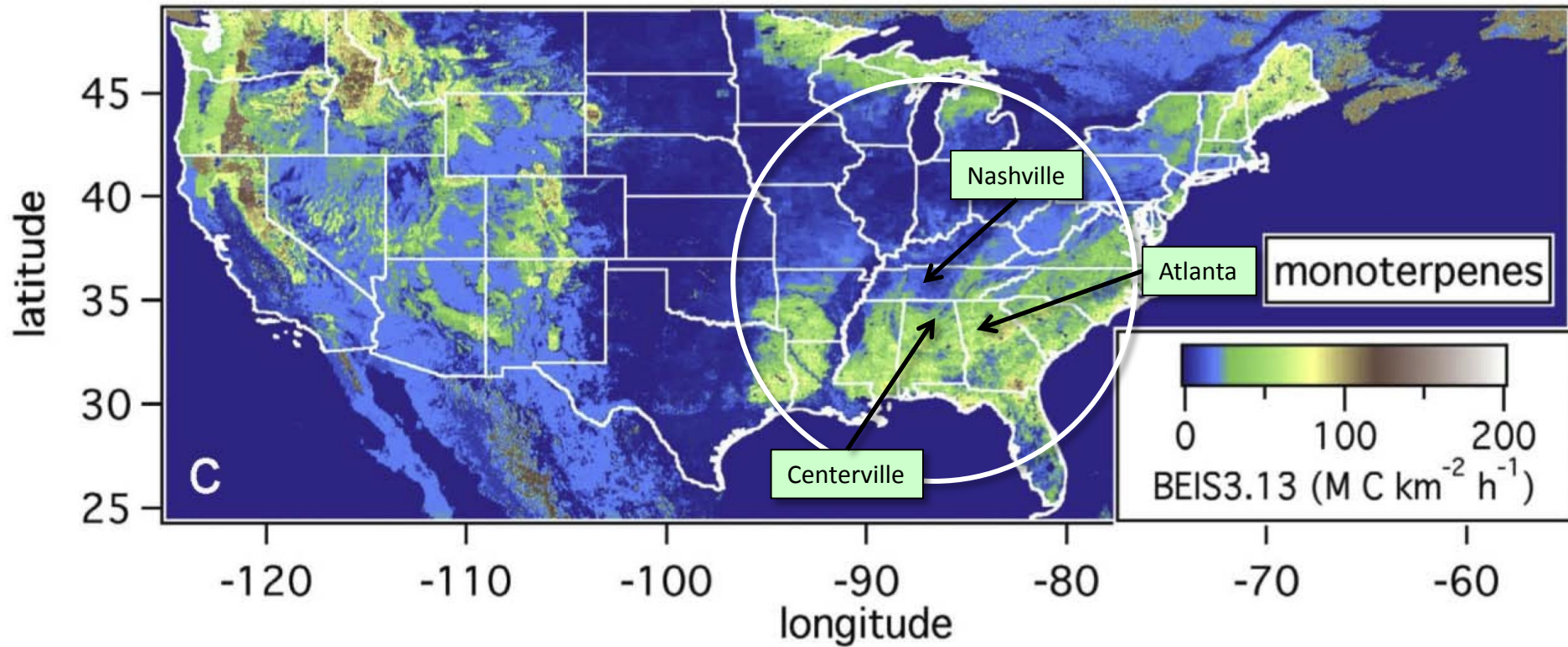
CRDS: Sta. 2

PILS/AMS: Sta. 3

CIMS: Galley

???: Galley

Base of Operations: Smyrna near Nashville



Within range of the NOAA WP-3D:
Southeast, Smoky Mountains and Ozarks
Atlanta
SOAS site at Centerville
Mississippi valley and mid-West



Major SENEX Study Components and Partners

NOAA ESRL, GFDL and ARL



- WP-3D instrumented with gas, aerosol, and aerosol radiative and CCN properties; Jun-Jul 2013
- Ground site participation
- AM3, WRF-Chem and FLEXPART modeling
- Profiler and ozone sonde network?
- Deposition measurements?

NSF: Southern Oxidants & Aerosol Study

- Ground site at Centerville, AL, SEARCH site (Carlton, Goldstein, Jimenez)
- NSF C-130: airborne flux measurements (Guenther)

EPA

- STAR grant funding

EPRI

- SEARCH network