LAND-ATMOSPHERIC INTERACTIONS IN THE SOUTHEAST UNITED STATES: CHALLENGES AND OPPORTUNITIES

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OVERVIEW

- Brief History of the Science
- Where the research is today
- Challenges/Opportunities (scientifically and operationally)
SEUS HAS RICH HISTORY IN LAND-ATMOSPHERIC RESEARCH

EPA Southern Oxidation Studies, SOS (mid 1990 - present)


FACE - Free air carbon dioxide enrichment – ecosystem experiments


NIFA 2010 joint venture DOE, NSF, USDA ecosystem modeling efforts.

TES – Terrestrial Ecosystem Sciences / NGEE
WHAT HAVE WE LEARNED

- **Large variation in carbon and water exchange rates** (climate, site preparation, site quality and genetic materials)

- Southeast United States has been a large sink of carbon, accounting for ~15 - 20% of US fossil fuel emissions
  - Large portion is southern Pine plantations (0.4 Tg C/yr, Branco et al. 2011)

- Elevated atmospheric CO₂ concentration increases carbon sequestration capacity for short periods of time

- Consequences for water use (Trading Water for carbon; Jackson et al. 2005)

- What you measuring at the tower may not be coming from the source area

- Scale is a significant factor in the carbon and water budgets of the region (Binford et al. 2006)

- Chu et al. in prep. AmeriFlux sites have relatively homogeneous land cover within the flux footprint, only a small portion of sites have similar land cover outside the footprint
UNKNOWN FROM PAST RESEARCH

There was a strong focus on Pine Plantations

- What about other vegetation types and land use?
- How does the pine focus affect land-atmosphere modeling efforts?
- Ideal conditions for land-atmosphere studies but we didn’t untangle heterogeneity in fluxes.
1. **How do we as a community study the large variance in fluxes that we see in the region?**

2. **What are the methane sinks in the region?**

3. **How does urbanization and urban pollution change energy balance, aerosol emissions, LE, etc.?**

4. **How do privately owned, small units of land affecting our ability to study the region?**
5. As forests in the region age, how will this affect land-atmospheric processes?

6. What is the role of prescribed fire in the region’s land-atmospheric processes?

7. How will genetic improvement of crops influence surface fluxes, temperature, BVOCs, LE?
OPERATIONAL CHALLENGES/OPPORTUNITIES

- **We can’t be everywhere? We may not want to be everywhere?**
- **Development of new Partnerships**
  - University
  - Other Observatories – NEON?
- **Linking Measurements at different scales**
THANK YOU