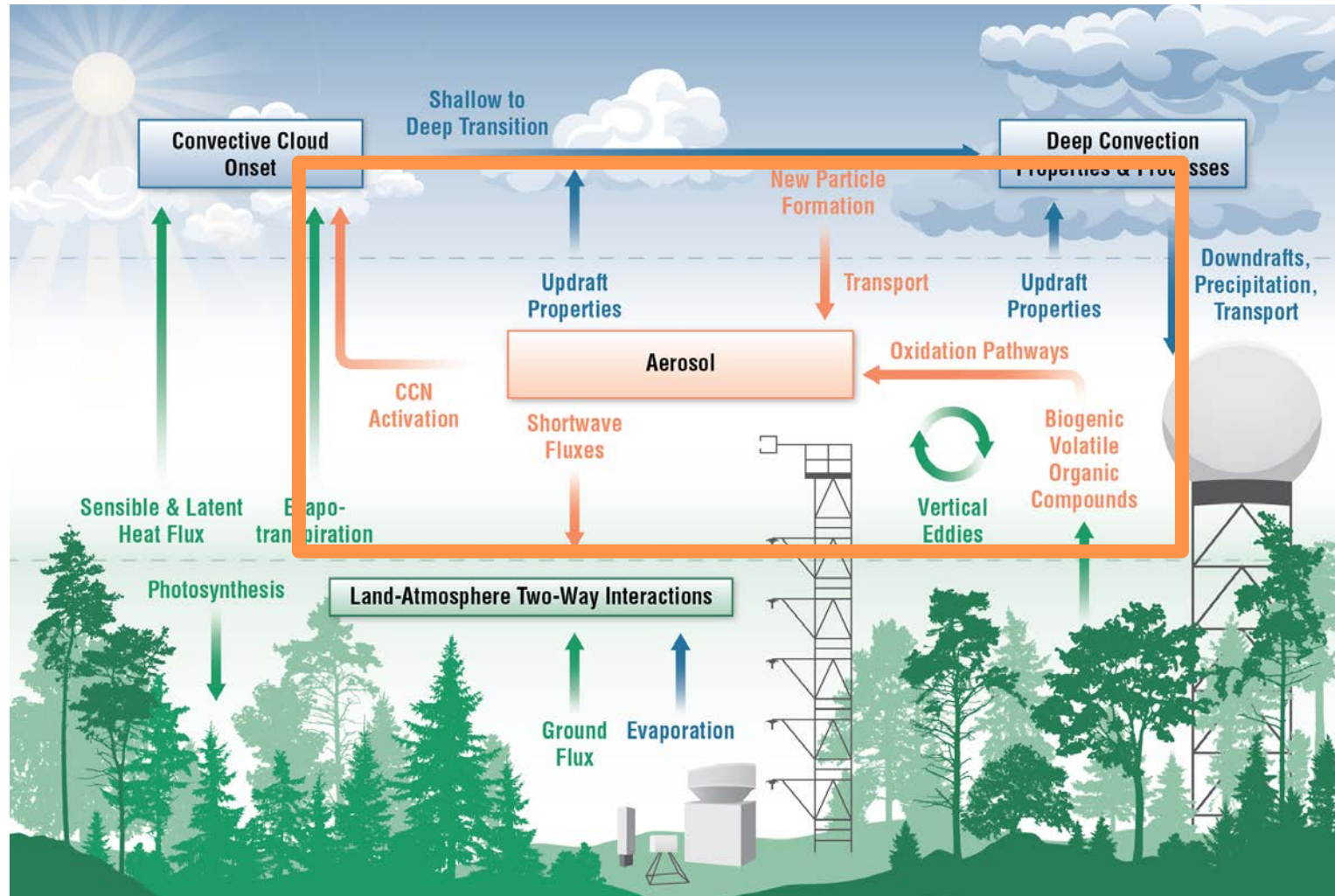




# AMF3: ATMOSPHERIC AEROSOLS IN THE SOUTHEASTERN US

Allison Steiner  
University of Michigan

# PROPOSED AMF3 AEROSOL PROCESSES



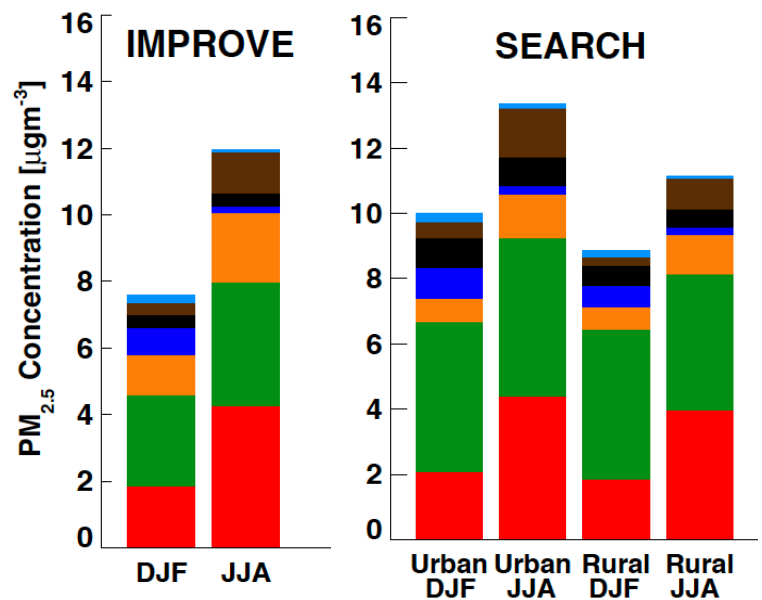
1. Dominant processes and properties that control the CCN budget
  - NPF
  - Organics
  - Hygroscopic properties
2. Aerosol direct impacts on radiation
  - Optical properties

# AEROSOL COMPOSITION IN THE SEUS: PAST STUDIES

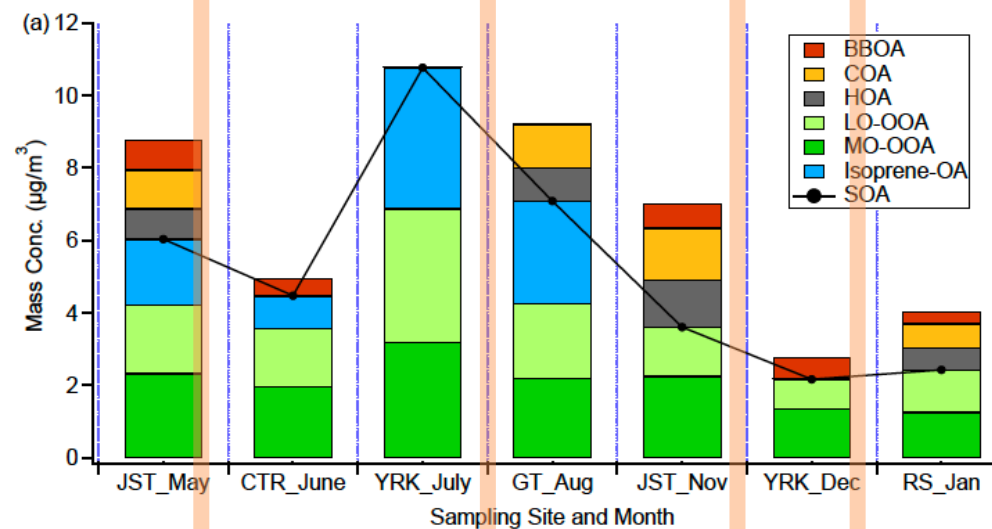
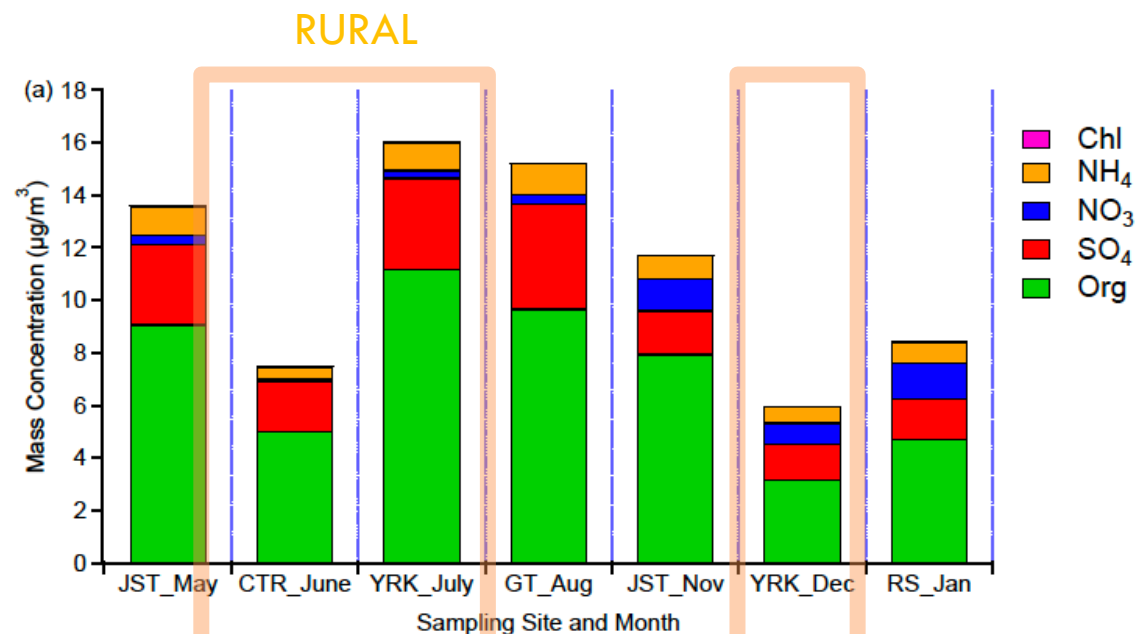
**Southern Oxidant Study (SOS; 1990s)** focus on aerosol and particulate matter

**Southeast Aerosol Study (SAS) 2013**

- Much of the aerosol is organic and most is secondary



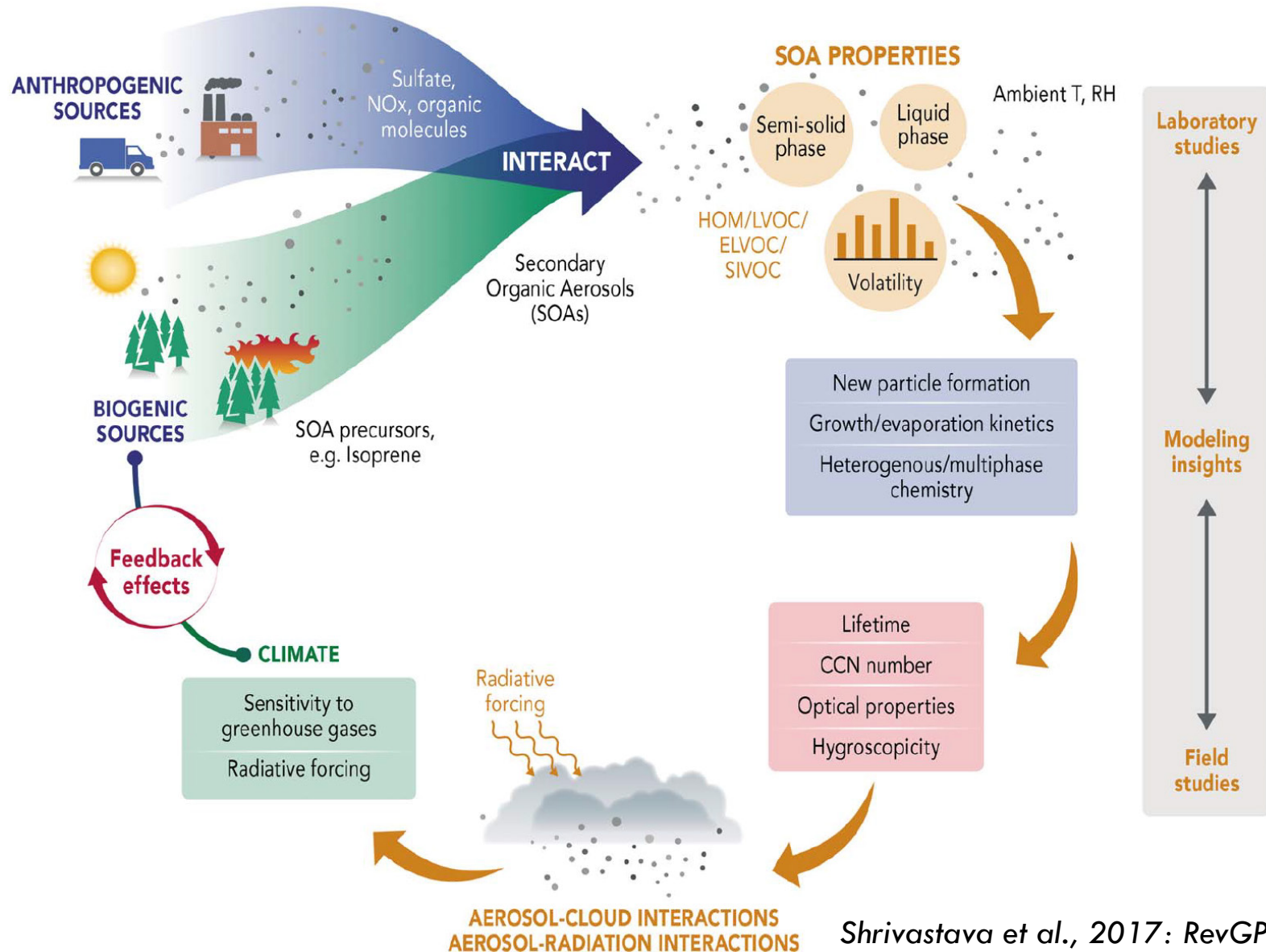
2006-2009 PM<sub>2.5</sub>:  
Ford&Heald 2013;  
ACP



2012-3 NR-PM<sub>1</sub>: Xu et al. 2015; ACP

# SOA FORMATION AND AMF3 SCIENCE QUESTIONS

- Linking precursor emissions with SOA: Isoprene versus terpene dominated ecosystems
- Connection to direct forcing (via optical properties) and clouds (via hygroscopicity)

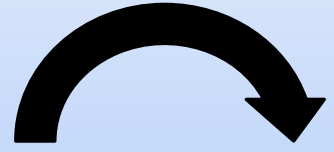




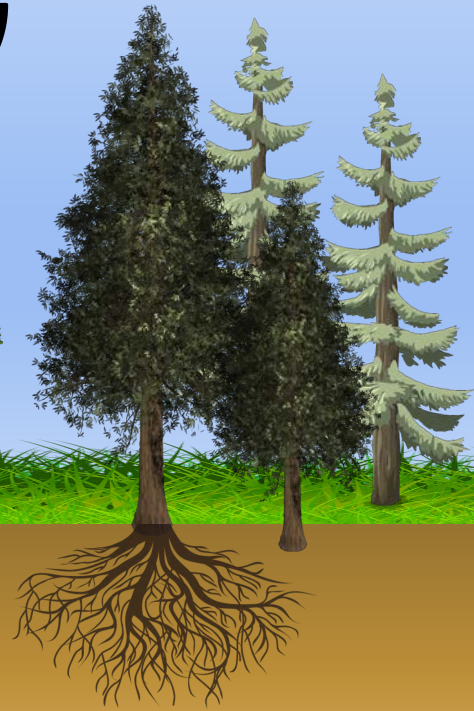
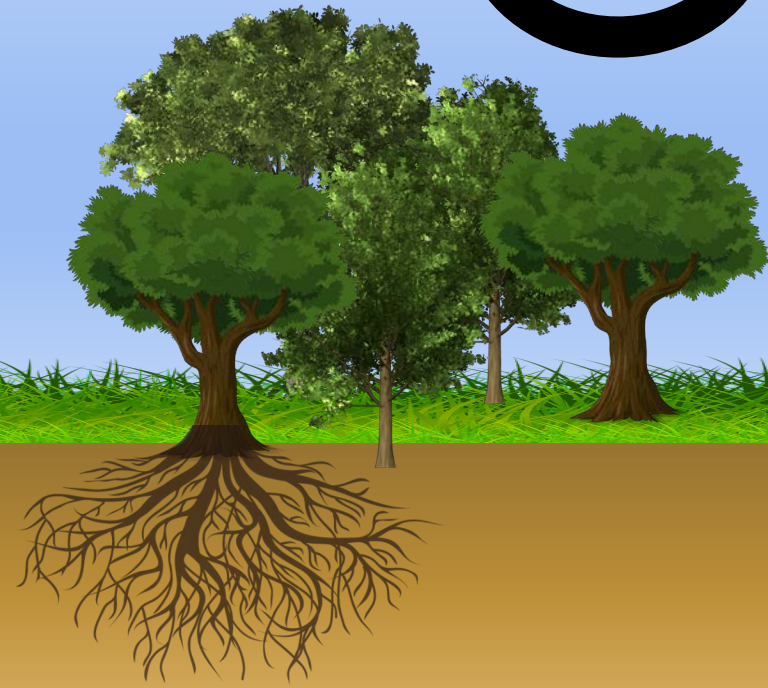
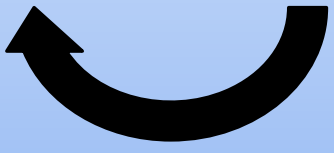


**BIOGEOPHYSICAL**

**BIOGEOCHEMICAL**

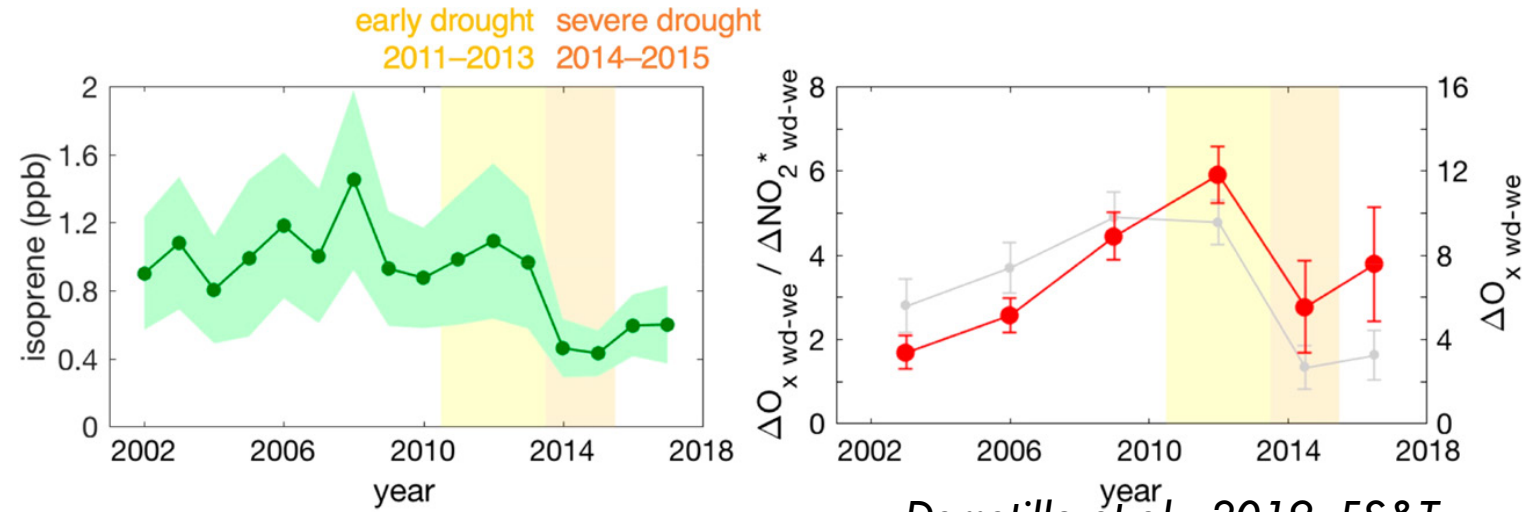


**Feedbacks**



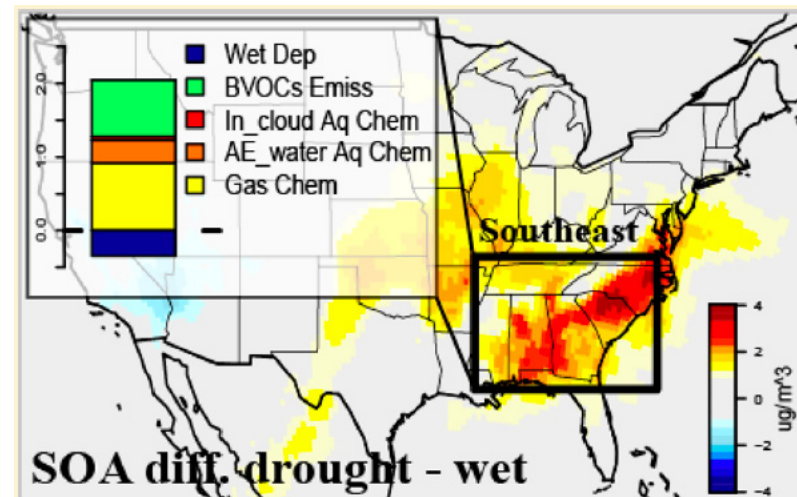
# BIOGEOCHEMICAL FEEDBACKS: ISOPRENE AND DROUGHT

- Observational evidence in California of isoprene decrease during drought that reduces ozone



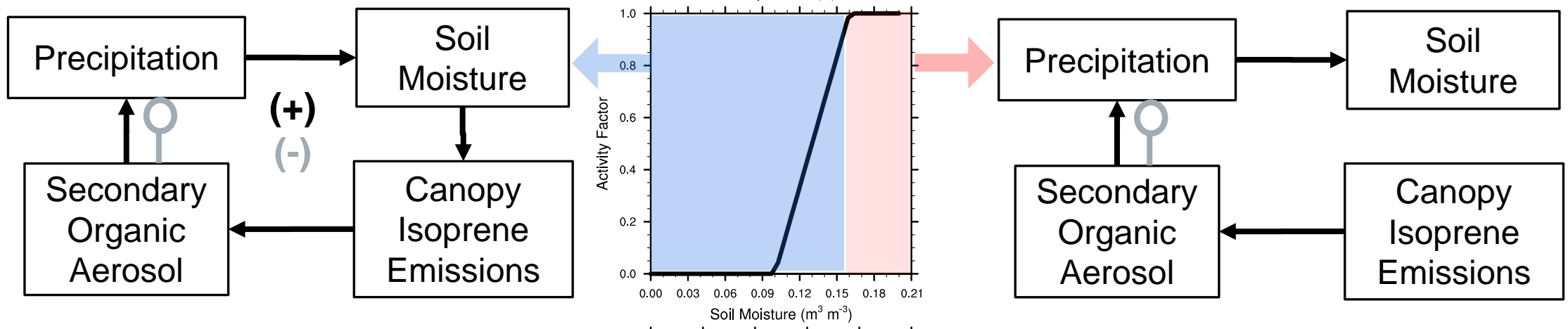
Demetillo et al., 2019: ES&T

- Yet modeling results show an increase in biogenic VOC emissions under drought (and subsequent increase in SOA) in the Southeast



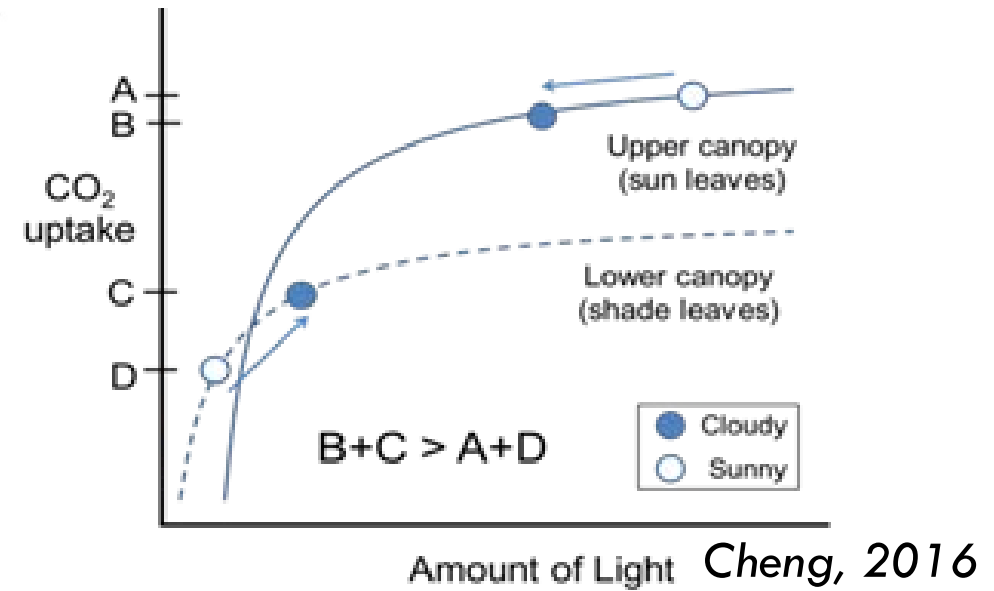
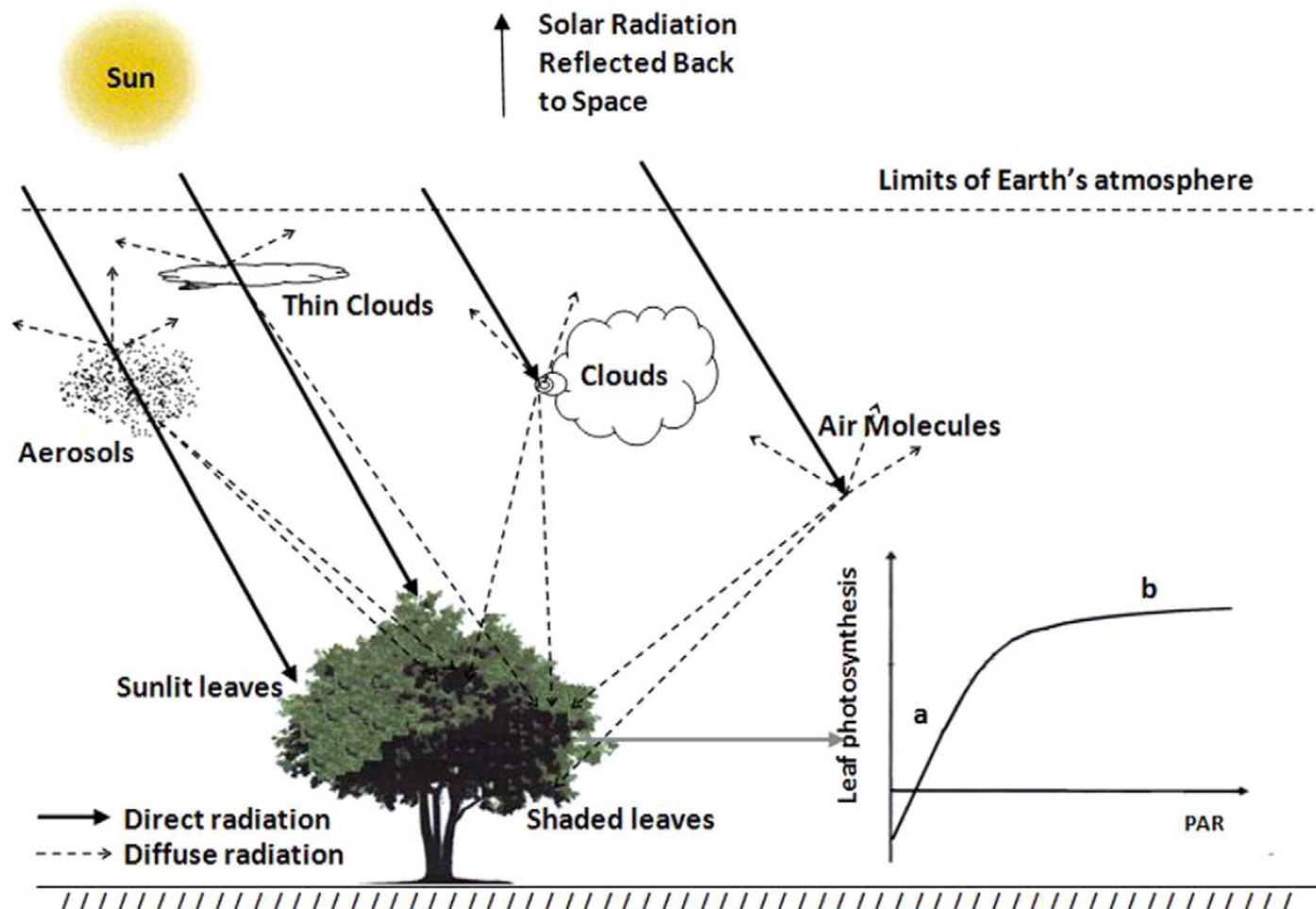
Zhao et al., 2019: ES&T

# ISOPRENE FEEDBACKS WITH SOIL MOISTURE



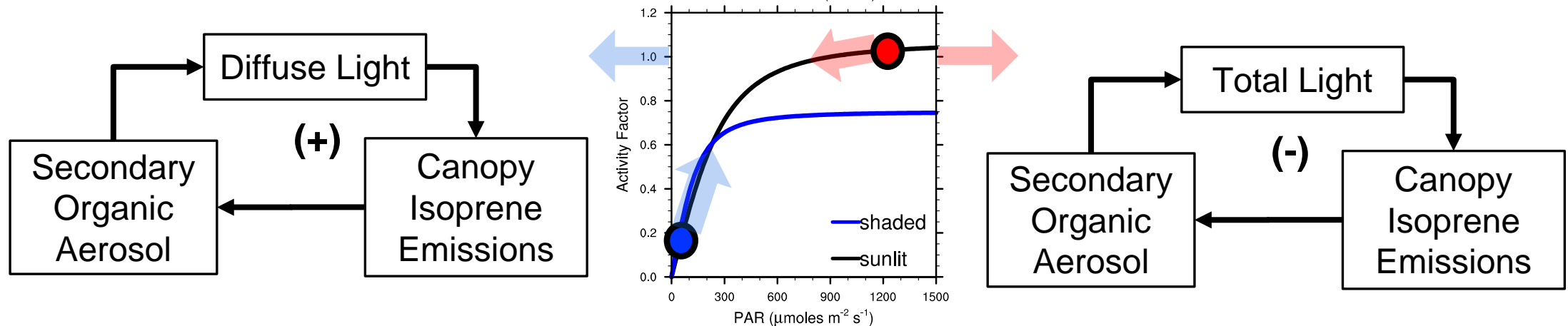
- Science question: How does drought influence the formation of SOA?
- AMF3 opportunities
  - Capture long-term changes in biogenic VOC emissions under interannual variability
  - Link BVOC emissions to changes in aerosol hygroscopicity and convective clouds
  - Potential to capture the effects of drought stress and feedbacks

# BIOGEOCHEMICAL FEEDBACKS: AEROSOL-CANOPY





# ISOPRENE FEEDBACKS WITH DIFFUSE LIGHT



- Science question: How does aerosol-generated diffuse light affect emissions and subsequent SOA formation?
- AMF3 opportunities
  - Develop relationship between biogenic VOC emissions and diffuse light
  - Potential to capture biogeophysical feedbacks between aerosols and ecosystems

# MODELING CHALLENGES

- Spatial heterogeneity of emissions and feedbacks (isoprene vs. terpenes)
- Sufficient chemical composition and vertical profiles to connect observations to cloud-relevant parameterizations

