

# Selected Highlights from CARES

Rahul Zaveri, PNNL



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## Campaign Objectives:

- Investigate **Anthropogenic-Biogenic Interactions** in SOA formation.
- Investigate **black carbon (BC) mixing state evolution**.
- Quantify the effects of aerosol ageing on **aerosol optical and CCN activation properties**.

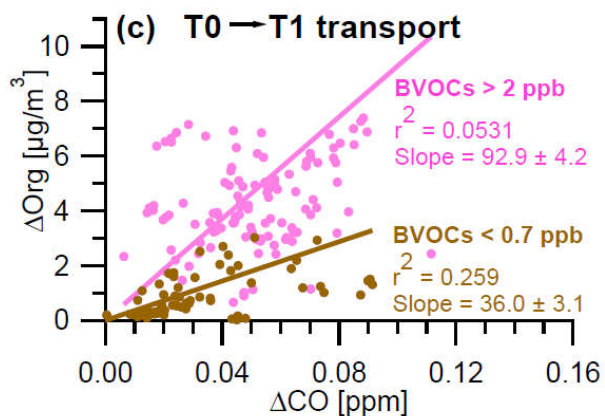
## Output

- **Discovery of several aerosol process phenomena.**
- **35 papers (~5 modeling) published so far, with more in the works.**
- **Inspired several laboratory campaigns to study these processes in controlled environments for developing model parameterizations.**

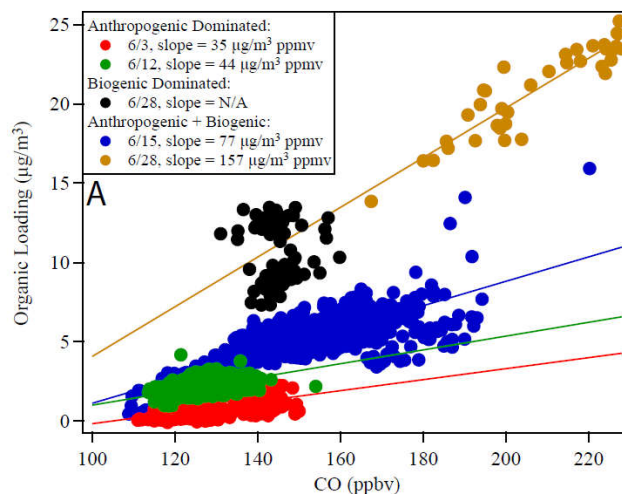
# SOA Formation

## Enhanced SOA formation from Anthropogenic-Biogenic Interactions.

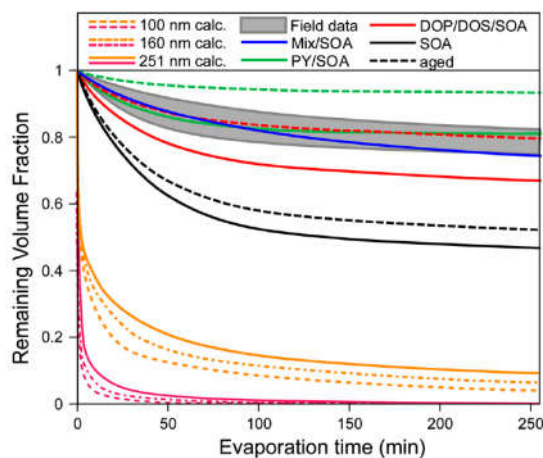
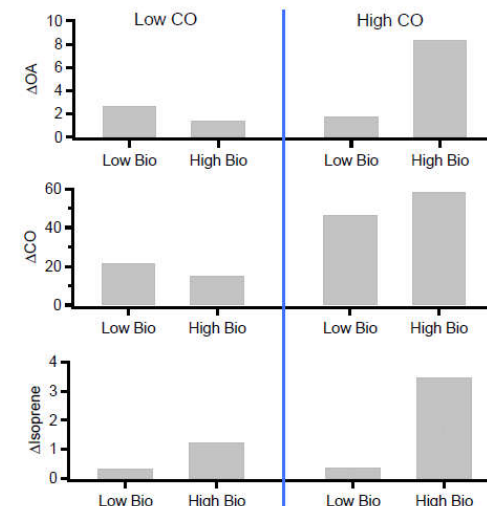
Setyan et al. (2012) ACP



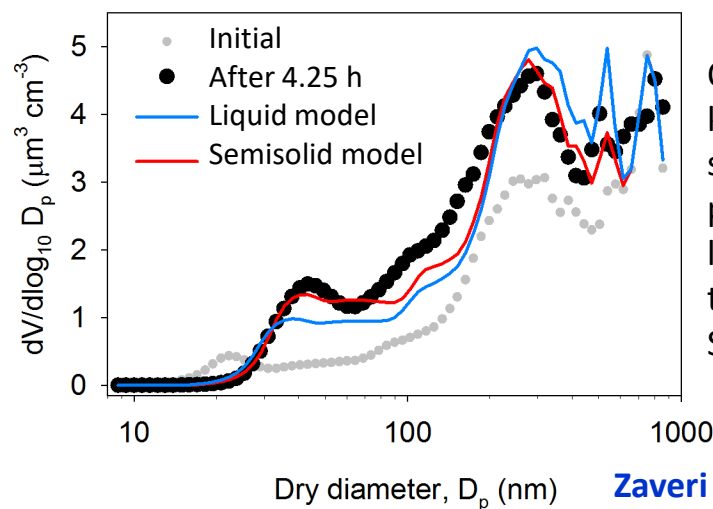
Shilling et al. (2013) ACP



Kleinman et al. (2016) ACP



Surprisingly slow evaporation kinetics suggests SOA is viscous semisolid.



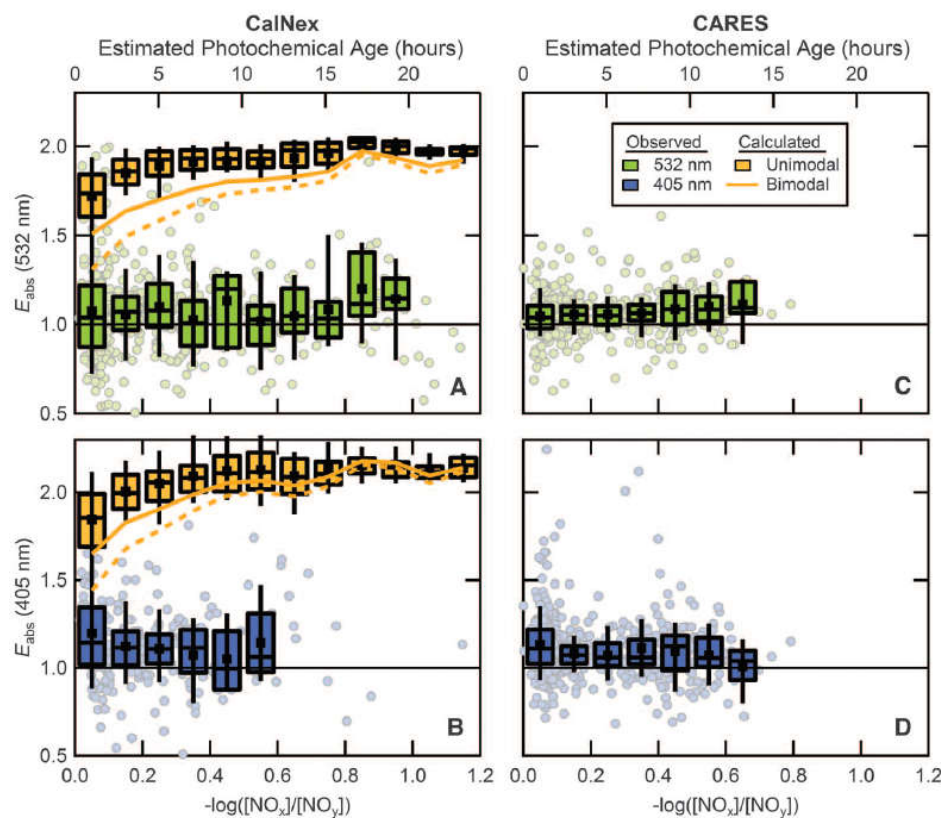
Observed growth kinetics also suggests particle-phase diffusion-limited mass transfer in viscous SOA.

Vaden et al. (2011) PNAS

Zaveri et al. In prep.<sup>2</sup>

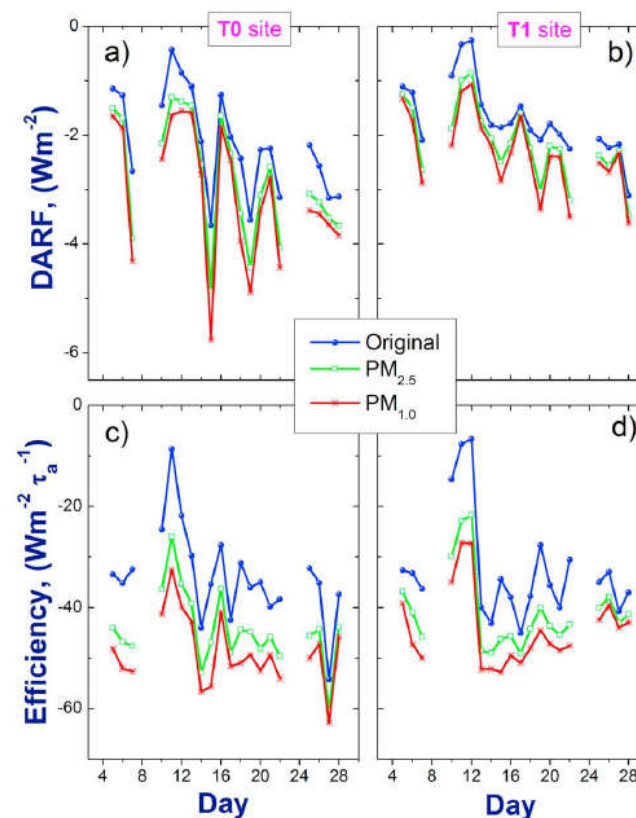
# Aerosol Radiative Properties

Cappa et al. (2012) Science



These observations inspired the “Soot Aerosol Aging Study (SAAS)” – a collaborative lab campaign at PNNL to understand the lack of absorption enhancement.

Kassianov et al. (2012) GRL



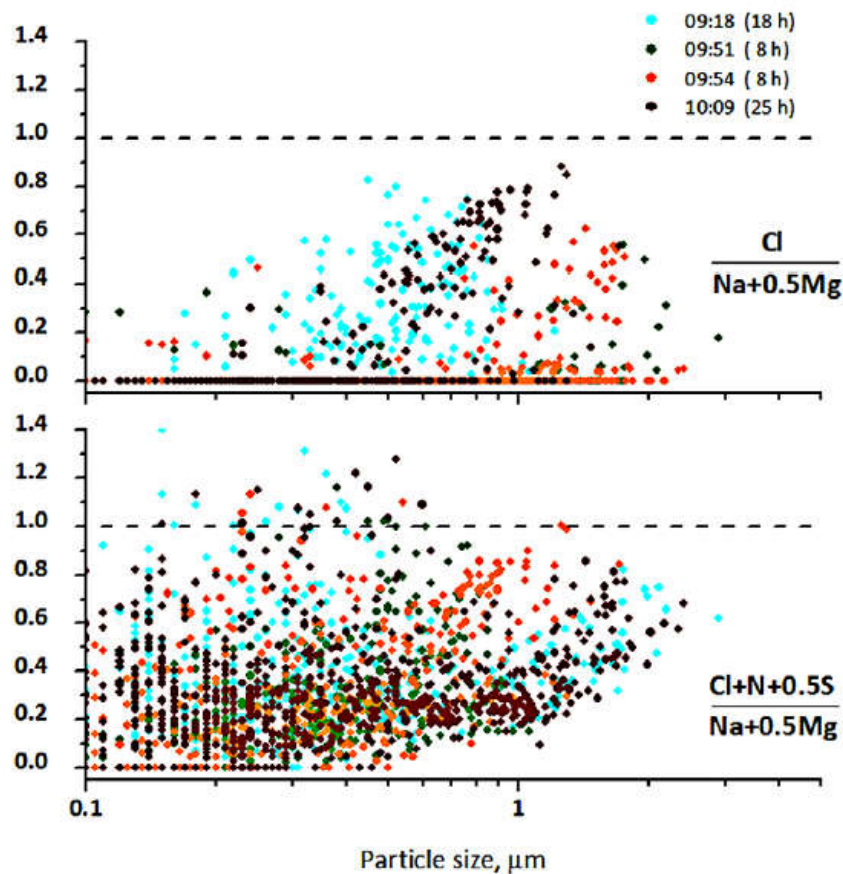
Unexpectedly large contribution of coarse mode (sea salt) to aerosol radiative forcing.

# Coarse mode organics



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Surprising reactivity of coarse mode sea salt chloride with weak organic acids

**Laskin et al. (2012) JGR**