

Introduction: SOA
Anthropogenic-Biogenic
Interactions Focus Group

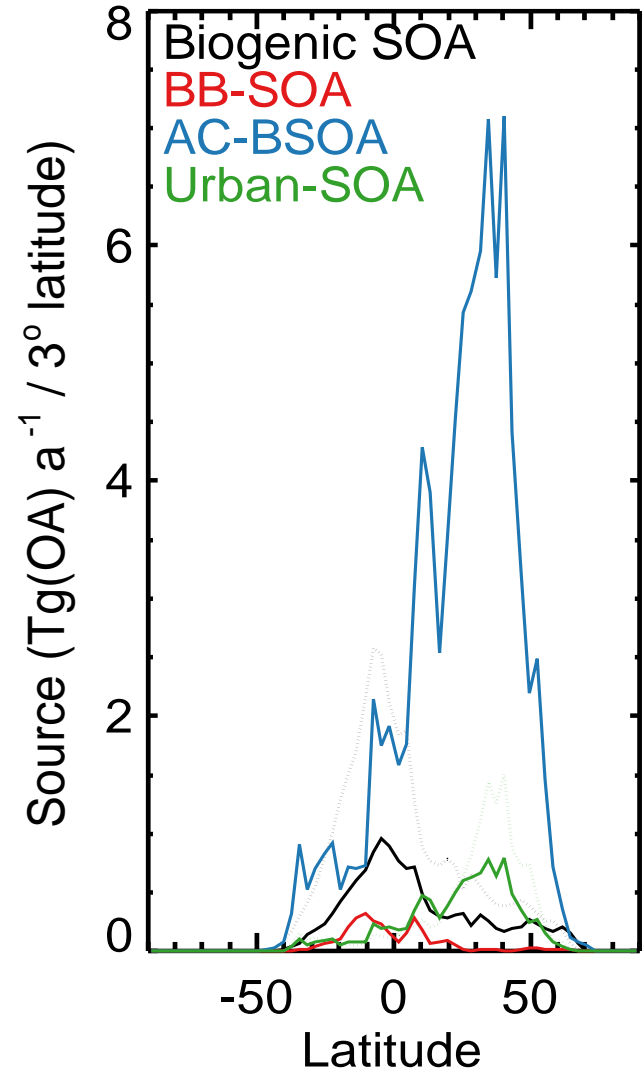
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Motivation: Effect of A-B Interaction on SOA

- ▶ SOA concentrations correlate with anthropogenic tracers such as CO or alkyl nitrates.
- ▶ ^{14}C studies indicate most (40-80%) of the aerosol carbon is modern.
- ▶ Implies an enhancement of biogenic SOA by anthropogenic emissions.
- ▶ **Extra -0.86 W/m^2 forcing.**
- ▶ **Could imply a higher climate sensitivity.**

Spracklen et al. ACP, 2012 (b)



Why DOE and ASR?

- ▶ A-B interactions impact climate change models.
- ▶ Anthropogenic emissions have a clear tie to energy production and use.
- ▶ The ASR program has a focus on understanding aerosol processes and their effect on climate change.
- ▶ ASR has already funded modeling and laboratory SOA process studies.
- ▶ ARM has already invested in several past and future field campaigns which have A-B interactions as a theme.
 - CARES, B-BOP, GoAmazon.
- ▶ ASR has the expertise and we are already doing this work; we just need to organize to improve collaborations and speed progress.

A-B Interactions Focus Group Goals

- ▶ Understand when and where A-B interactions occur in the ambient atmosphere.
 - Field studies.
- ▶ Investigate mechanisms responsible for A-B interactions in both gas and condensed phase.
 - Field, and laboratory studies with input from modelers.
- ▶ Develop computationally efficient parameterizations of these mechanisms.
 - Modeling studies with input from observations and experiments.
- ▶ Investigate the implications of these mechanisms on climate now and in the future.
 - Modeling studies.
- ▶ **Make significant and measurable progress in 3-5 years.**

A-B Focus Group strategy

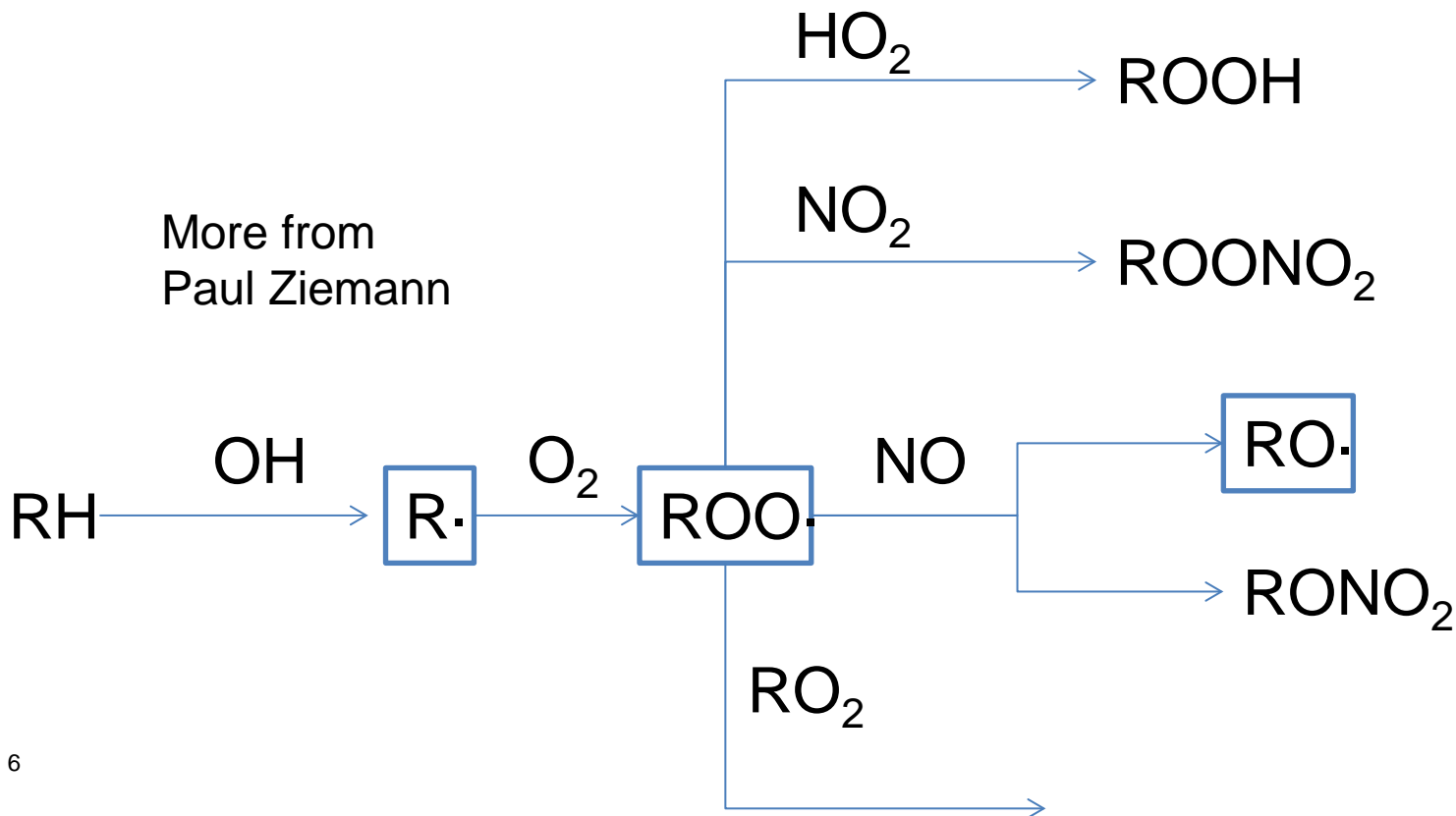
- ▶ Adopt a measurement to modeling approach.
 - Tight coupling of laboratory, field, and modeling studies is needed to solve this problem.



- ▶ This is an expansive topic so we chose 3 climate-relevant processes to focus on.
 - Processes effect particle number-size distributions, CCN activity, and aerosol optical properties.

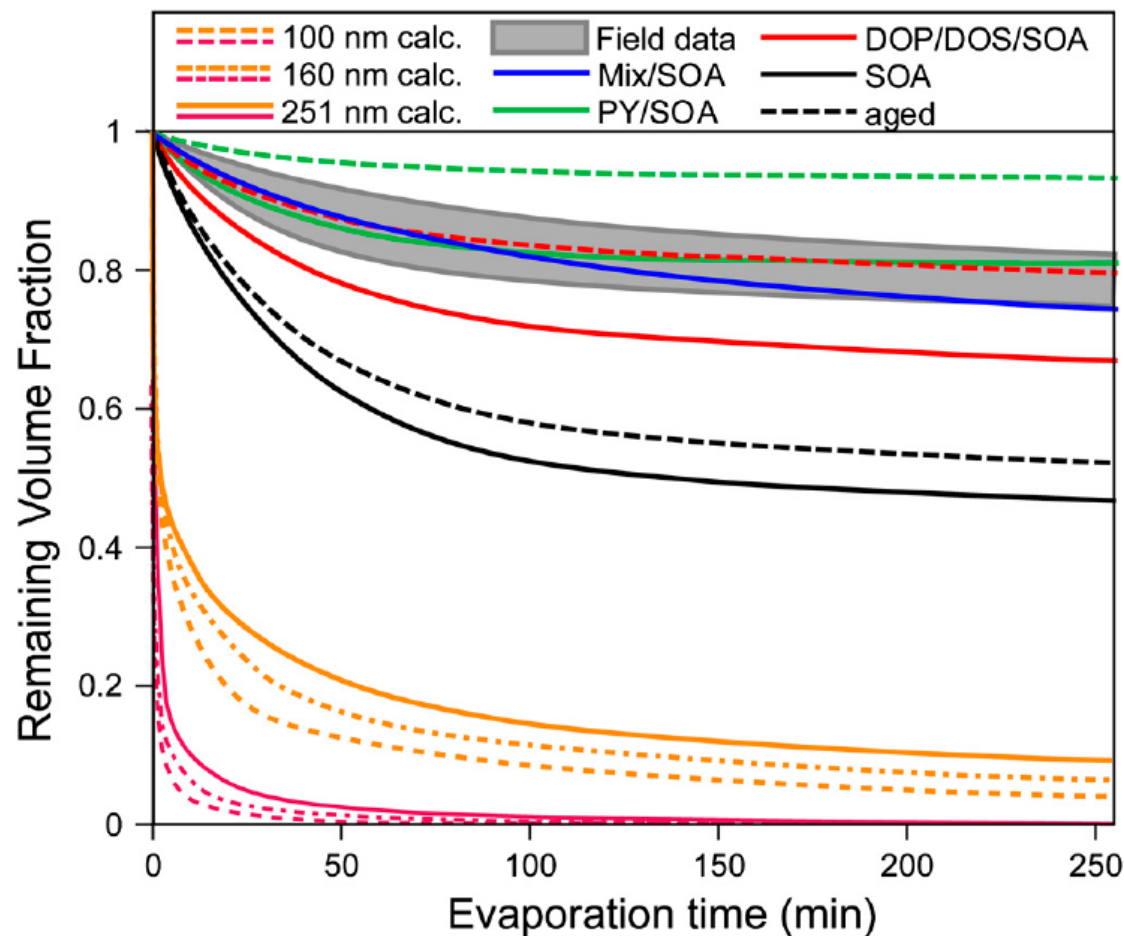
Focus Area 1: Fate of ROO Radicals in the Gas Phase.

- ▶ Understand how the fate of the ROO radical in the gas-phase is affected by anthropogenic activities.
- ▶ Understand how this affects aerosol size distributions, hygroscopicity and optical properties.



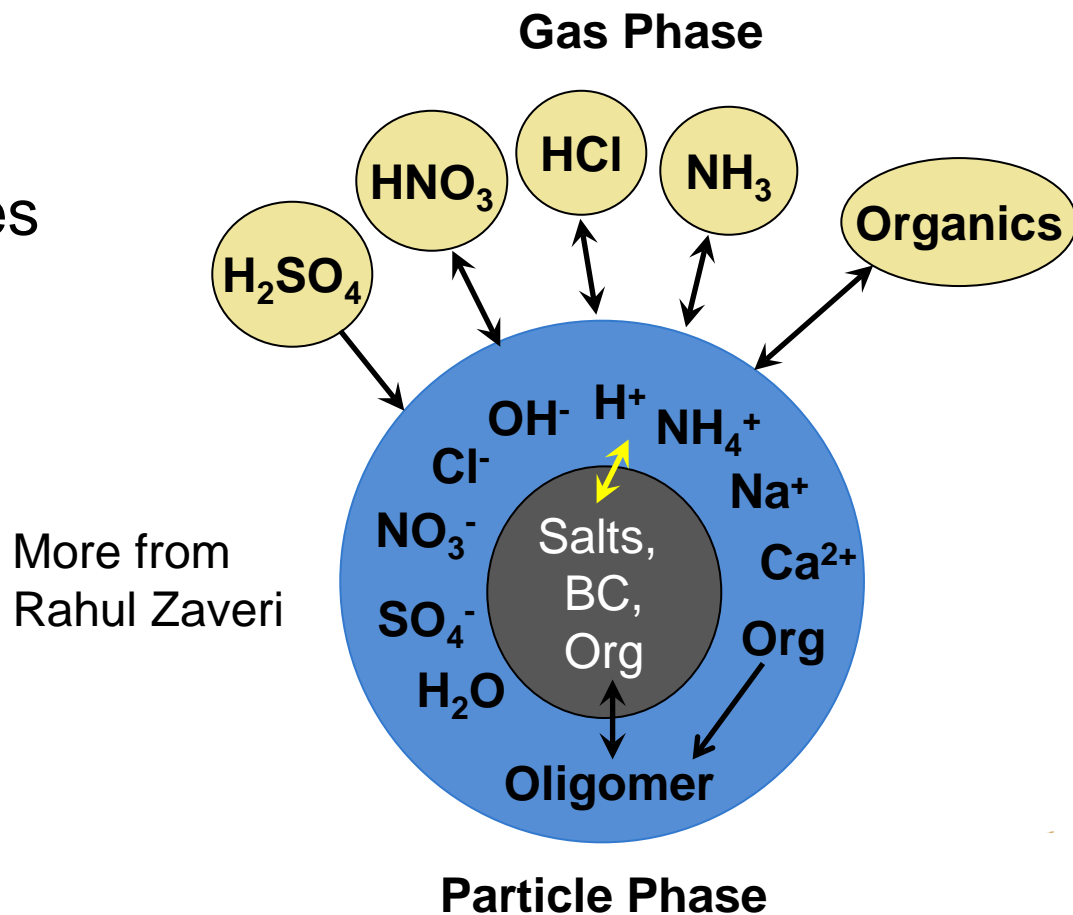
Focus Area 2: SOA Physical State and Morphology

- ▶ Understand the physical state of organic aerosol as affected by anthropogenic activities.
- ▶ Understand the implications for SOA properties and climate models.



Focus Area 3: Particle Phase Reactions

- Understand particle-phase reactions as affected by anthropogenic activities and subsequent climate-relevant SOA properties.



Agenda

15:45 John Shilling – Overview / Biogenic-Anthropogenic Interactions / Focus Questions

15:55 Paul Ziemann – Proposed Laboratory Studies as Relevant to the Focus Questions

16:05 Scot Martin – Opportunities in Upcoming Field Campaigns for Data Sets Relevant to the Focus Questions

16:15 Rahul Zaveri – Proposed Modeling Improvements and Implementation Relevant to the Focus Questions

16:25 - 17:30 Discussion

BACKUP SLIDES

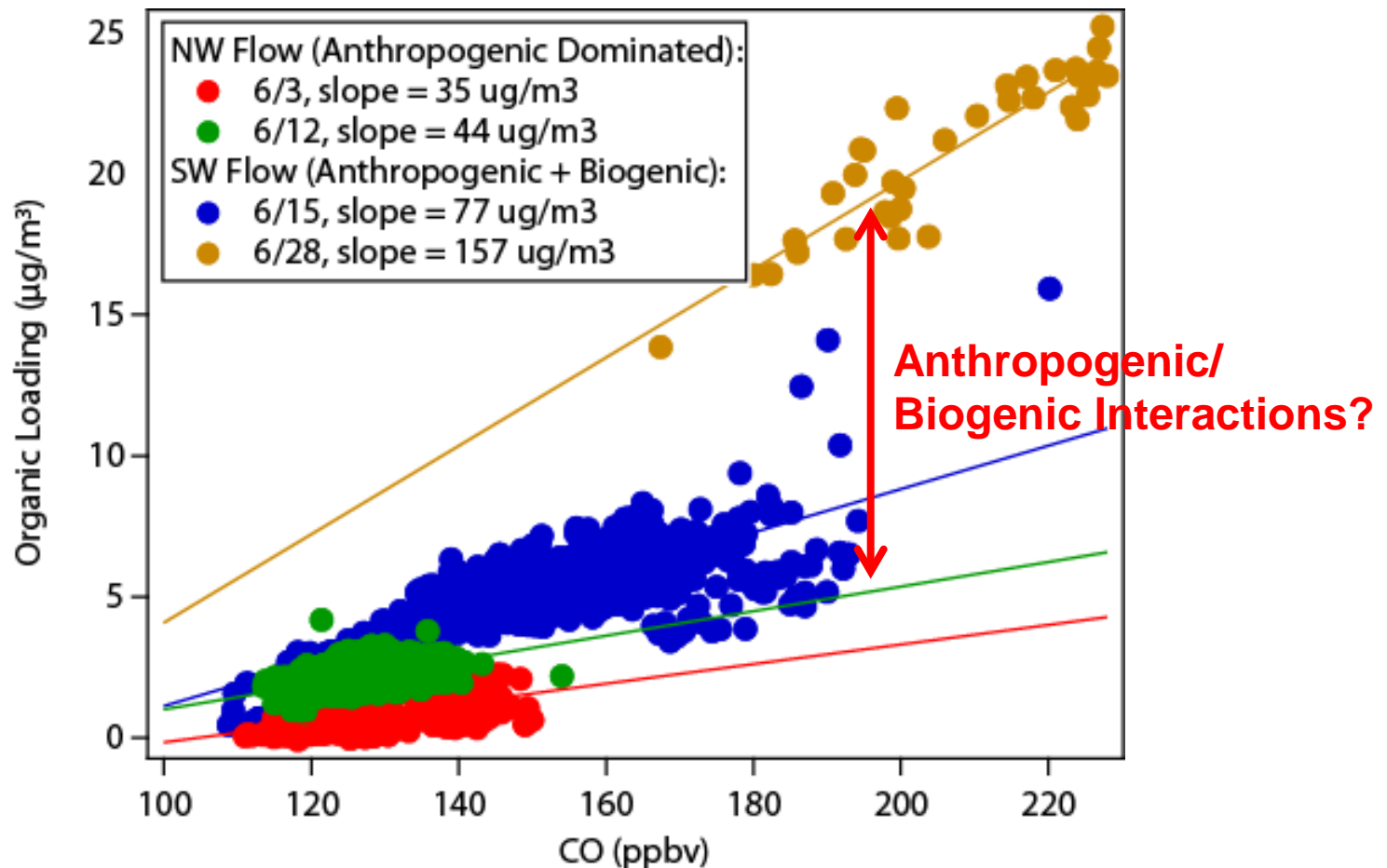


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Anthropogenic Enhancement of SOA observed during CARES.

- ▶ More OA is produced when anthropogenic and biogenic emissions mix.



Motivation: Modeling Results

- ▶ SOA has correlates with anthropogenic tracers such as CO.
- ▶ ^{14}C studies indicate most (40-80%) of the aerosol carbon is modern.
- ▶ Observed SOA levels cannot be explained by known chemistry.
- ▶ Implies an enhancement of biogenic SOA by anthropogenic emissions.
- ▶ Affects aerosol loading and therefore aerosol direct and indirect effects.

