

PARTICULARS

The E-Newsletter of the American Association for Aerosol Research

WINTER 2017

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As always, we'd love any feedback or suggestions you may have for *Particulars*.

Simply email info@aaar.org with the subject line '*Particulars*'

Kristina Wagstrom, Editor

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President's Message

Dear Colleagues,

I hope those of you who were able to attend the conference in Raleigh had a productive and enjoyable week. Hats off to conference chair Nicole Riemer and the many others who organized an excellent program.

While I personally still prefer holding the conference in a hotel rather than a convention center (more feeling of community), overall the Raleigh venue worked well for us – the space was right, the downtown area was close and walkable, and attendance was enhanced by the concentration of aerosol research activity in the area. One lesson learned is we need larger rooms for the popular atmospheric chemistry sessions - additional space has already been identified and reserved for when we return to Raleigh in 2020.

Looking briefly at the financial side, 2017 to date has been a good year for AAAR thanks to a bull stock market and sound financial policy. We continue to enjoy strong financial footing which allows us more opportunities to promote and communicate technical advances in the field of aerosol research as well as helps safeguard against any difficult times that might appear in the future. For those interested, more financial information can be found in the Form 990 tax returns posted on our website.

Looking ahead to 2018 we can expect to see more video offerings and of course we will host the **International Aerosol Conference** which comes to North America once every 12 years.

We currently have 17 aerosol history videos which can be found on our web site and work has begun on creating video versions of some of our tutorials. In a separate project recently approved by the board AS&T editor-in-chief Warren Finlay will have video vignettes produced for two

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Recent Notables Papers. The board has also approved a proposal from the Education Committee to produce whiteboard interpretations of a plenary and tutorial. I look forward to see the results of these efforts and feedback from the membership is encouraged to help us evaluate whether to continue funding these sorts of projects in the future.

The IAC will be held **September 2-7** in St. Louis. Please note the earlier date than our traditional October timeslot and also the program is one day longer than our typical annual conference. Abstract submissions will be open **Dec 1, 2017-February 1, 2018** with no extensions. The no extensions policy is necessary to allow international attendees who need a visa enough time to apply after being notified their abstract has been accepted. Conference Chair Pratim Biswas and the conference committee have already been working hard for over a year to make sure this will be a memorable and successful event.

Tyler Beck, AAAR President

AS&T Article Highlight

By Benjamin Murphy

“Why would apparent κ linearly change with O/C? Assessing the role of volatility, solubility, and surface activity of organic aerosols”

Shunsuke Nakao

<https://doi.org/10.1080/02786826.2017.1352082>

Computational models continue to be fraught by the challenge of representing the vast number and complex behavior of organic compounds present in the atmosphere. This complexity creates difficulties when predicting impacts of organic particles and vapors on the formation and properties of clouds. Nearly all large-scale models (and many laboratory-scale models) thus represent these compounds with a reduced set of surrogate species chosen to reproduce the distribution of important properties that govern atmospheric processing of organics (e.g. volatility, carbon number, the ratio of oxygen atoms to carbon atoms (O/C), polarity, solubility, etc). However, it is often not clear how to connect these properties to important microphysical phenomena. For example, as Nakao points out in this study, studies have disagreed about the degree of correlation between O/C and κ , a parameter that quantifies a chemical component's hygroscopicity and connects mixture information to bulk cloud condensation nuclei (CCN) activity.

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Nakao has laid out a straight-forward framework that links existing organic aerosol theories (i.e. 2D-Volatility Basis Set) with parameterizations of organic solubility and finally with κ -Köhler theory in order to calculate bulk CCN activity. Importantly, this comprehensive approach accounts for the effects of both solubility and molecular size simultaneously on bulk mixture behavior. The author uses an example population of compounds, in this case they are laboratory-observed oxidation products of α -pinene ozonolysis, in order to demonstrate why models should utilize distributions of properties like O/C and volatility when parameterizing κ , rather than relying on averaged estimates.

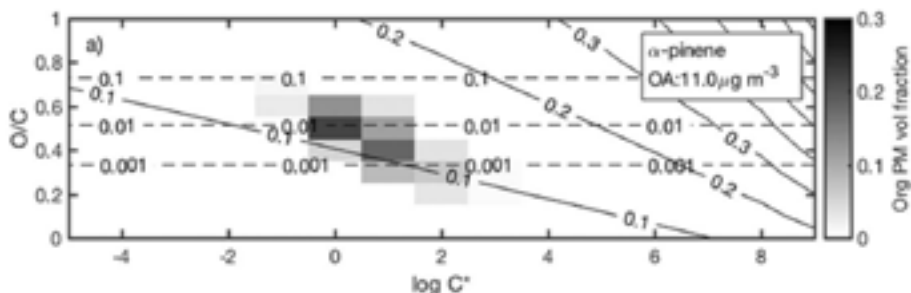


Figure 2. Simulation results of α -pinene SOA without inorganic seed. The 2D-VBS distribution is taken from Donahue et al. (2012). $D_{\text{dry}} = 100$ nm. (a) Distribution of organic aerosol volume in terms of O/C and $\log C^*$. The solid lines correspond to intrinsic κ . The dotted lines correspond to volume-based solubility C .

He is also able to report a practical upper-limit on κ values associated with organics equal to 0.3, given the relevant volatility and O/C values observed in the ambient.

The study further explores the impact of surface activity, accounting for both depletion of bulk-phase solute concentration and surface tension depression. Because relationships between properties describing surface activity and molecular properties like volatility and O/C are lacking, 1000 simulations are performed using plausible ranges for parameters describing surface activity. The study finds that the solute and surface tension effects generally counter-balance each other if one assumes the compounds are all highly soluble. The author points out though, that more studies are needed to constrain the behavior of mixtures with surface-active, slightly soluble compounds as the undissolved portion may enter the bulk to replace the molecules that partition to the surface, and thus replenish the depleted solute.

Finally, Nakao predicts κ as a function of O/C using several atmospherically relevant mixtures of organic compounds from previous literature. The analysis reproduces the generally linear relationship between κ and O/C found in several studies, but is also able to explain observations where κ does not seem to vary with O/C or decreases when ambient particles are heated in a thermodenuder. The framework Nakao has put forth resolves a number of mysteries, misunderstandings, and missing pieces in the literature involving organic aerosol and cloud interactions. It has the potential to be a crucial asset to coupled chemistry-meteorological models in the future, and enable evaluation of lumped distributions (e.g. 2D-VBS, etc) using κ measurements. ●

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In Case You Missed It

By Kristina Wagstrom

Ships increase thunderstorm intensity.

A new study from the University of Washington in cooperation with NASA Marshall Space Flight Center recently identified an increase in thunderstorm intensity along areas of heavy shipping.

<http://news.agu.org/press-release/ship-exhaust-makes-oceanic-thunderstorms-more-intense/>

Thornton, J. A., K. S. Virts, R. H. Holzworth, and T. P. Mitchell (2017), Lightning enhancement over major oceanic shipping lanes, *Geophys. Res. Lett.*, 44, 9102–9111, doi:10.1002/2017GL074982.

NASA's 2017 hurricane visualization.

NASA has released a stunning new video of the 2017 hurricane season.

<https://svs.gsfc.nasa.gov/12772>



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The advertisement features a woman with long brown hair, wearing a yellow scarf and a blue jacket, looking upwards against a background of bright yellow autumn leaves. The RTI International logo is in the top left, and the website URL is in a blue box at the bottom right.

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AAAR 2017 Award Winners

Fellow Award Winner:

Paul J. Ziemann

Fellow Award Winner:

Chong S. Kim

AS&T Outstanding Publication

Award Winner:

Tami C. Bond

AS&T Outstanding Publication

Award Winner:

Robert Bergstrom

Sheldon K. Friedlander

Award Winner:

Bryan Bzdek

Benjamin Y. H. Liu Award Winner:

James N. Smith

Thomas T. Mercer Joint

Prize Winner:

Anthony Hickey

David Sinclair Award Winner:

Lidia Morawska

Kenneth T. Whitby Award Winner:

Cari Dutcher

Rough November for air pollution in India.

Many news outlets commented on the severe and prolonged air pollution episode that blanketed Delhi this November with many days exceeding the maximum Air Quality Index of 999.

Forbes: <https://www.forbes.com/sites/insideasia/2017/11/20/delhis-pollution-crisis-how-in-dia-is-falling-short/#7c3228314bad>

BBC: <http://www.bbc.com/news/world-asia-india-41925067>

A, B, and AB blood-types at higher risk due to air pollution.

A recent study from the Intermountain Medical Center Heart Institute in Salt Lake City and Brigham Young University reported higher risks of heart attack during high air pollution episodes for individuals with A, B, or AB blood types. They shared these results in November 2017 at the American Heart Association Scientific Sessions in Anaheim, CA.

<https://intermountainhealthcare.org/news/2017/11/certain-blood-types-have-increased-risks-of-heart-attack-during-periods-of-high-air-pollution/>

NASA Earth and Space Air Prize.

<https://www.earthspaceairprize.org/>

NHLBI RFA-HL-17-021:

Cardiovascular and Pulmonary Research on E-Cigarettes (R01)

<https://grants.nih.gov/grants/guide/rfa-files/RFA-HL-17-021.html> •

Aerosol Scientist Spotlight:

By Mike Kleeman

1.) When were you first interested in aerosol research and how did that interest develop into an established career?

My interest in aerosol research developed at Caltech while I was taking classes in the first year of the Environmental Engineering and Science program. I had previously studied combustion chemistry and atmospheric fluid mechanics as an undergraduate Mechanical

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Engineering student. Graduate school introduced me to aerosol physics and all the unique phenomena that are associated with very small particles.

I was very lucky to find a PhD research project that allowed me to make measurements and to perform model calculations for aerosols in regional air pollution problems. It was a really exciting time to contribute knowledge and tools that helped identify sources of ambient aerosols so that effective emissions controls programs could be designed to protect public health.

I continued studying aerosols related to other regional air pollution problems when I started my faculty position at UC Davis. An early focal point was the creation of regional grid models that could track source contributions to primary and secondary particulate matter. Measuring source profiles for ultrafine particles and performing source apportionment calculations for ultrafine particles was another long term effort. Much of our recent work revolves around climate policy, adoption of new energy sources and related impacts on aerosols. Looking back on all of these topics, I think my career evolved as I tried to harness the exciting results from past work to answer compelling new questions facing the field.

2.) Which people or programs in our field have been the most influential to you and your path?

My PhD advisor Glen Cass at Caltech had great influence on my early development. Glen tirelessly pursued solutions to real-world

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problems based on the latest scientific developments. He led by example and tried to deliver the best possible science from every research project. I still carry that philosophy with me today.

The research programs and the California Air Resources Board and the United States Environmental Protection Agency have also had a very large influence on my career path. Many researchers from these programs have been great collaborators over the years.

3.) What challenges were completely unexpected as you began and grew your own research group?

I have always been very excited about my research and I prioritize it very high in my life. When I first started my own group I had to learn that the people around me often had other competing interests that they balanced more evenly with research. Learning how to recognize that early and how to set appropriate goals for each group member was a key challenge.

4.) What is one of the most effective strategies/practices for ensuring a successful proposal?

Good technical editing. The best idea in the world will never be funded if it isn't presented in a clear and compelling manner. Have a senior colleague or a professional editor read the proposal and suggest ways to help make the message clear.

5.) What currently excites you about working in California? What has changed with respect to the culture or priorities of environmental research in the state during your tenure, if anything?

California has always maintained a commitment to research and a principle to use the best available science to set air quality policy. As a recent example, California has a clear set of climate policy objectives and the state is funding the research to support them. California is also investing significant resources into studying emerging pollutants like ultrafine particles. All of these things make California an exciting and dynamic place to work.

6.) Are there new aerosol research directions that you see as particularly important or interesting?

Ultrafine particles have been a very interesting topic for many years but it is only recently that we have been able to predict ambient concentrations accurately enough to support realistic epidemiology studies for exposure to ultrafine particle mass (PM_{0.1}). I'm really excited about the possibility of building a strong weight evidence from epidemiology studies to compliment existing literature on the toxicology of ultrafine particles. ●