

# SEMINAR

## Aerosol water: now you see it, now you don't

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### Abstract:

Summertime aerosol optical depth (AOD) in the southeast U.S., location of the global “warming hole”, is enhanced over wintertime values by a factor of 2-3. Investigators hypothesize this effect is a consequence of anthropogenic and biogenic emissions combining to form secondary organic aerosol, a near-term climate forcer that results in a cooling haze. However, surface mass measurements of organic aerosol in the southeast U.S. do not exhibit the same strong seasonality, and the geographic distribution across the U.S. does not match spatial patterns in seasonal AOD differences. An aloft source of organic aerosol is suggested as a potential explanation to reconcile satellite and surface mass measurements. Previous studies rule out uptake of water by particles as a cause of the seasonality in AOD through analysis of RH. However, aerosol liquid water (ALW) is a complex, non-linear function of particle concentration, hygroscopicity, temperature and RH. These variables exhibit geographic and temporal variation. We apply the thermodynamic model ISORROPIA to simulate lower-bound estimates of ALW at the surface from chemically-speciated particle mass measurements at Interagency Monitoring of Protected Visual Environments (IMPROVE) sites, using NCEP North American Regional Reanalysis (NARR) meteorological data at the same locations across the U.S. from 1988 – 2014. We find that regional and temporal trends in ALW provide a plausible explanation for the geographic distribution in AOD seasonality. Liquid water is removed in surface aerosol mass measurements and plausibly reconciles satellite AOD and surface observations. For the time period of 2000-2007, the highest mean regional seasonal difference in aerosol liquid water occurs in the southeast U.S. ( $5.5 \mu\text{g m}^{-3}$ ), and is lowest in the dry Mountain West ( $0.44 \mu\text{g m}^{-3}$ ).

**Date: Friday, April 15**  
**Time: Refreshments 3:15pm, Seminar 3:30pm**  
**FL2-1022, Large Auditorium**

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