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An Overview of the Soot Aerosol Aging Study (SAAS) Laboratory Campaign

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ENERGY

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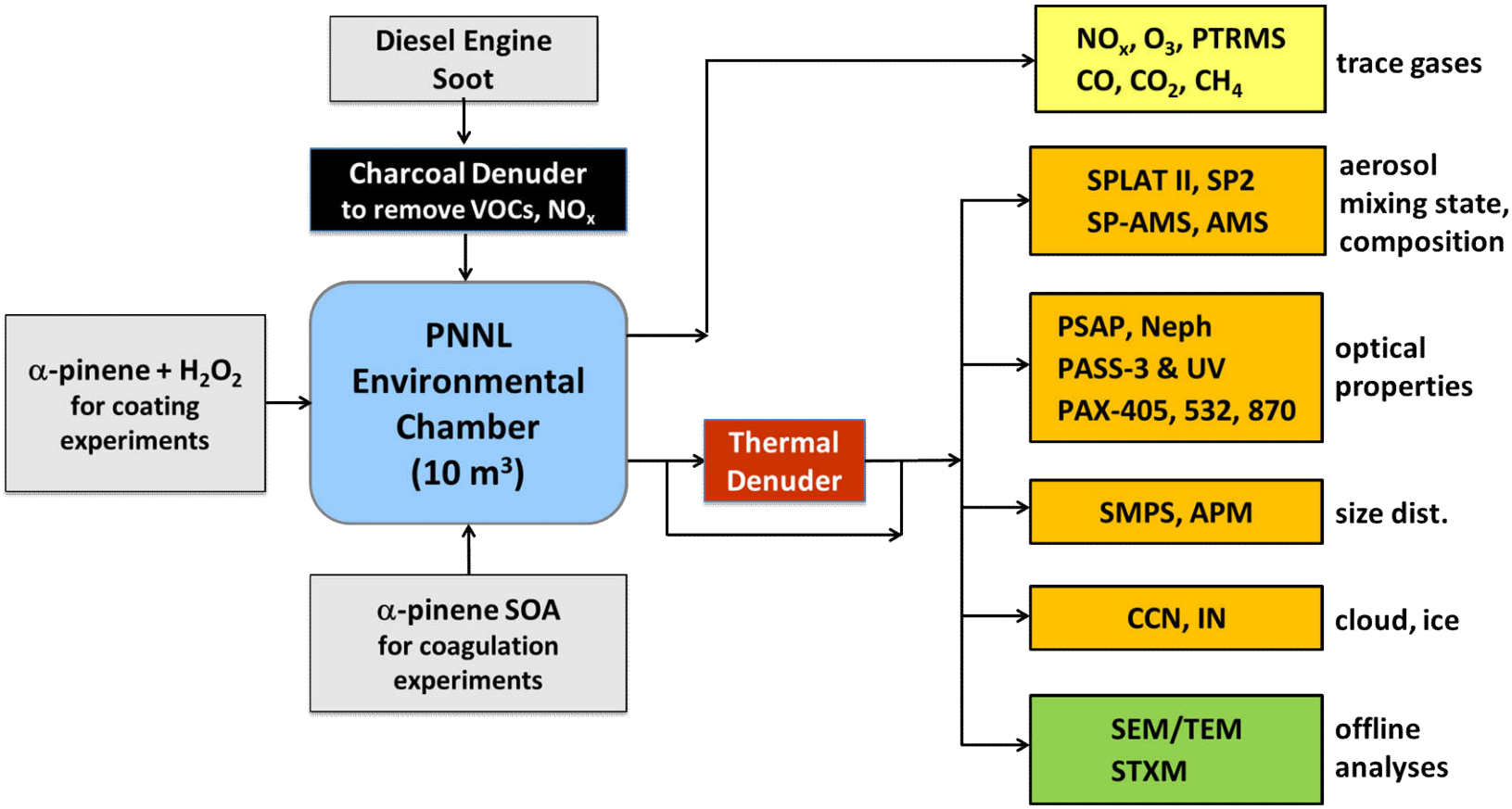
- Properties (composition, size, morphology) of soot particles change due to deposition and removal of SOA coating, affecting their optical properties, CCN and IN activity
- SAAS was designed to simultaneously characterize the evolution of soot mixing state due to condensation and coagulation processes and the associated optical, CCN, and IN properties (16 experiments simulating atmospheric aging of soot and SOA)



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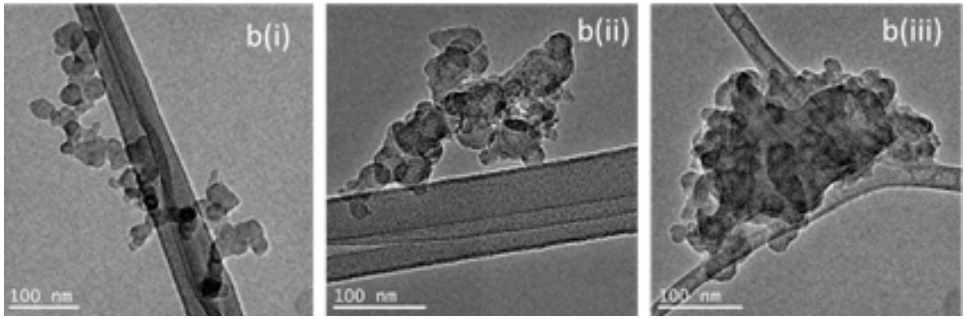
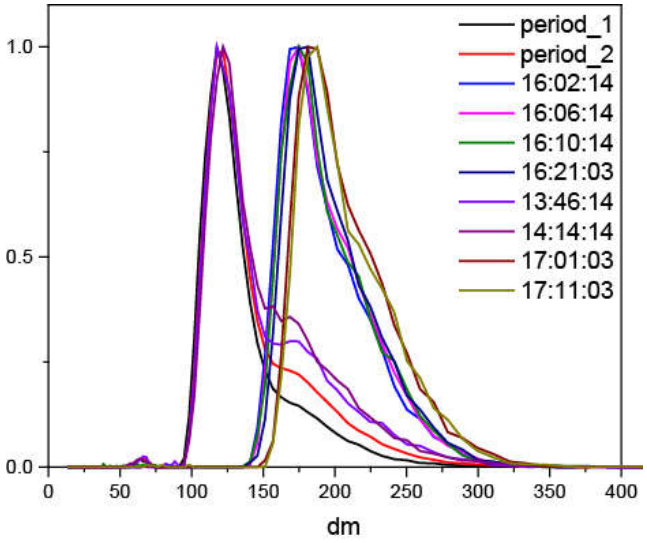
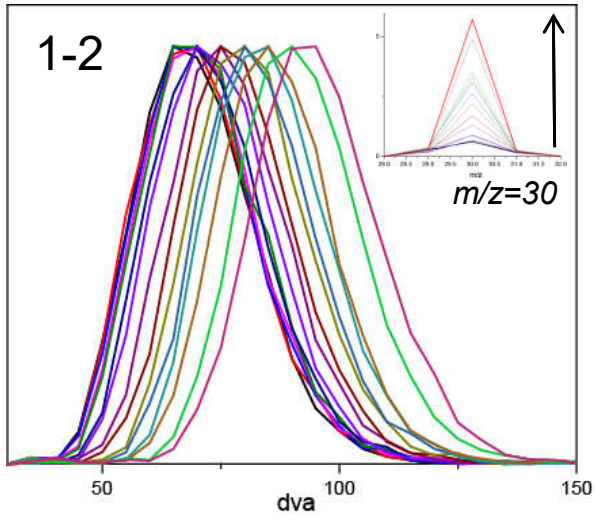
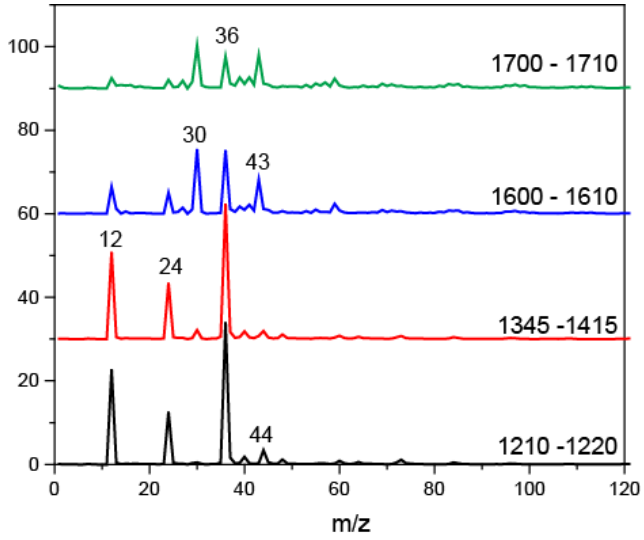
- SOA coating changes particle size distributions, compositions, and morphology

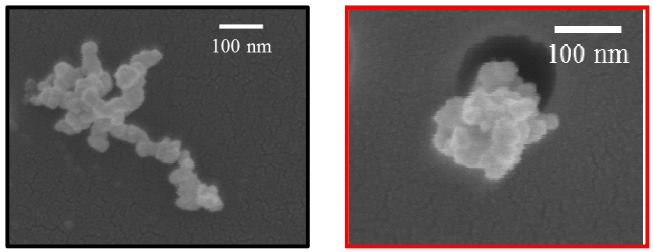


ρ_{eff} (fractal soot) = 0.58 g cm^{-3}
m_p=0.66 fg, d_{ve}= 87 nm, N_p=48, Φ=0.62
ρ_p (coated, spherical) = 1.31 g cm^{-3}









- Particle composition and morphology changes after SOA removal in TD

ρ_{eff} (collapsed soot) = 0.98 g cm^{-3}

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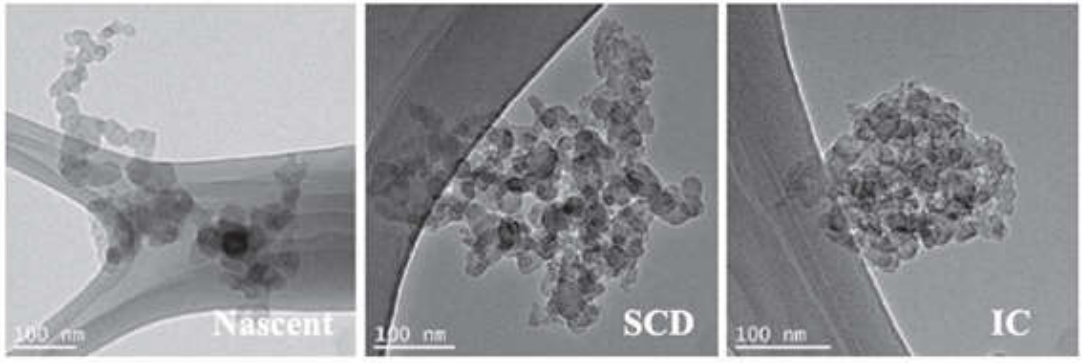
- Cold cloud processing affects soot morphology and optical properties

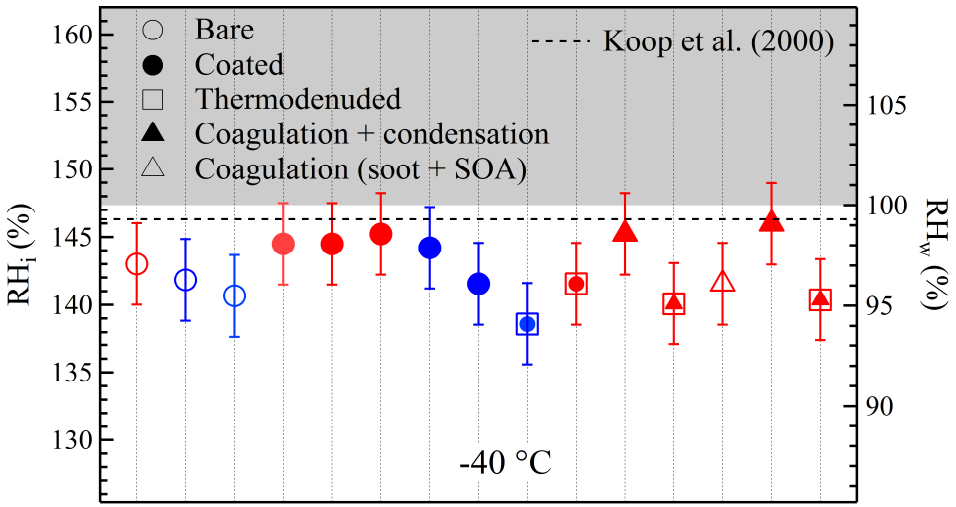


China et al. ERL (2015)

Optical properties of nascent soot and soot residuals were simulated using the discrete dipole approximation.

More compact structure of ice residual enhances SSA by ~1.4, thereby reducing the top-of-the-atmosphere direct radiative forcing by 63%

- SOA coatings affect particle optical properties, CCN, and IN activity



Kulkarni et al. GRL (2016)