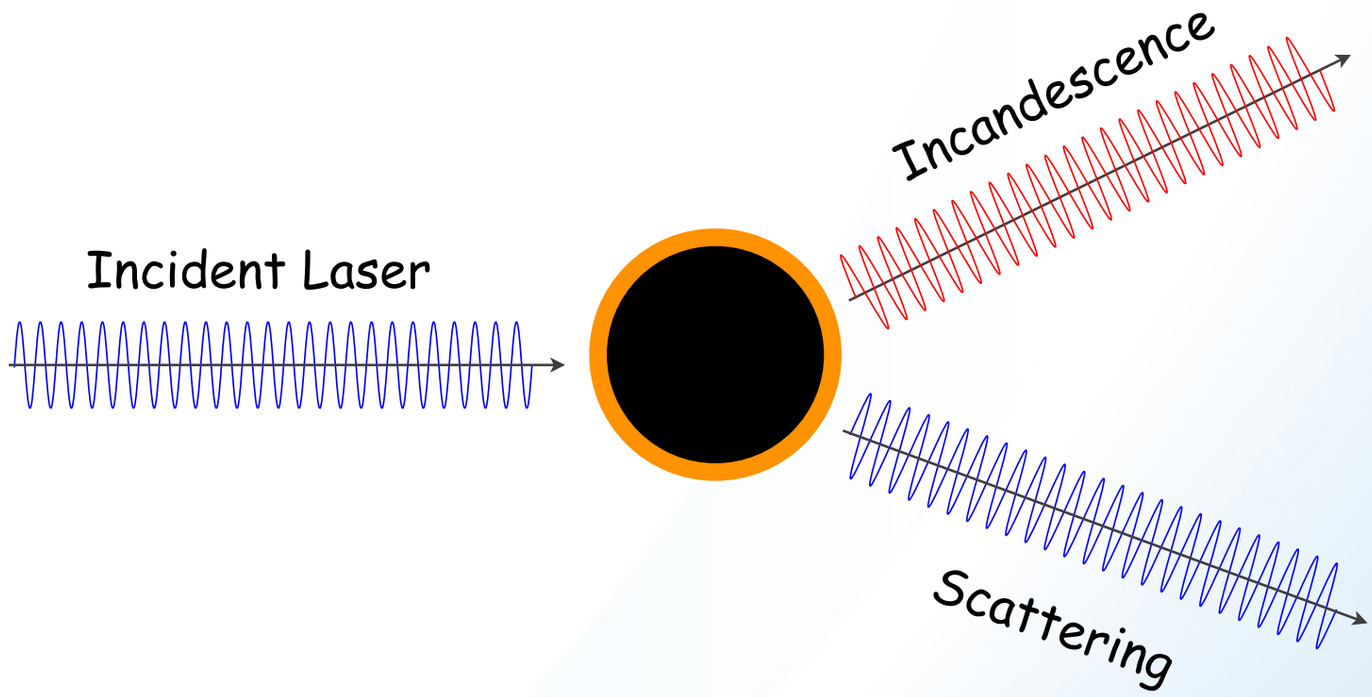
Principle behind SP2 (Single-Particle Soot Photometer)

Schwartz et al., 2006; Moteki & Kondo, 2007, Subramanian et al., 2010

High specificity towards 'refractory' black carbon (rBC)
Particle-by-particle measurement scheme



Standard Data products:

- Time series: number conc; mass conc;
- Distributions: $dN/dlogD_p$; $dM/dlogD_p$

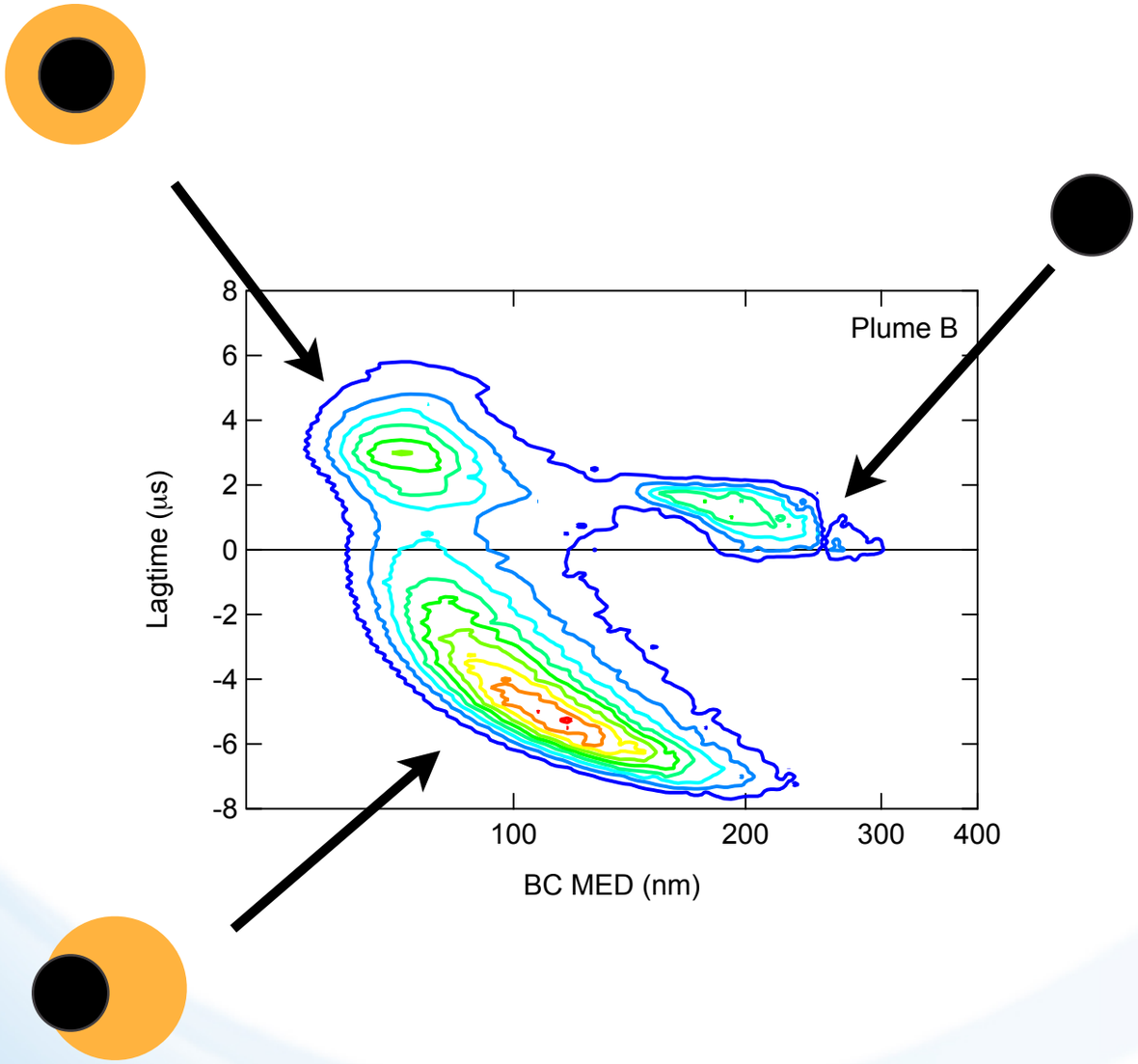
rBC Mixing State:

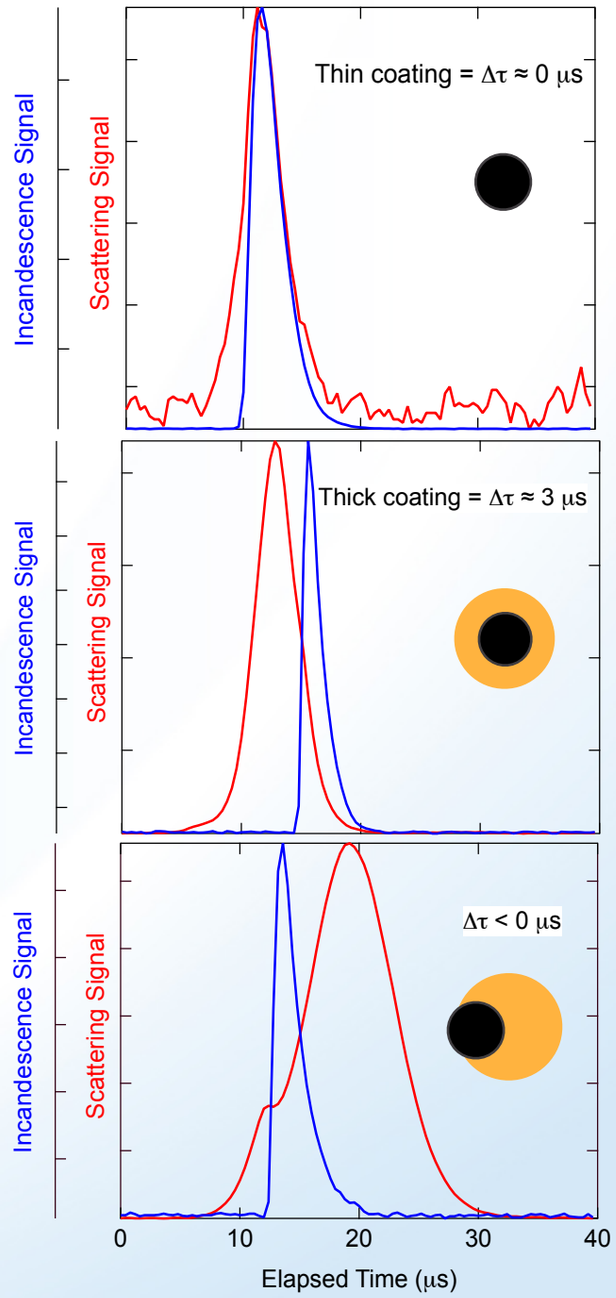
- Probe coating thickness: optical and BC mass equivalent diameters
- Examine temporal profiles of the scattering and incandescence signals

Probing Configurational Mixing State of rBC

Scattering and incandescence signals provides information ratio of aged/fresh rBC and fraction of off-center rBC-containing particles.

$\Delta\tau = \tau_{incandescence} - \tau_{scattering}$ = time to 'boil off' coating



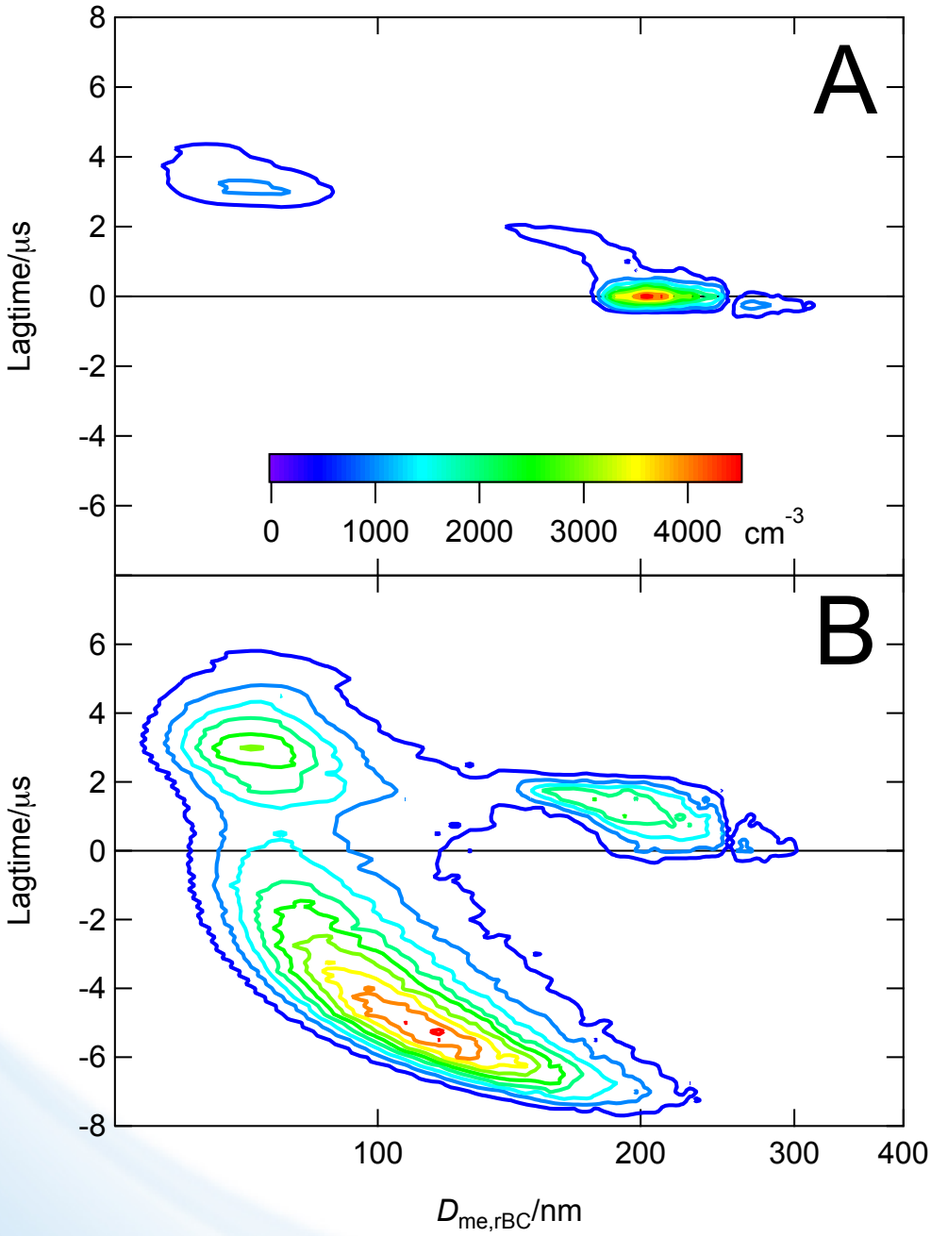


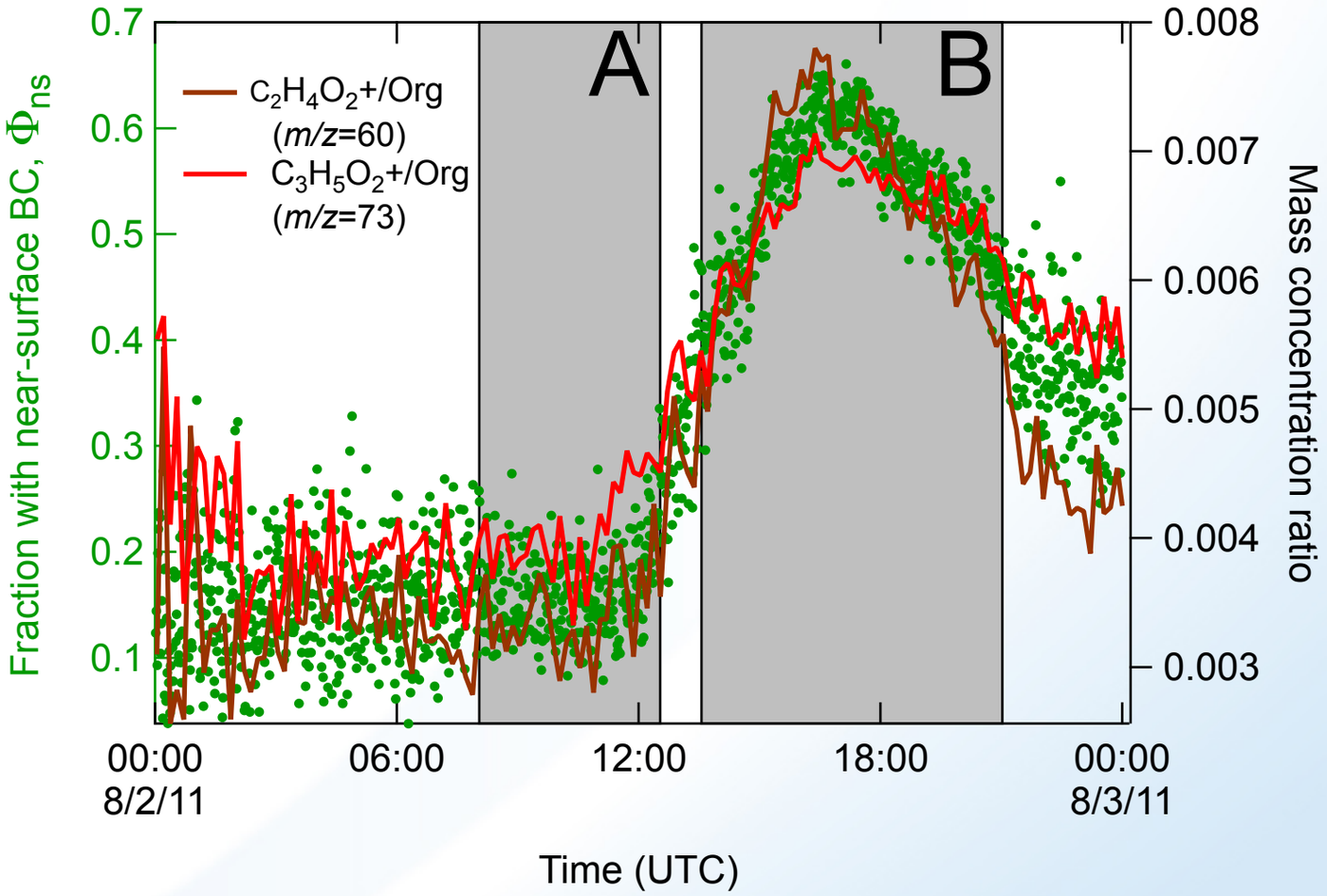
Sedlacek et al., 2012

Probing rBC Mixing State: Negative Lagtimes

Sedlacek et al., 2012

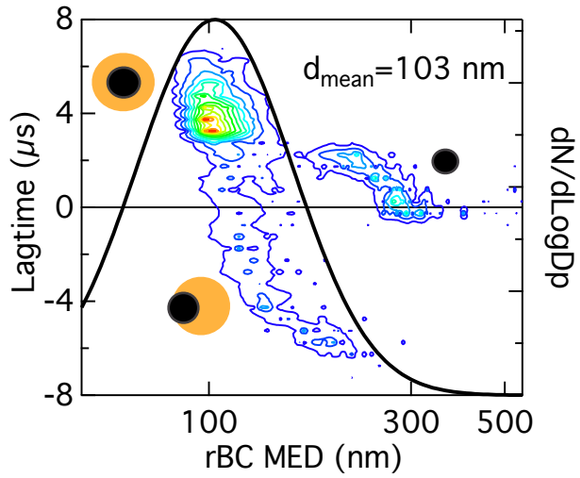
Near surface rBC-particles in biomass burns

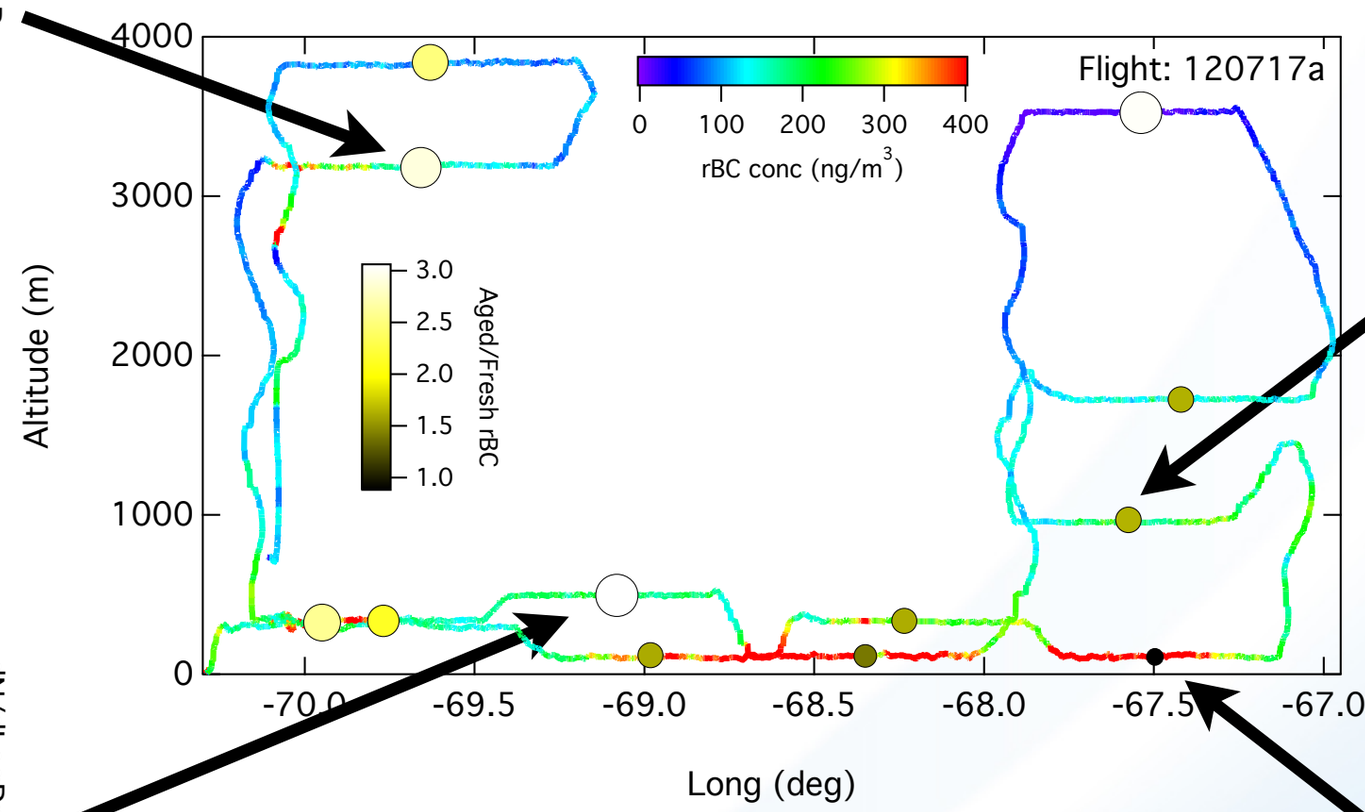


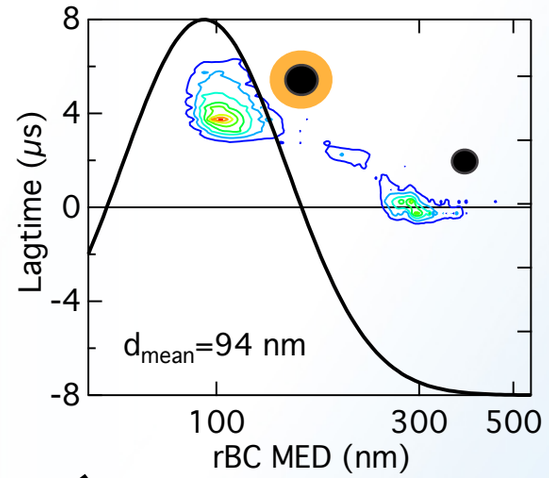


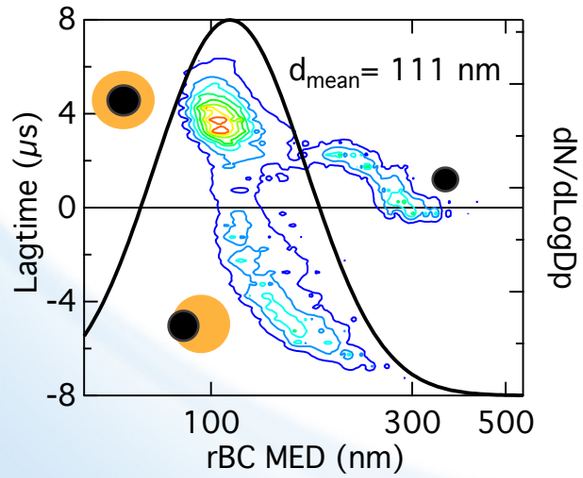
TCAP: July 17, 2012 - preliminary

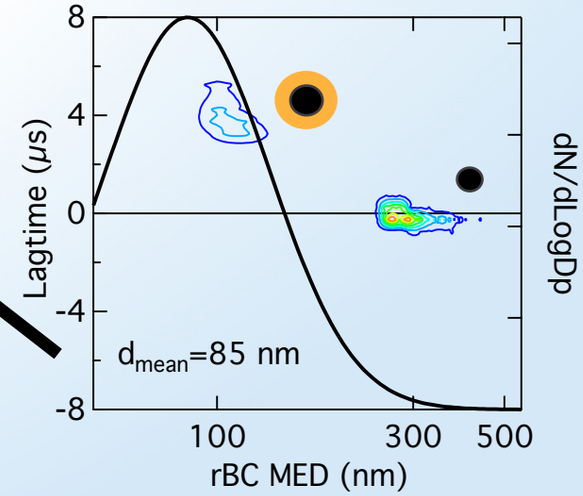
SP2 Lagtime analysis suggests significant variations in rBC-particle morphology.
Variations in particle morphology accompanied by differing size distributions





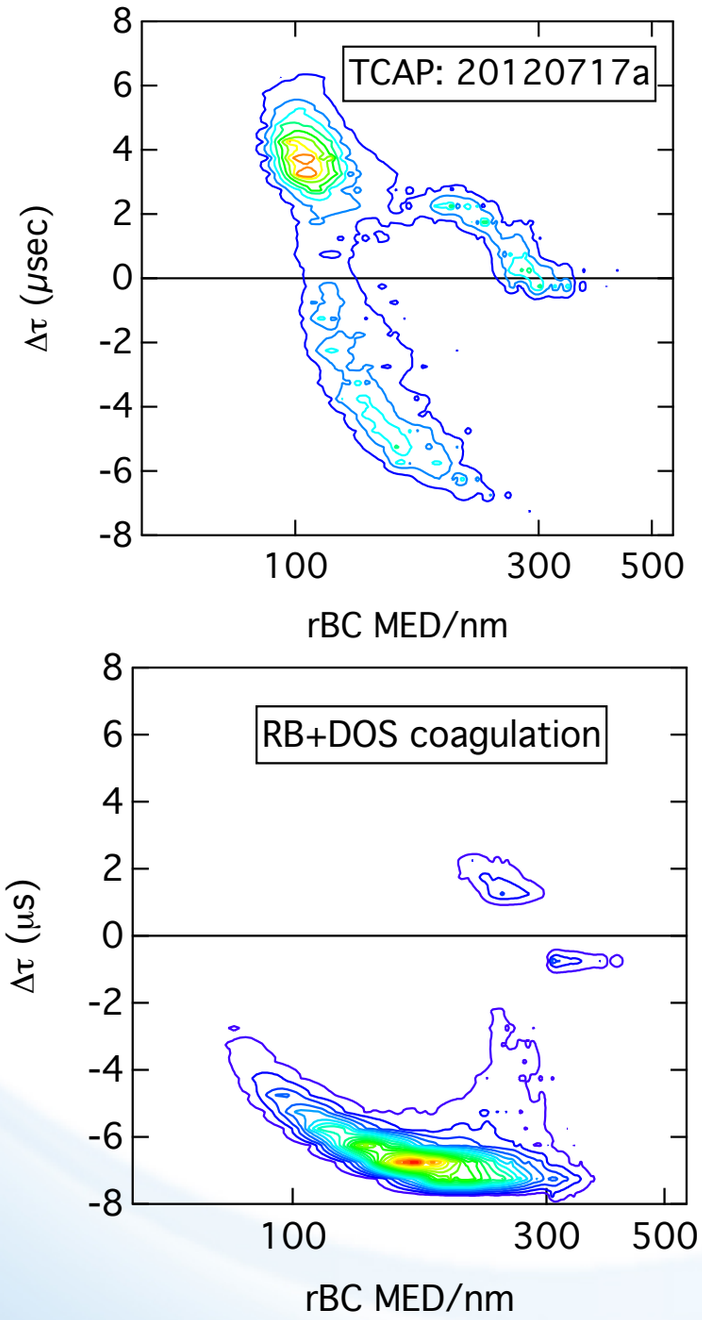


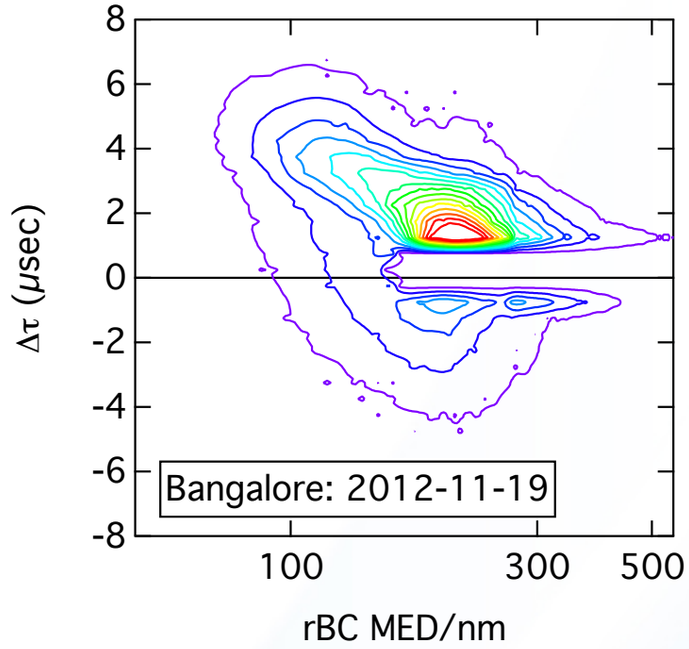


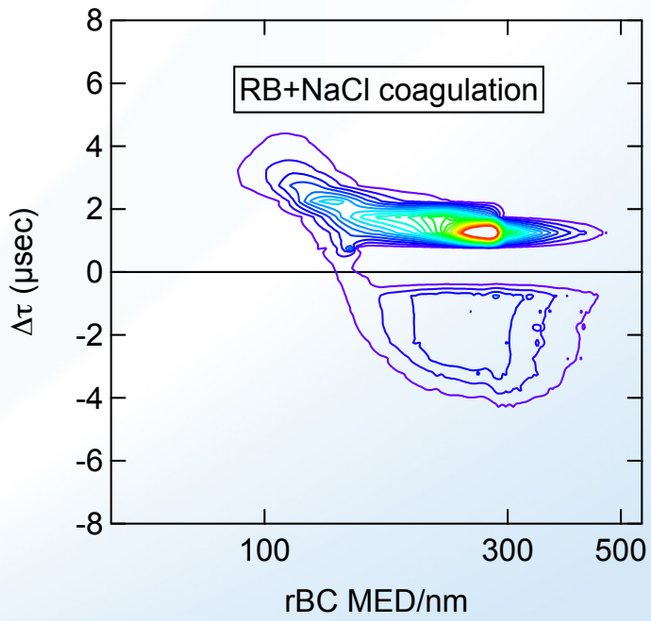


Comparison of Lab and Field Lagtime Distributions

Initial comparisons between laboratory data and field measurements suggests variation in configuration mixing state







Preliminary data

Compositional and Configurational Mixing State

TCAP and BBOP offer the opportunity to look at the relative importance of these two mixing states

TCAP: Urban emissions

SPLAT provides chemical composition on rBC-containing particles

SP2 provides configuration information on rBC-containing particles

BBOP: biomass burn emissions

SP-AMS provides chemical composition on rBC-containing particles

SP2 provides configuration information on rBC-containing particles

Closure through R_{rBC}: non-refractory mass/rBC mass