Deliverable D10: **Chamber experiments and PR modeling to study mixing state**

Objective: Conduct well-controlled mixing state experiments in laboratory-based aerosol chambers using real-time and off line measurements of single particle mixing state and the simultaneous quantification of the ensemble chemical, optical and hygroscopic properties to develop instrumental techniques for field applications and to provide validation data for PartMC model simulations, including the quantification of model errors and uncertainties.

Lead personnel: Davidovits, Lambe, Lewis, Onasch, Sedlacek
Collaborators: Riemer and West (modeling), Claudio Mazzoleni (microscopy), Chris Cappa (optical properties)
Funding status: proposal submitted to DOE ASR/initial work carried out

Challenges or needed resources/collaborators:

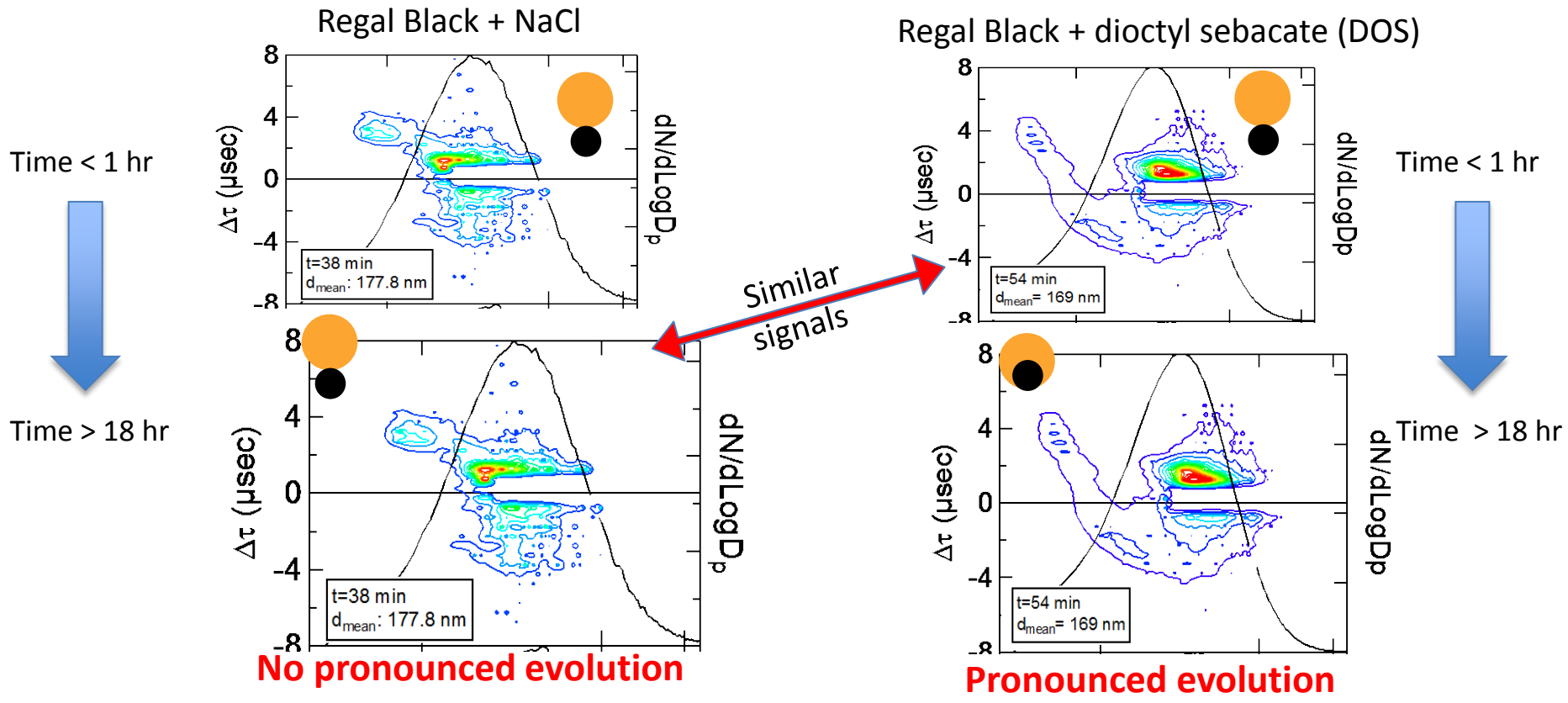
- Support for planned additional, focused laboratory experiments (e.g., Boston College), including the continuation of current and the addition of potential future collaborations.
- Support for direct involvement of modeling personnel in the planning/execution of experimentally-based lab projects.
- Support (funding and additional collaborations) for single particle microscopy components, including resources for direct involvement of microcopy-related personnel in project planning and sample collection (in addition to analysis of single particle morphological mixing states).

Summary of progress:

- Developed and assembled a new laboratory setup in the Boston College laboratories that enable the generation and characterization of externally and internally mixed particles with different morphological mixing states as a function of interaction time (from minutes to hours).
- Initial experiments on soot particles intermixed with organic and inorganic particles were conducted at Boston College and the first manuscript is in preparation.
- Modeling efforts of the initial experimental results are currently underway.
- This deliverable will help develop new instrumental techniques for characterizing the morphological mixing state of soot-containing particles and provide the laboratory-based results needed by models to bound the impact of soot-containing particles' morphological mixing states on radiative forcing.

Surface/Subsurface rBC-containing Particles

SP2 lagtime analysis methodology shows promise of cataloging rBC-containing particles as (i) nascent/fresh; (ii) core-shell; and (iii) off-center (manuscript in prep.)



RB+DOS lagtime distribution exhibits pronounced evolution while RB+NaCl shows none. This behavior may provide insight into evolution of particle morphology.