

**Combining Aircraft Observations and Lightning Assimilation  
in a Multiscale Modeling Framework to Study Deep Convective  
Transport during DC3 And SEAC4RS**

NASA to AER, Inc. subcontracted to FSU

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This research combines well-established and advanced modeling capabilities with NASA-sponsored aircraft and satellite observations to answer fundamental scientific questions about deep convective trace gas transport. We will use a demonstrated lightning assimilation method to improve the timing and location of parameterized deep convection during the NASA DC3 and SEAC4RS airborne campaigns. The improved convection will allow for a more direct comparison with aircraft observations of trace gasses to evaluate the parameterized vertical transport of pollution from the boundary layer to the upper troposphere. Satellite-derived cloud properties will be used to evaluate the parameterized convection at the mesoscale (e.g., cloud top height). Aircraft observations of vertical velocity and entrainment also will provide insight into the dynamical characteristics of the convection. Idealized large-eddy simulations will be combined with aircraft observations to study the physical processes modulating the accurate simulation of deep convective trace gas transport. Finally, this new understanding of deep convective transport will be translated into model improvement pathways for the climate and composition communities.

We are collaborating with Dr. Becky Adams-Selin of AER, Inc. and Dr. Nick Heath formerly of AER Inc.