

Planned Modeling Activities for TCAP

Jerome Fast

Near Term (this FY)

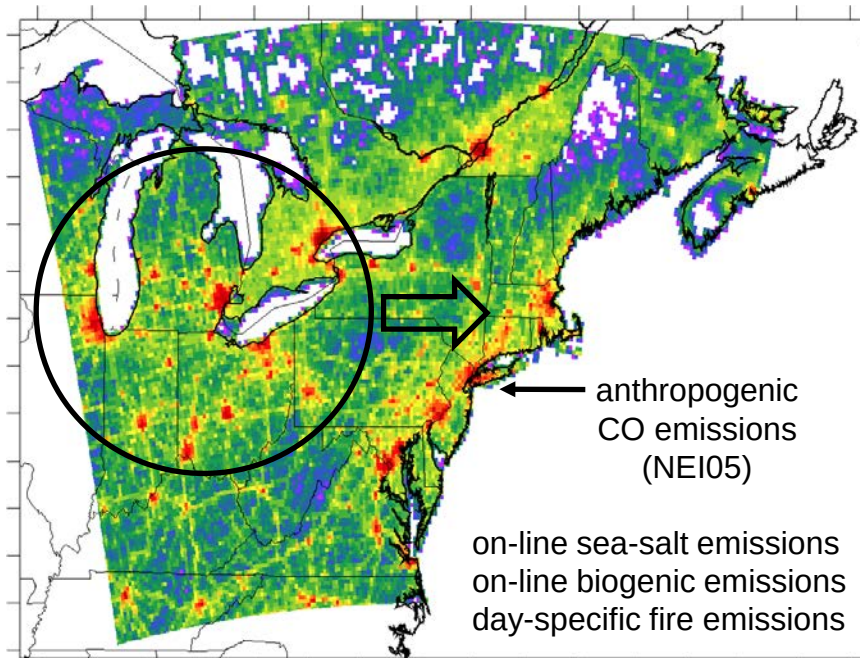
- ▶ Air-mass trajectory analysis
- ▶ WRF-Chem simulations of TCAP phase 1
- ▶ Evaluating simulated optical properties: on-line and off-line methods

Long-Term (next FY)

- ▶ WRF-Chem simulations of TCAP phase 2
- ▶ CAM5 simulations of TCAP – off-line meteorology
- ▶ TCAP Aerosol Modeling Testbed case

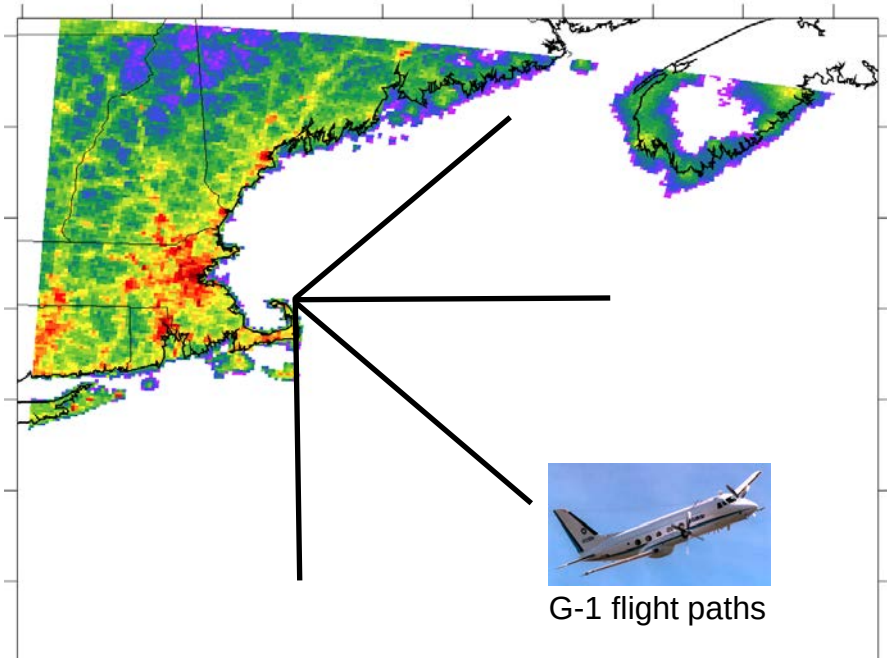
Modeling Domain and Configuration

$\Delta x = 12$ km



meteorology and chemistry boundary conditions
from global model

$\Delta x = 4$ km



G-1 flight paths

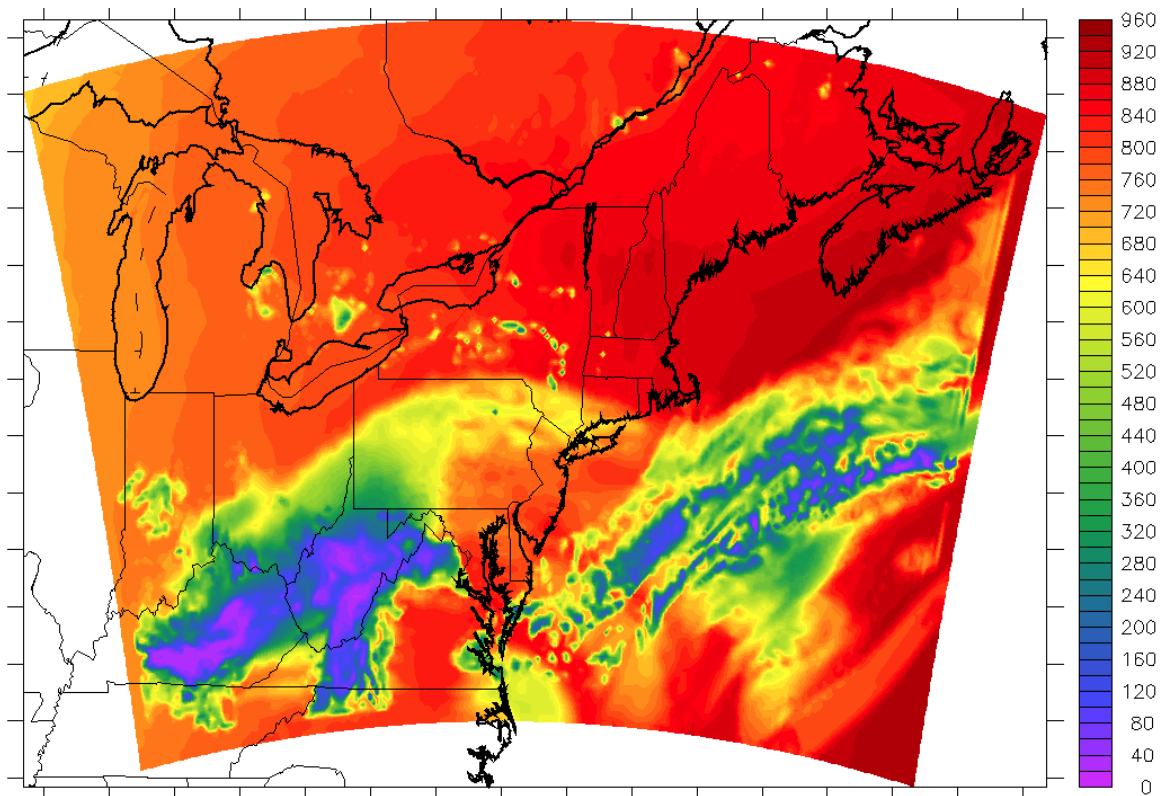
Run model for entire IOP period + 1 week “spin-up” period

- ▶ WRF physics (MOSAIC aerosols), direct and indirect effects
- ▶ CAM5 physics (MAM aerosols), direct and indirect effects
- ▶ Other sensitivity tests (emissions, boundary conditions)

evaluate with G-1
and AMF data

Test Simulation Complete (Meteorology Only)

Downward Shortwave Radiation July 13

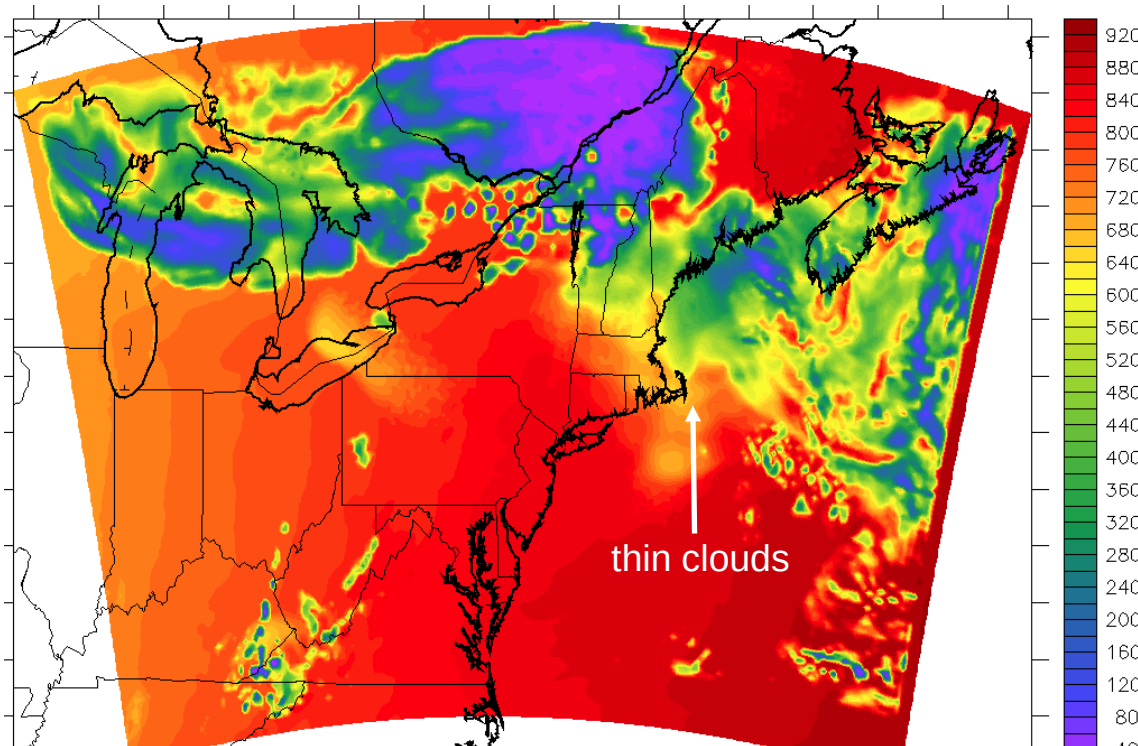


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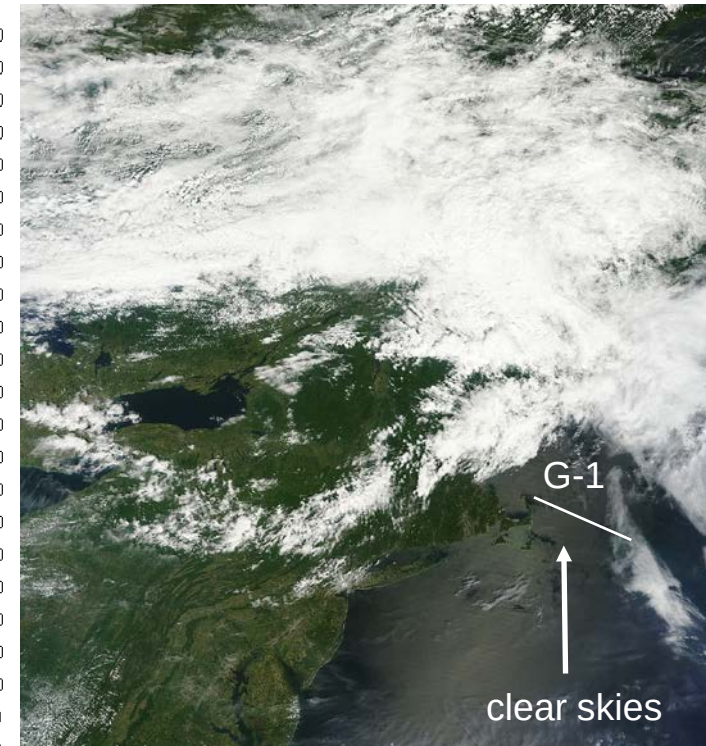


Test Simulation Complete (Meteorology Only)

Downward Shortwave Radiation July 17



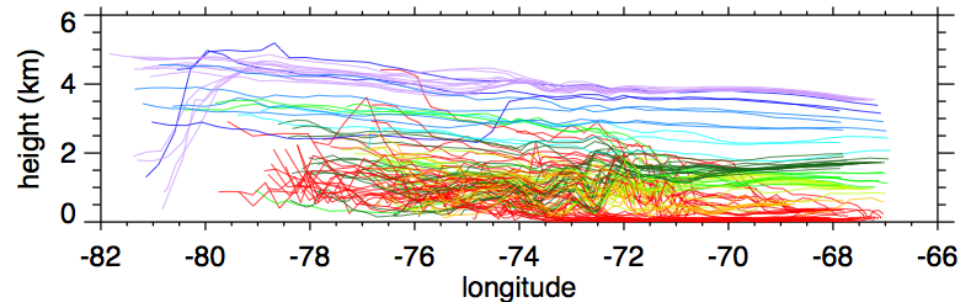
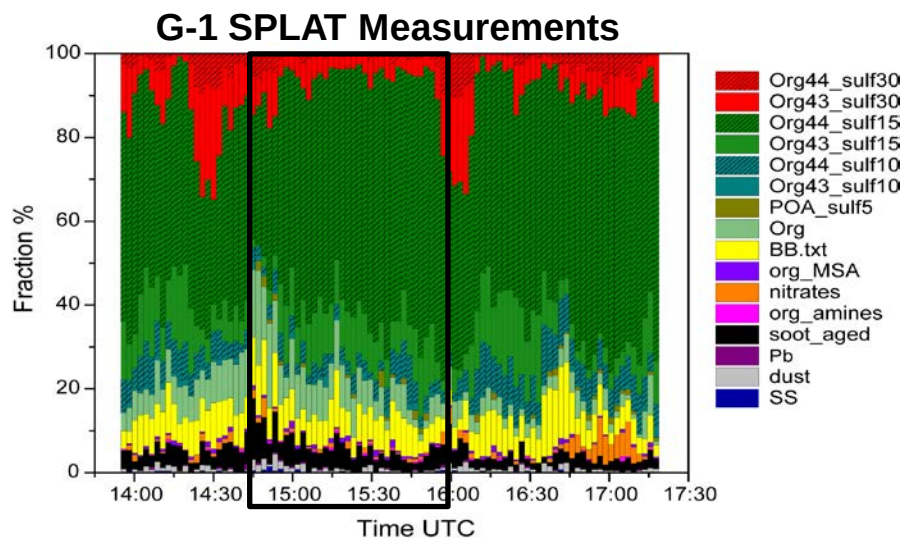
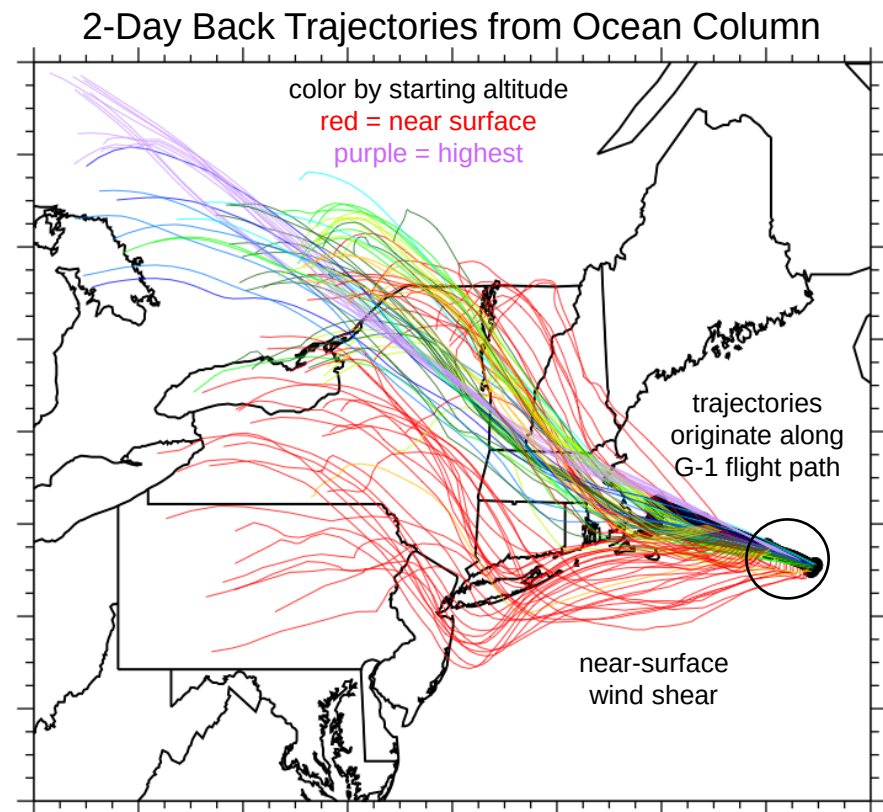
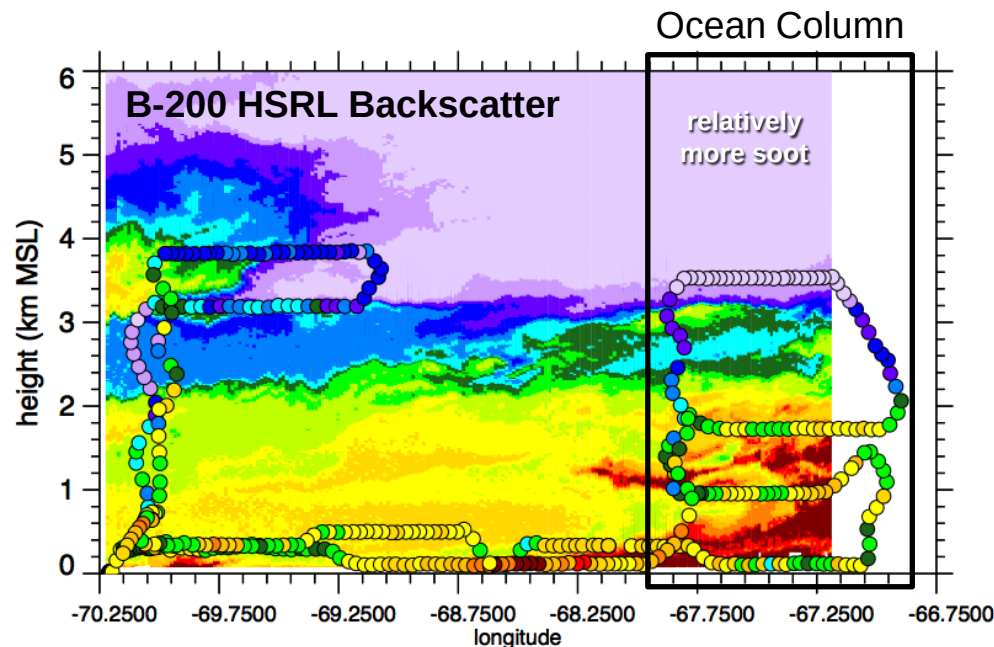
MODIS



Run model for entire IOP period + 1 week “spin-up” period

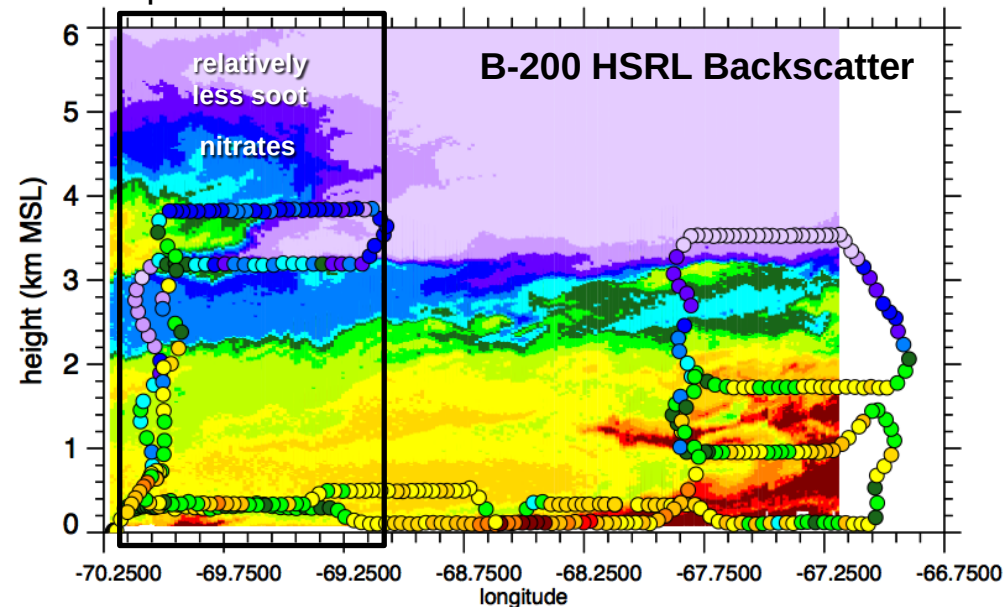
- ▶ Test shows that overall meteorological conditions are simulated reasonably well
- ▶ On some days, errors in simulated clouds will affect radiation calculations

Air Mass Trajectories – July 17

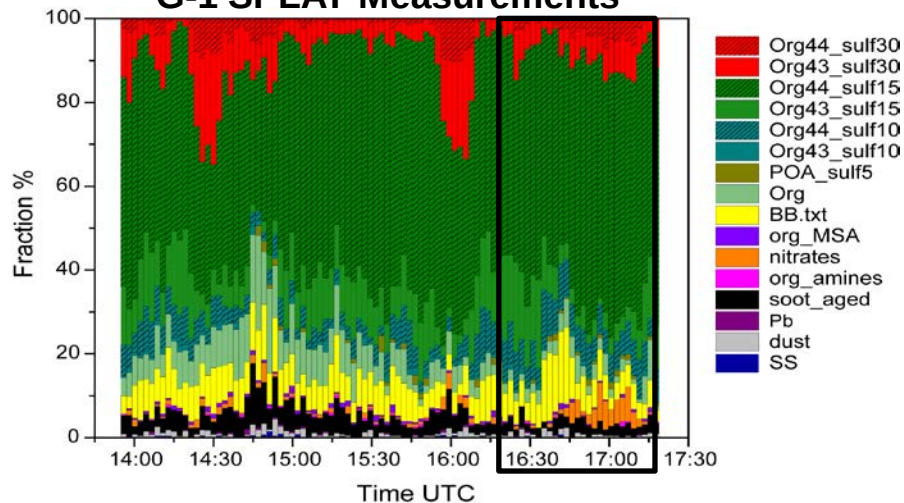


Air Mass Trajectories – July 17

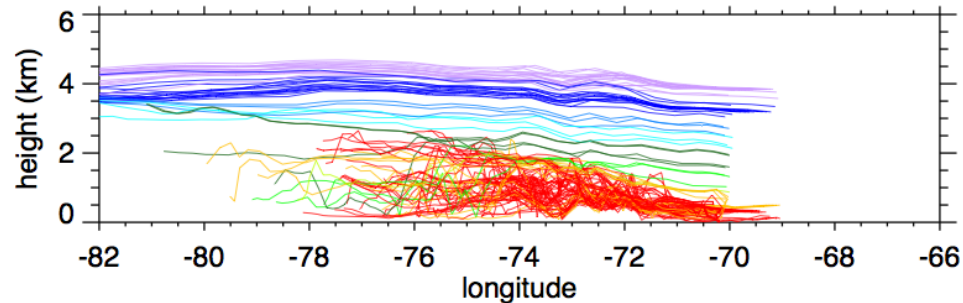
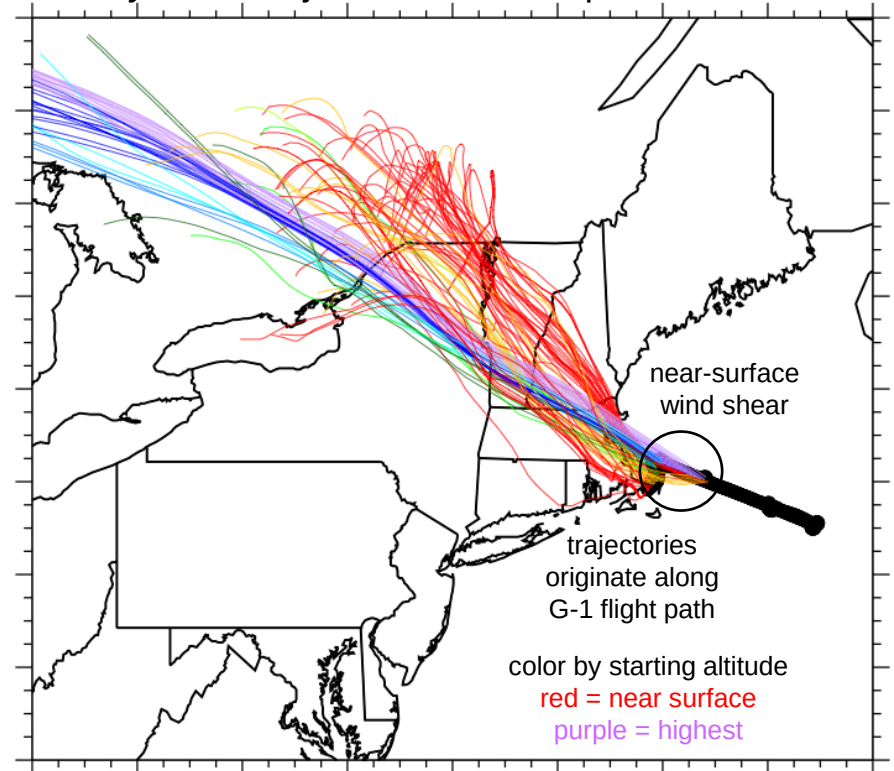
Cape Cod Column



G-1 SPLAT Measurements

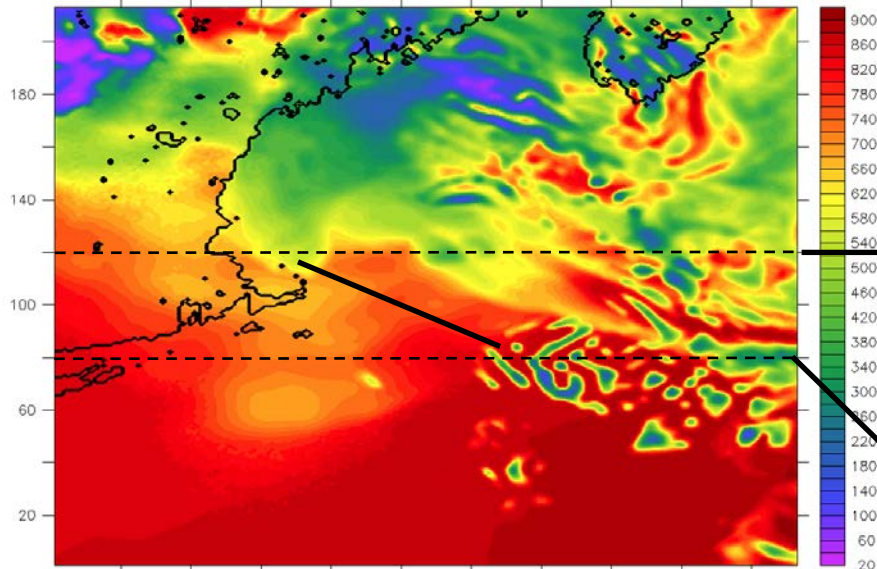


2-Day Back Trajectories from Cape Cod Column

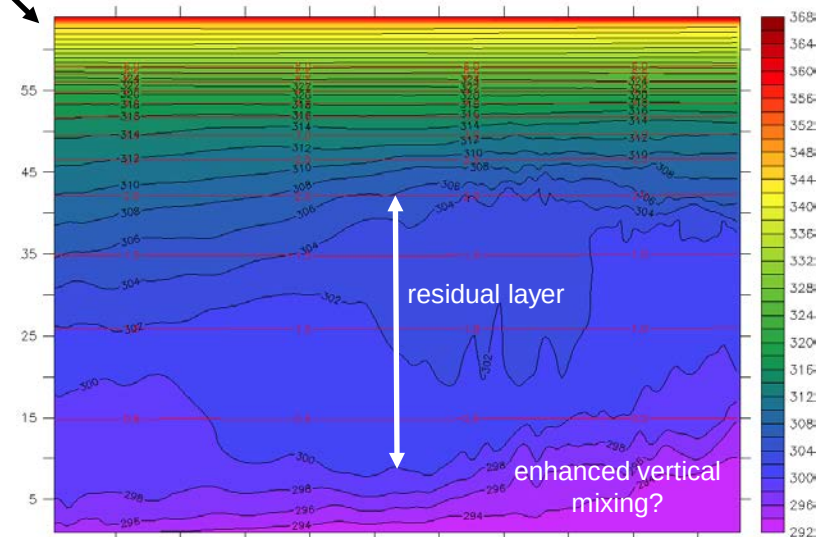
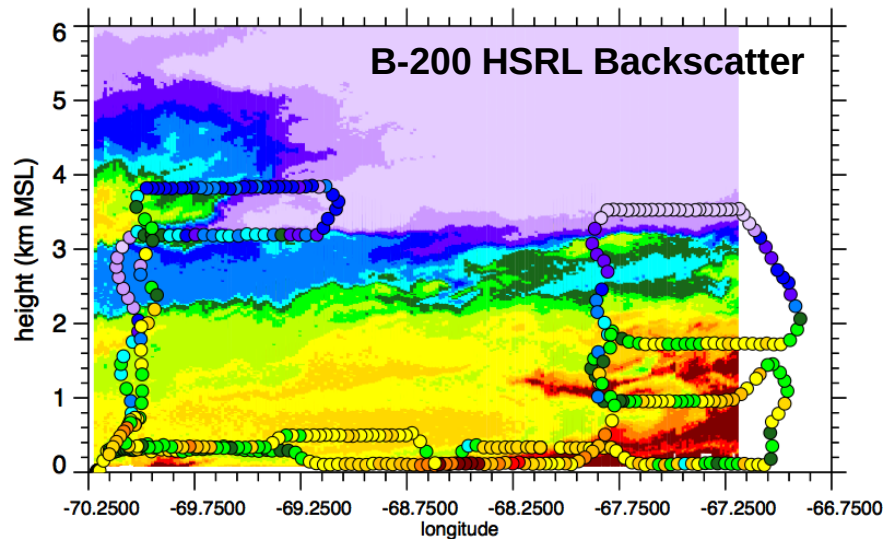
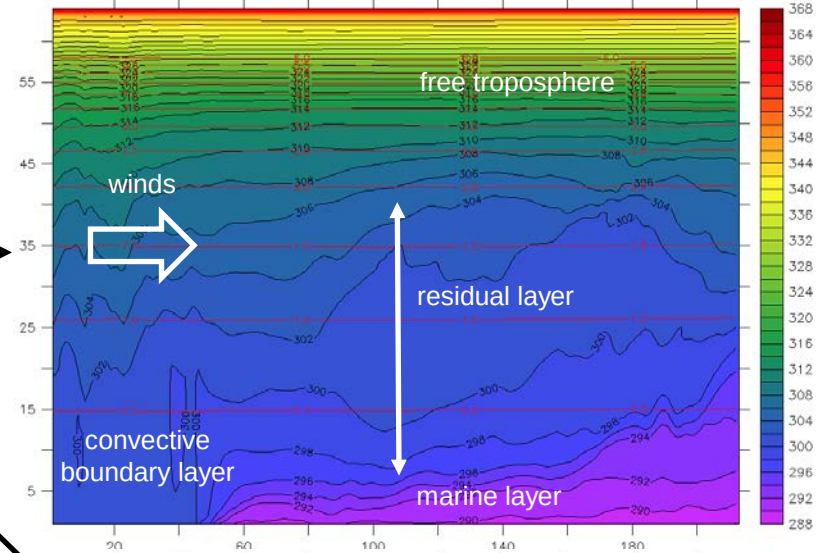


Residual Layer – July 17

Downward Shortwave Radiation, 15 UTC



Potential Temperature Cross Sections



Objectives of Modeling Studies

- ▶ Provide an interpretation of observed aerosol properties along G-1 aircraft flight paths and at AMF site: aerosol sources, transport pathways, mixing processes
- ▶ Determine how well models simulate the mass, composition, and size distribution of aerosols as they are transported over the ocean
 - Compare MOSAIC and MAM (from CAM5)
- ▶ Determine how well models simulate aerosol optical properties
 - Prognostic aerosols vs constraining optical property modules with observations
- ▶ Quantify the impact of errors in simulated aerosol optical properties on regional radiative forcing
- ▶ Determine whether internal mixture assumption employed by models is adequate when compared with findings from TCAP data analyses
- ▶ Identify changes in model performance during the summer and winter periods
- ▶ Collaborate with European groups performing similar research (TRAQA, June – July 2012)