Planned Modeling Activities for TCAP

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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

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

Delta x = 12 km
- meteorology and chemistry boundary conditions from global model
- on-line sea-salt emissions
- on-line biogenic emissions
- day-specific fire emissions
- anthropogenic CO emissions (NEI05)

Delta x = 4 km
- G-1 flight paths
Test Simulation Complete (Meteorology Only)

Downward Shortwave Radiation July 13

MODIS

Siberian smoke
Test Simulation Complete (Meteorology Only)

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

B-200 HSRL Backscatter

G-1 SPLAT Measurements

2-Day Back Trajectories from Ocean Column

- Trajectories originate along G-1 flight path
- Near-surface wind shear
- Color by starting altitude: red = near surface, purple = highest

![Image of B-200 HSRL Backscatter](image_url)

![Image of G-1 SPLAT Measurements](image_url)

![Image of 2-Day Back Trajectories from Ocean Column](image_url)
Air Mass Trajectories – July 17

Cape Cod Column

B-200 HSRL Backscatter

G-1 SPLAT Measurements

2-Day Back Trajectories from Cape Cod Column

Near-surface wind shear

Trajectories originate along G-1 flight path

Color by starting altitude:
- Red = near surface
- Purple = highest
Residual Layer – July 17

Downward Shortwave Radiation, 15 UTC

Potential Temperature Cross Sections

- free troposphere
- winds
- residual layer
- convective boundary layer
- marine layer

B-200 HSRL Backscatter

enhanced vertical mixing?
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)