

# Forecast and Analysis of the Transport of Aerosol and Carbon Monoxide Using GEOS-5/GOCART Model Simulations and MODIS/AIRS Satellite Measurements During ARCTAS

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## Pre-mission preparation:

- Analysis of the performance of GEOS-5/GOCART aerosol and CO for 2006 especially during the INTEX-B periods
- Implementation of the MODIS aerosol height product into semi near real-time runs (not in operational system)
- Improvements of CO retrieval with better cloud detections
- Request of special retrieval processes (<8 hours of satellite overpasses) of MODIS aerosol and AIRS CO within the operational production systems

## In-field forecast and analysis:

- Analysis of GEOS-5/GOCART forecast outputs of aerosol and CO (up to 5 days)
- Analysis of near real-time MODIS aerosol and AIRS CO products
- Trajectory analysis of aerosol and CO based upon MODIS and AIRS retrievals (up to 5 days)
- Comparison of model outputs with airborne measurements
- Comparison of satellite retrievals with airborne measurements

## Post-mission analysis:

- Analysis of GEOS-5/GOCART outputs of aerosol and CO with assimilated meteorological fields
- Comparison of model outputs with better calibrated airborne measurements
- Comparison of satellite retrievals with better calibrated airborne measurements
- Evaluation of aerosol radiative forcing using GEOS-5/GOCART model and satellite measurements

### GEOS-5/GOCART Global Model Simulations (0.5°x0.5°)

Model	Species	Products (00Z, 06Z, 12Z, and 18Z)
GEOS-5/GOCART	Aerosol	Total, sulfate, dust, BC, OM, seasalt and tagged smoke aerosol.
GEOS-5/GOCART	CO	Total and tagged outputs from emissions of pollution (North America, Europe, Asia), boreal biomass burning (North America and Eurasia), and non-boreal biomass burning (mid -latitude and tropical),

### MODIS and AIRS Measurements

Sensor	Platform	Products (Operational near-real time)
MODIS	Terra and Aqua	Operational products (AOD and fine-mode fraction); <b>limited only over non-snow/ice covered surface</b>
MODIS	Terra and Aqua	Research products (Aerosol height); <b>not limited by snow/ice surface and not sensitive to aerosol type; useful to estimate aerosol (smoke and dust) injection height for trajectory forecast</b>
AIRS	Aqua	Columnar and 500 mb CO; <b>retrieval improvements due to cloud screening</b>
MODIS/AIRS	Terra and Aqua	Trajectory forecast up to 120 hours

# Requirements/Operational Specifics/Issues

- **Deployments:** two persons per deployment (2-table space; wireless or two ethernet jacks; accessible to color printers)
- **Coordinated flights with Terra or Aqua MODIS for validation of AOD and Aqua CO**
  - Background aerosol (column and profile)[P-3 AATS, B-200 HSRL]
  - Background CO (profile) [DC-8 DACOM]
  - Fresh and aged smoke size distribution, absorption, humidification [P-3 HiGEAR]
  - Transported aerosol composition, size distribution, and optical properties [P-3 HiGEAR]
  - Surface characterization of snow/ice and melting snow/ice (spring) and boreal forest and other vegetated surfaces (summer) [P-3 CAR]
  - Measurements of dust and smoke events [DC-8, P-3, B200]
- **Coordinated flights with Aqua MODIS and CALIPSO for validation of aerosol height**
  - Various aerosol loading, type, and height [P-3 AATS, B-200 HSRL]
  - Various surface type including ocean, snow/ice, boreal forest, and other vegetations [P-3 CAR]
- **Designated flight patterns to routinely cover a certain area (TBD)? (for example, between Alaska and Greenland during spring phase and northern Canada including boreal forest during summer phase)**

