

Black carbon and AeroCom

Joshua Schwarz, NOAA

Current foci of interest:

- Mid/Upper tropospheric variability –
- Time scales for change –
-> Mechanisms that control m/uT loads

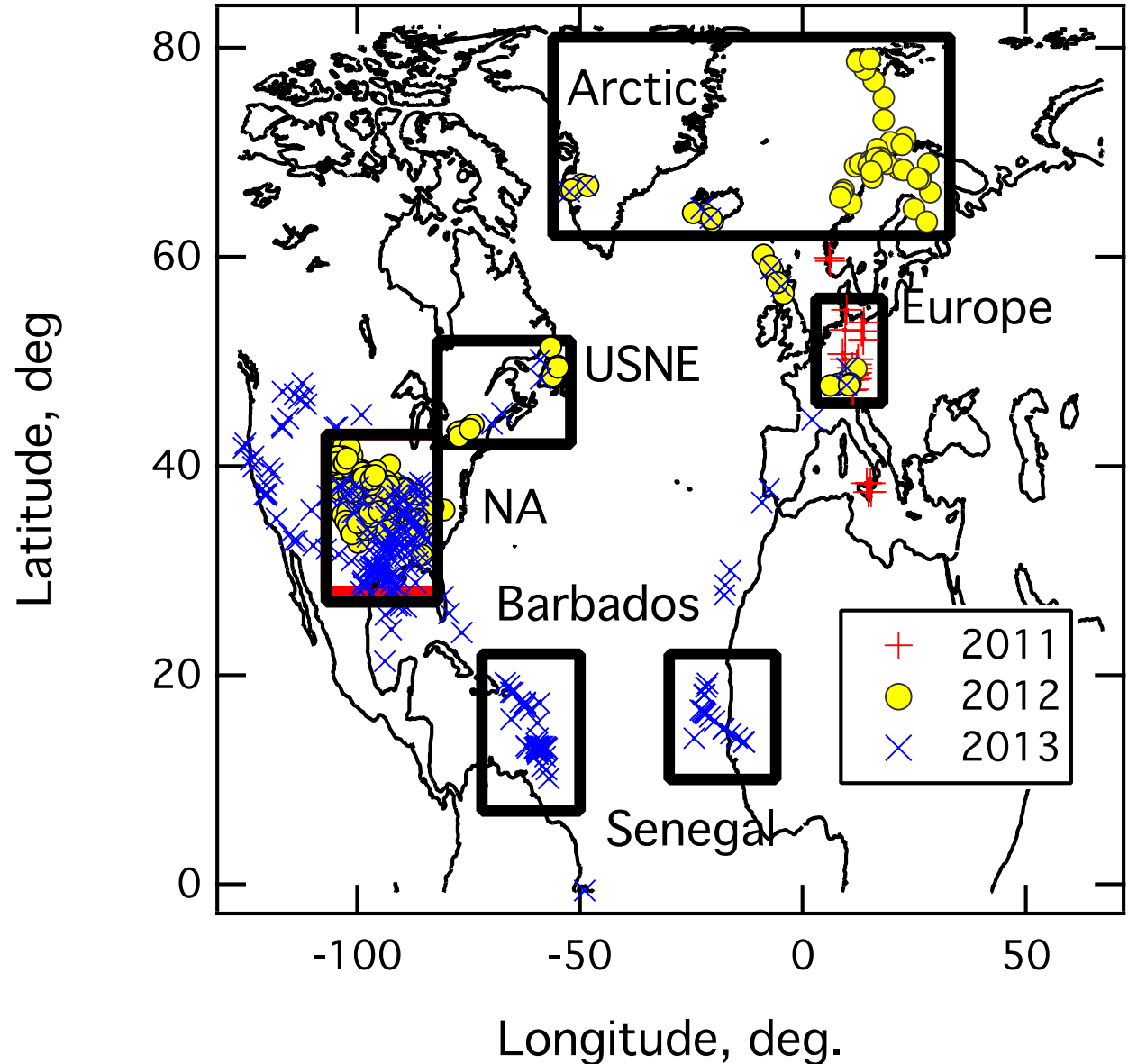
Future datasets:

- ATom
- KORUS-AQ
- ONFIRE/ORACLES/CLARIFY



Trans-Atlantic Model/Measurement BC Analysis

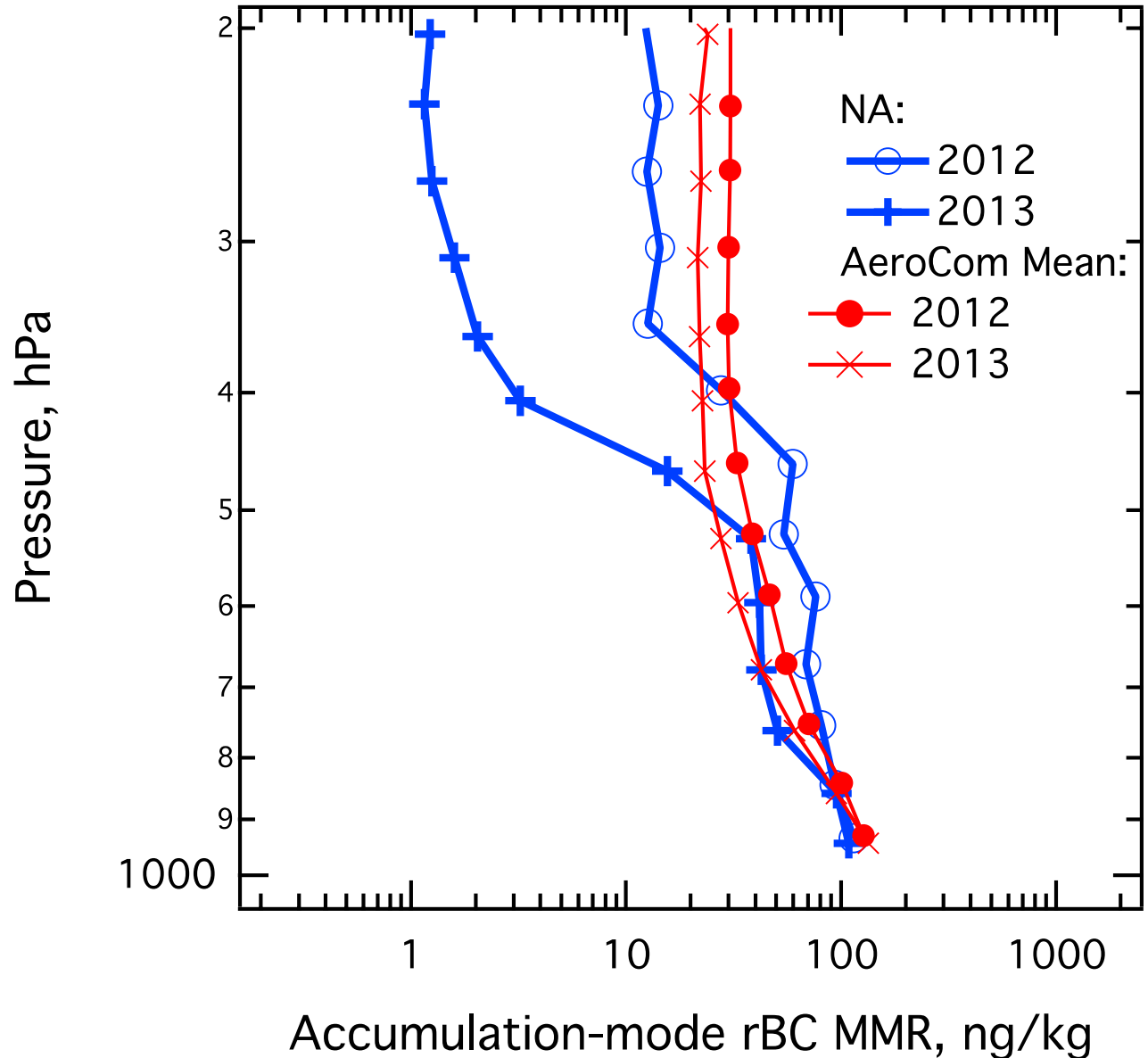
- Expanding beyond Pacific remote profiles
- **DLR and NOAA** data from 2011 – 2013
- Focus on **source regions**, and assessing **longitudinal variability**, mixing
- Model/Measurement comparison



- Data from 2012 Deep Convective Clouds and Chemistry (DC3) campaign: May/June
- and
- SEAC4RS 2013 Campaign: August/September
- Order of magnitude difference in mid/upper trop loads
- BC MMR decreases at ~450 hPa hard to capture in models

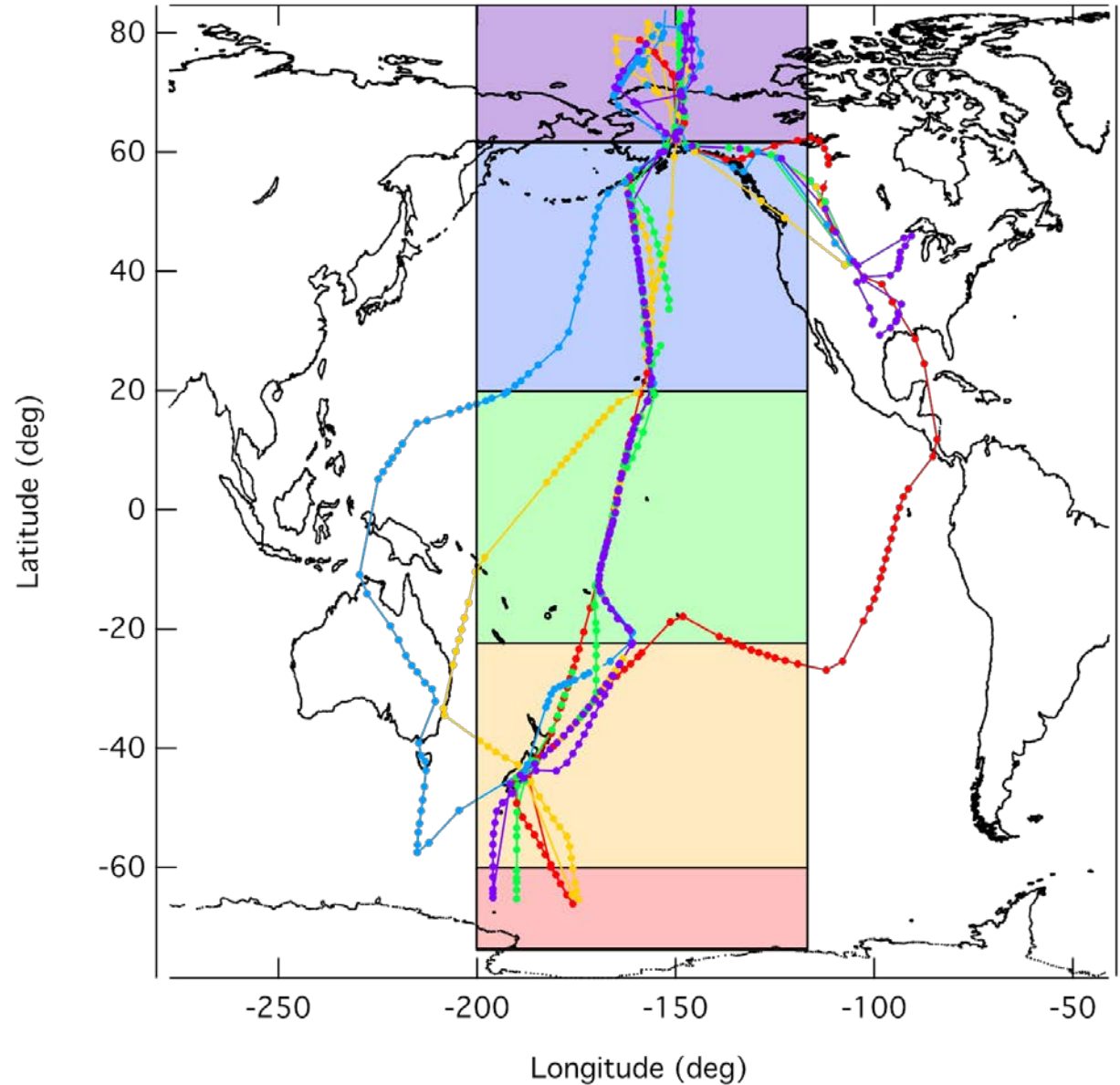
2015 AeroCom Workshop

North American BC Vertical Profiles



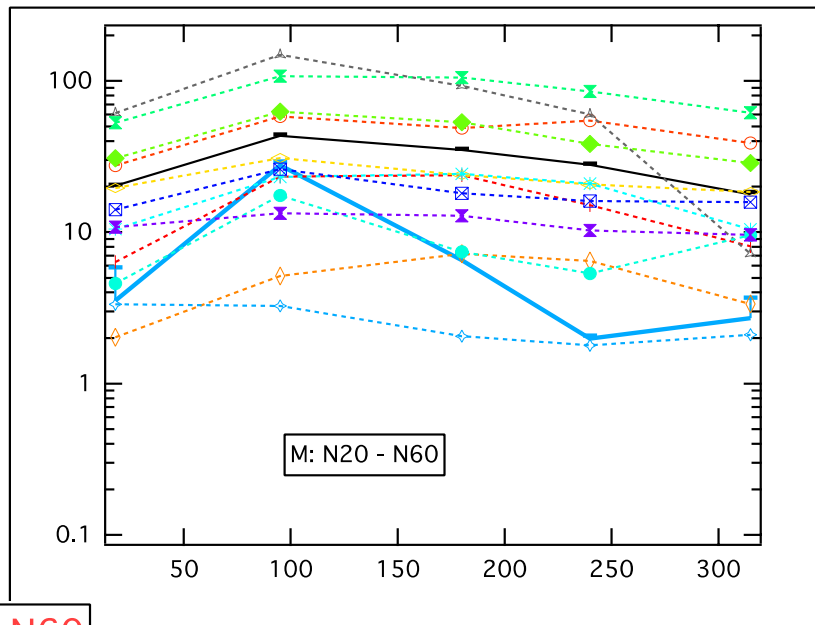
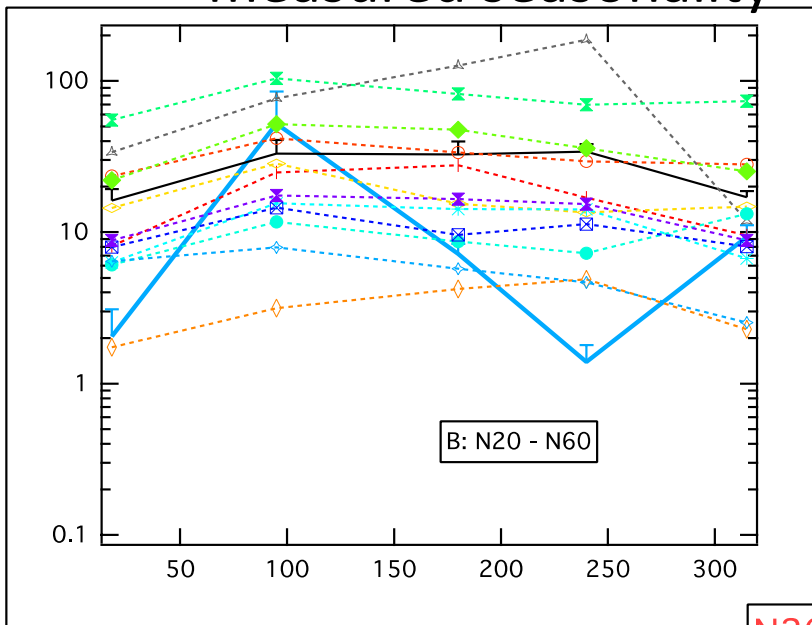
HIPPO – Remote profiles 2009- 2011

- >500 Vertical profiles
- 5 flight series over three years
- Reasonable calendar year coverage



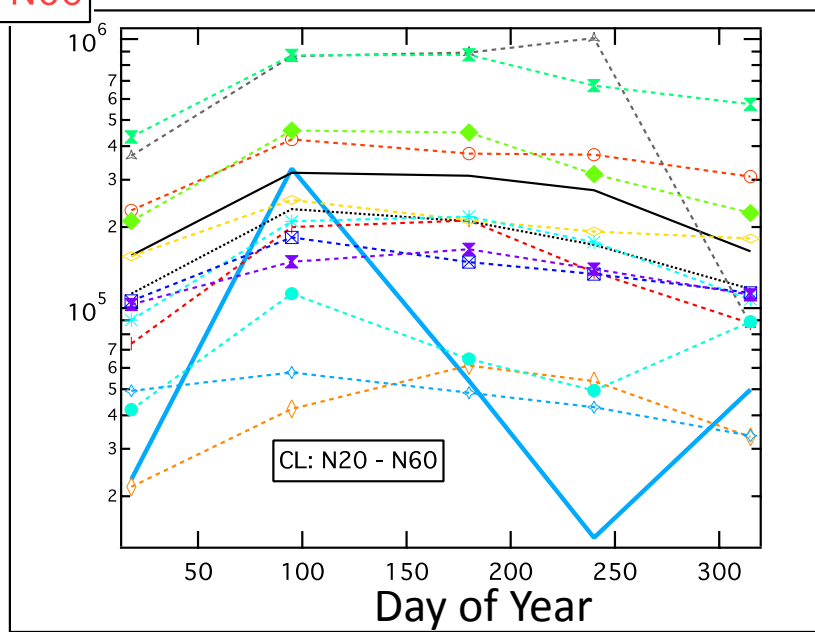
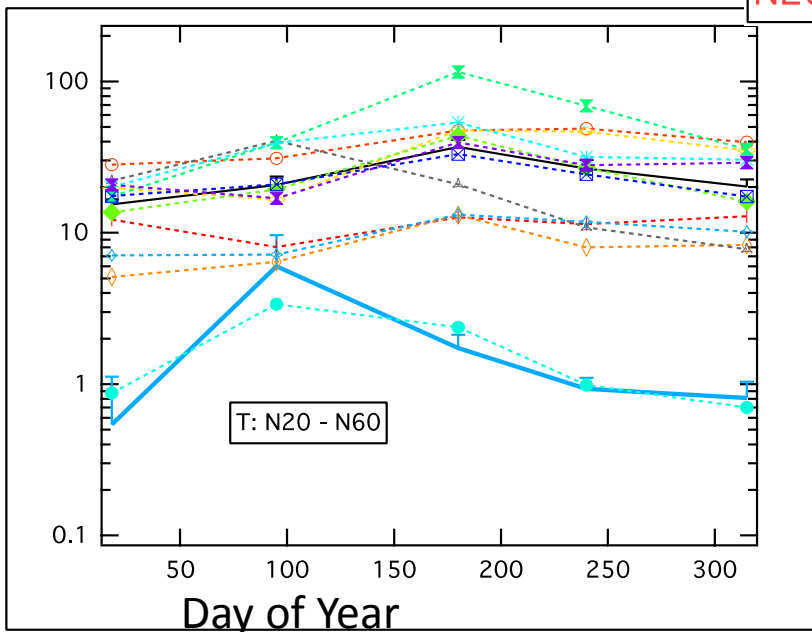
Relevant Latitude band: models don't echo measured seasonality

BC MMR, ng/kg



N20-N60

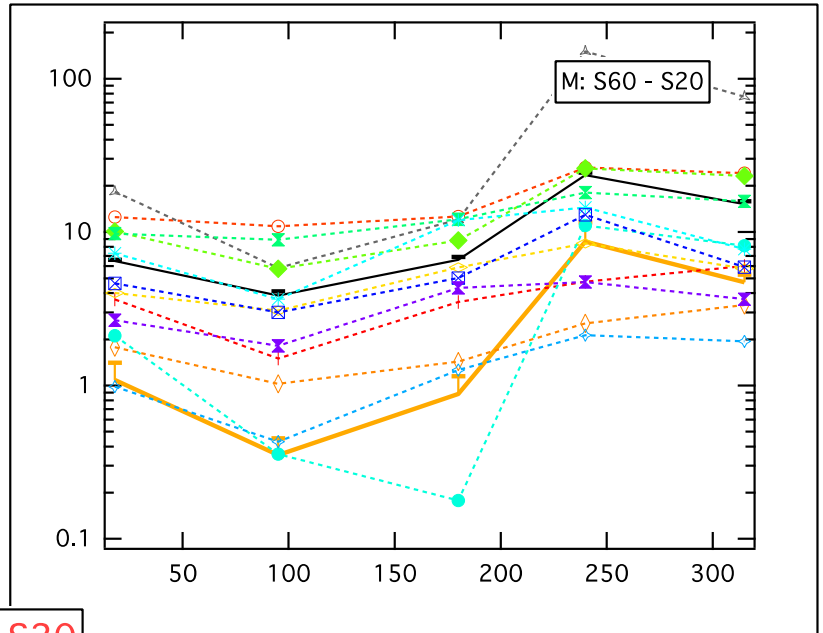
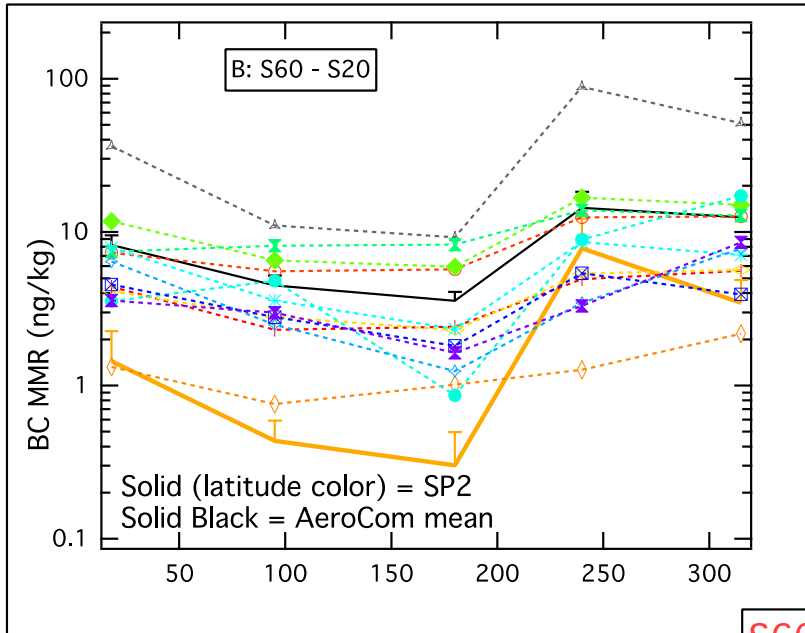
BC MMR, ng/kg



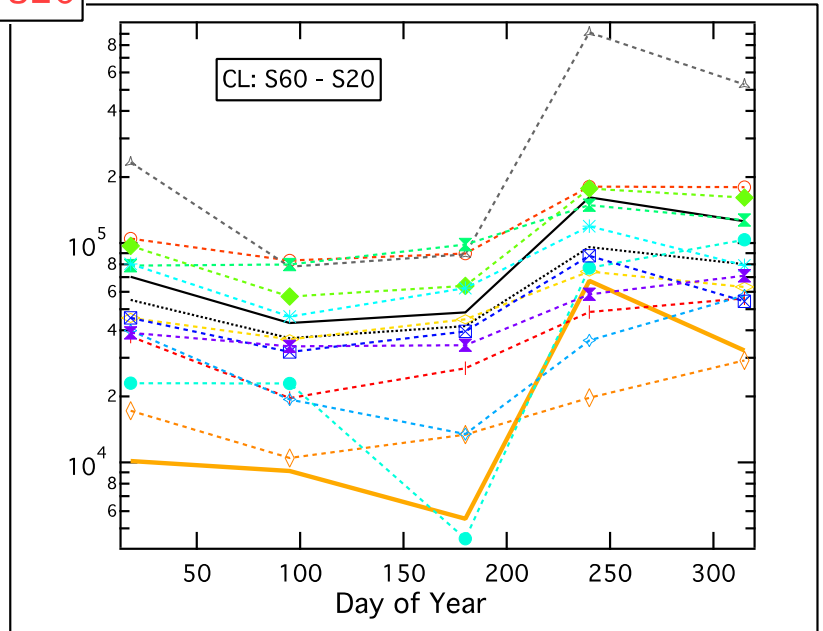
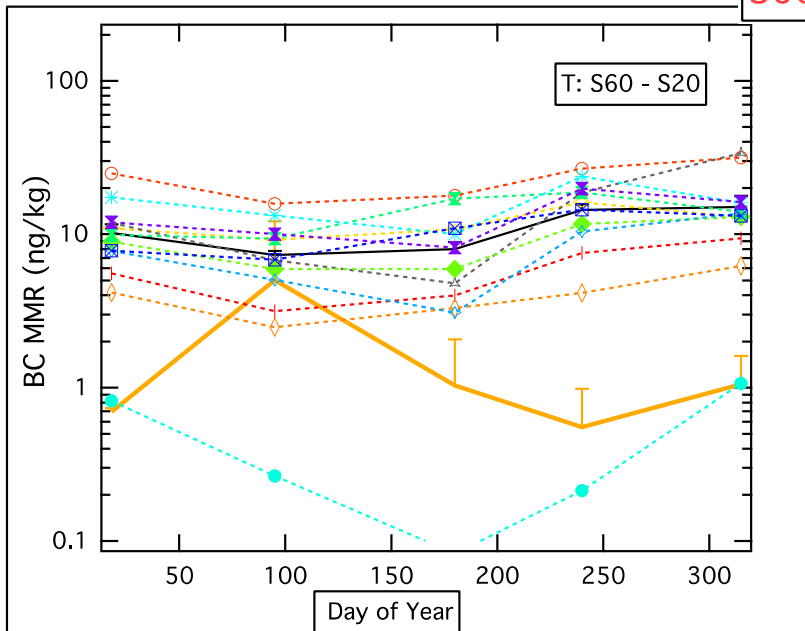
Day of Year

Day of Year

IN THIS LATITUDE BAND YOU SEE SOME CLEAR SEASONALITY CAUGHT BY MODELS



S60-S20



Can these issues be addressed via:

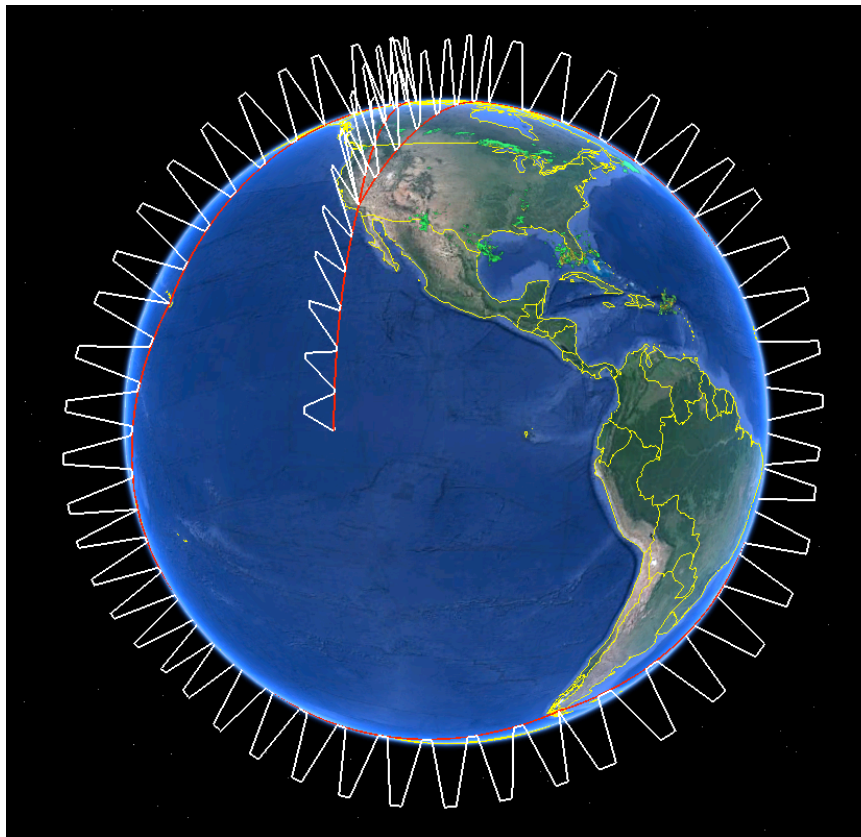
Conserved and aerosol tracer experiments ?

1) time scales of mixing - “Delta-function”
injection at altitude, at surface

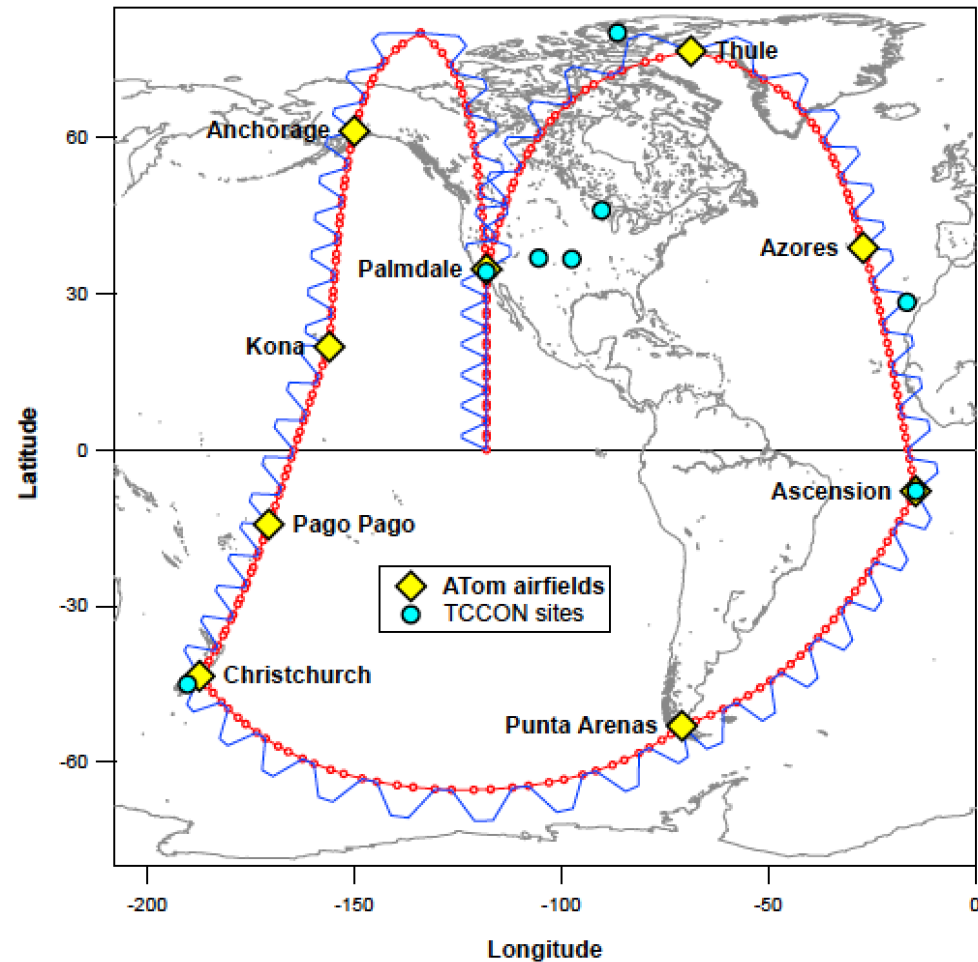
2) time scales of removal: abrupt reduction in
steady-state emissions of tracers, or of BB
emissions?

Dependence on time of year, location?

Atmospheric Tomography Mission (ATom) 4 Sequences 2016-2018 NASA DC-8



All profiles to 12 km



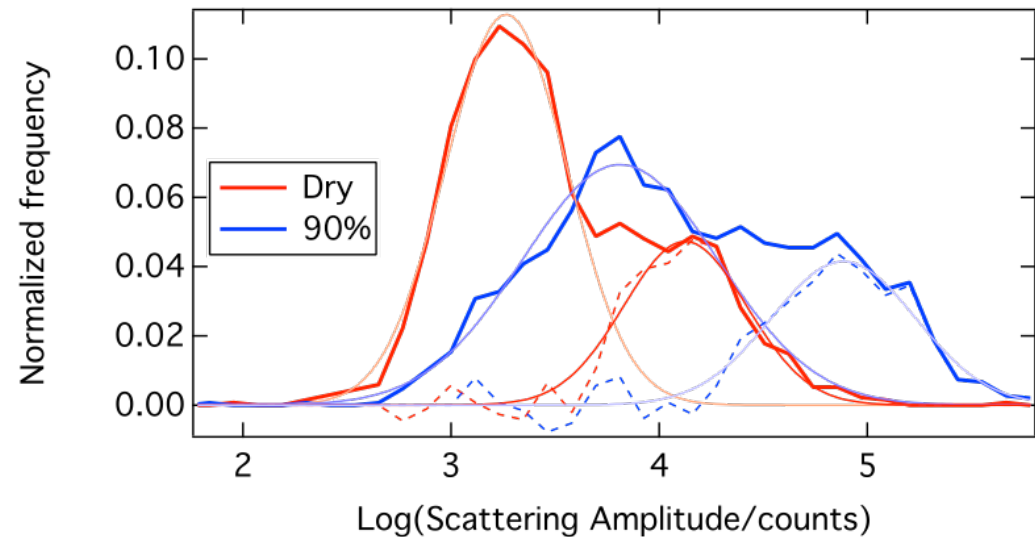
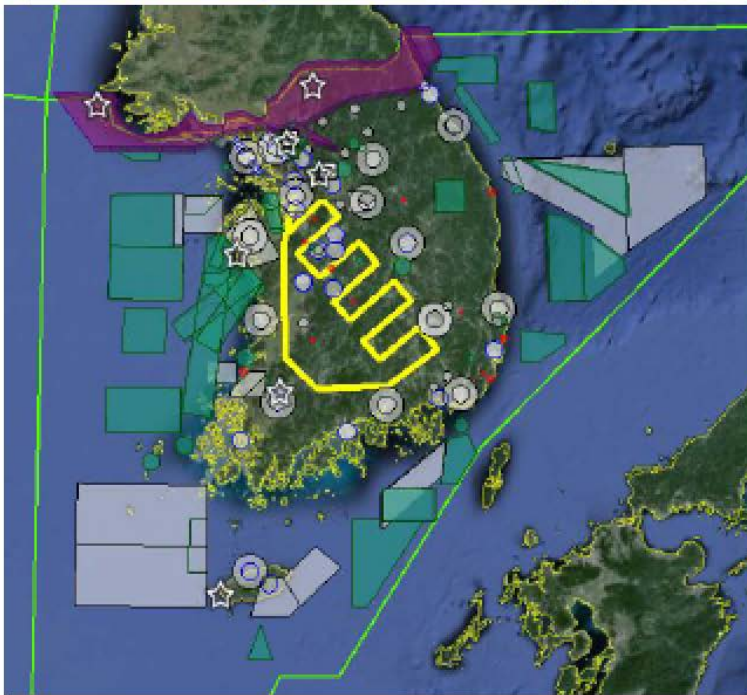
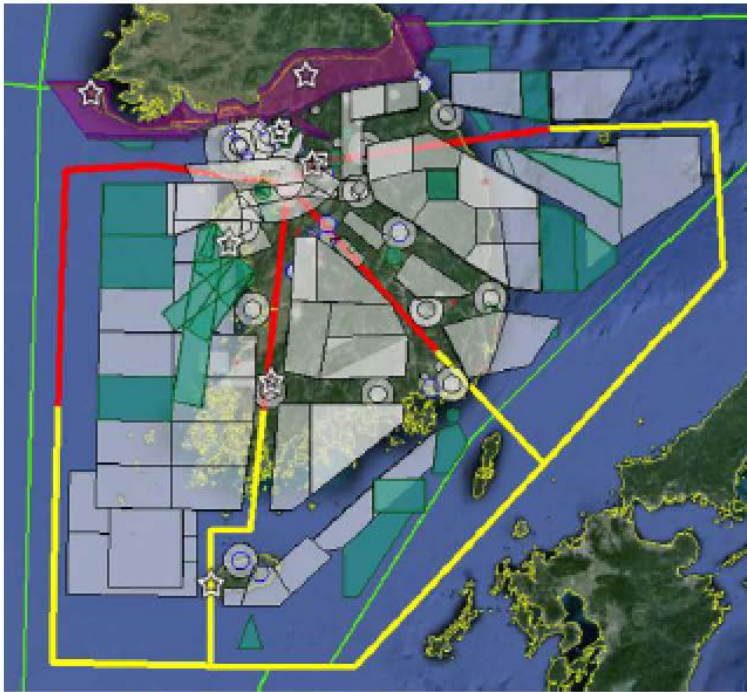
KORUS-Air Quality Mission, May/June 2016: NASA DC-8

Question 1: Satellite observations of air quality
Question 2: Ozone photochemistry and aerosol evolution?

Question 3: Model performance and necessary improvements?

Question 3a. **Are modeled gradients across the Korean peninsula consistent with local/upwind sources, transport, and chemistry?**

Question 3b. **Are air quality and atmospheric chemistry forecasting systems prepared to utilize GEO observations?**



Focus on aerosol in the SE Atlantic:

- Observations of Aerosols above Clouds and their interactions, ORACLES: NASA P3 and ER-2
- Observations of Fire's Impact on the southeast atlantic REgion (ONFIRE) – 2017, NSF C130

- Clouds and Aerosol Radiative Impacts and Forcing: (CLARIFY) - FAAM BAE-146

