Aura Validation During the INTEX-B Science Campaign

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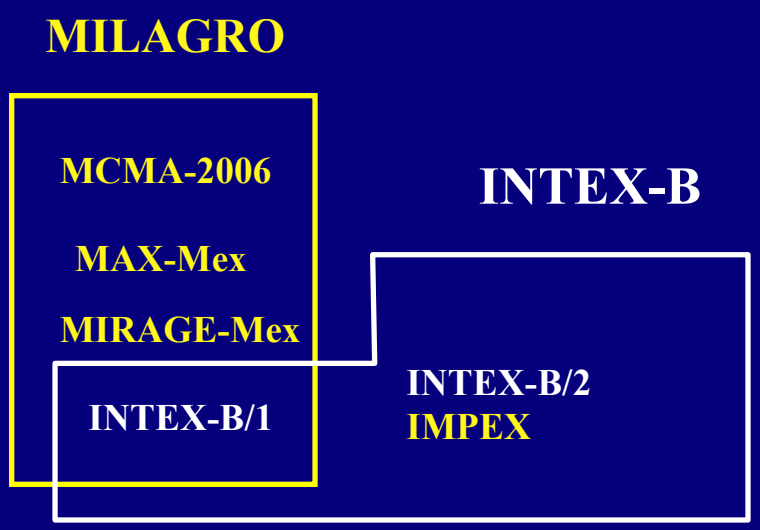
(http://cloud1.arc.nasa.gov; http://www.joss.ucar.edu/milagro/)

GOAL: To understand the transport, transformation, & impacts of gases & aerosols on air quality & climate from local to global scales

- INTEX-B/MILAGRO: Spring 2006
  - maximum Asian inflow to NA
  - Mexico City pollution

Partners:
U.S. (NASA, NSF, DOE), MEX, CAN, GER



INTEX-B OBJECTIVES

- **Continental Outflow:** Extent & persistence of the outflow of pollution from Mexico

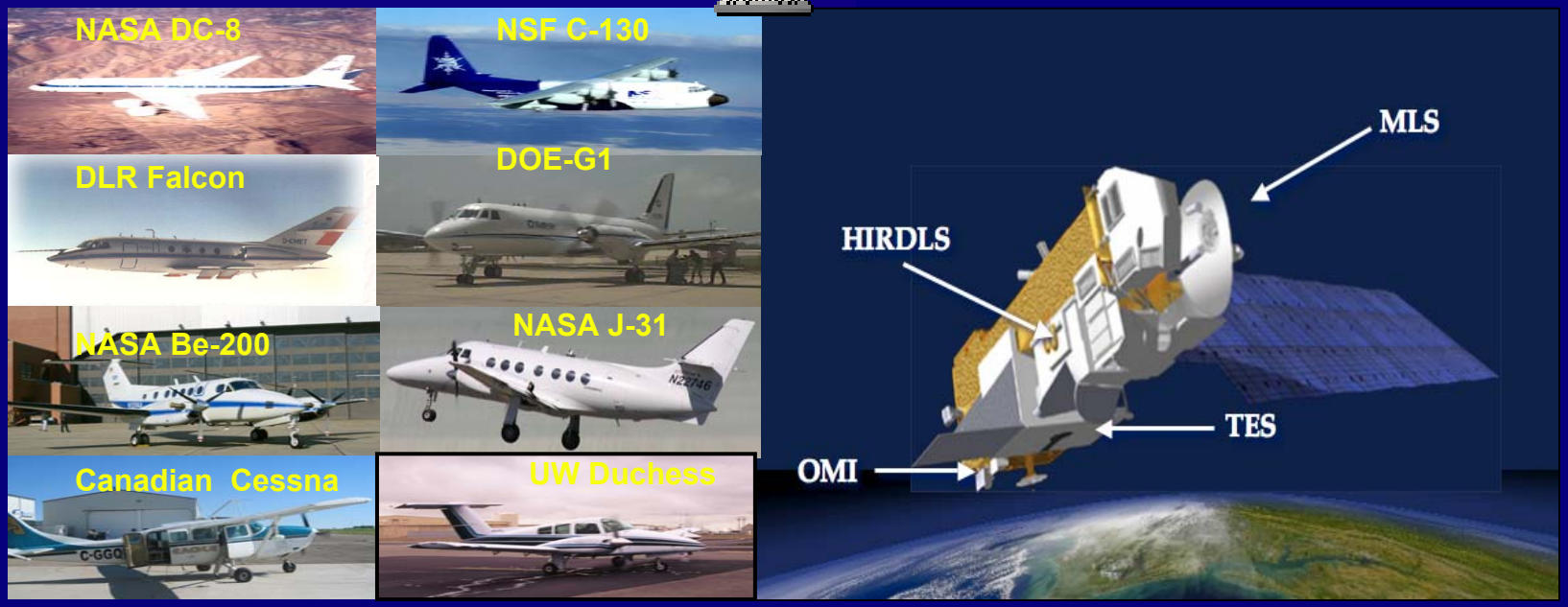
- **Transpacific Pollution:** Transport and evolution of Asian pollution & implications for air quality & climate

- **Air Quality:** Mapping of anthropogenic & biogenic emissions; relating atmospheric composition to sources & sinks

- **Aerosol Radiative Forcing:** Characterizing effects of aerosols on solar radiation over NA & Gulf of Mexico

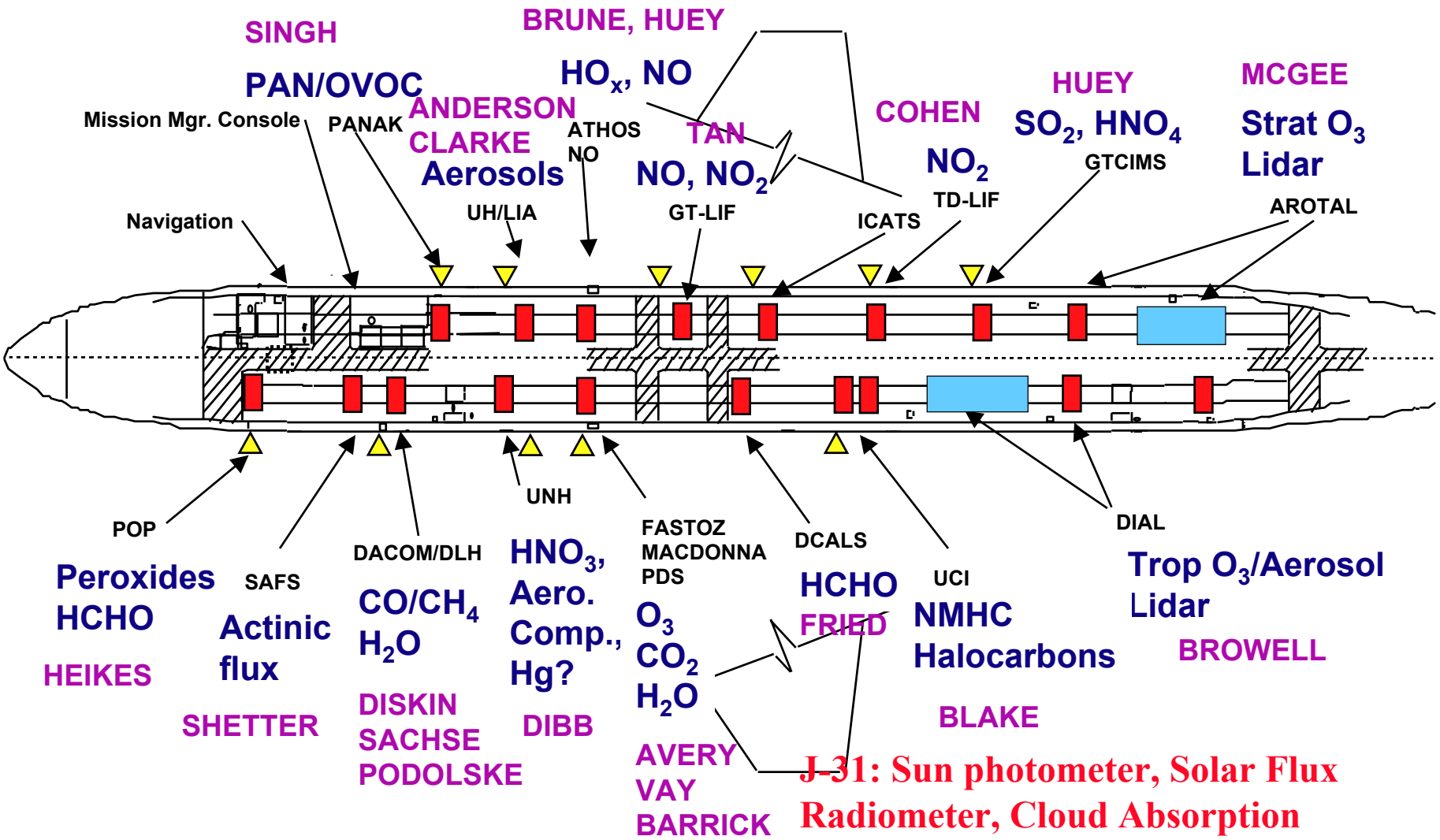
- **Satellite Validation:** Validation of space-borne observations of tropospheric composition

INTEX-B/MILAGRO Platforms & Coordination



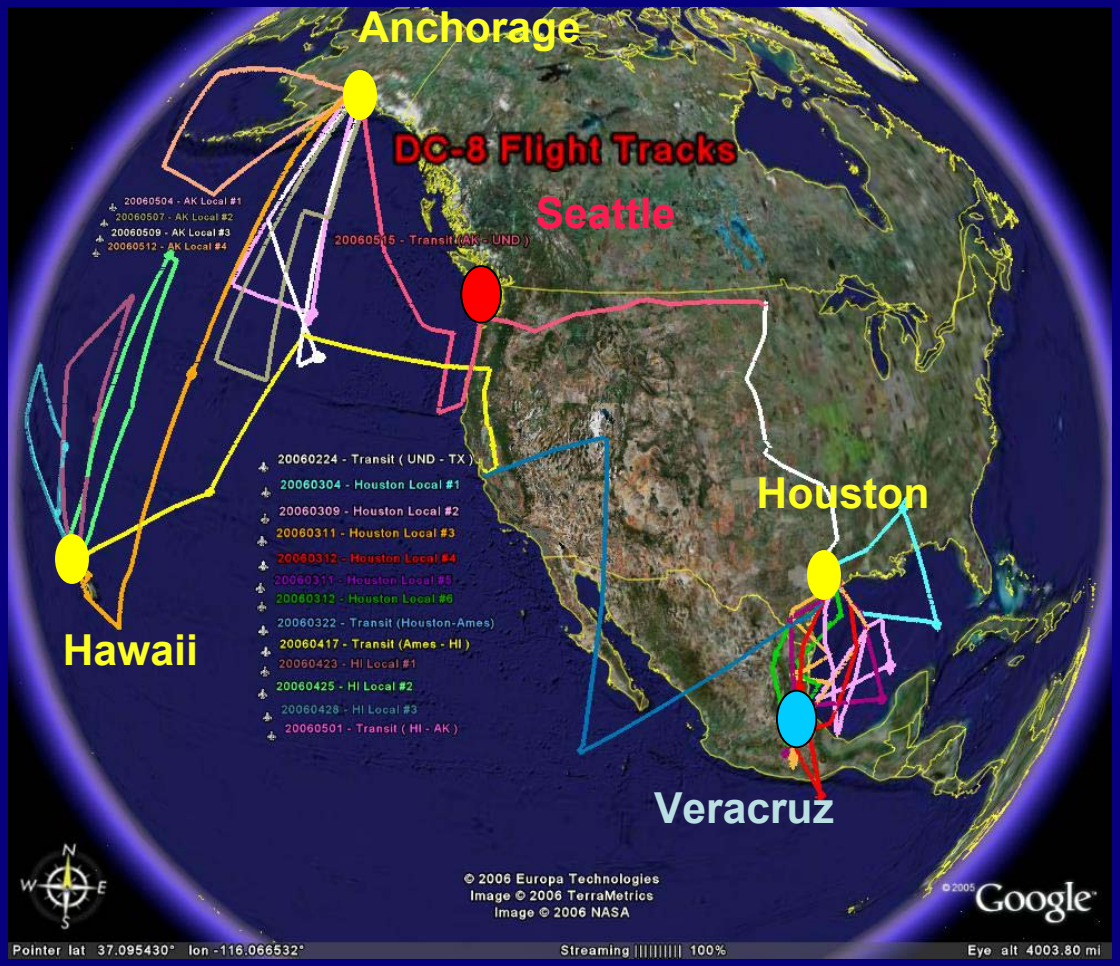
- Inter-comparisons
- Coordinated science flights
- Sharing of forecasts & data
- Joint publications

DC-8, J-31 & B-200 INTEX-B Payload



J-31: Sun photometer, Solar Flux Radiometer, Cloud Absorption Radiometer, Scanning Polarimeter;
B-200: HSRLidar, HySPAR, LAABS, Nadir digital camera

INTEX-B DC-8 Flight Tracks



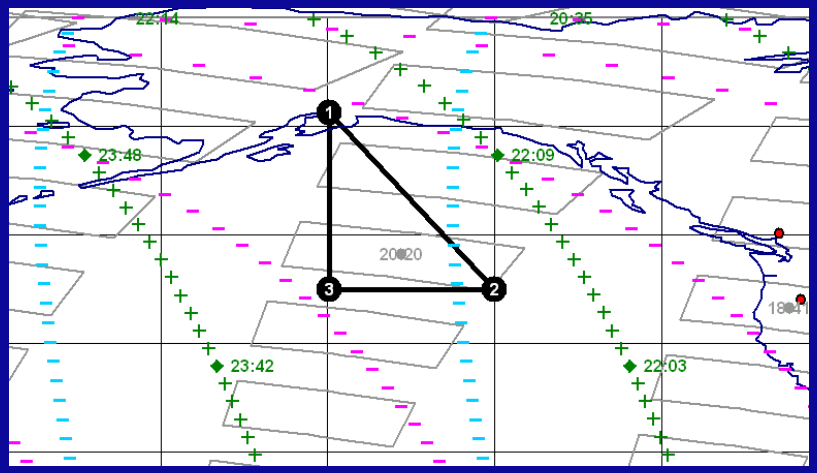
INTEX-B:
DC-8: 145 Flight hrs; 17 science flights

J-31: 43 Flight hours; 13 Science Flights

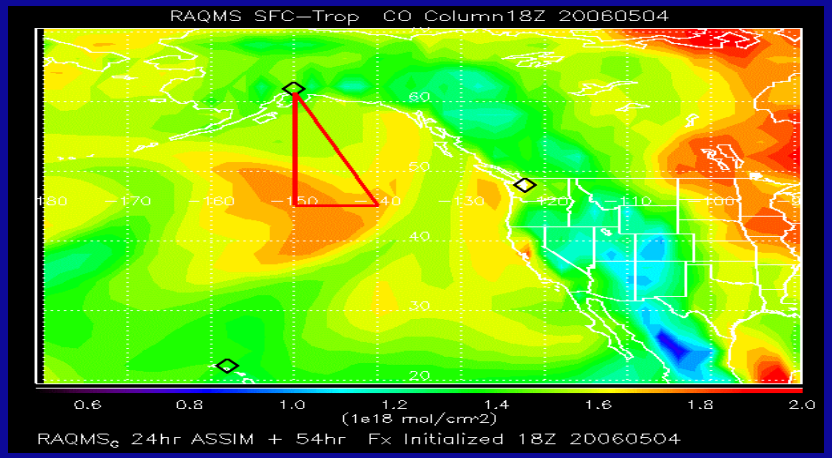
B-200: 65 Flight hrs; 18 Science Flights

- DC-8
- C-130
- C-130+J-31+B-200+G-1

Model Forecasts for Flight Planning



SAT Tracks



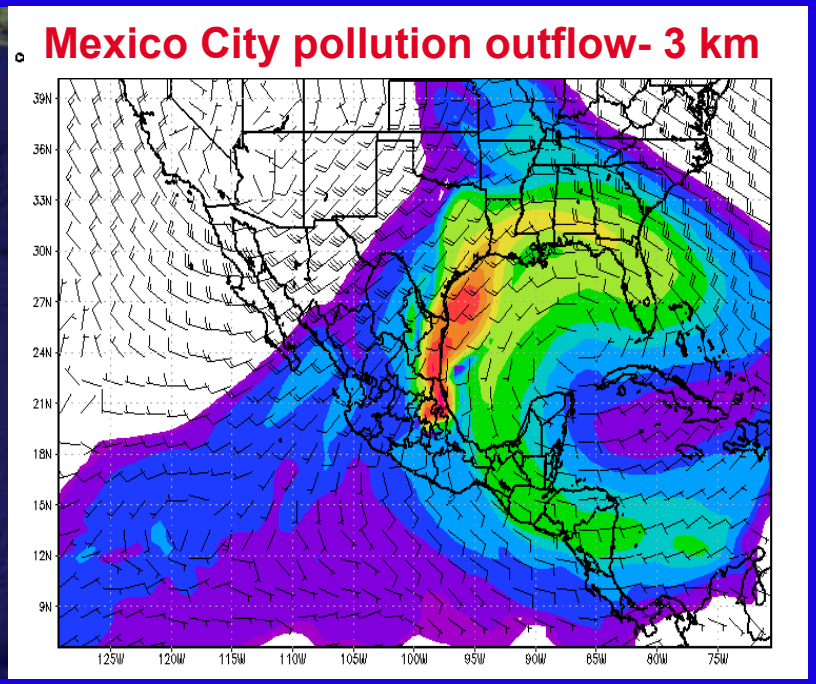
Model Forecasts

MET data
Trajectories
Convective influences
Fires

AIRS- CO
MOPITT- CO
MODIS- Aerosol
SCIA- NO2
GOES- clouds

GEOS-Chem (Harvard)
MOZART (NCAR)
RAQMS (Langley)
STEM (U. Iowa)
PNL (Milagro)

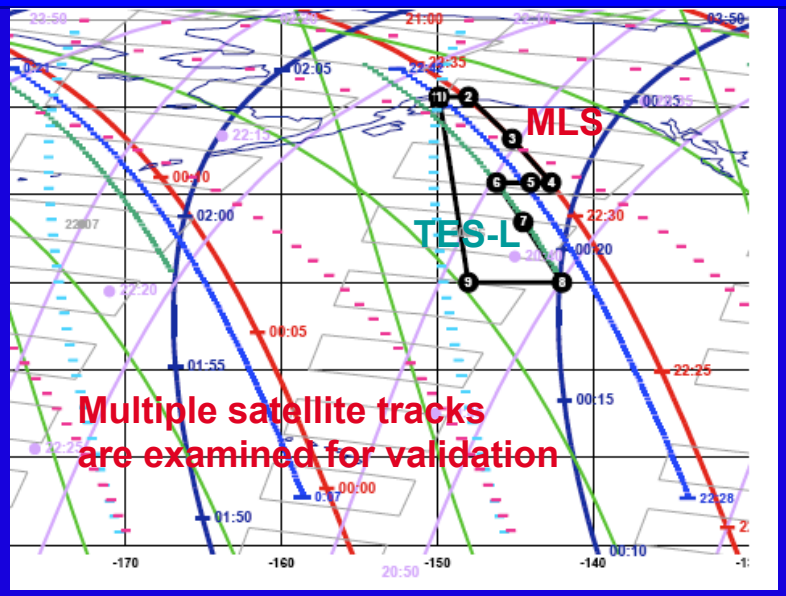
INTEX-B Flights Accomplish Multiple Objectives - Example 1: DC-8 Flight 8 (19 March, '06)

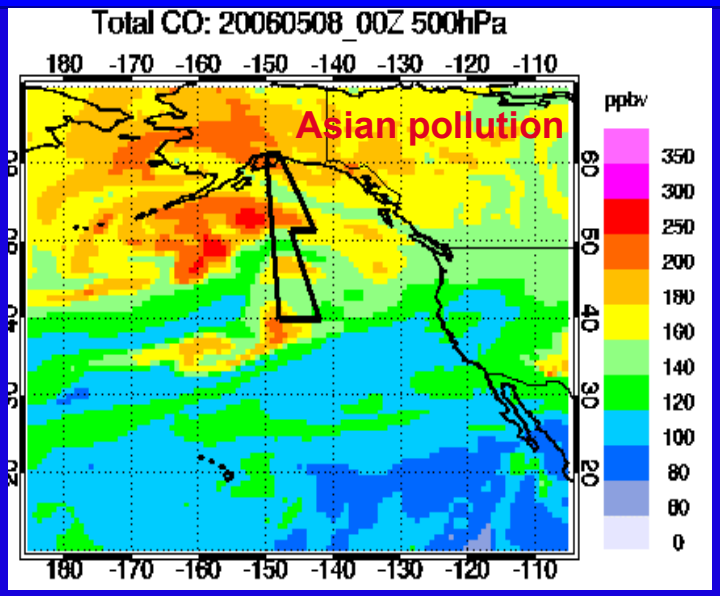


Flight 8 objectives:

- DC-8 inter-comparison with the C-130
- DC-8/J-31 coordinated spiral over Mexico City (MC)
- DC-8 validation of TES & OMI in the nadir (spiral) & along track
- Near source characterization of MC & Monterrey pollution
- Sampling of aged MC pollution outflow

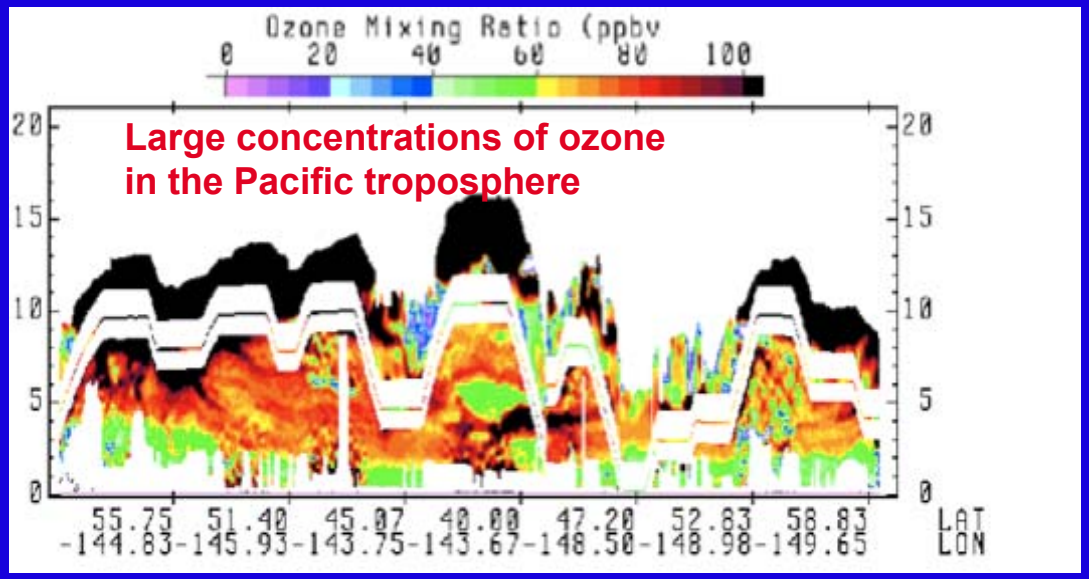
INTEX-B Flights Accomplish Multiple Objectives - Example 2 : DC-8 Flight 16 from Anchorage





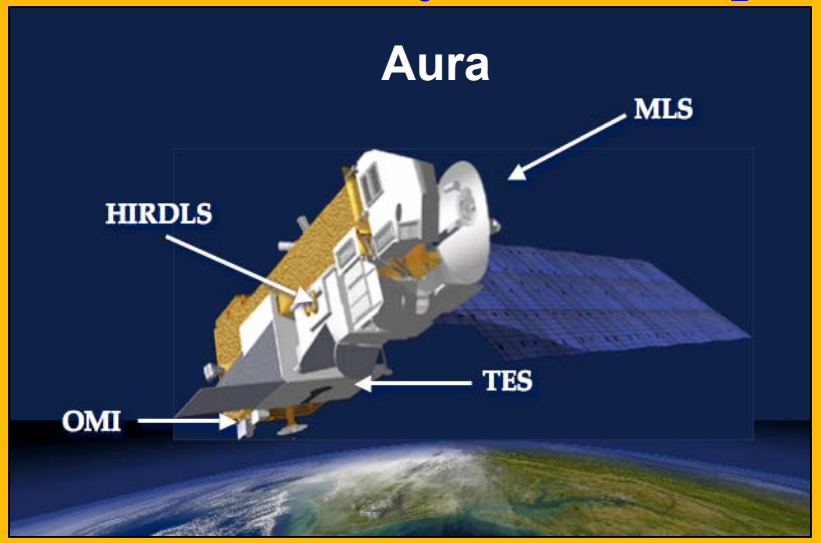
Flight 16 objectives:

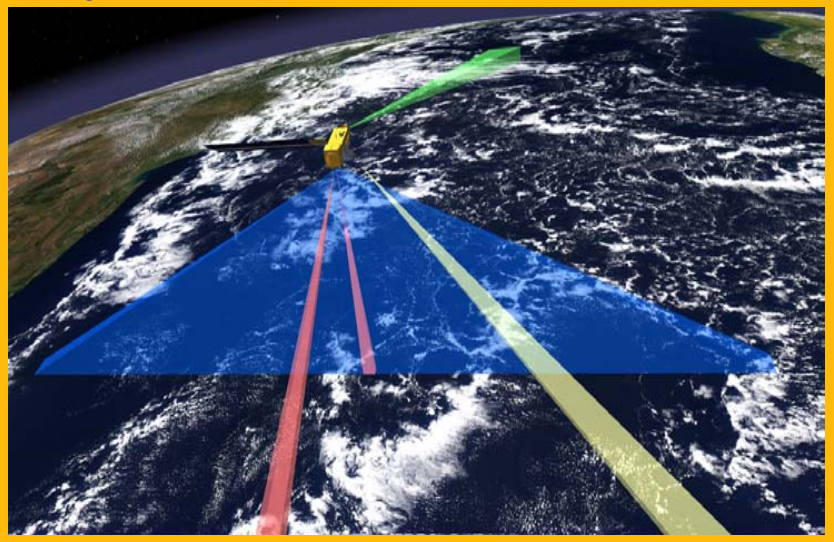
- Sampling fresh & aged Asian pollution
- MLS validation
- TES-limb validation



INTEX-B Targeted Aura Satellite Validation Activities

(CO, O_3, $HCHO$, NO_2, HNO_3, H_2O, HCN, Aerosol)





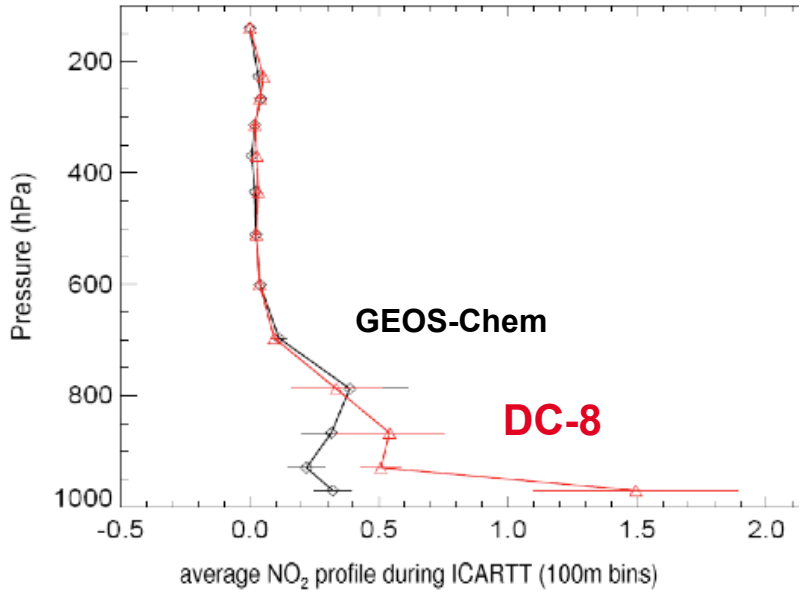
Aura/ others	DC-8															C-130					
	3/4	3/9	3/12	3/16	3/19	3/21	4/17	4/23	4/25	4/26	4/30	5/4	5/7	5/9	5/12	4/24	4/28	5/1	5/3	5/8	5/11
TES*	●	●	●	●	●		●	●	●	●	●		●	●	●						
OMI	●	●	●	●	●		●	●				●				●	●		●	●	●
HIRDLS#						●					●										
MLS									●				●								
Others**	●	●		●	●	●	●	●		●	●	●	●		●			●		●	●

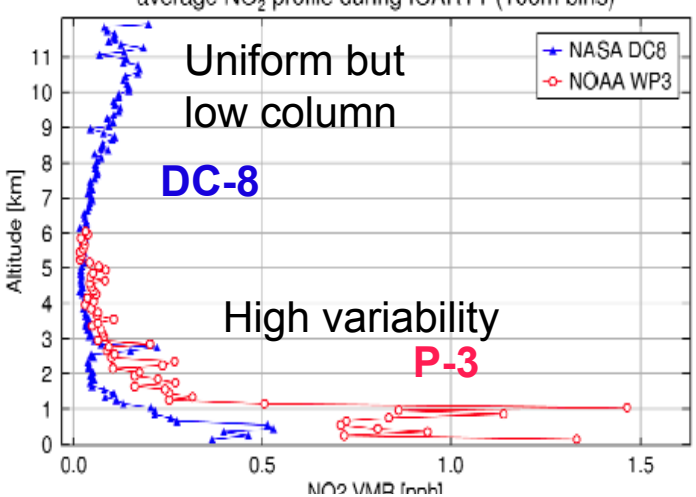
* TES validation for Nadir & Limb measurements over land and water

Night flights required for HIRDLS validation

** Mainly AIRS, SCIAMACHY, and MODIS

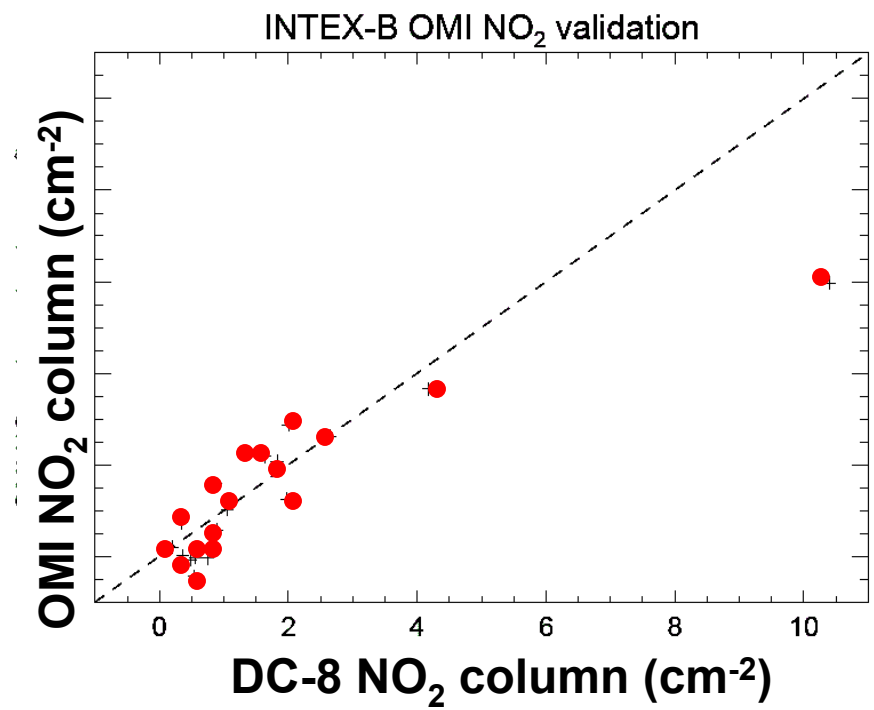
Validation of OMI Trop NO_2 During INTEX-B



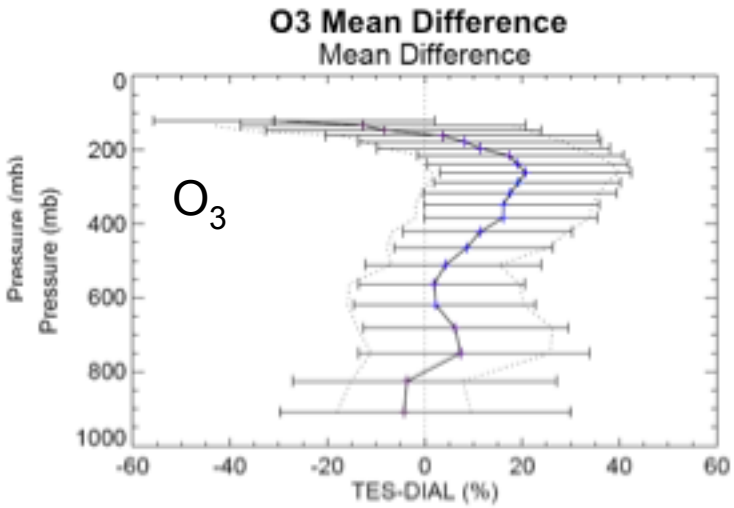


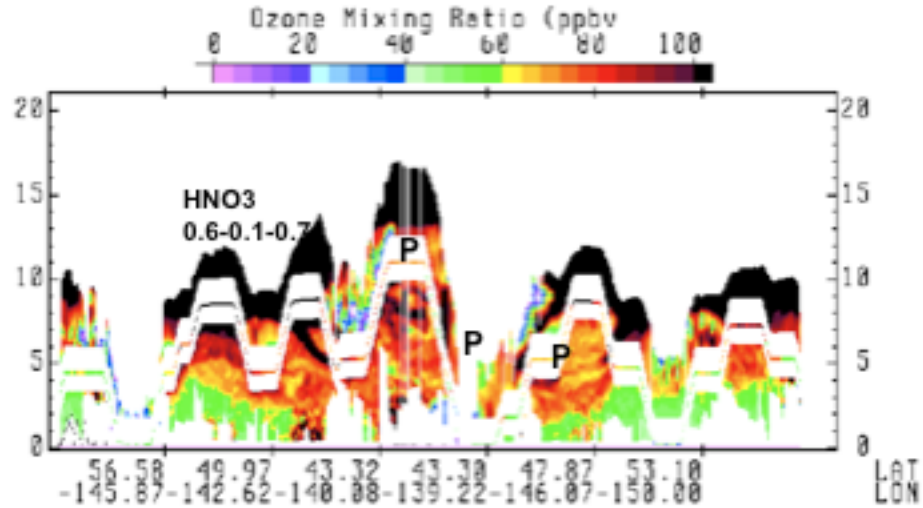
NO_2 (ppb)

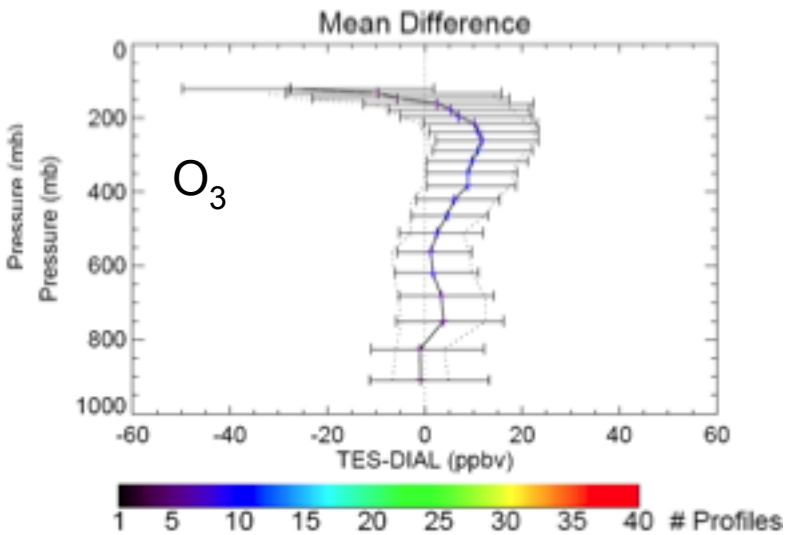
OMI NO_2 Validation w/aircraft profiles

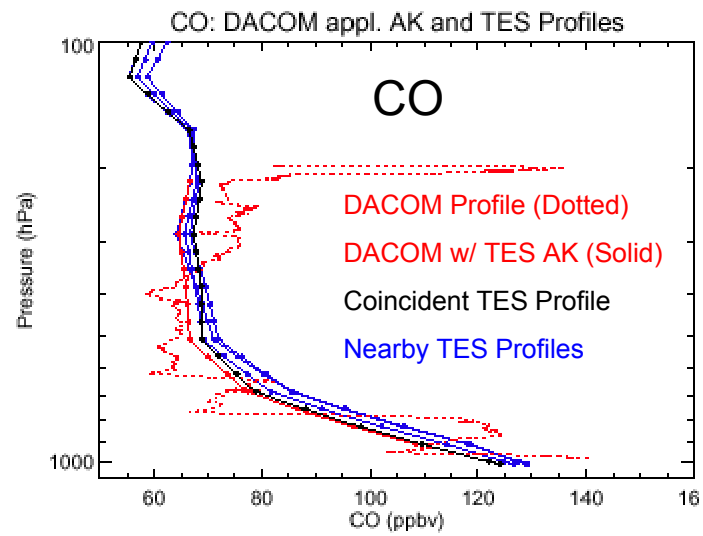


O_3, CO, & HNO_3 Comparisons Between TES & DC-8

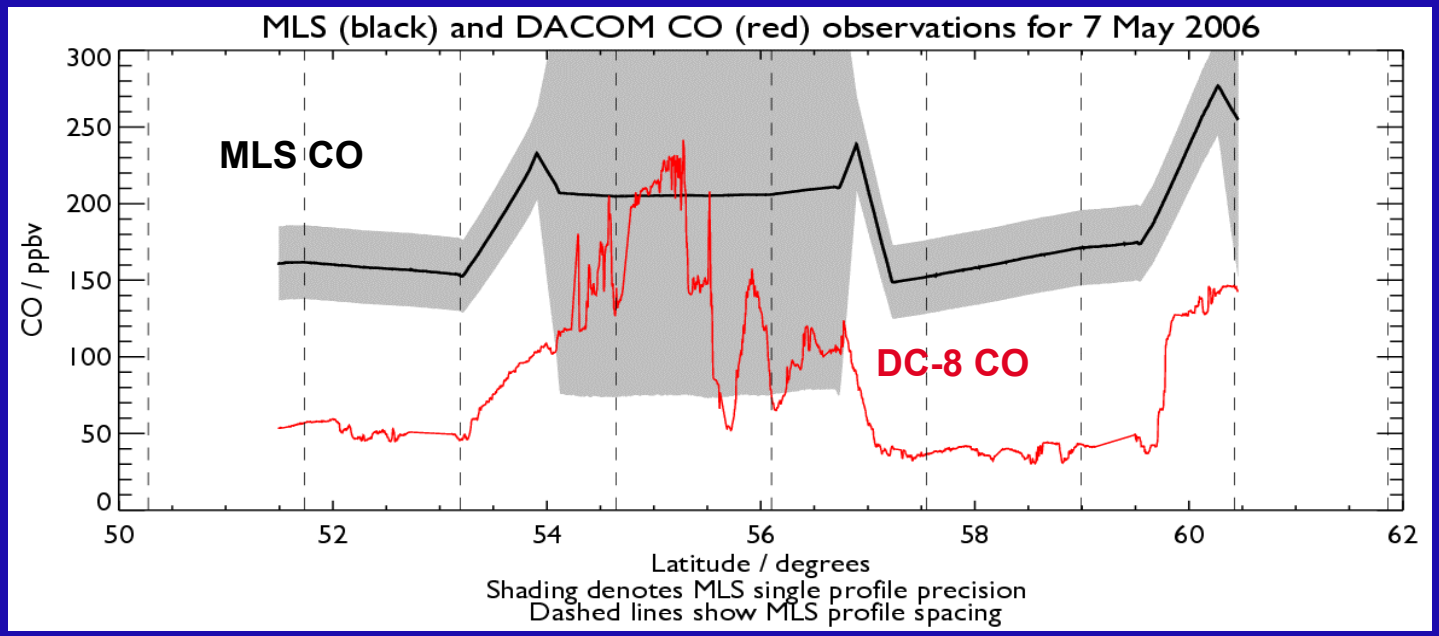








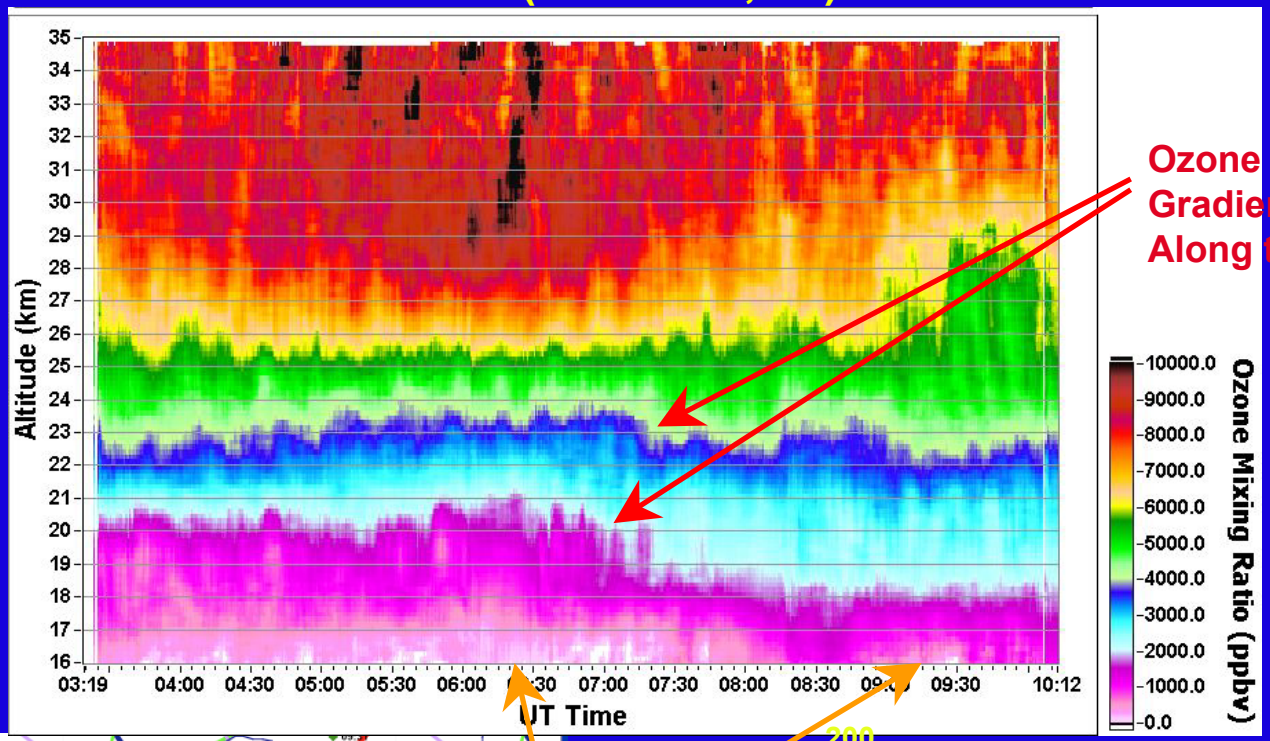
DC-8 & MLS: Sample of Correlative Observations in INTEX-B

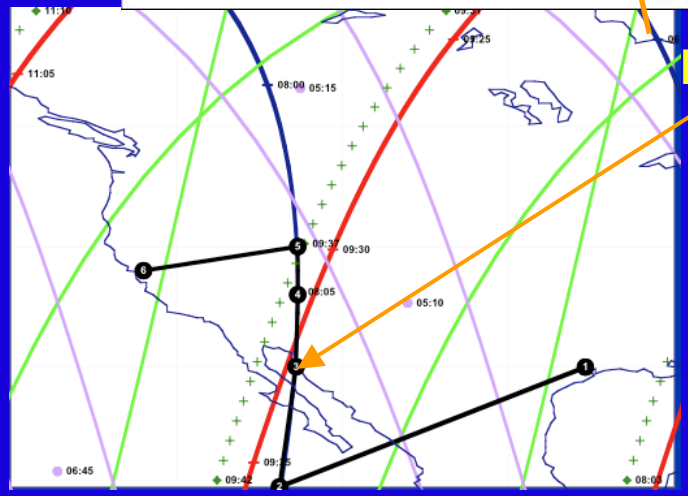


- Encouraging general agreement on CO morphology
- INTEX flights confirm high bias in MLS v1.51 UT CO data
- Later MLS processing to address the UT bias issue

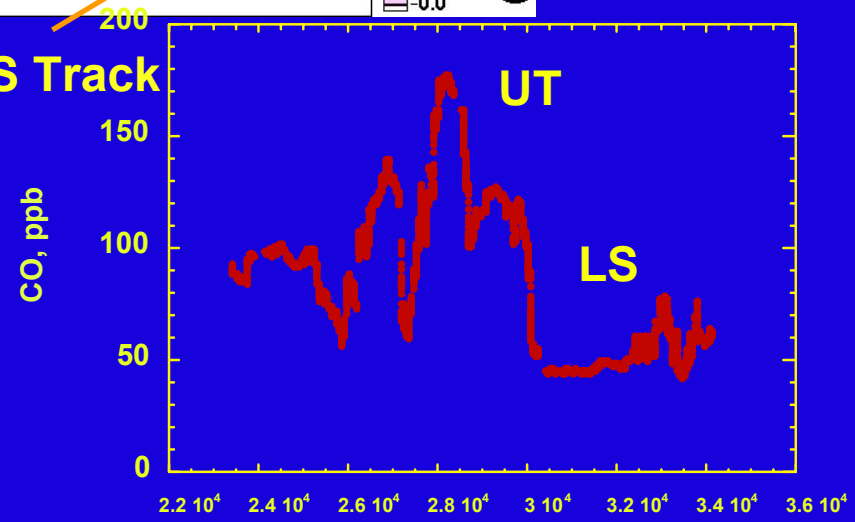
HIRDLS Track: INTEX-B/AROTAL O_3 Night Flight

(March 22,'06)

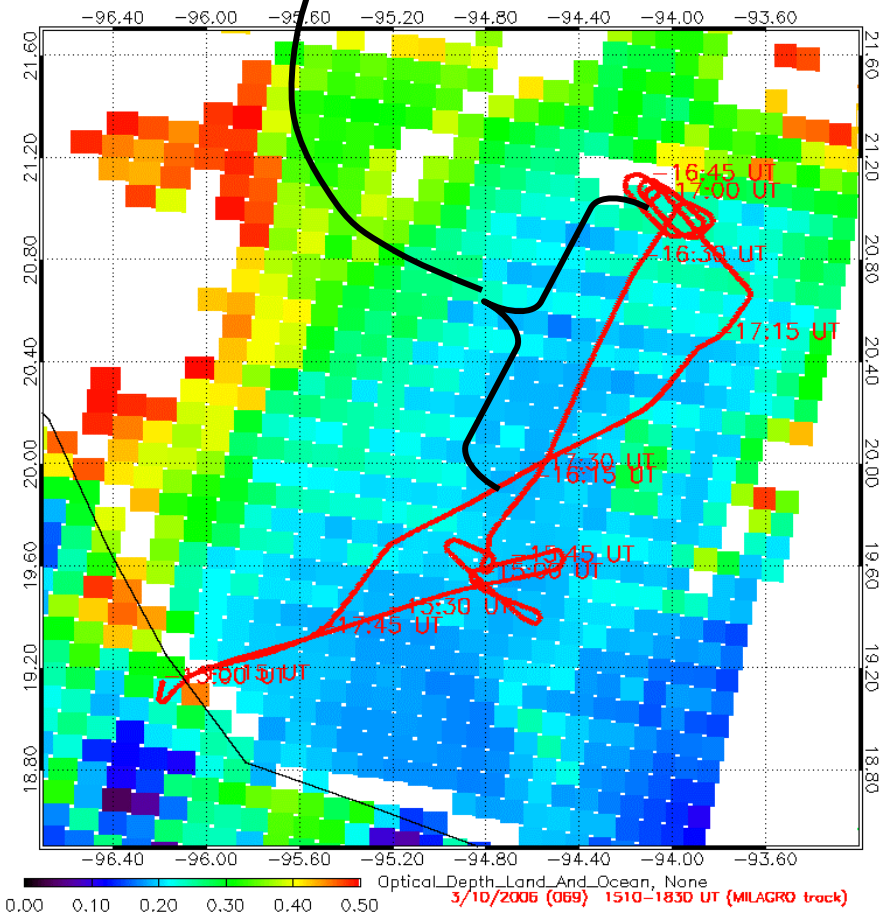




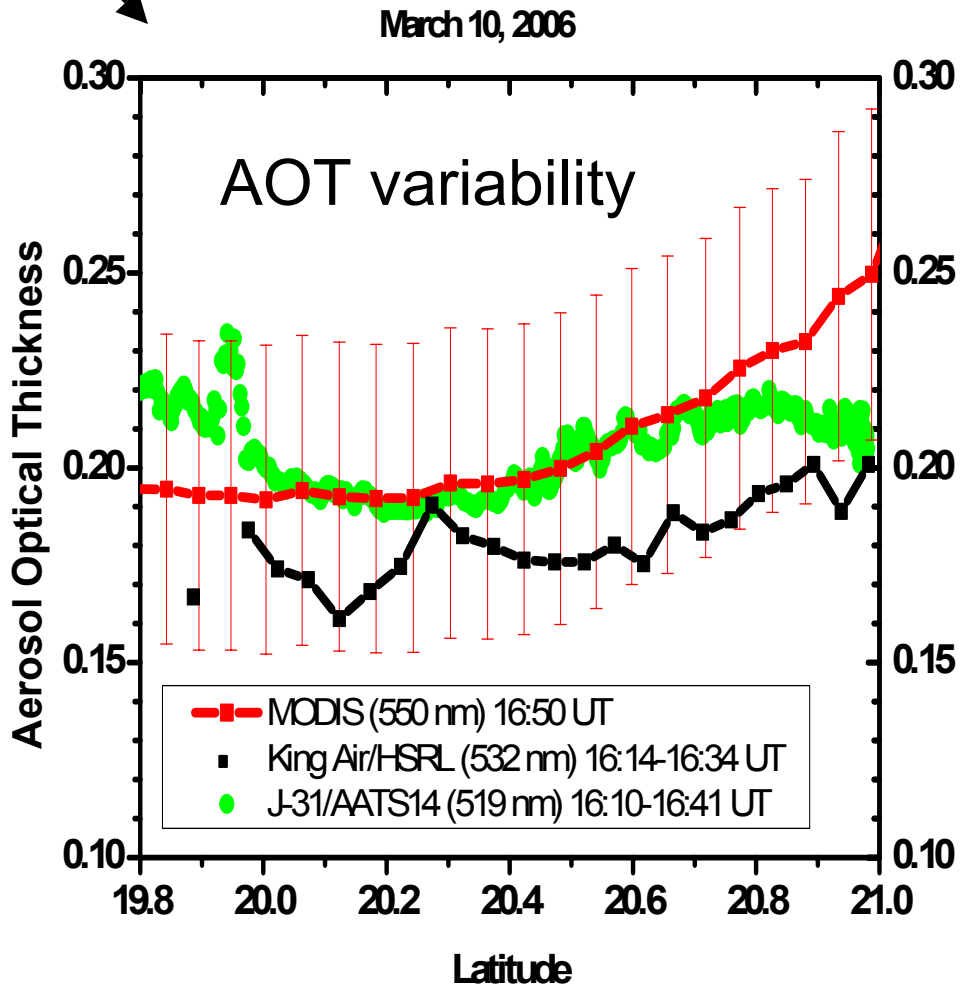
HIRDLS Track



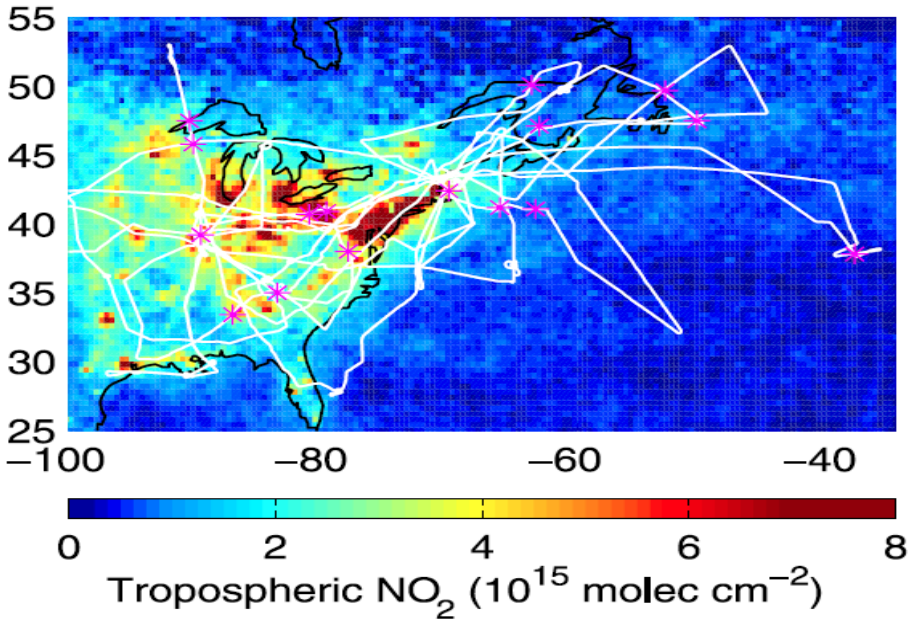
J-31 & King Air Evaluate MISR/MODIS/OMI Optical Measurements

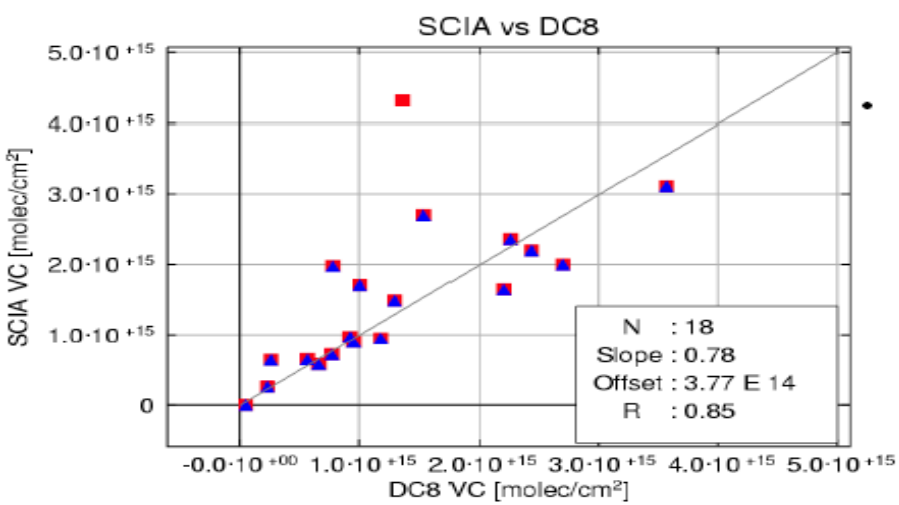


Terra MODIS AOT (550 nm)

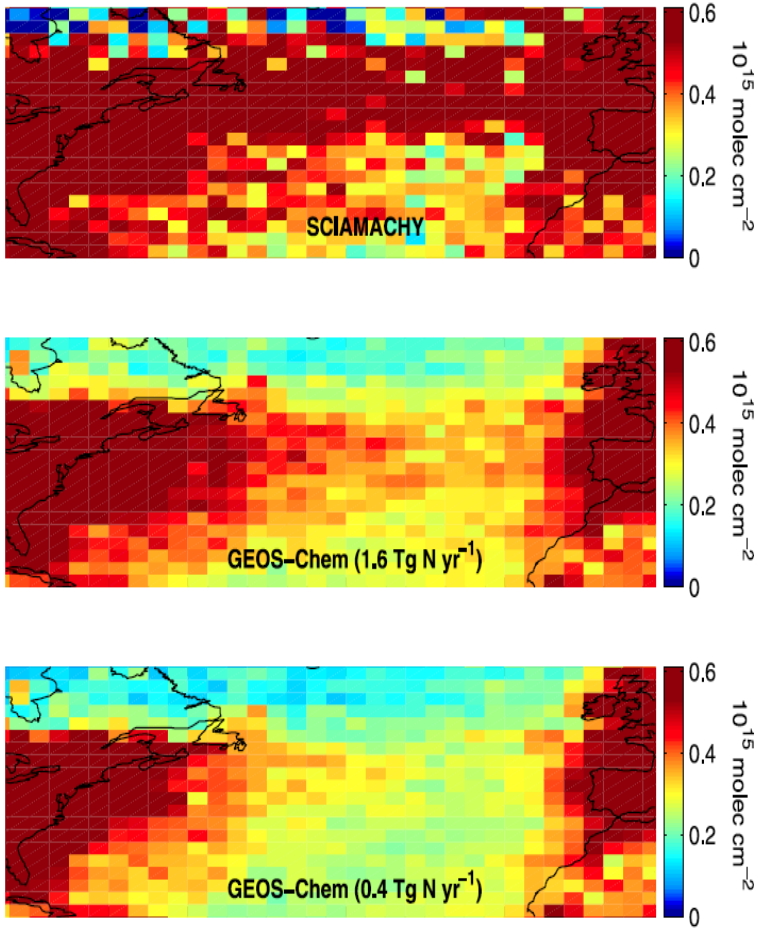


DC-8/SCIA Tropospheric Column: NO_2 & HO_x



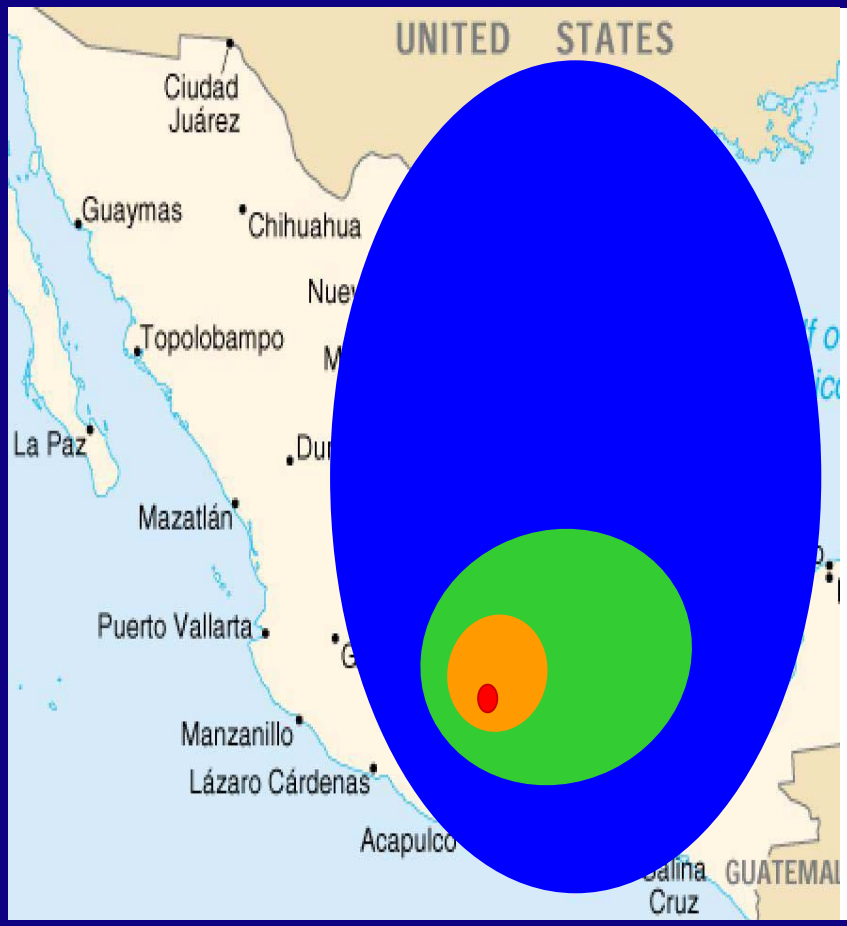
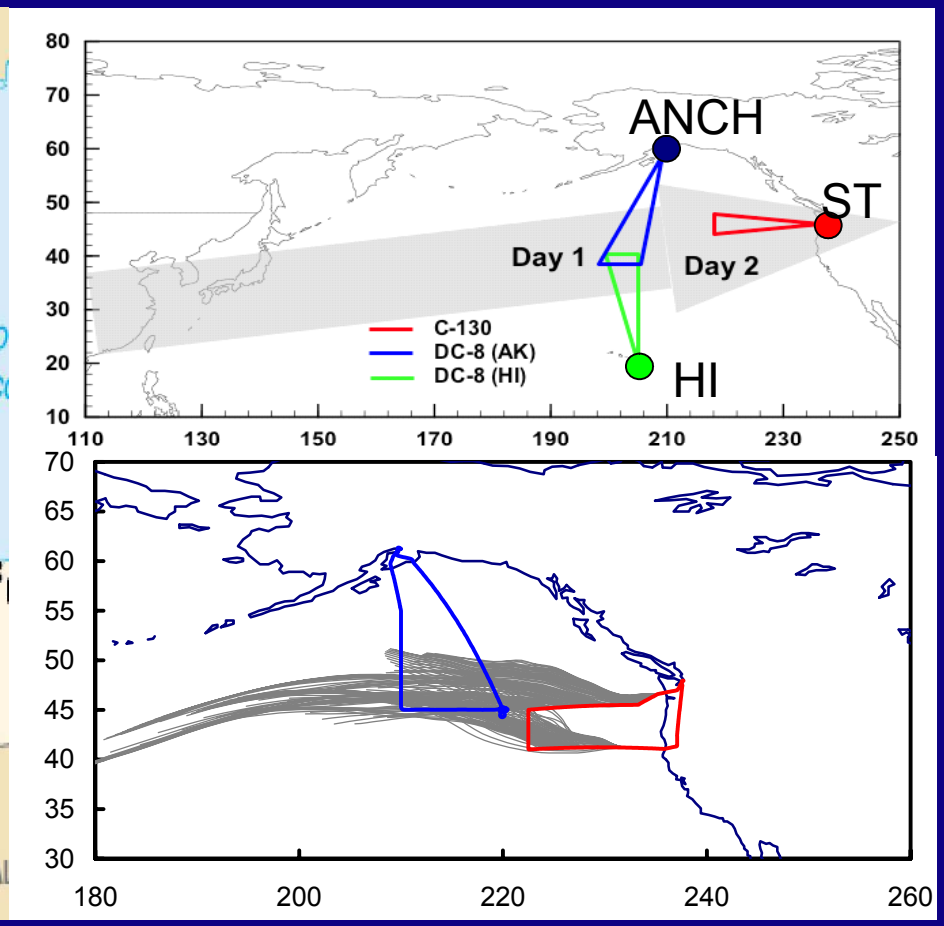


Lightning emissions 5-10 times expected



Preliminary Concluding Observations

- Science based field experiments can perform extensive satellite validation and guide the future utility of satellite observations (e. g. organics)

- INTEX has provided a remarkably rich data set to interpret satellite observations, develop better predictive capabilities, & enhance overall science

DC-8 & C-130 Coordination in INTEX-B