Ozone and Aerosol Measurements with Airborne Lidar During the INTEX-NA Field Experiment: Initial Results

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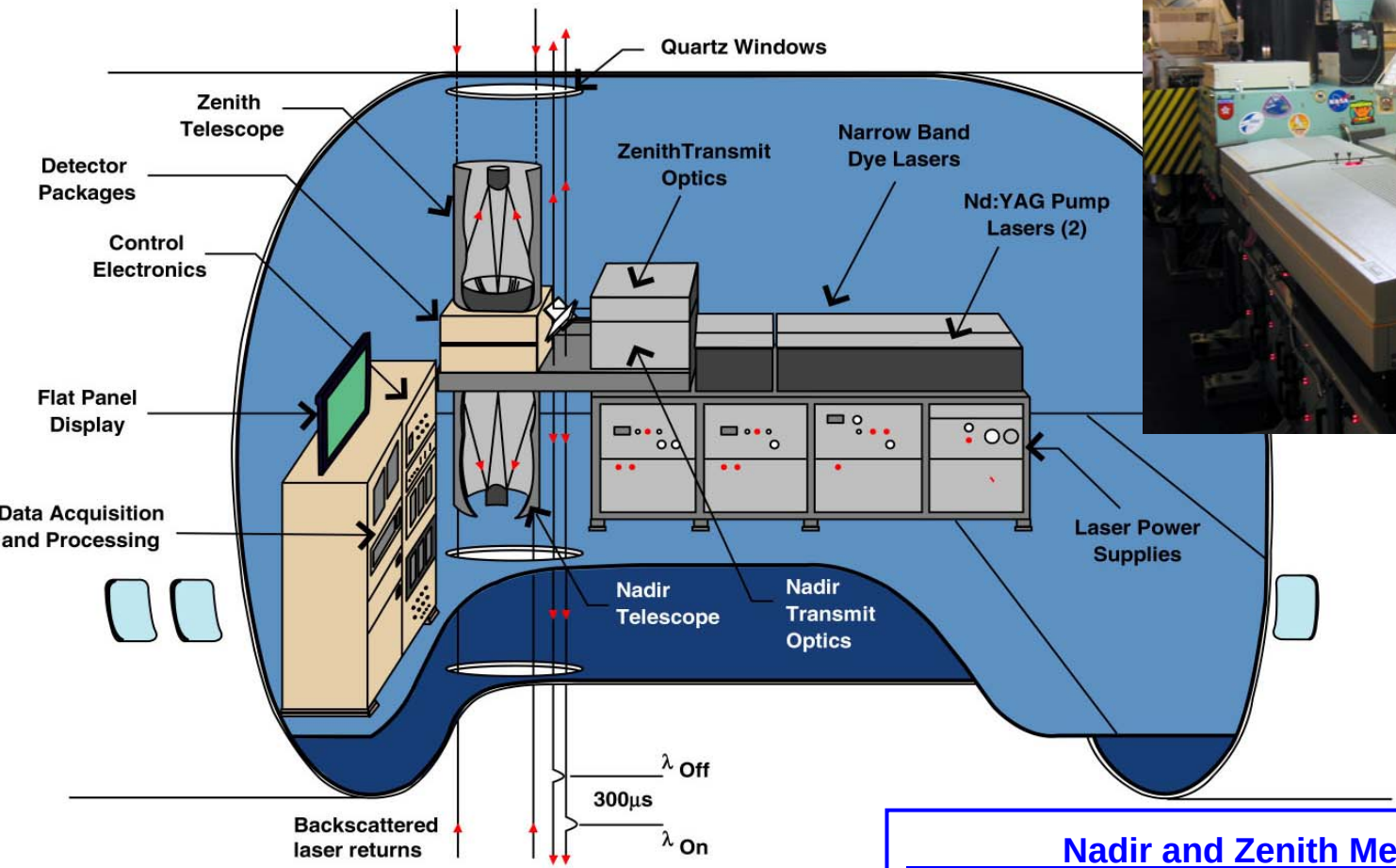
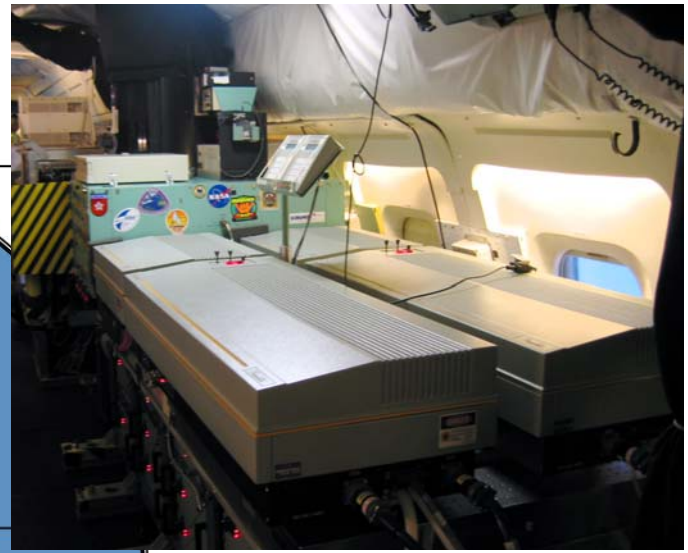
Hampton, Virginia

INTEX-NA Workshop
29 March - 1 April 2005

Airborne Ozone & Aerosol Lidar Measurements

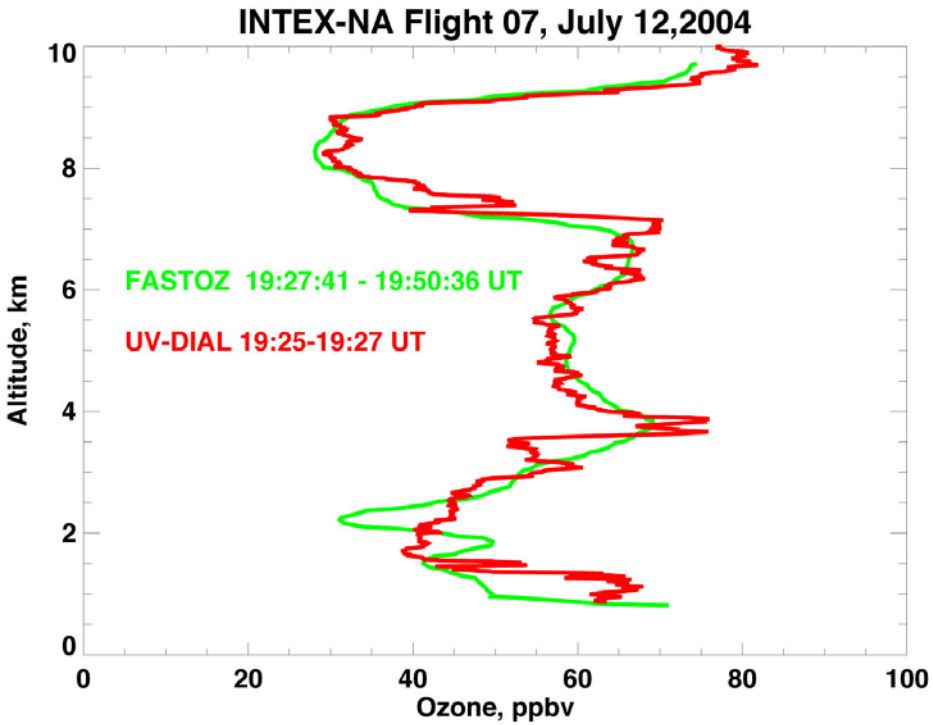


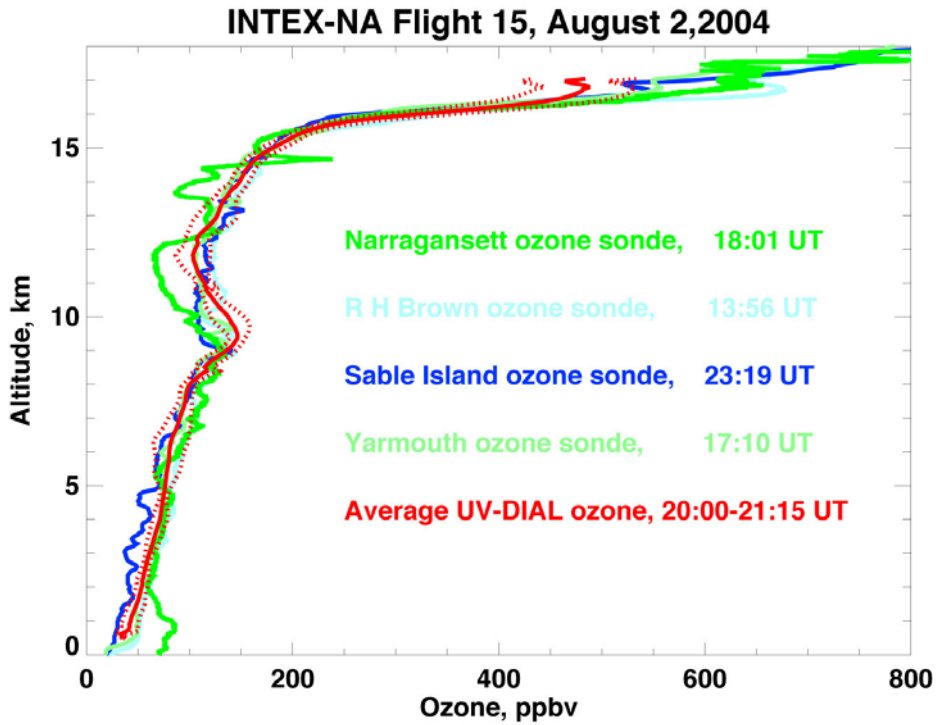


Nadir and Zenith Measurements

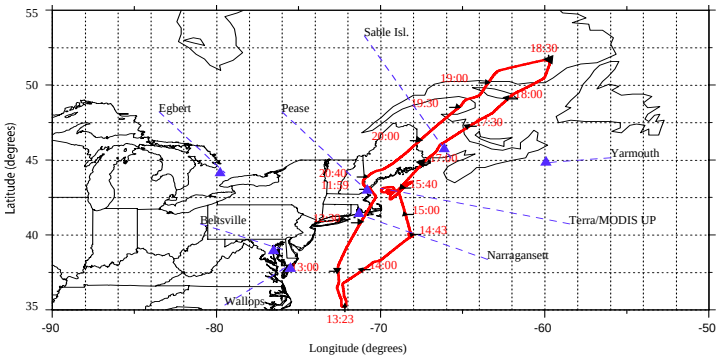
- Ozone Profiles (λ_{ON} = 288 nm & λ_{OFF} = 300 nm)
- Aerosol Backscatter Ratios Profiles (1064, 600, 300 nm)
- Aerosol Depolarization Ratio Profiles (600 nm)

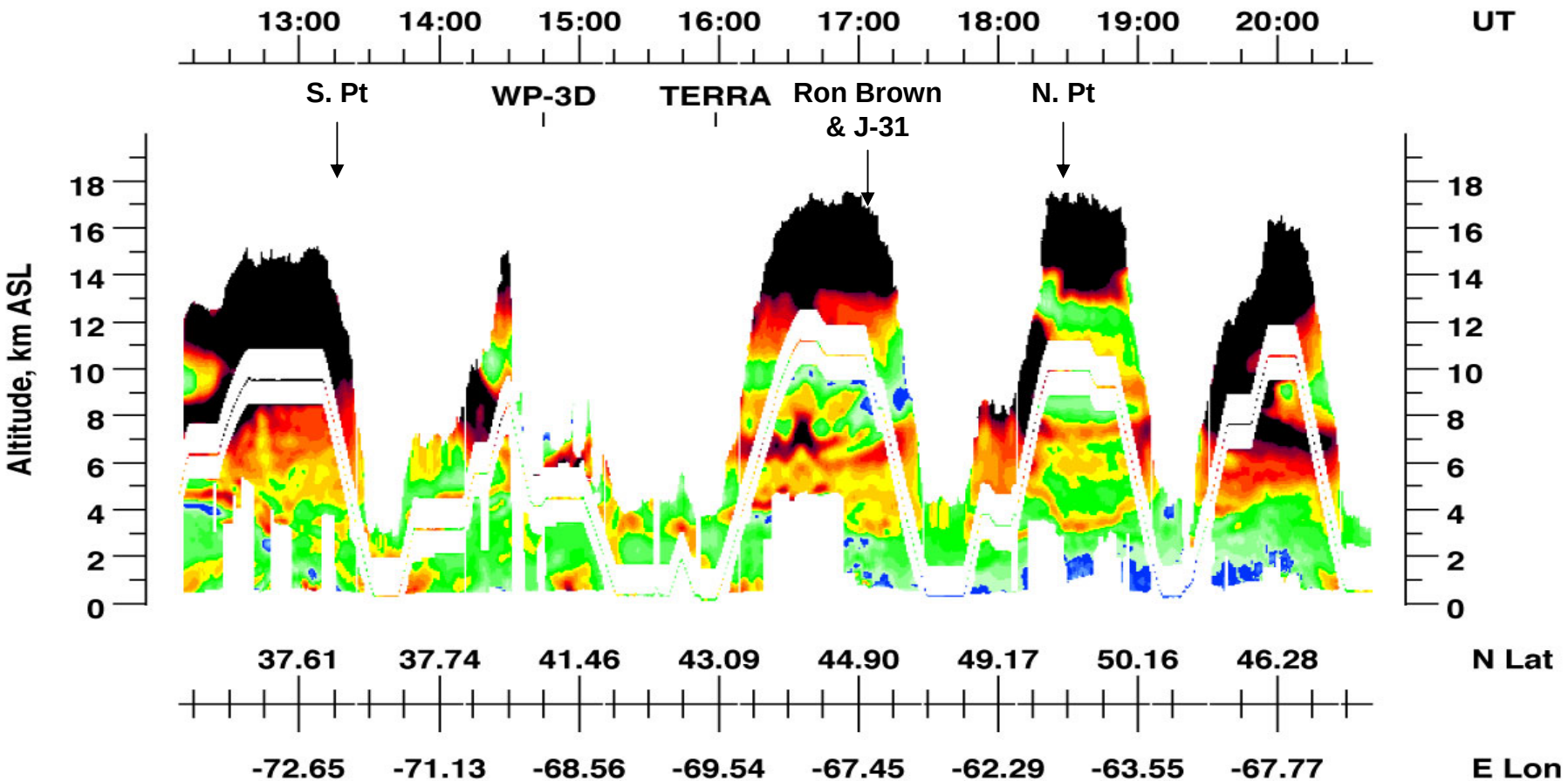
Sample DIAL Ozone Comparisons





22 July 2004 (Flight #11) River of Pollution





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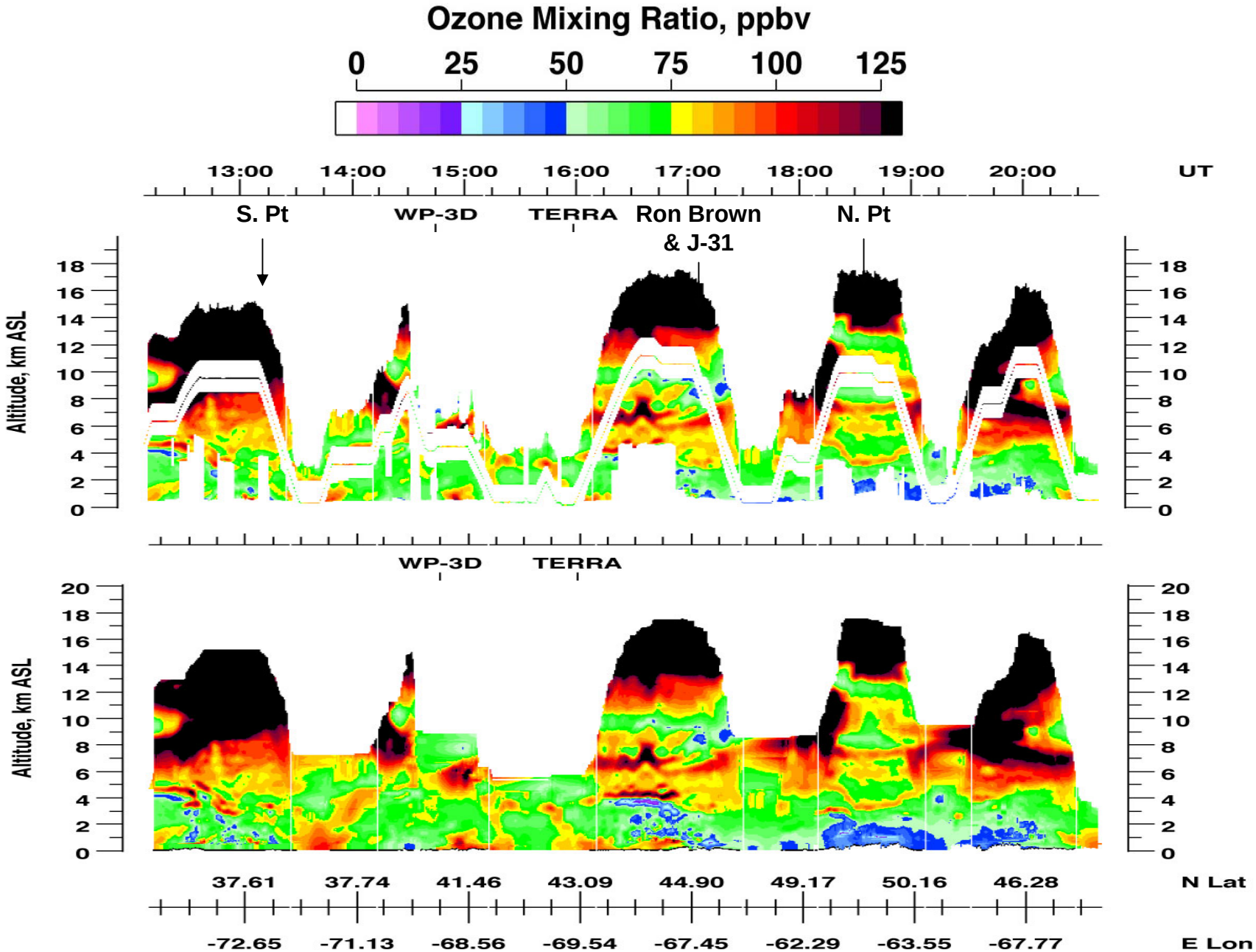

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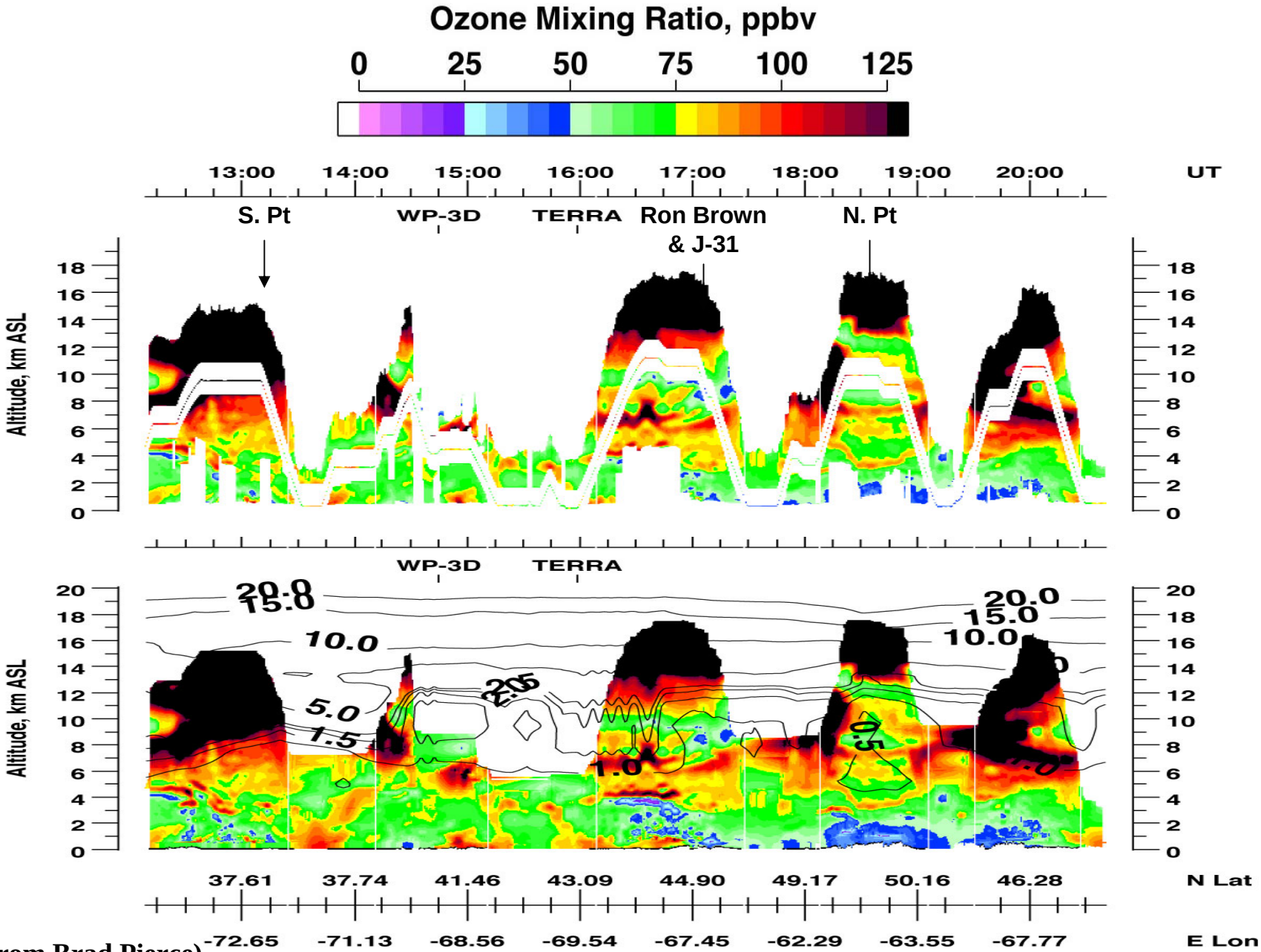
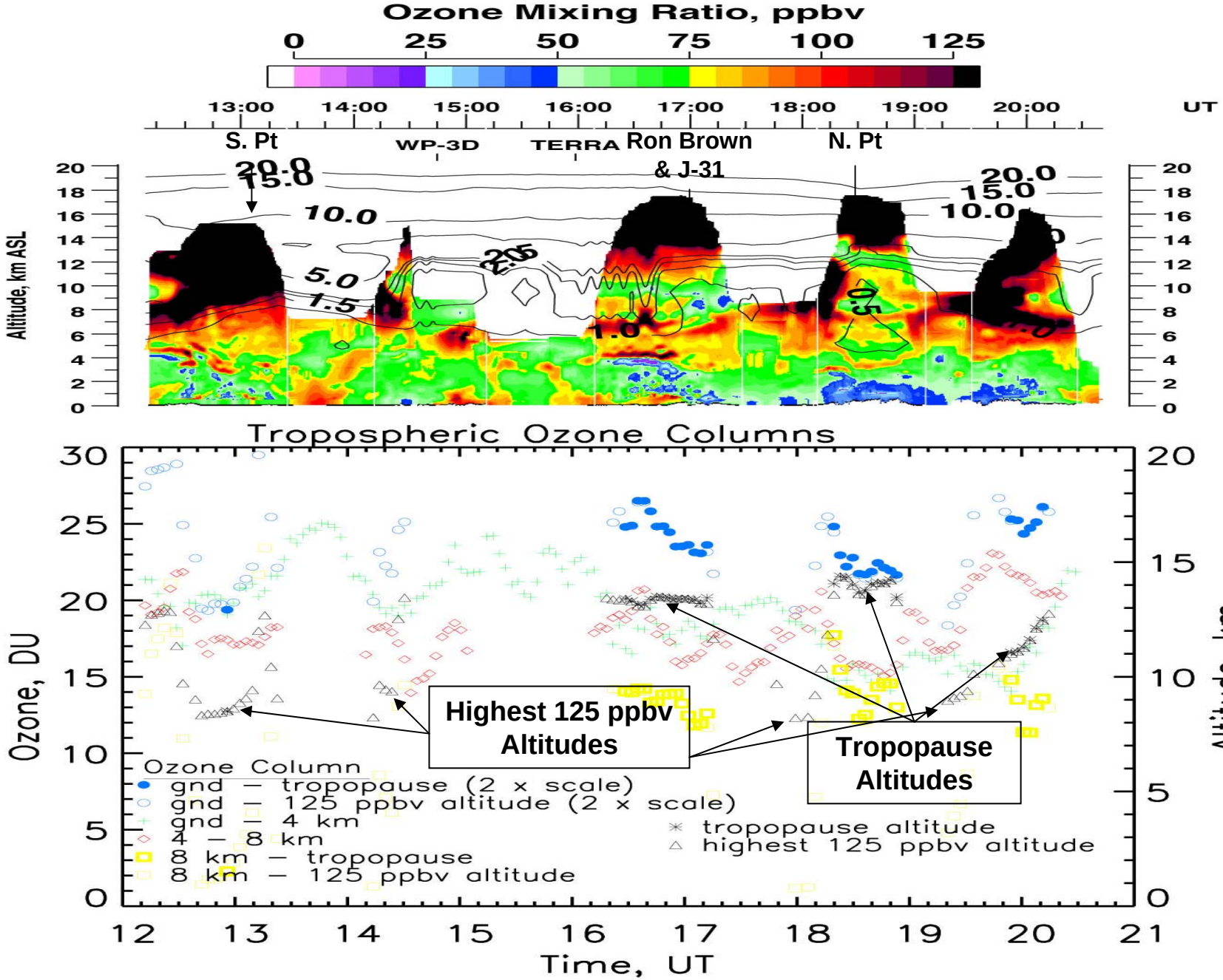


(PV from Brad Pierce)

22 July 2004 (Flight #11) River of Pollution



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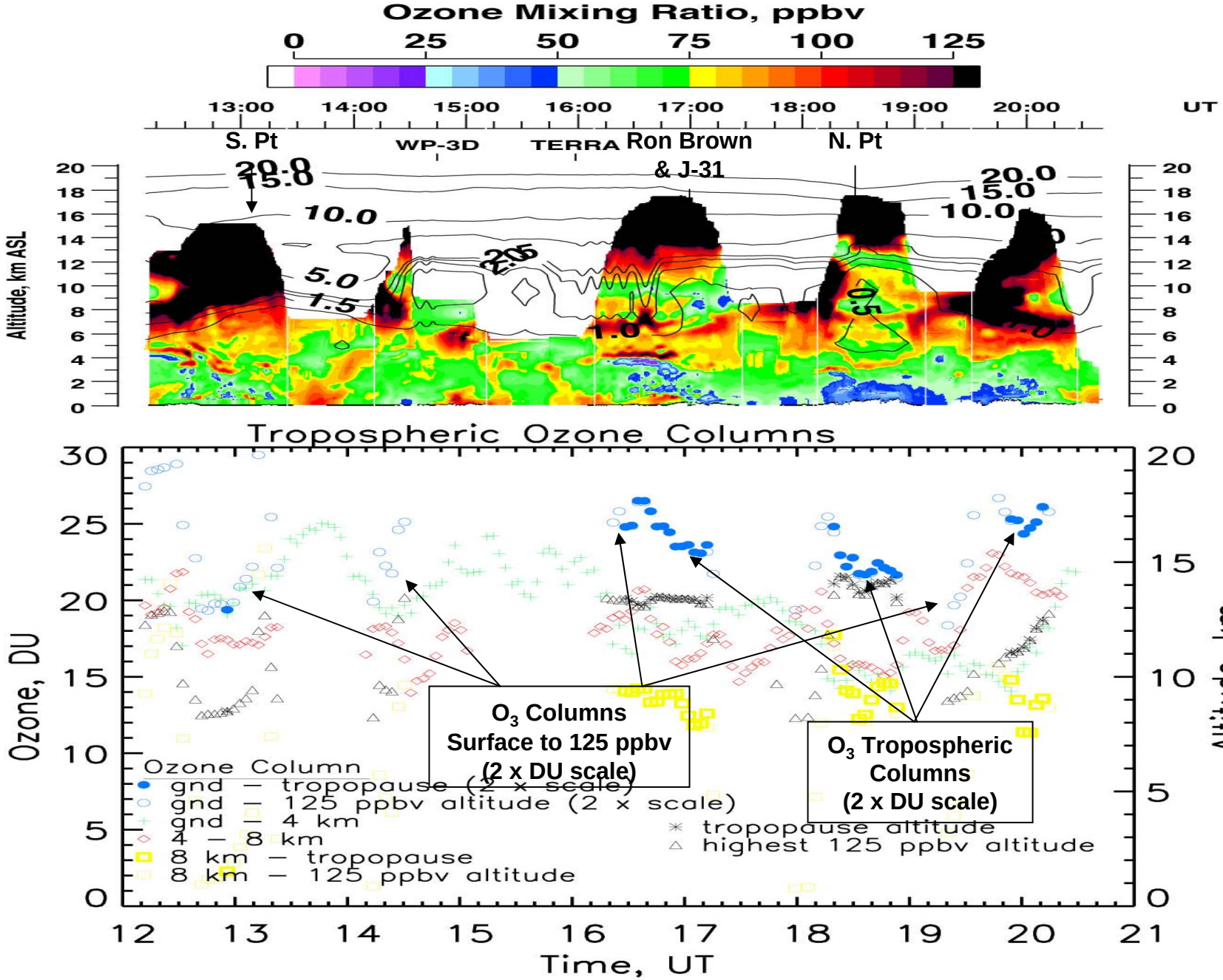

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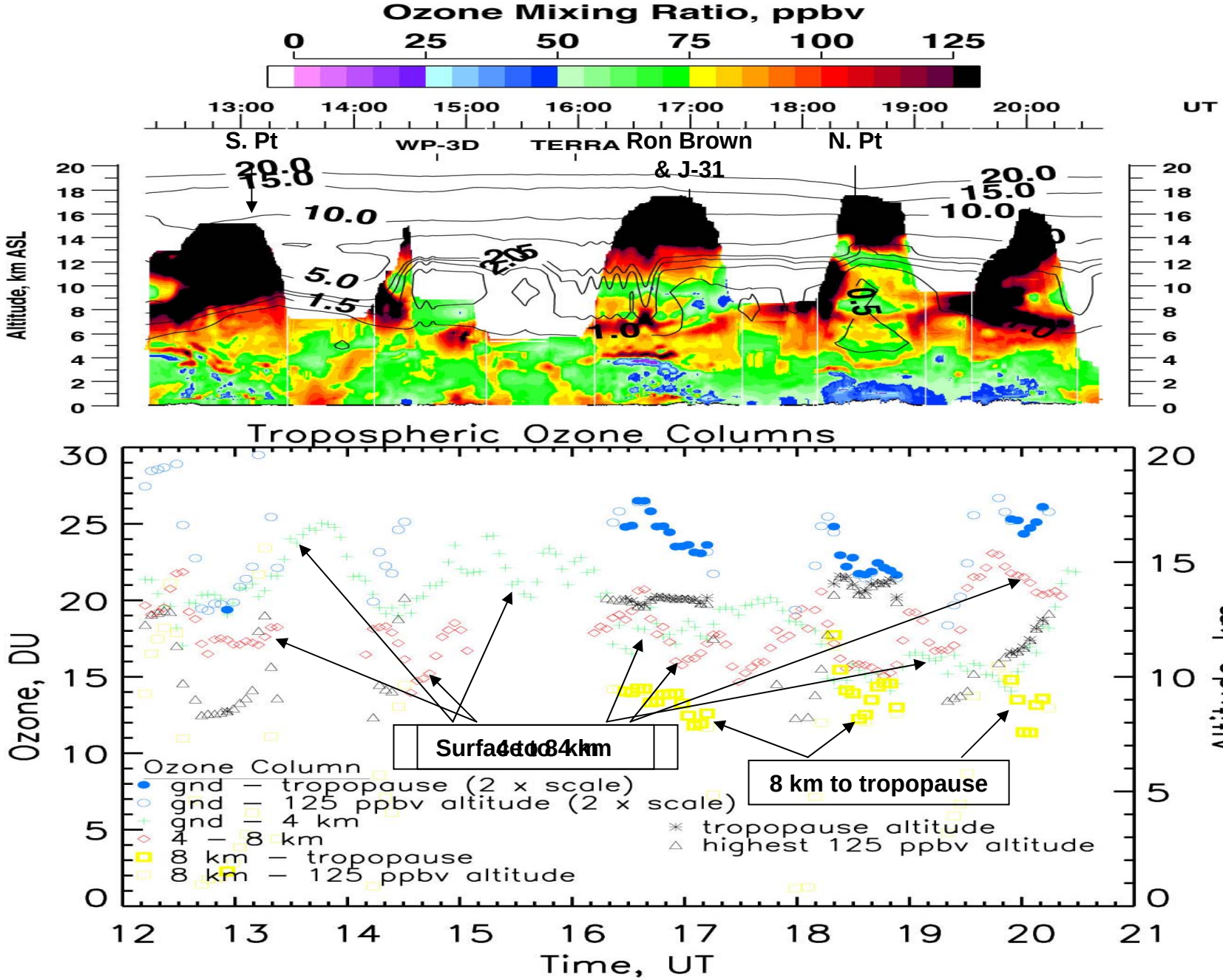

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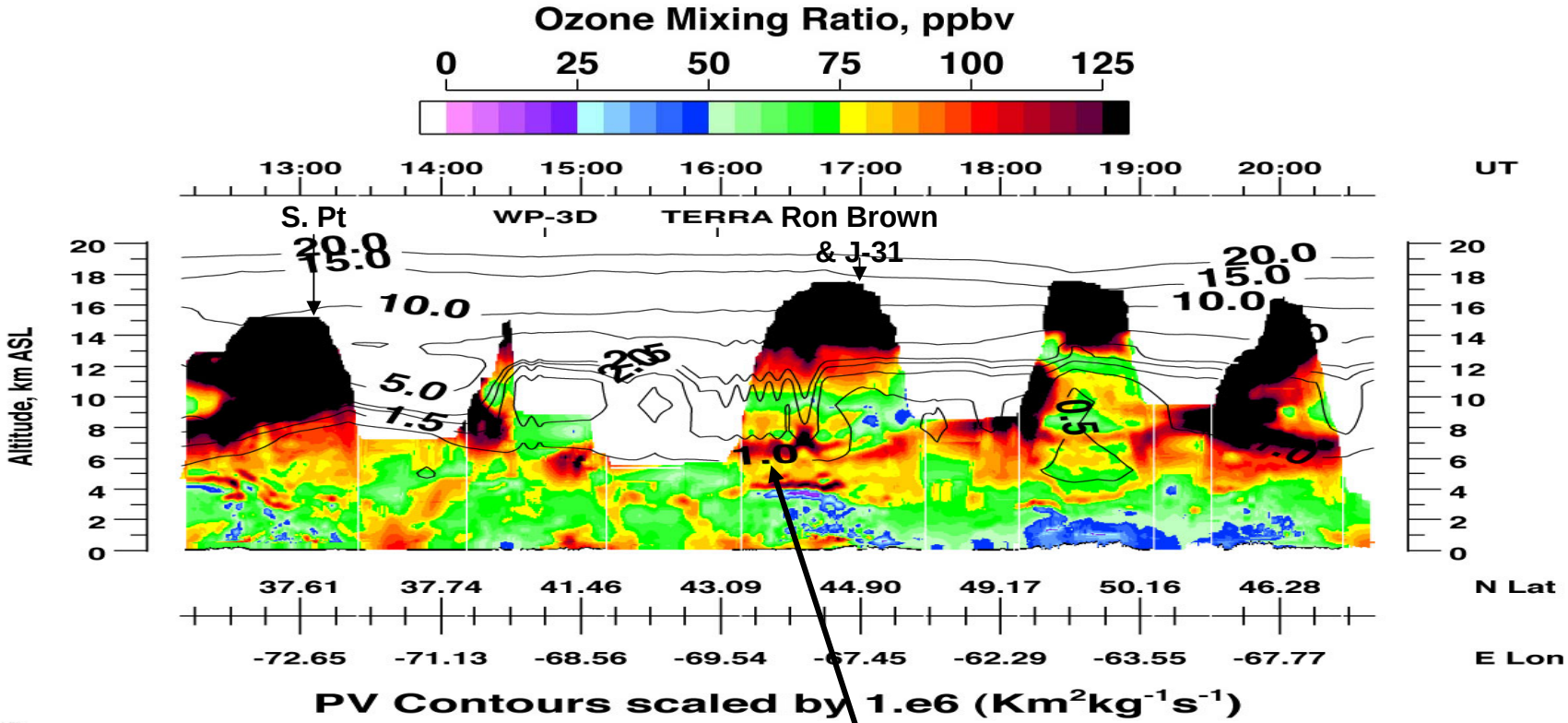

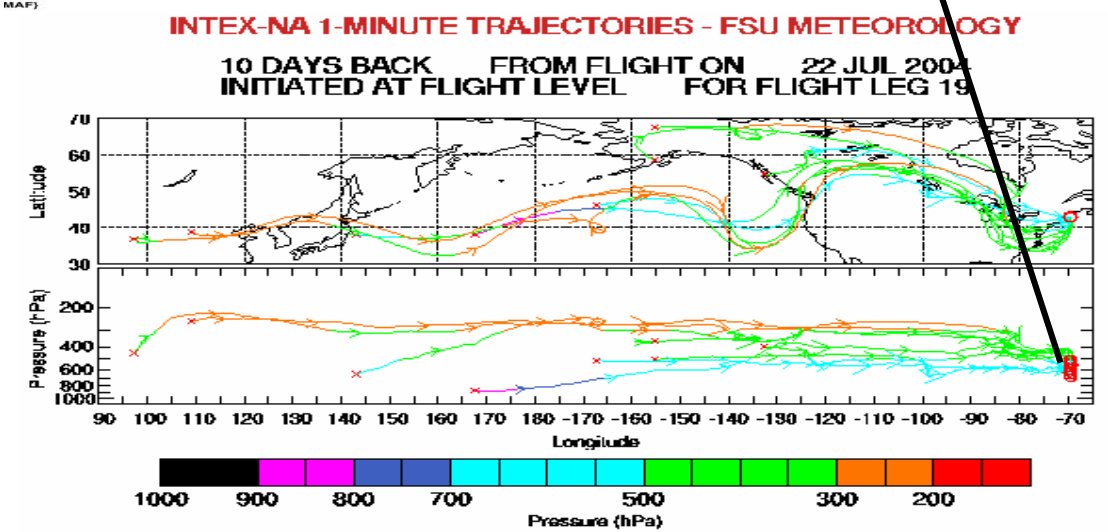

PV from RAQMS Model (Brad Pierce)

Backtrajectories from FSU (Henry Fuelberg)

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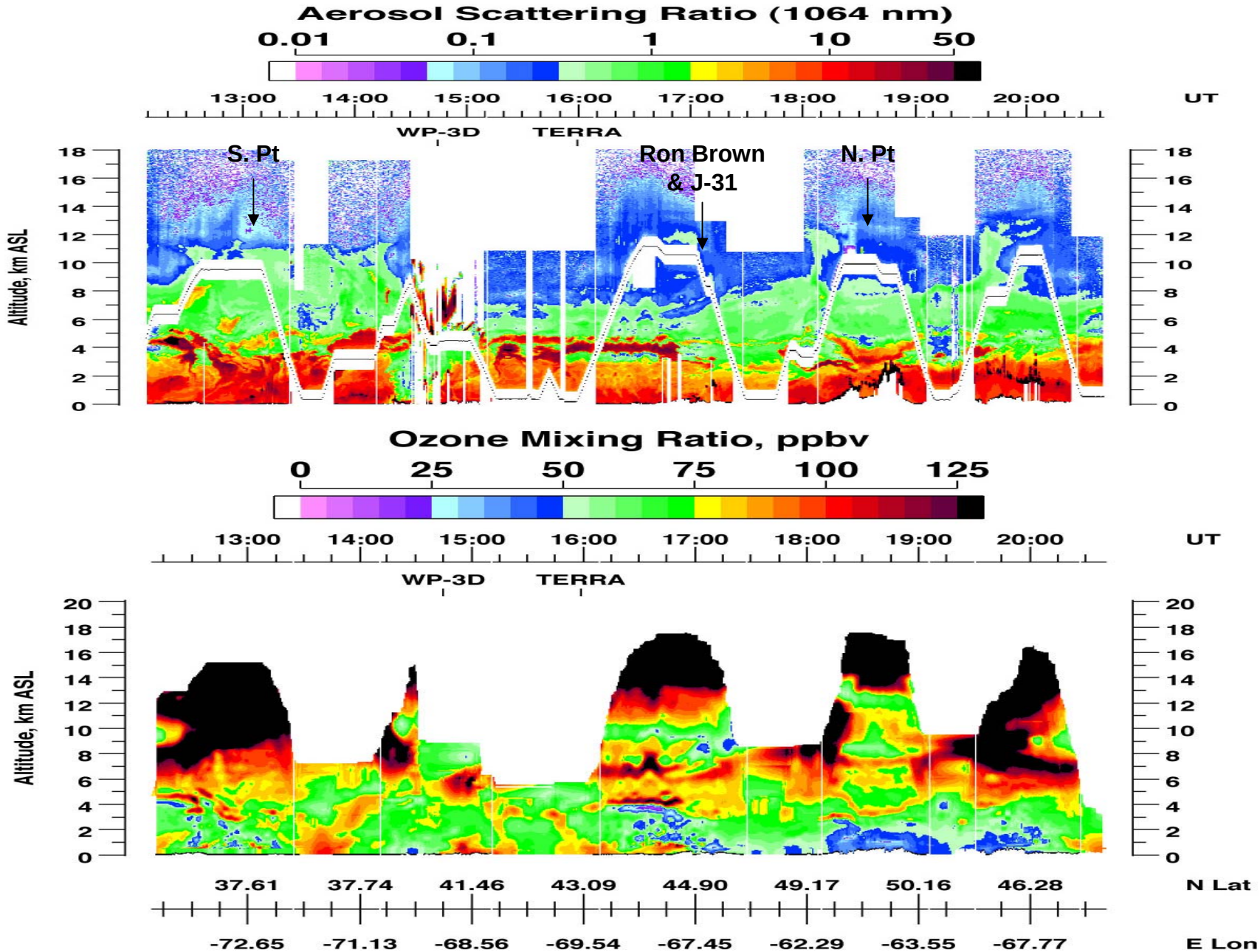

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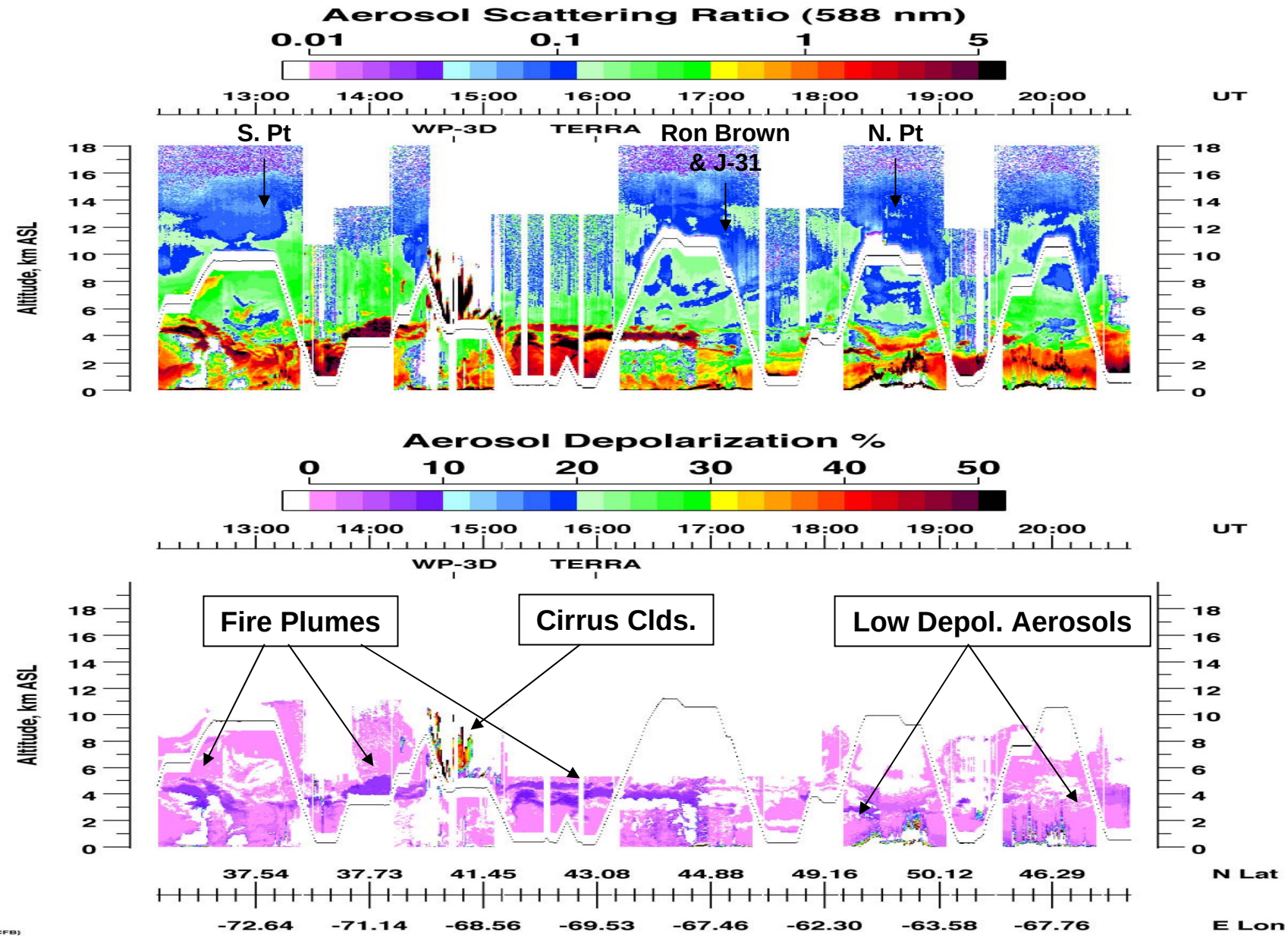

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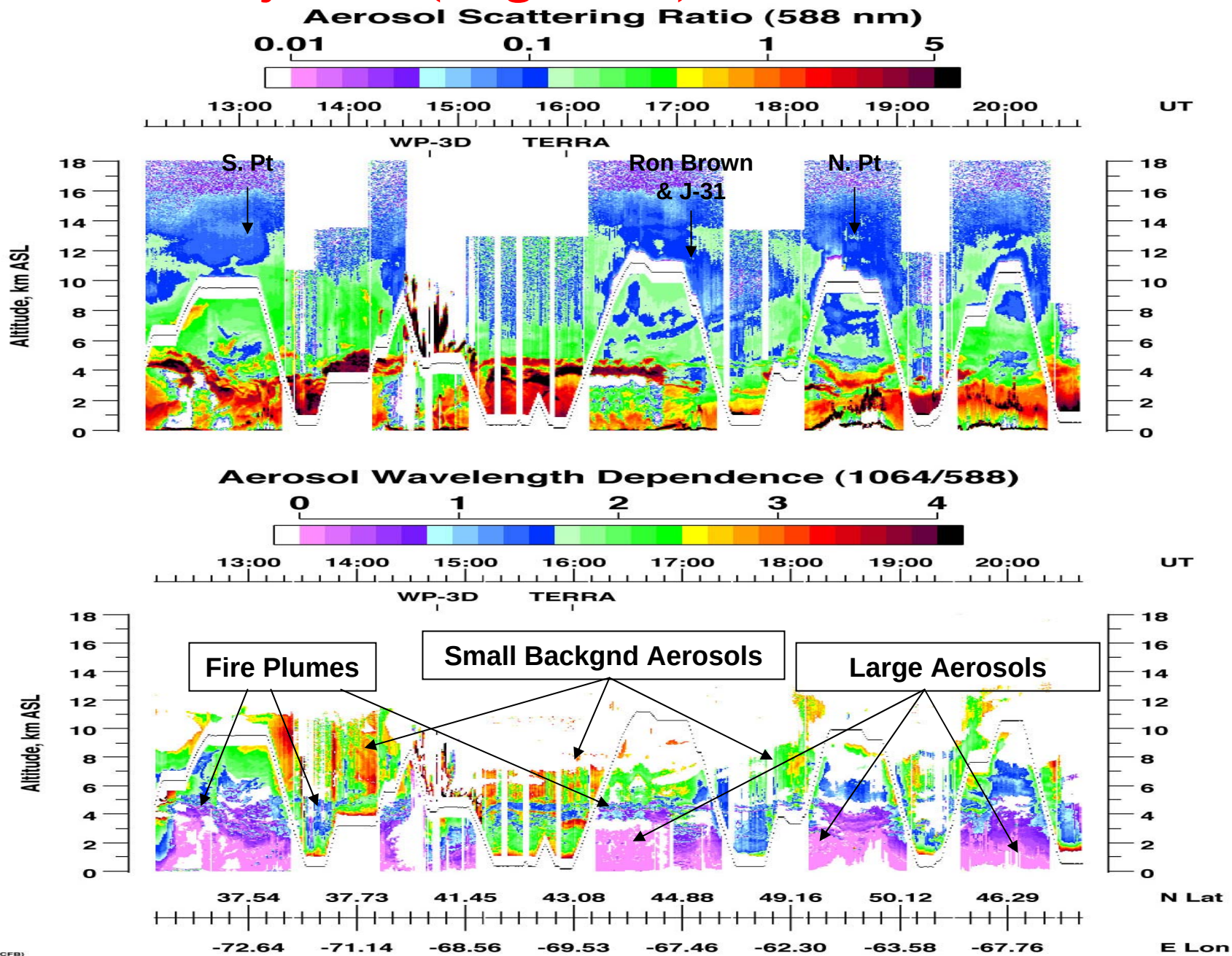
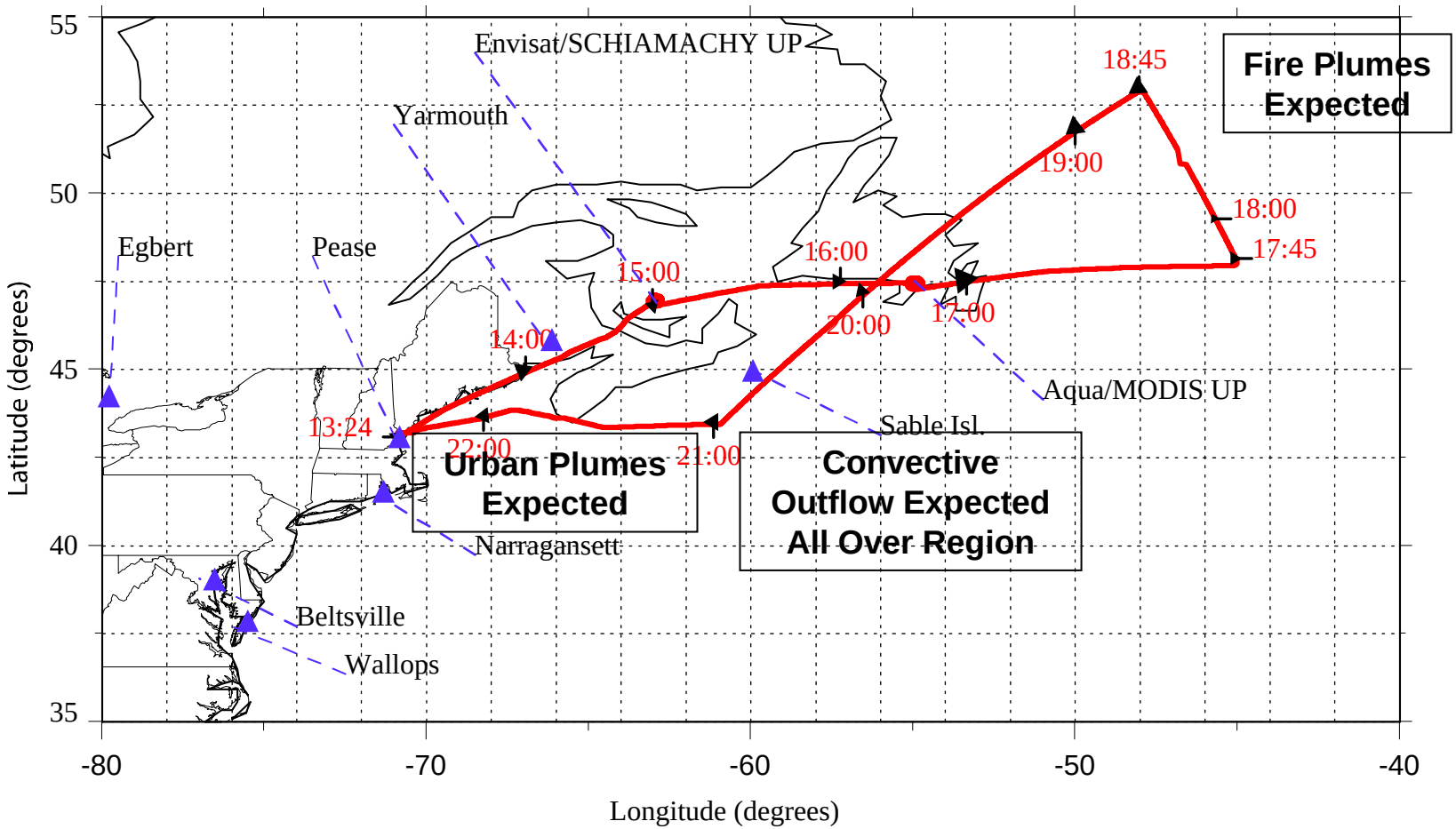
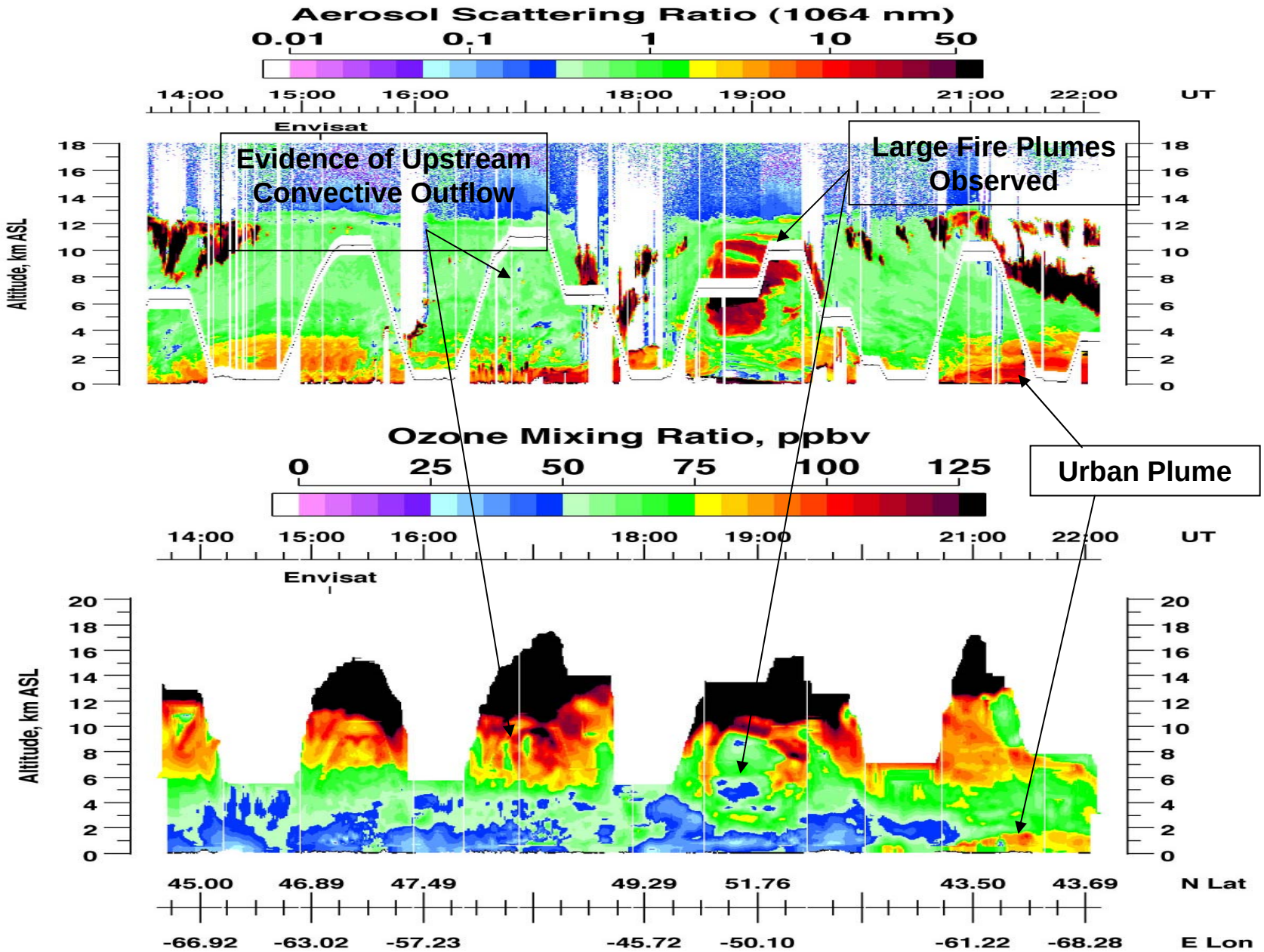


18 July 2004 (Flight #9) U.S. Outflow

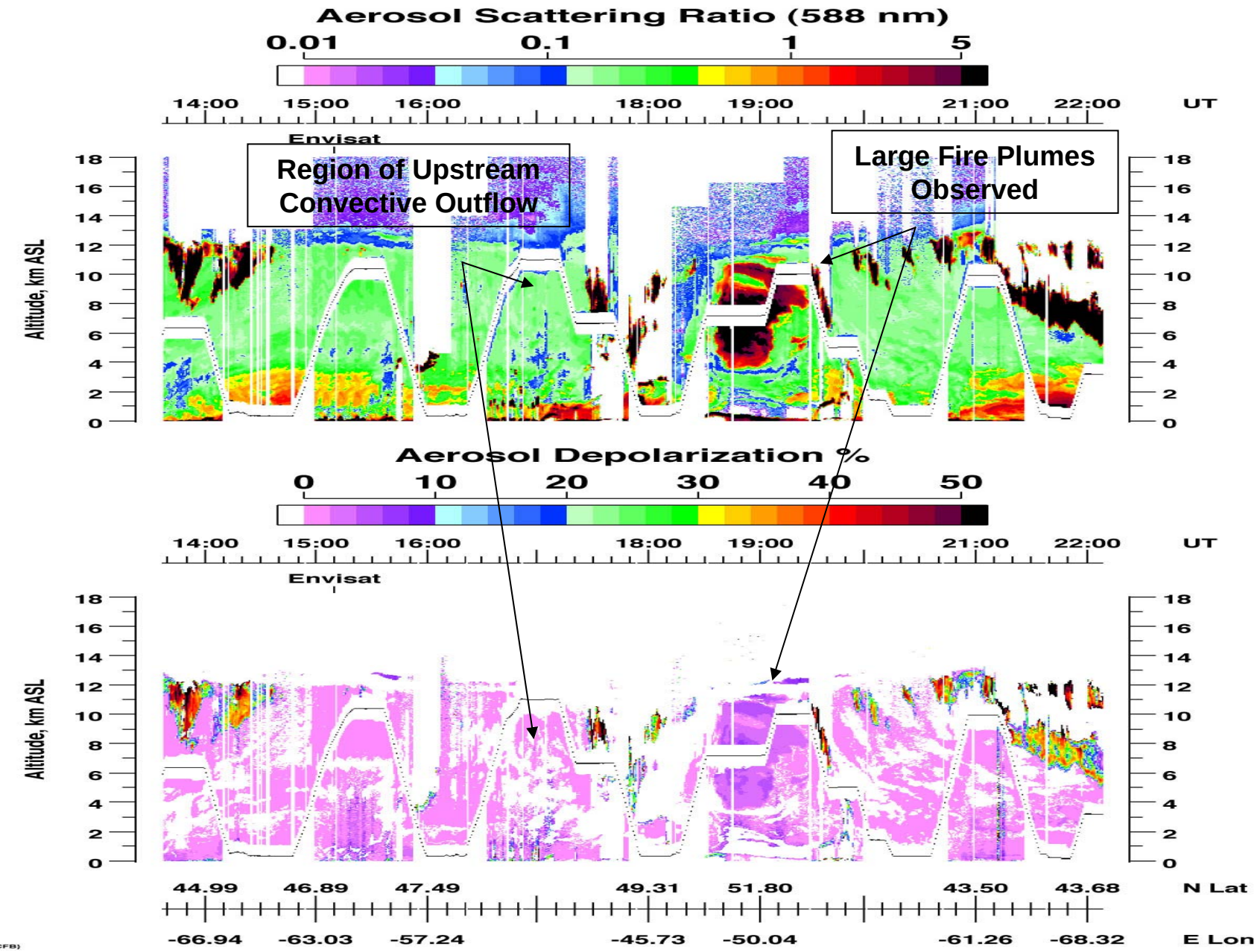
DC-8 Flight Track



18 July 2004 (Flight #9) U.S. Outflow

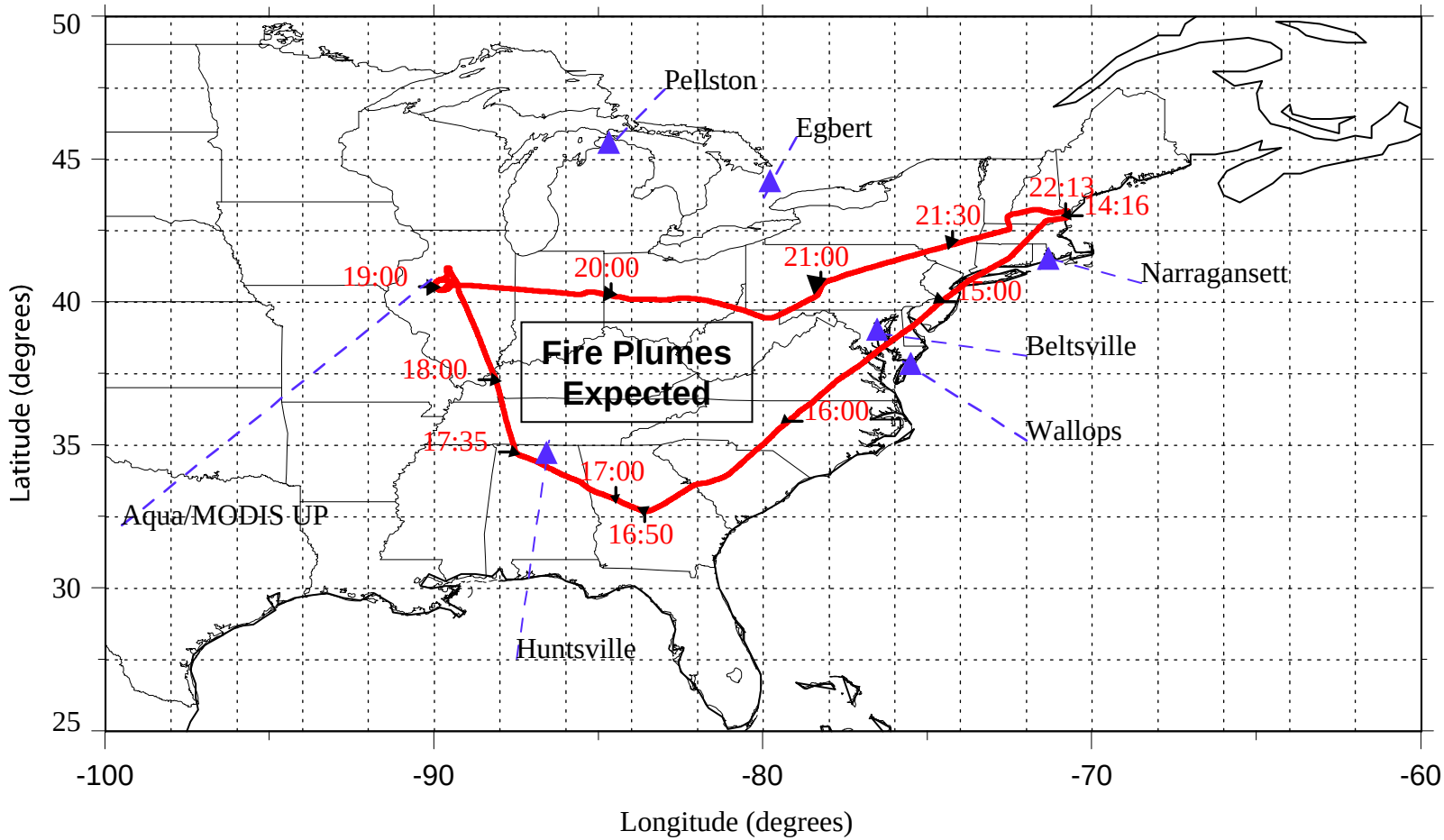


18 July 2004 (Flight #9) U.S. Outflow

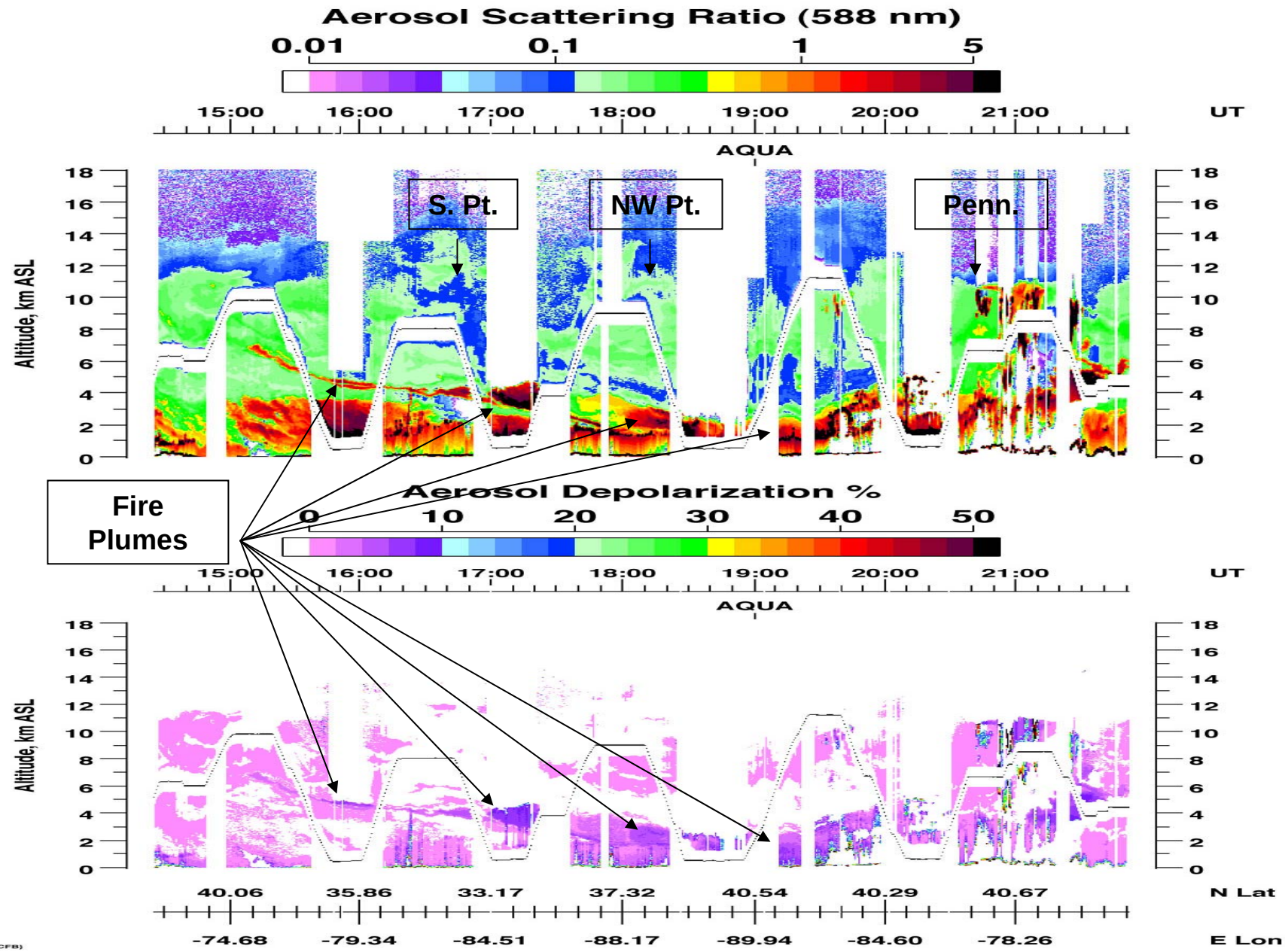


20 July 2004 (Flight #10) Alaskan Smoke Plumes

DC-8 Flight Track

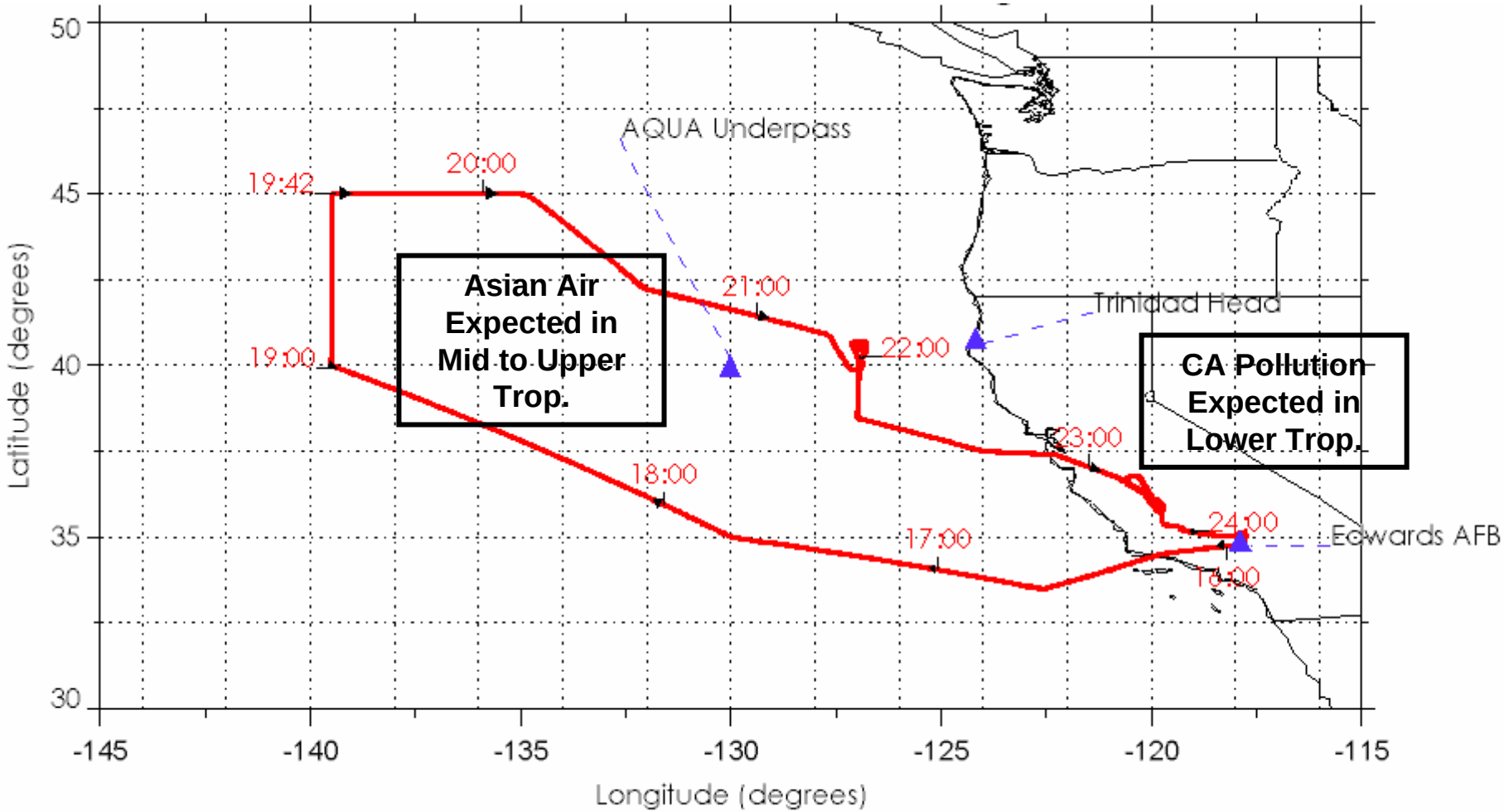


20 July 2004 (Flight #10) Alaskan Smoke Plumes

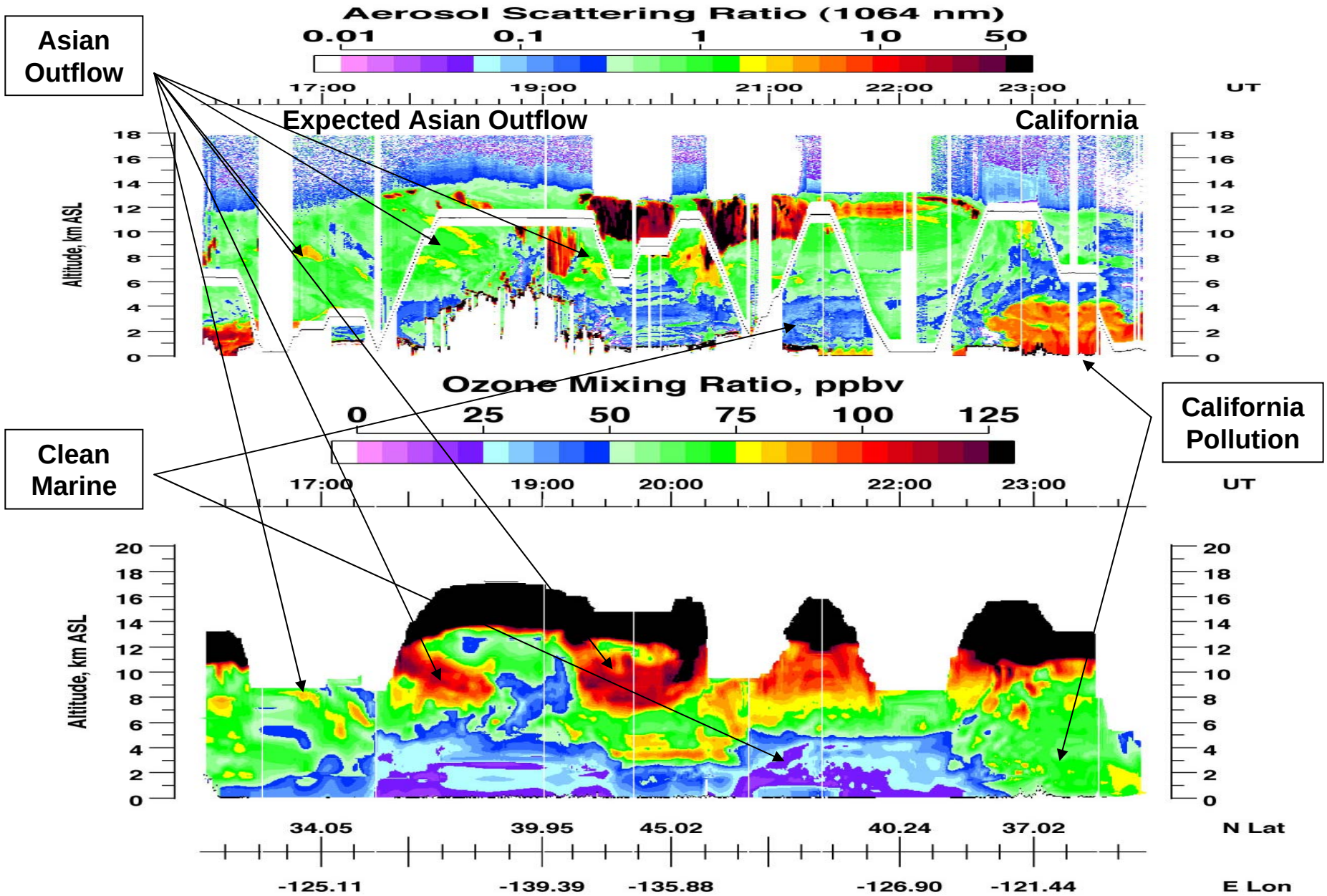


1 July 2004 (Flight #3) Asian & CA Outflow

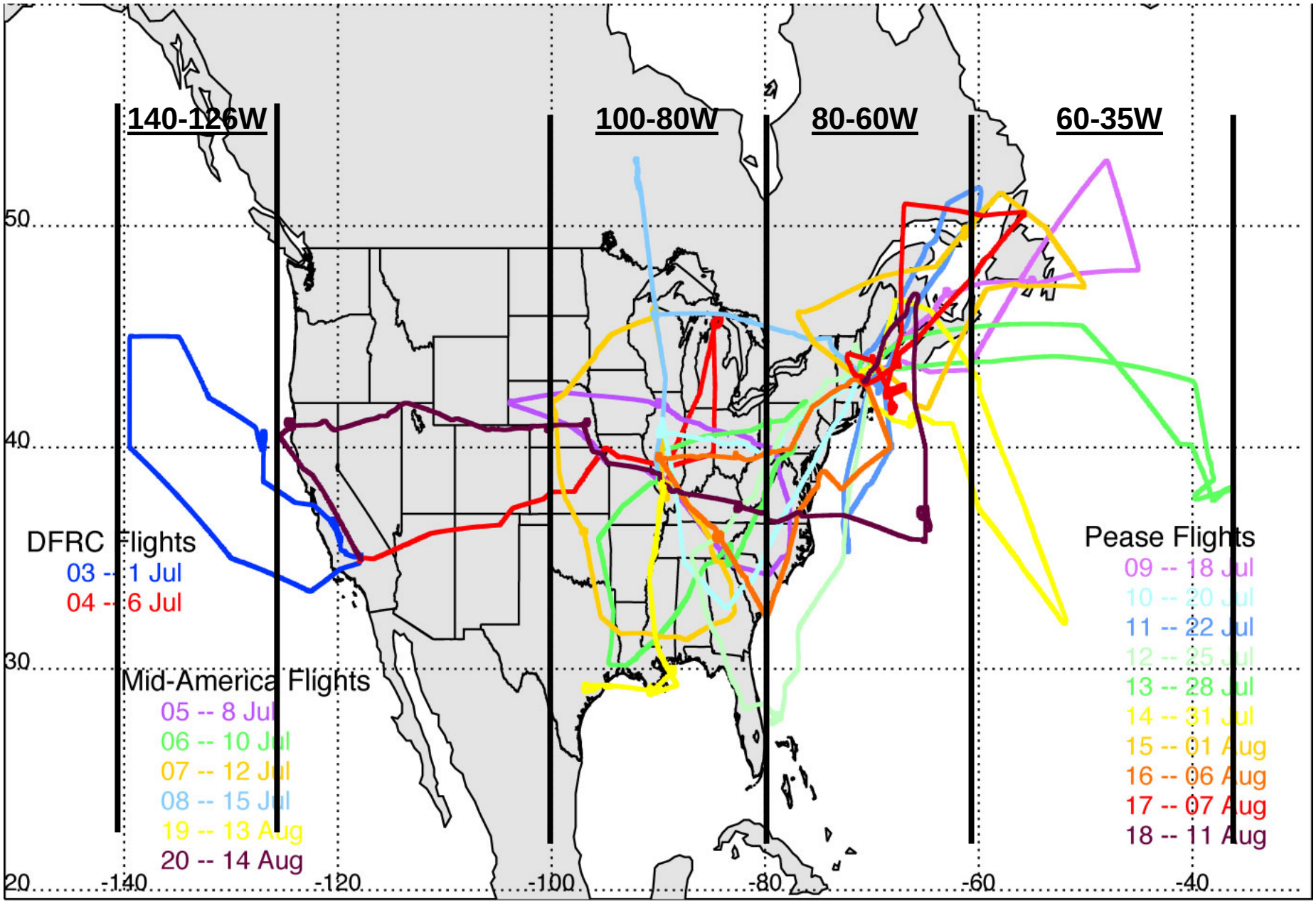
DC-8 Flight Track



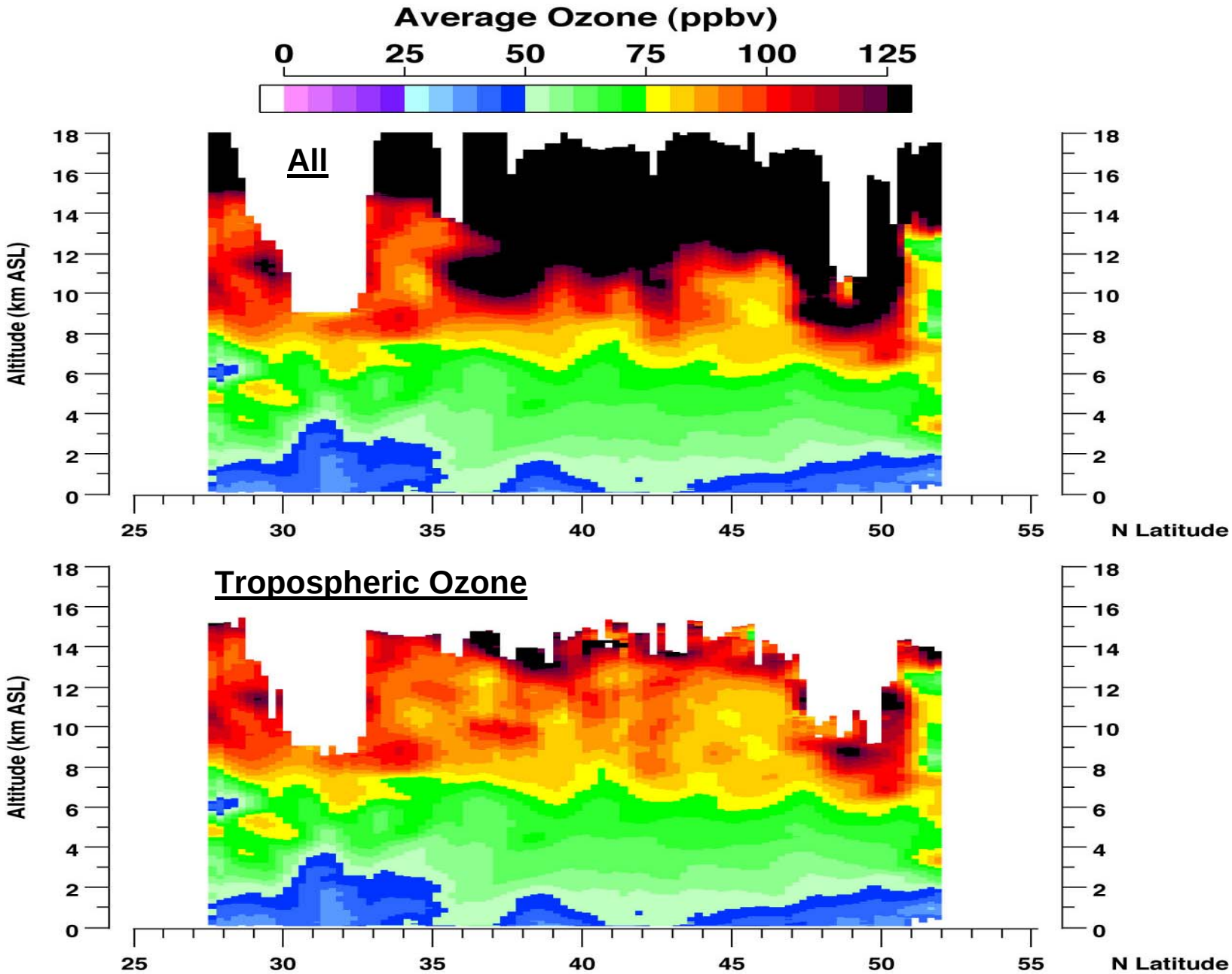
1 July 2004 (Flight #3) Asian & CA Outflow



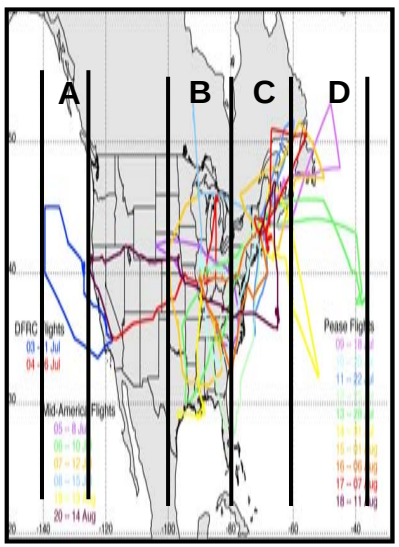
INTEX-NA: 1 July - 14 August 2004 (18 Flights)

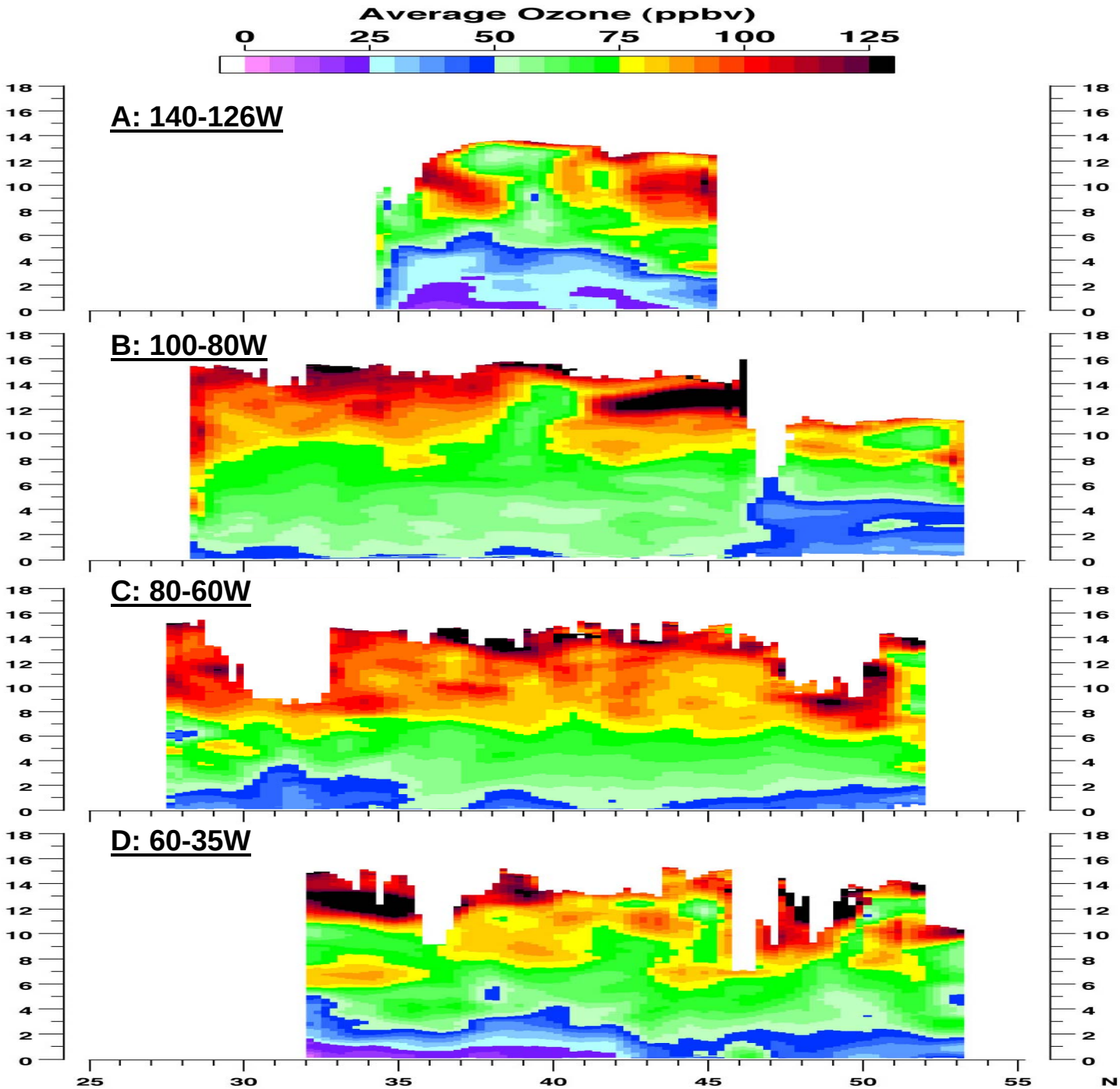


INTEX-NA: Average Latitudinal O_3 Distributions (80-60W)

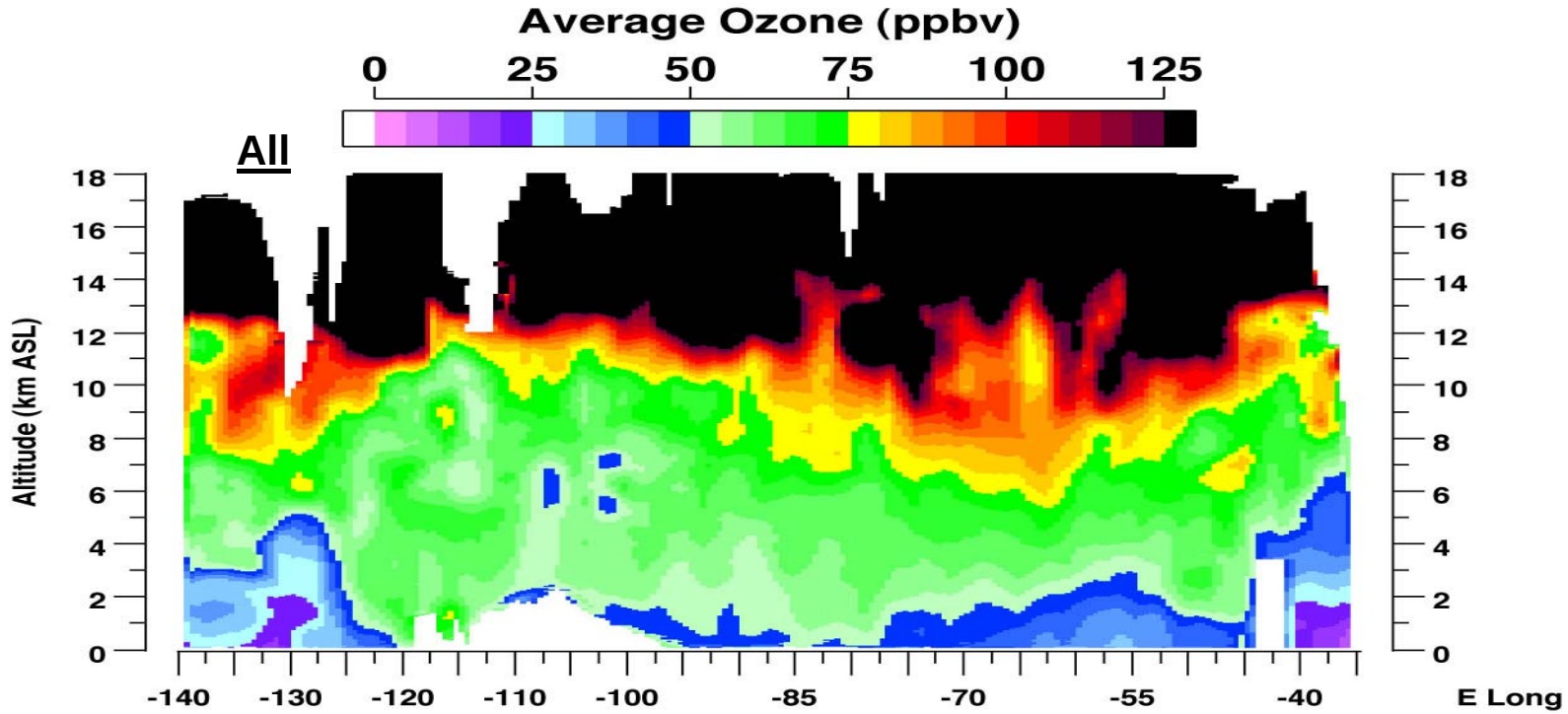


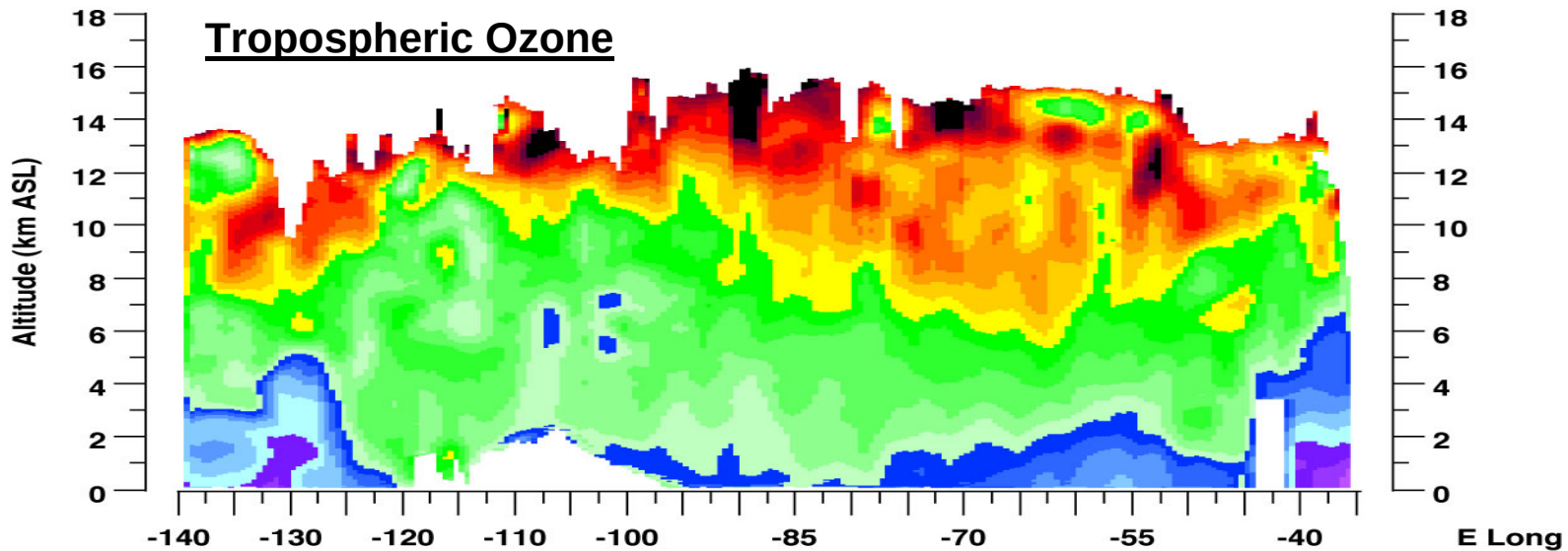
INTEX-NA: Average Latitudinal Tropospheric Ozone Distributions





INTEX-NA: Average Longitudinal O_3 Distributions (25-55N)





Preliminary Results

- **Obtained large-scale distributions of O_3 and aerosol characteristics from near surface to mid-trop./lower strat. on all but one INTEX-NA flights.**
- **Observed long-range transport of Asian pollution with enhanced aerosols and O_3 in mid-upper trop. in the eastern Pacific to possibly eastern U.S.**
- **Observed variable tropopause levels and presence of stratospheric air mixed with polluted air masses from up wind convection.**
- **Observed enhanced aerosols and O_3 in lower troposphere associated with pollution over the U.S. and advection over Atlantic.**
- **Observed aerosol characteristics & long-range transport of Alaskan fire plumes to mid, eastern, and northeastern U.S. in layers which mixed into PBL in some cases and Saharan dust over southern U.S.**
- **Determined the average latitudinal & longitudinal O_3 distributions for examining the continental scale variations observed during INTEX.**

All INTEX data images available at http://asd-www.larc.nasa.gov/lidar/

Future Activities

- **Determine the average aerosol lat. & long. distributions to correlate with the average O_3 lat. & long. distributions.**
- **Complete air mass categorization based on O_3 , aerosol characteristics, and potential vorticity levels, vis-à-vis, TRACE-P.**
- **Determine fraction of time each air mass type was observed and the relative contribution of each air mass type to trop. O_3 budget.**
- **Determine chemical characteristics of each air mass type based on in situ measurements of the remotely categorized air masses.**
- **Determine the eastward flux of O_3 observed over eastern North America and western Atlantic (80-60W).**
- **Compare O_3 and aerosol results with model predictions.**
- **Compare large-scale average O_3 and aerosol distributions, air mass types, and fluxes with previous field experiments.**
- **Collaborate with Science Team in chemistry/transport process studies and satellite & model validation activities.**

See posters by Fenn et al. and Butler et al. for additional O_3 and aerosol results!