

# ROLE OF GLOBAL MODELS IN ICARTT

*Mission Design*

*Execution*

*Analysis*



## ICARTT QUESTIONS

Emissions, outflow,  
LRT transport & processing

*A priori* knowledge  
described by models

Mission design

Observations  
targeted at  
testing models

Flight planning

Model forecasts

Post-mission analysis:  
model vs. observations

Improved knowledge

Presentations by D. Jacob (Harvard), B. Pierce (LaRC), K. Pickering (UMd),  
S. Turquety (Harvard), A. Stohl (NOAA/AL)

# **CONVECTIVE AND ASIAN INFLUENCES IN ICARTT: A PRELIMINARY LOOK**

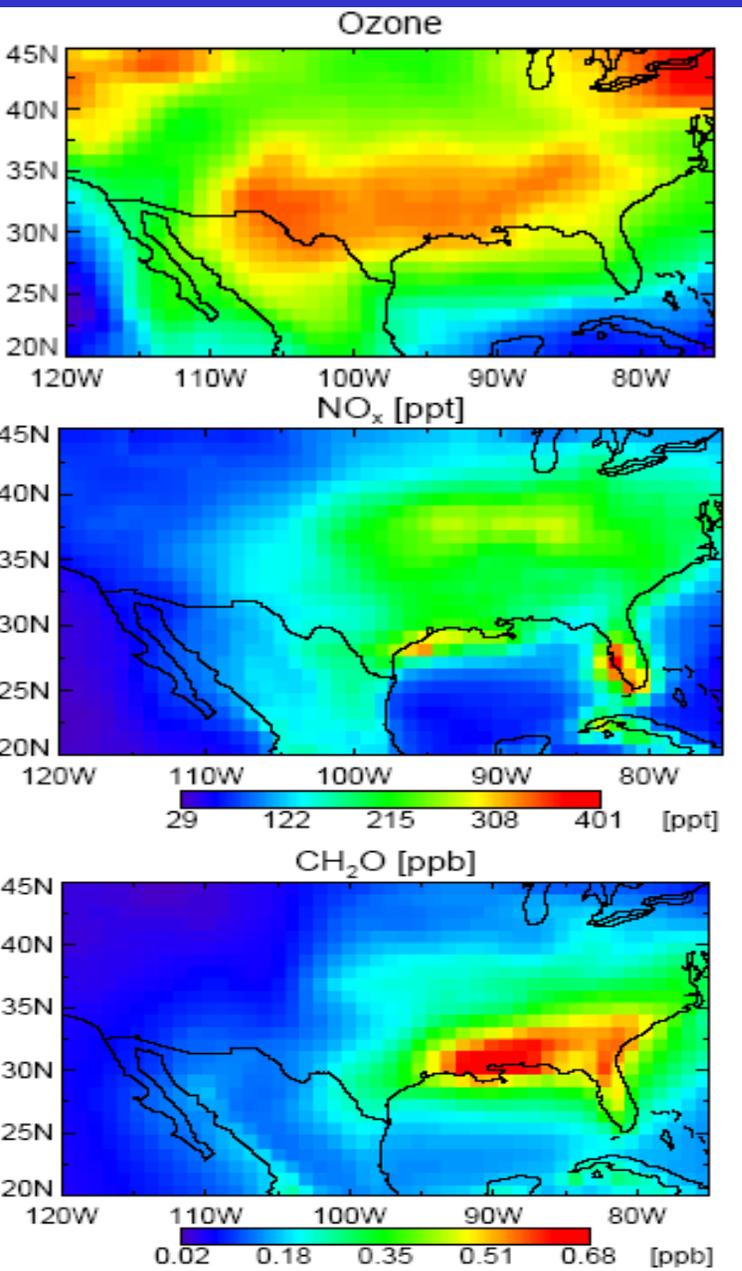
**Lyatt Jaegle (U. Washington), Qinbin Li (JPL),  
Solene Turquety (Harvard), Daniel J. Jacob (Harvard)**

**with observations from M. Avery (LaRC), E.V. Browell (LaRC),  
J.E. Dibb (UNH), A. Fried (NCAR), G.W. Sachse (LaRC)**

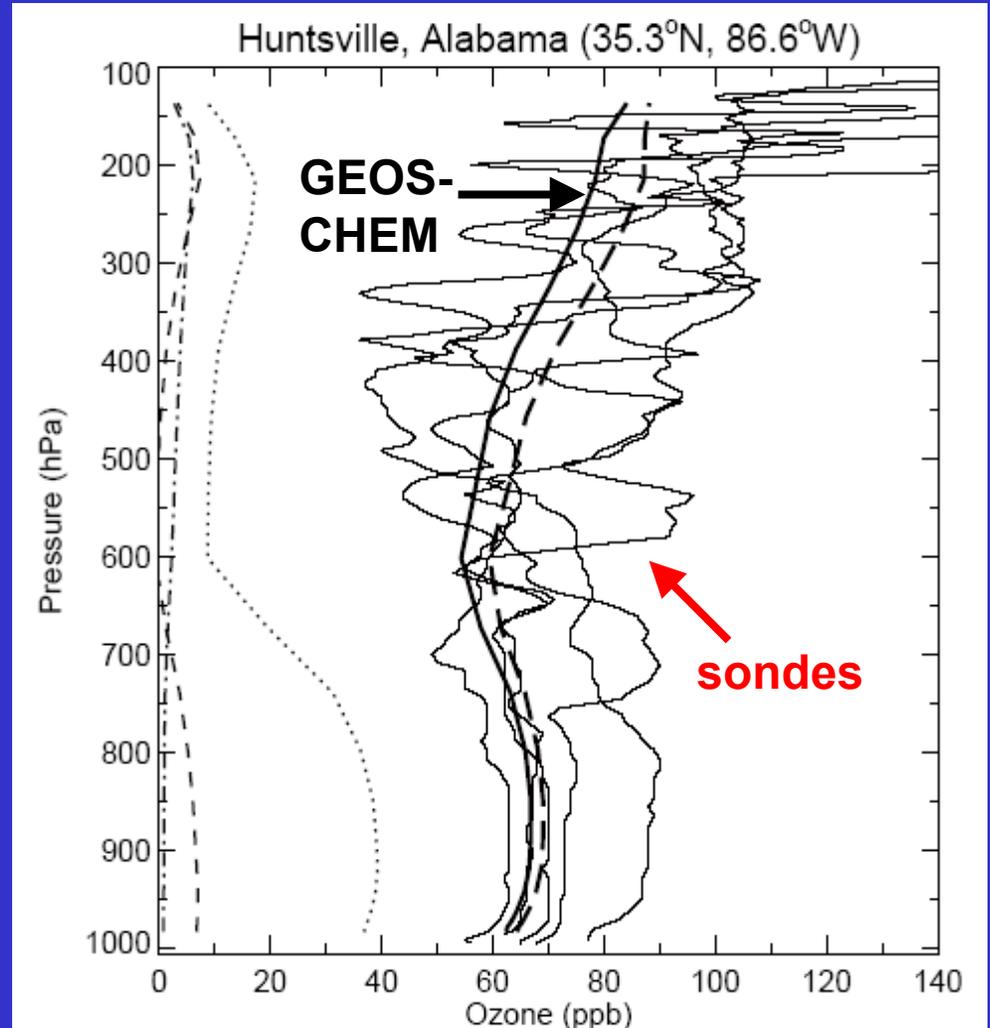
**and meteorological data from H.E. Fuelberg (FSU)**

# GEOS-CHEM monthly means at 300 hPa, July 2000 [Li et al., 2004]

## IS THERE A UT OZONE MAXIMUM OVER SOUTHERN U.S. IN SUMMER?

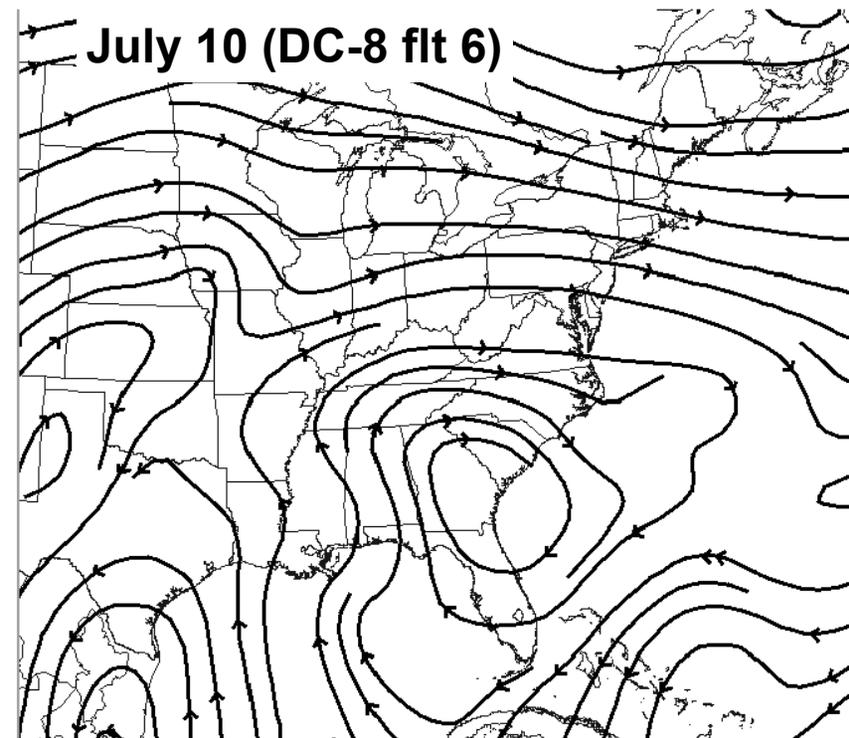


July 2000 ozonesonde data  
[Newchurch et al., 2003]

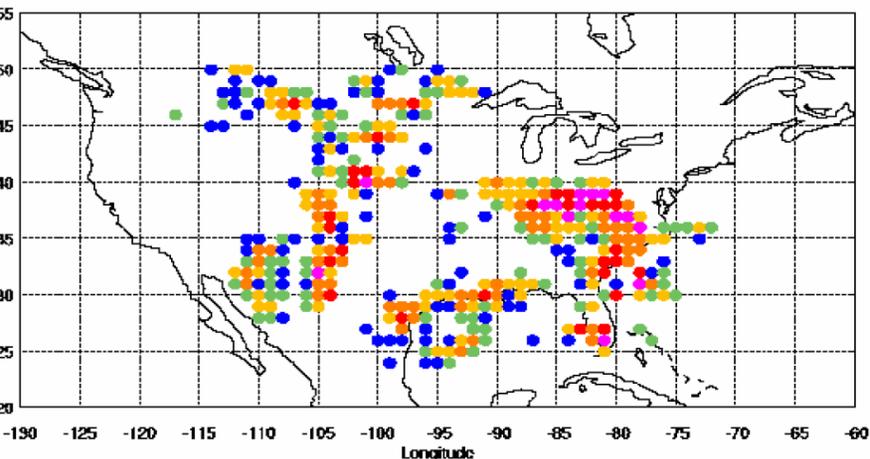


# 300 mb Winds

July 10 (DC-8 flt 6)

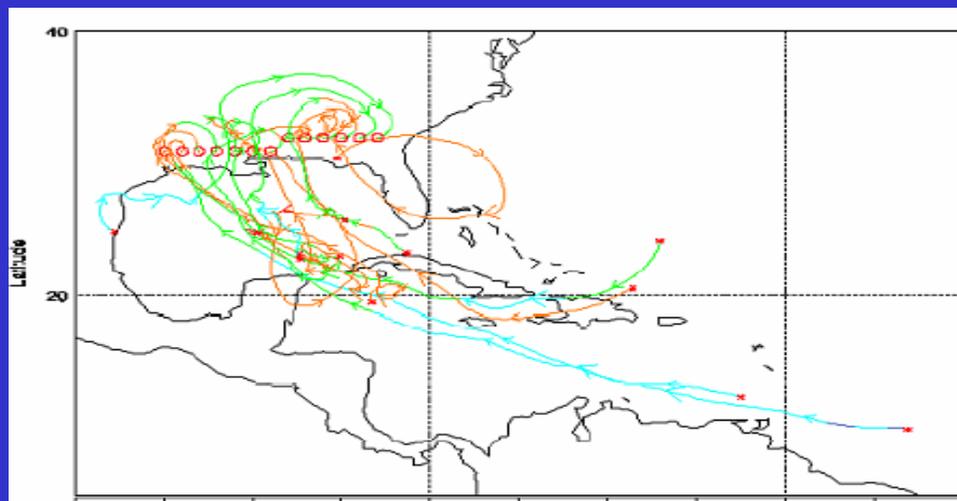


Lightning Intensity (strokes)  
For 24 Hour Interval Centered on  
2004 JUL 10 18 Z



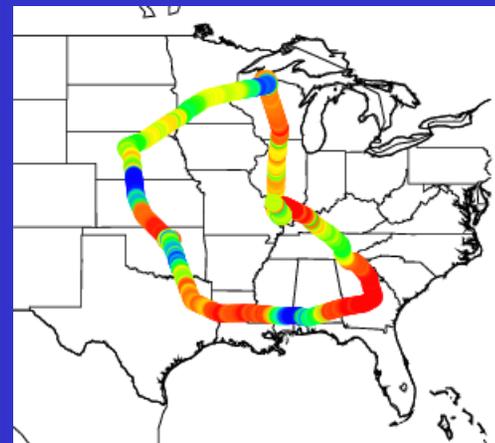
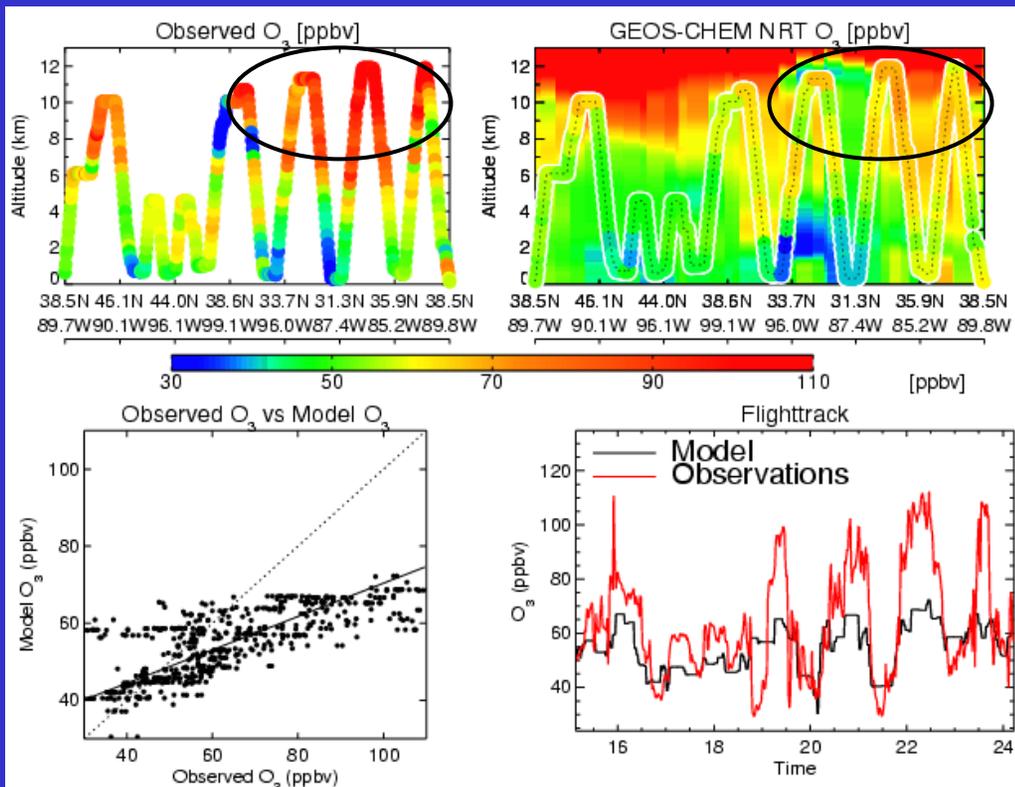
UT recirculation over SE U.S.  
during July 10-12 (H. Fuelberg)

300 hPa 7-day back-trajectories,  
July 12 flight track (DC-8 flt 7)

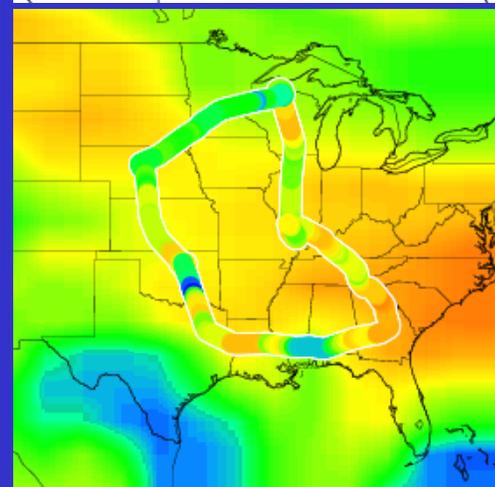


# DC-8 July 12 flight: 80-110 ppb O<sub>3</sub> observed at 6-10 km over SE U.S.

model too low by 20-30 ppbv

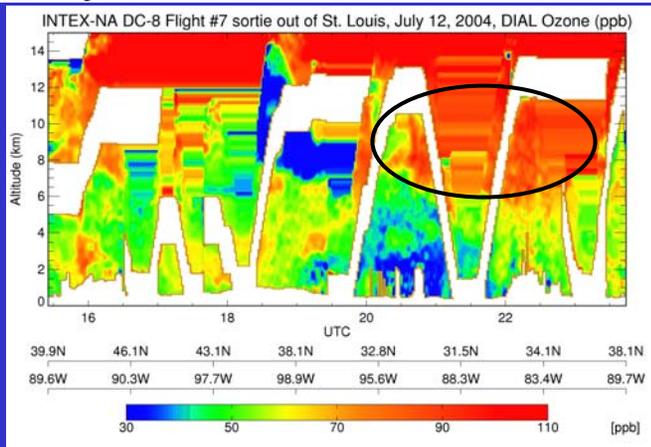


DC8



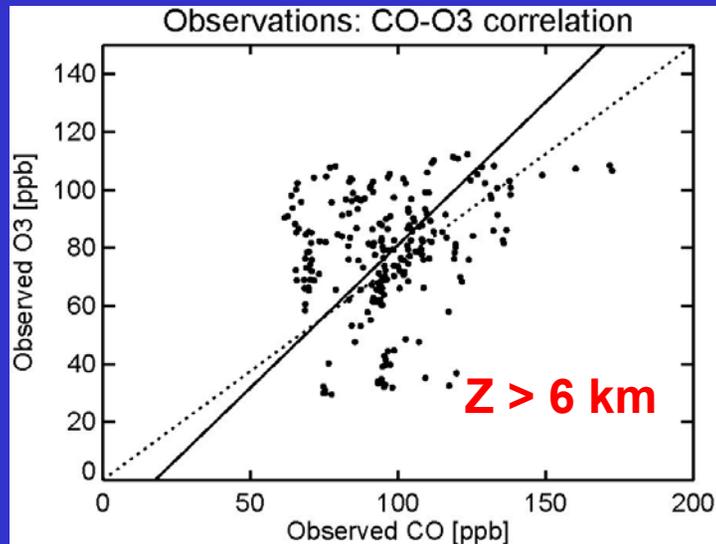
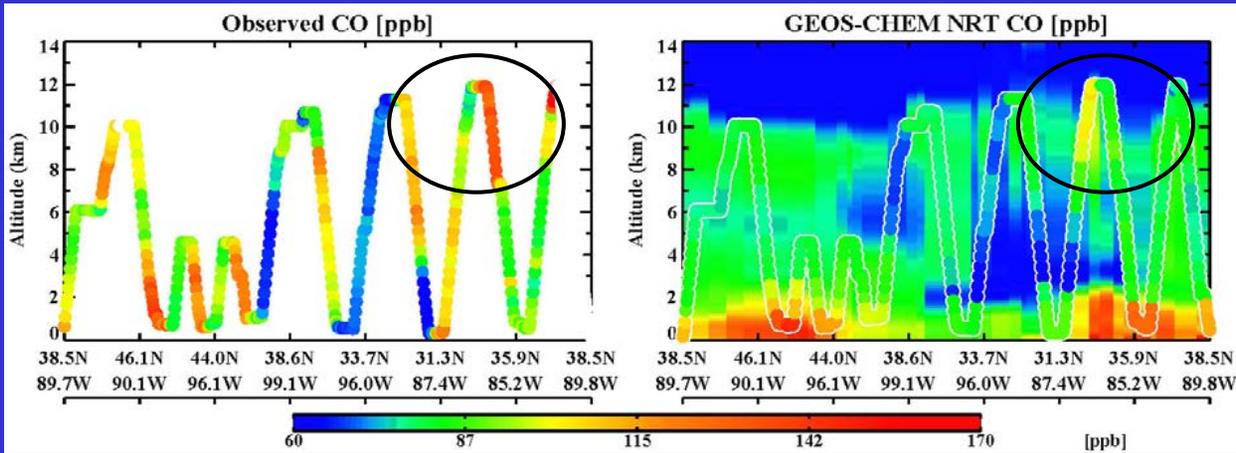
Model  
(300 hPa)

DIAL O<sub>3</sub>

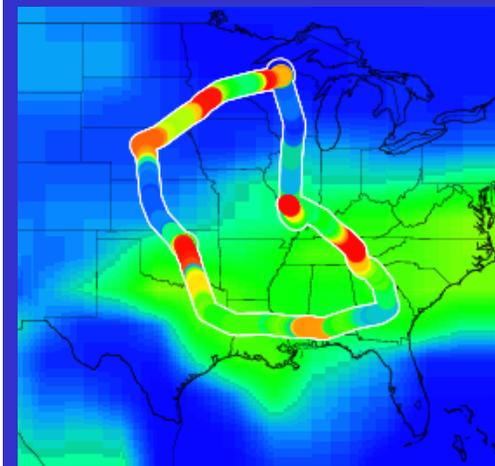
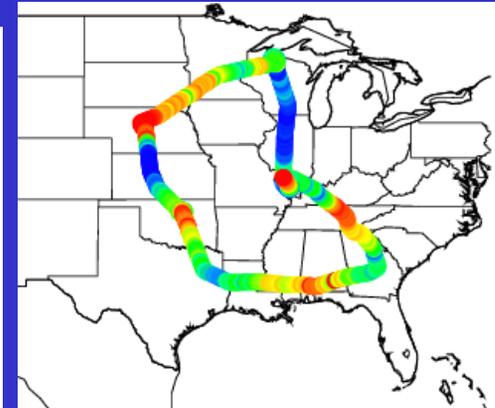
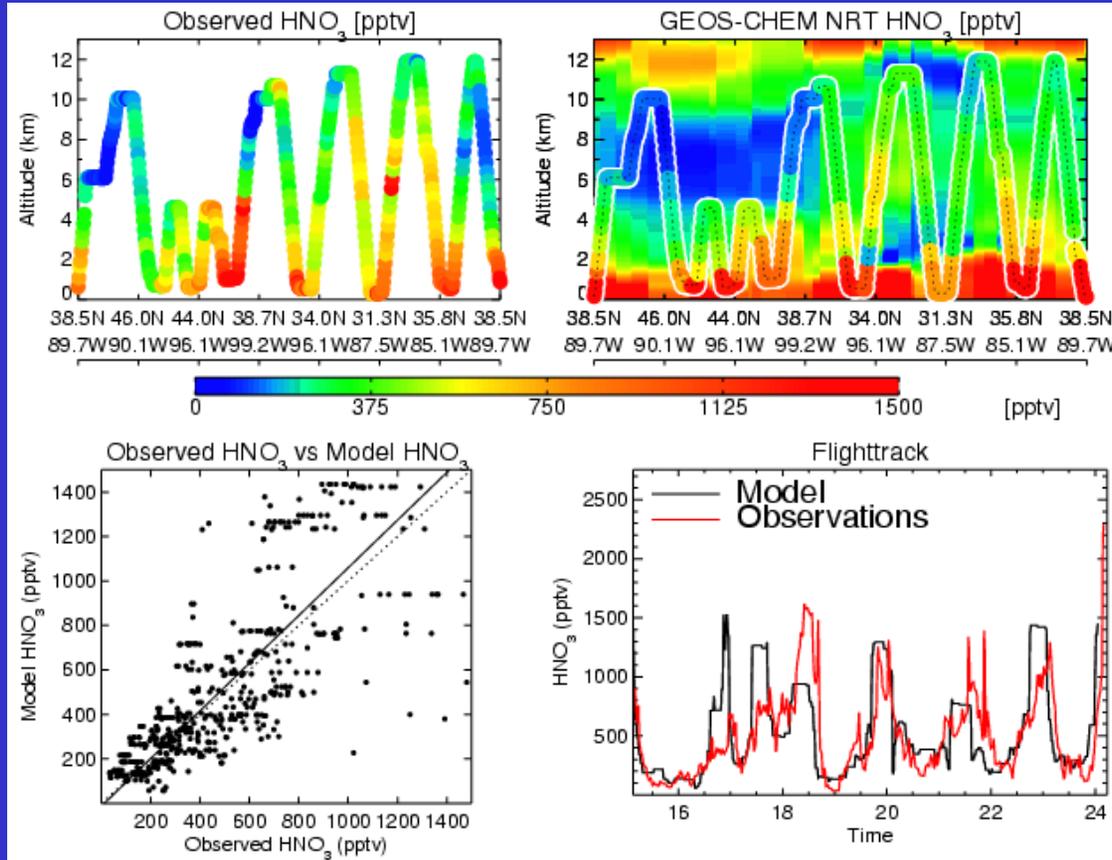


# DC-8 July 12 flight: high ozone in UT is correlated with CO

...indicates convective origin

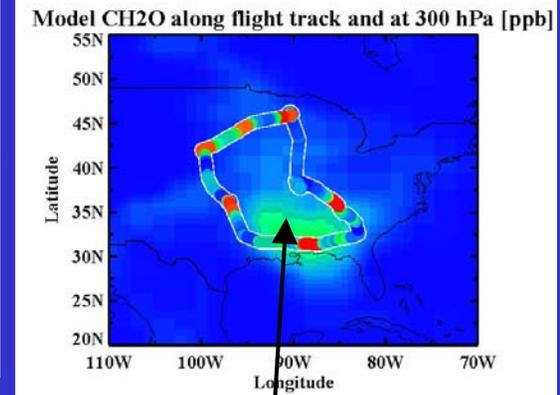
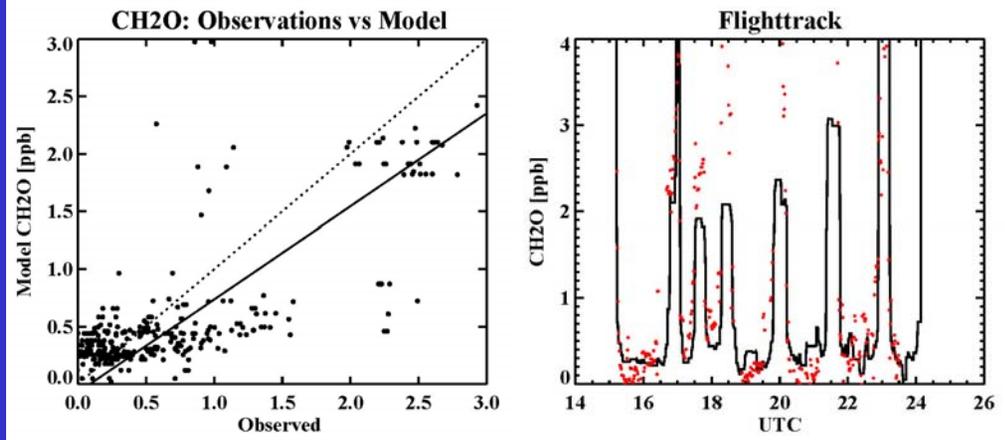
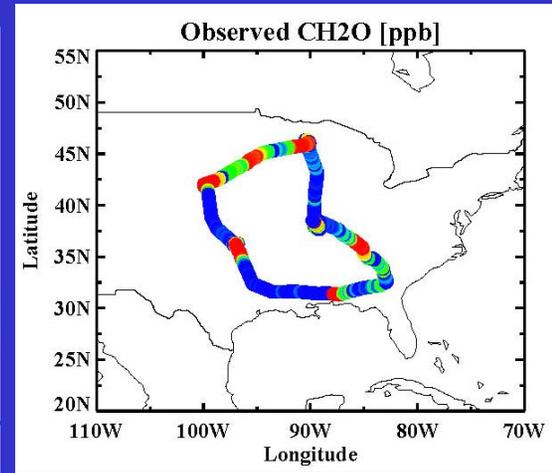
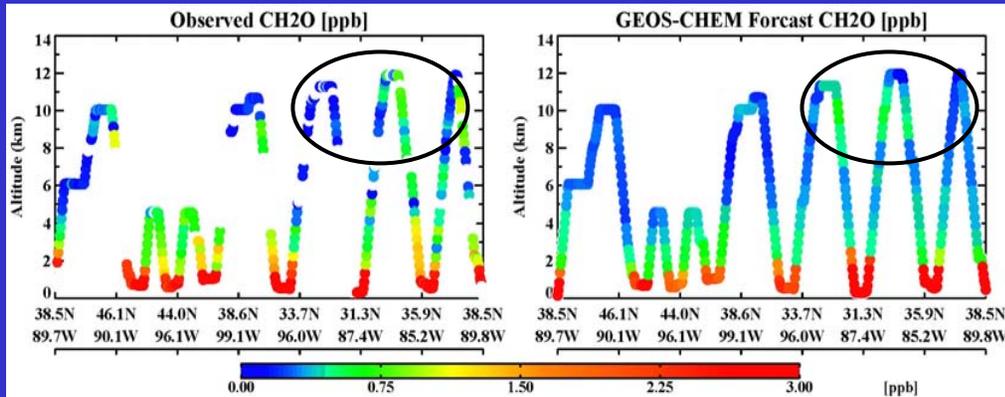


# DC-8 July 12 flight: nitric acid (obs. from J.E. Dibb)



No evident model bias  $\rightarrow$   $\text{NO}_x$  supply OK?

# DC-8 July 12 flight: formaldehyde (obs. from A. Fried)

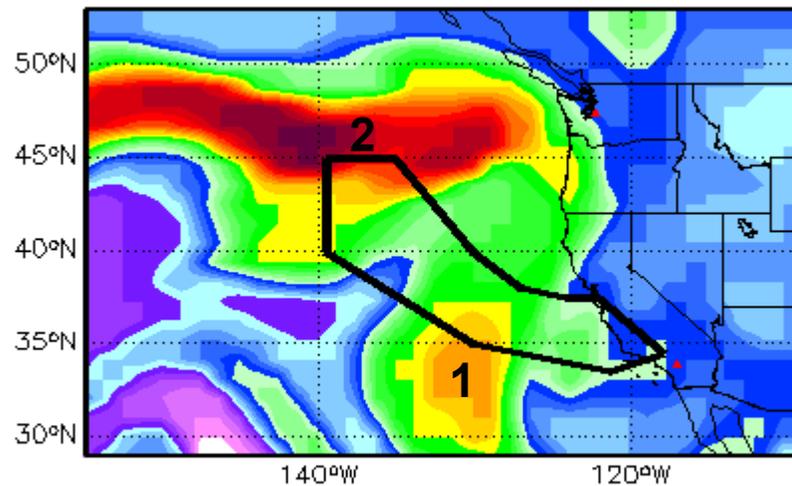


Model seems OK too → HO<sub>x</sub> supply OK?

CH<sub>2</sub>O from deep convection

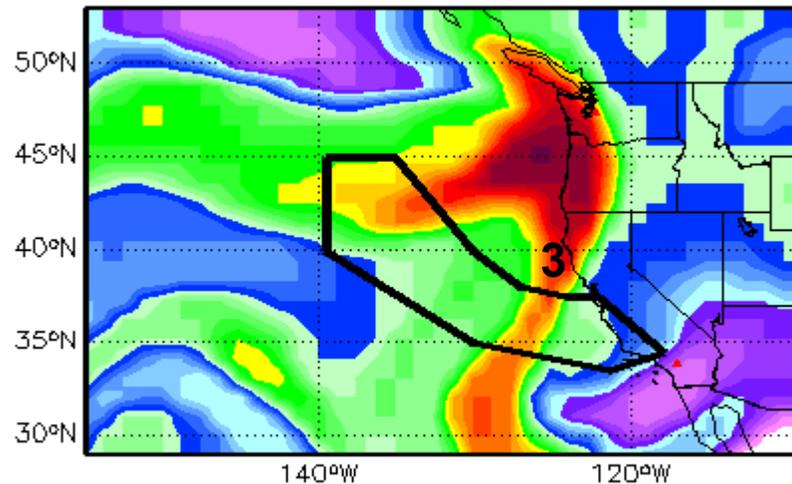
# GEOS Asian plume forecast for DC-8 flight #3 (July 1)

Asian CO 20040702 00 GMT at 310 hPa (8.8 km)



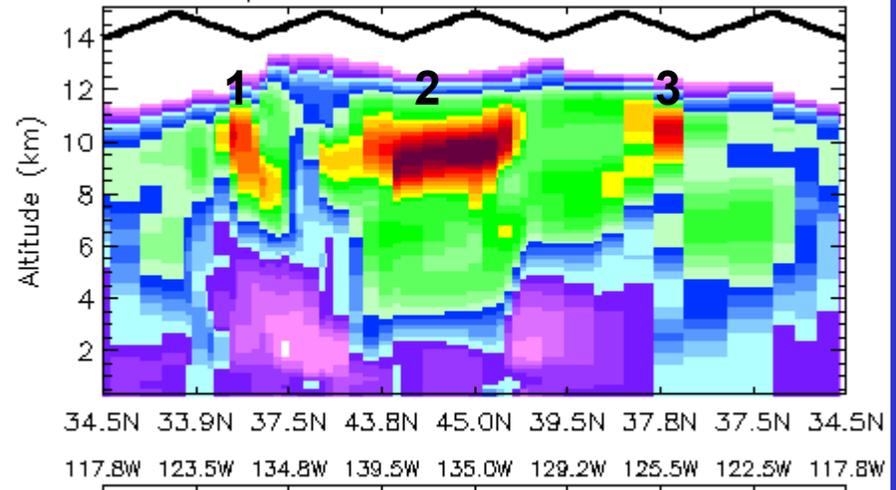
10 25 40 55 [ppbv]

Asian CO 20040702 00 GMT at 220 hPa (11 km)



10 25 40 55 [ppbv]

Curtain plot – Asian CO 20040702 00 GMT

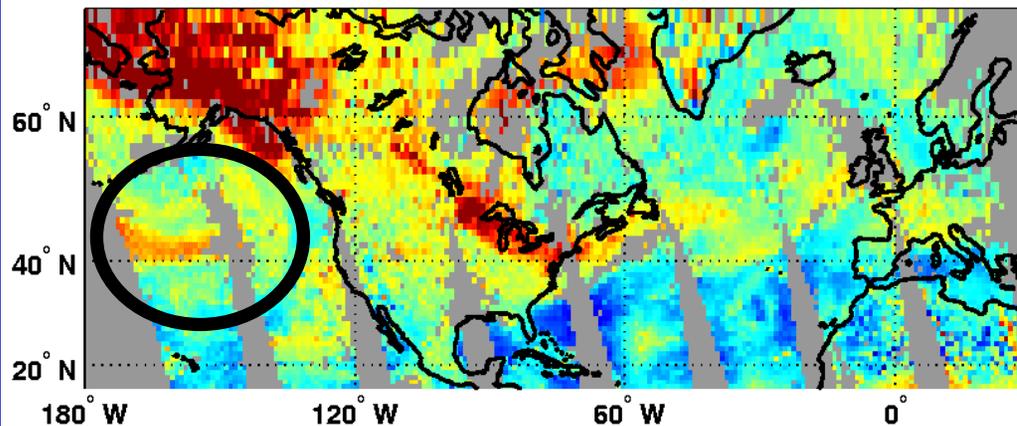


10 21 32 43 55 [ppbv]

5-day transport time from Asia

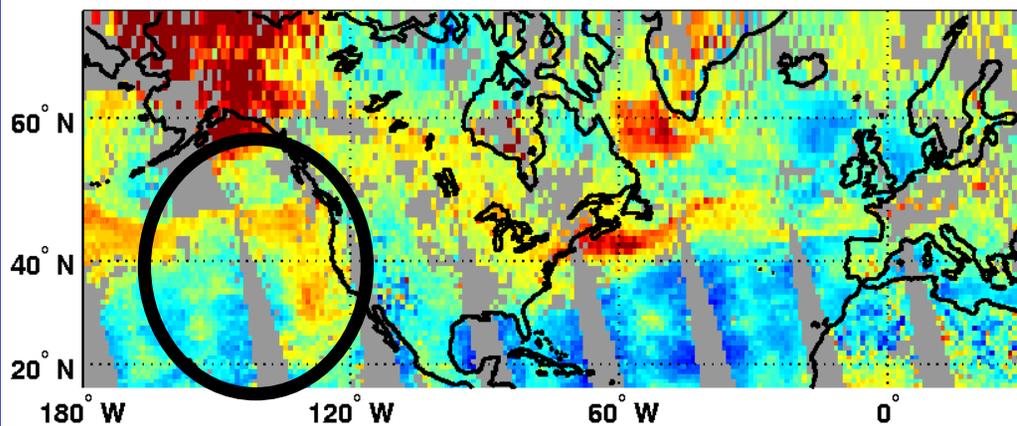
# Approaching Asian plume seen by AIRS CO

Local PM (ascending) AIRS CO at 500 mb on 20040629

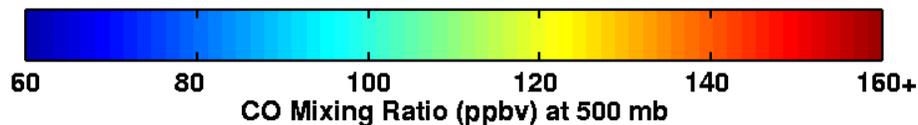


June 29

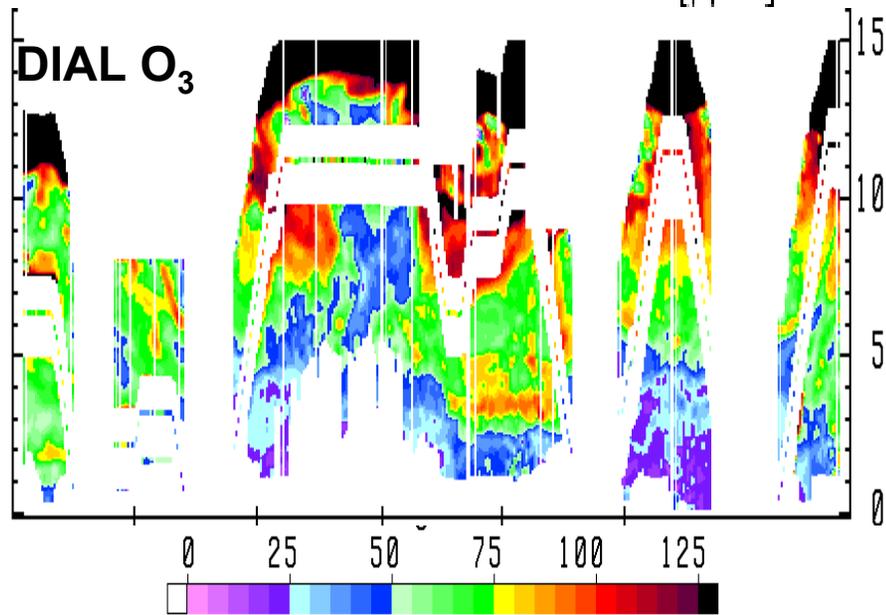
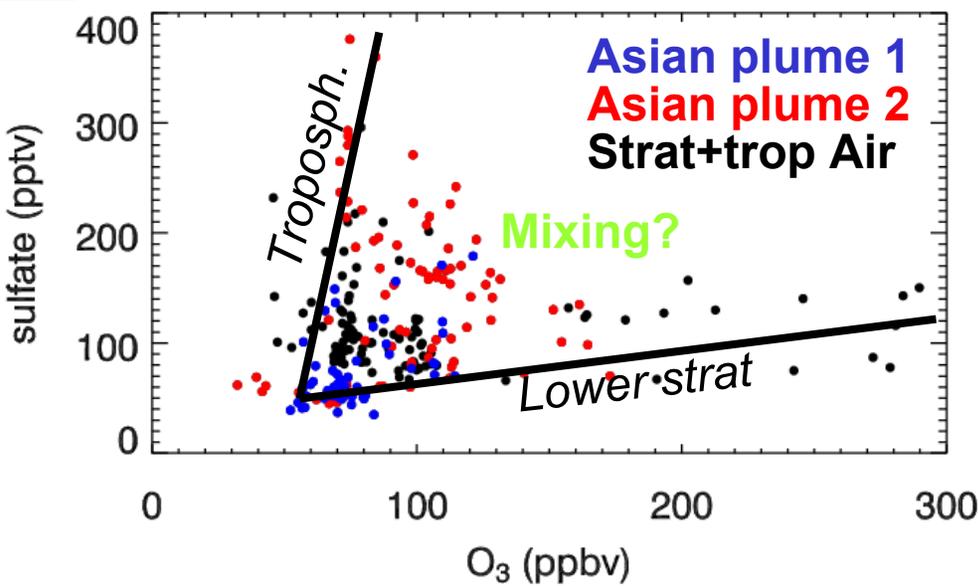
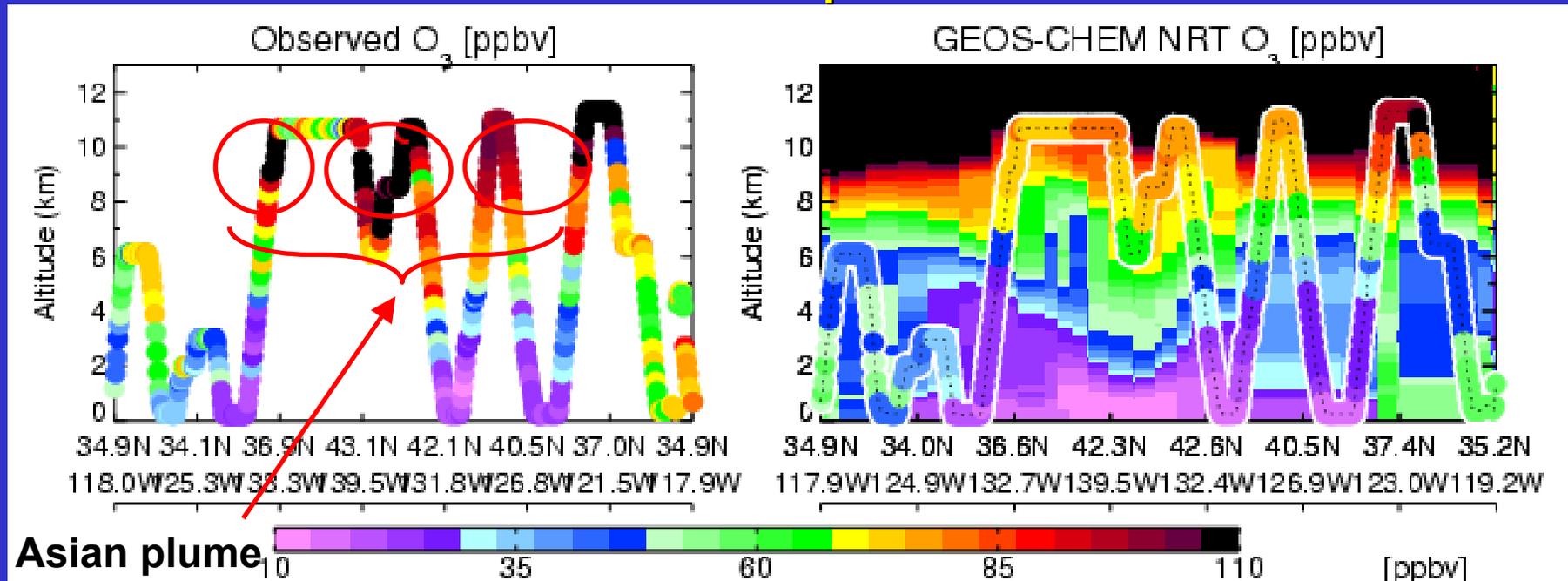
Local PM (ascending) AIRS CO at 500 mb on 20040701



July 01

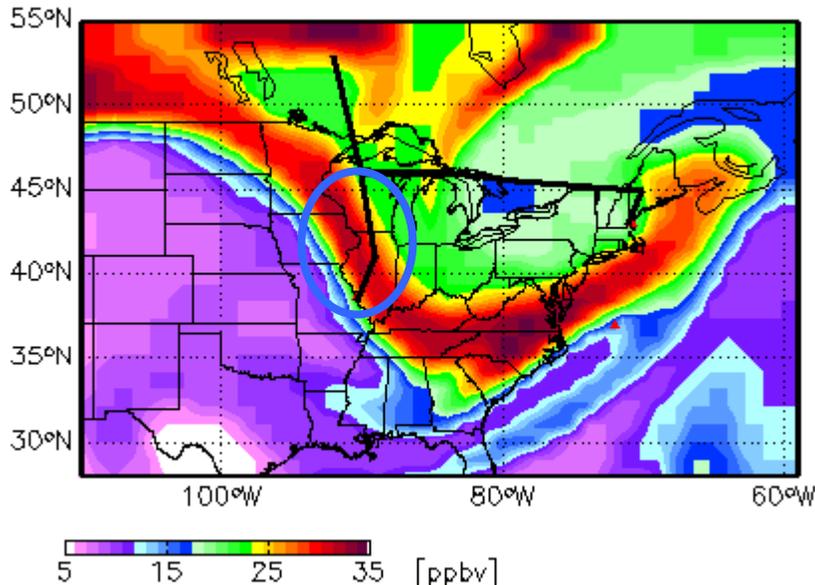


# July 1 flight: high ozone (80-120 ppb) in Asian plume interleaved with stratospheric influence

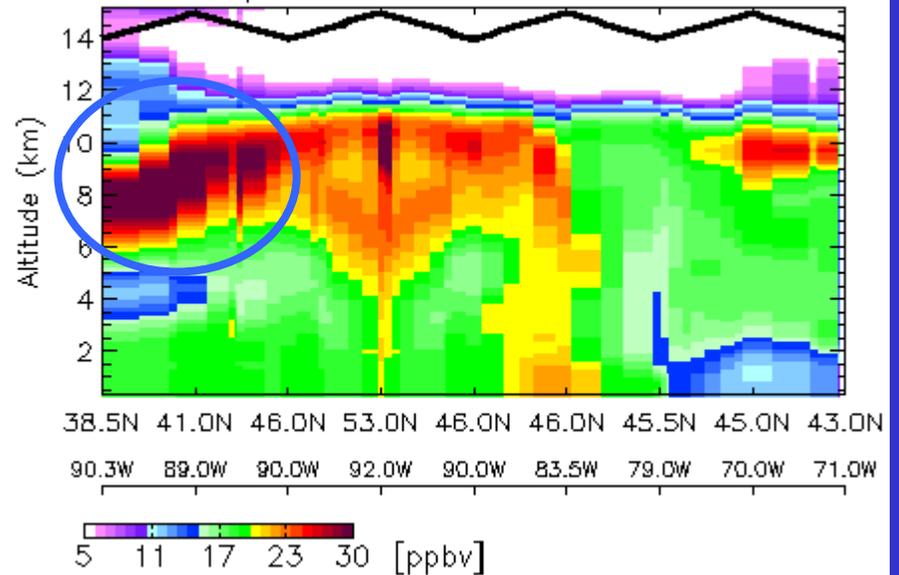


# GEOS Asian plume forecast for DC-8 flight #8 (July 15)

Asian CO 20040715 18 GMT at 310 hPa (8.8 km)

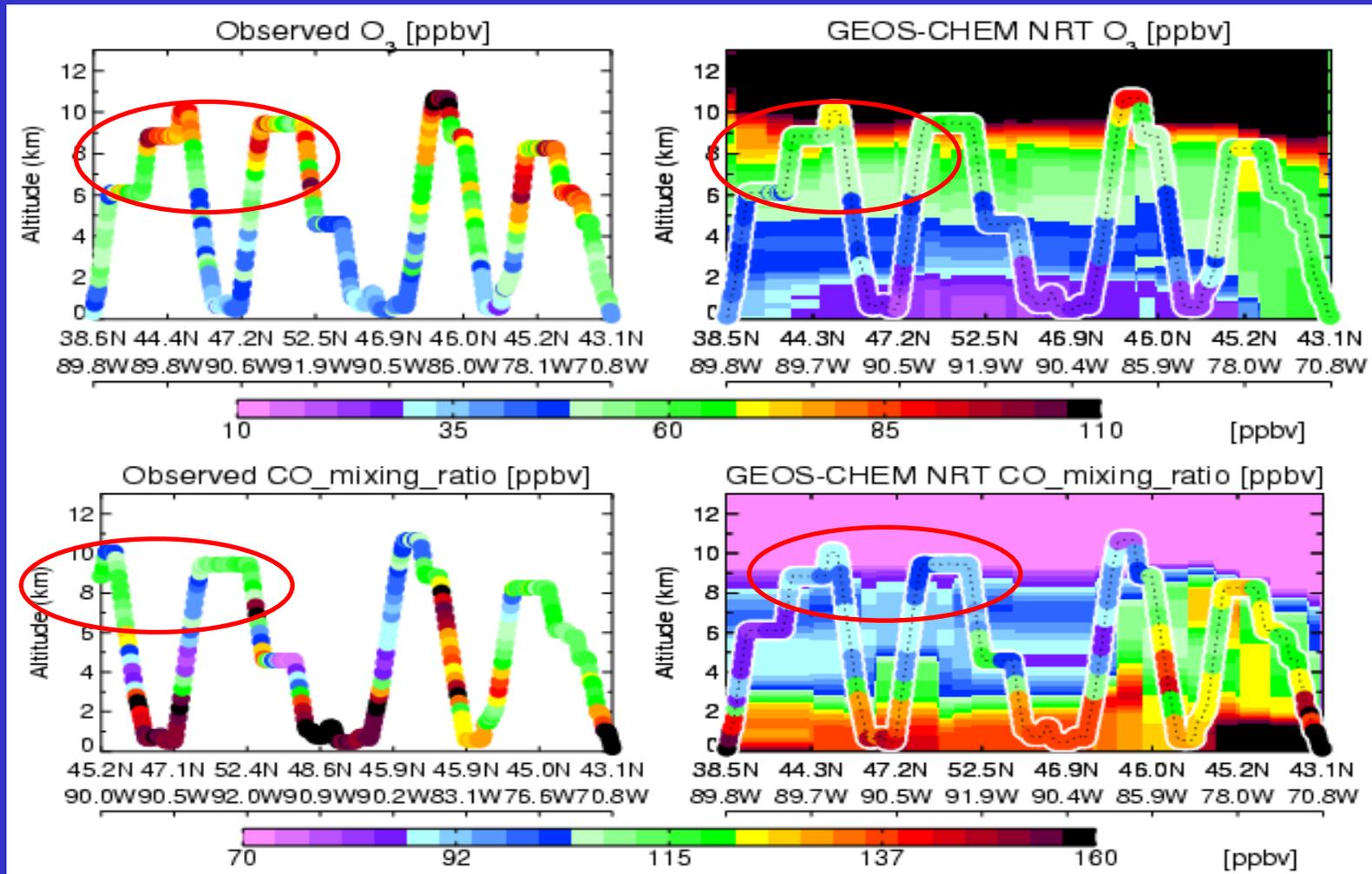


Curtain plot - Asian CO 20040715 18 GMT



8-9 day transport time from Asia

# July 15 flight: high ozone and CO observed in Asian plume



Observed  $\Delta O_3 = 20-40$  ppbv,  $\Delta CO = 20$  ppbv  
GEOS-CHEM  $\Delta O_3 = 5-10$  ppbv,  $\Delta CO = 10-20$  ppbv