

# **Update on: AIRS Carbon Monoxide**

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University of Maryland, Baltimore County

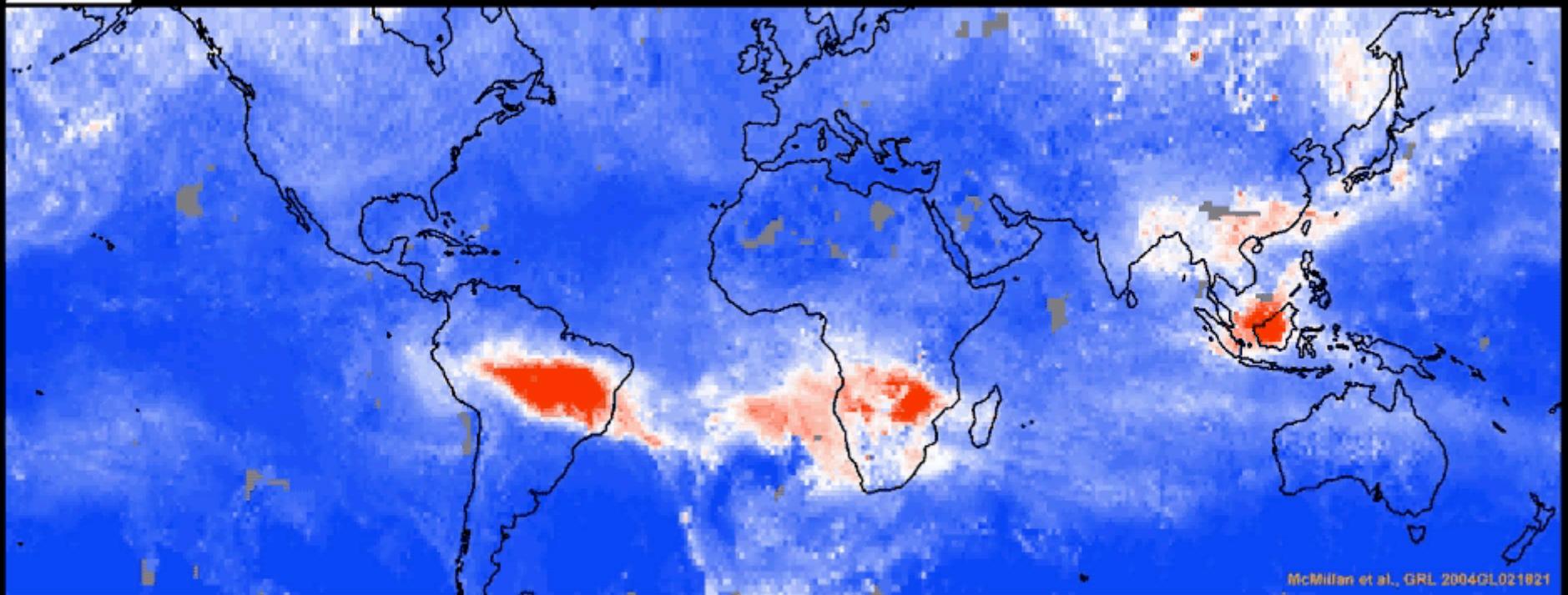
C. Barnet and W. Wolf (NOAA/NESDIS),  
X. J. Warner, M. L. McCourt, L. L. Strow, and Allen Chu (UMBC)  
P. Novelli (NOAA/CMDL), Glen Sachse (NASA/LaRC)

# AIRS Daily Global CO



Mean 500mb CO

AIRS Data, September 22-23, 2002



parts per billion by volume (PPBV)

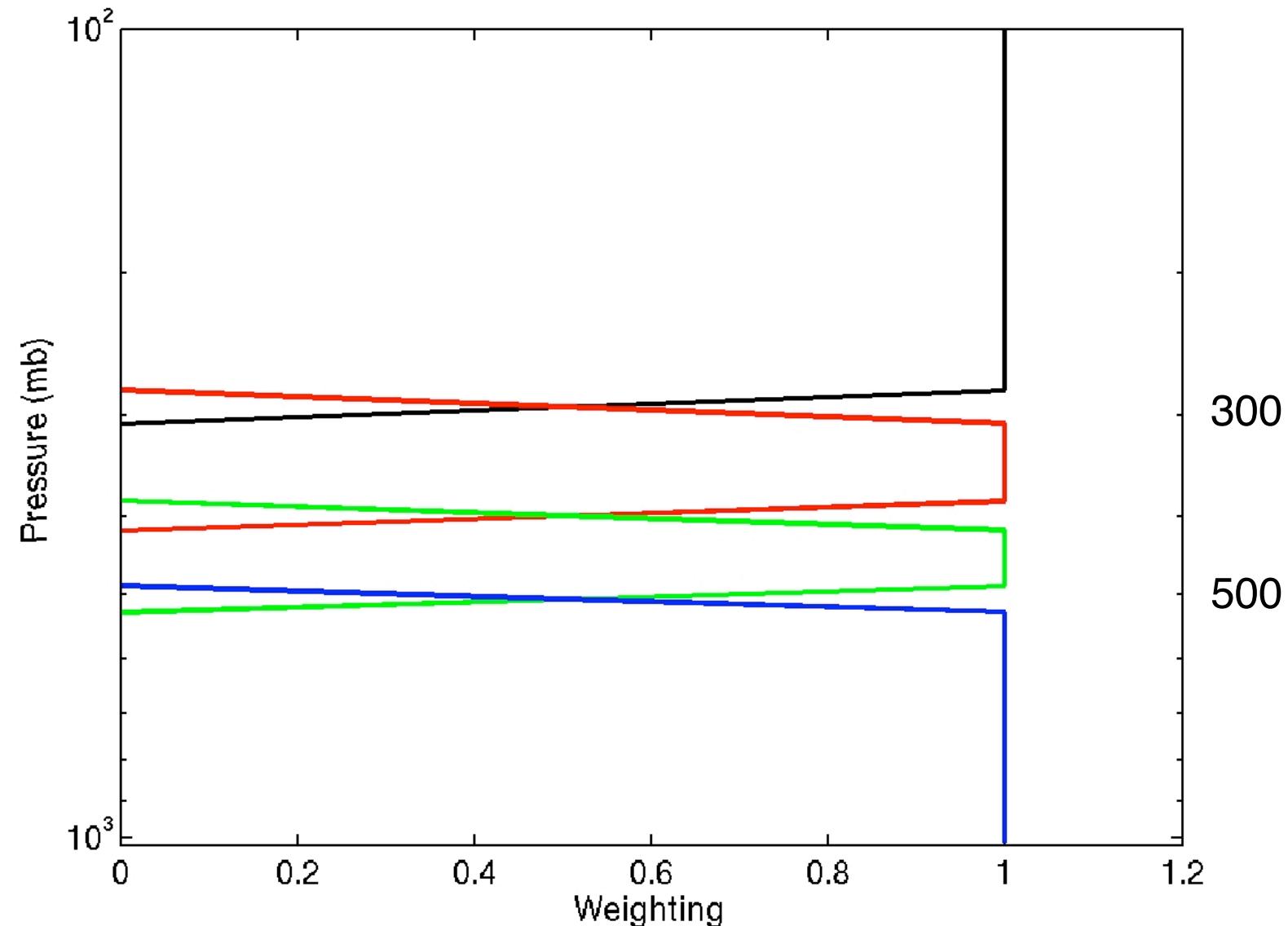
75 105 135 165 195

- Based on data in GRL paper now in revision

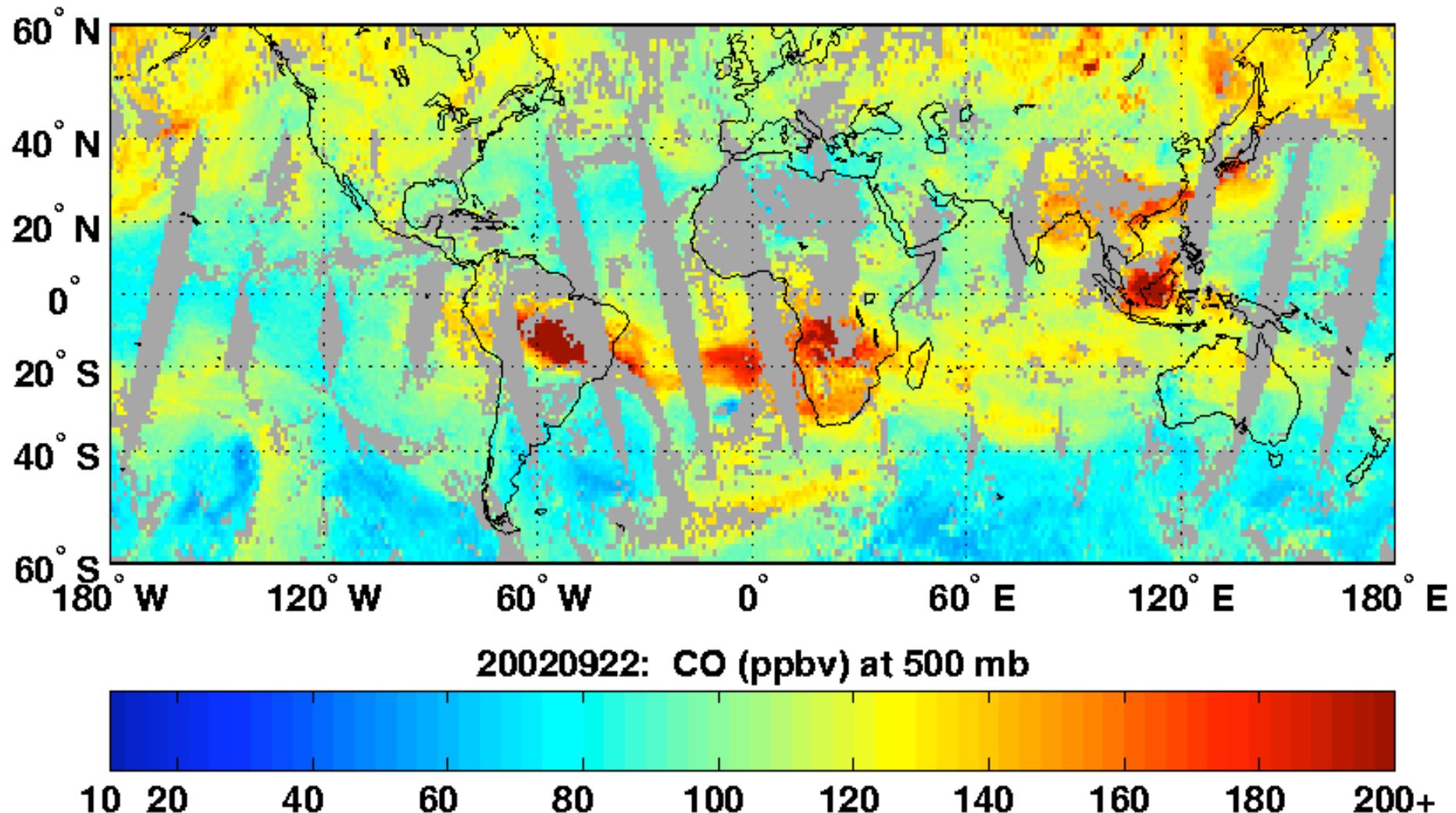
# AIRS CO Status

- GRL manuscript: in revisions
- JPL first public movies based on GRL
- CO verticality?
- CO first guess?
- CO correlations with aerosols?
- Impacts of clouds and smoke?
- CO only a support product in v4.0!
- NASA INTEX-A field experiment
- Retrieval Algorithm Optimization → v5.0
- Validation vs. In situ and MOPIIT
- Other Case Studies

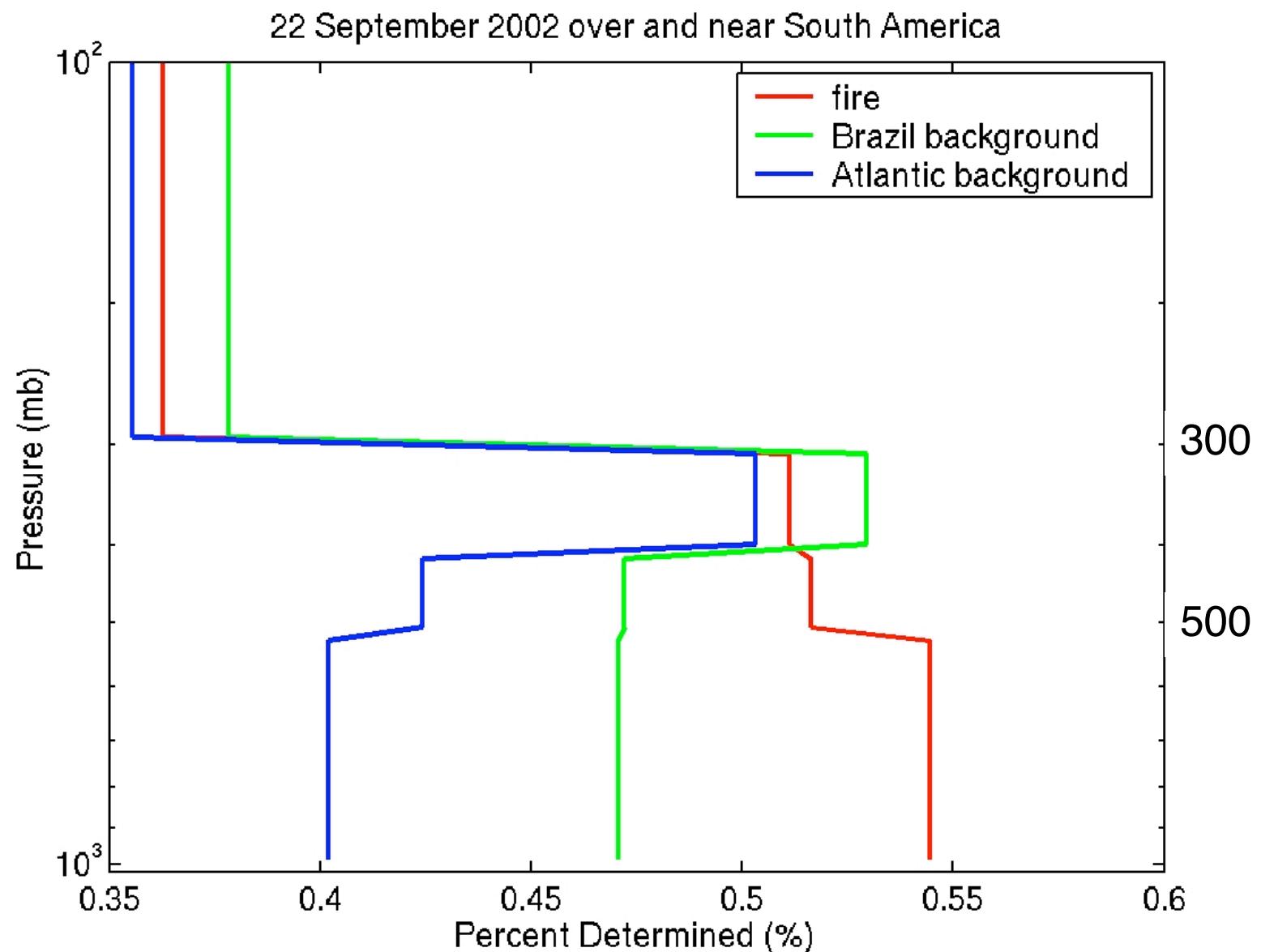
# AIRS CO Retrieval Trapezoids



# AIRS CO Retrieval Map



# AIRS CO *Verticality*



Intercontinental chemistry and Transport EXperiment

## AIRS CO for INTEX-A

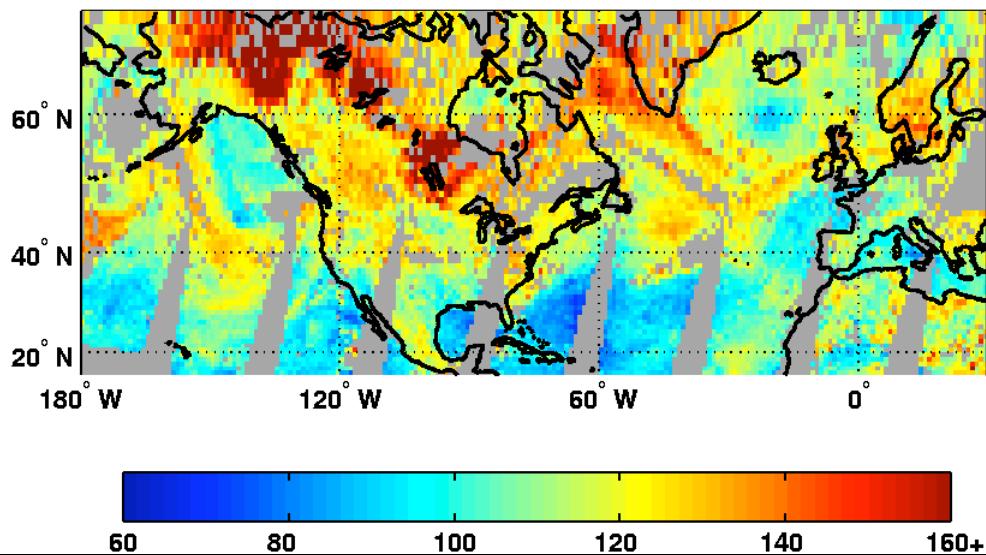
- Next-day CO maps and 48-hour trajectory forecasts for flight-planning
- Large-scale view for Lagrangian experiment
- Automated processing w/online posting

## INTEX-A for AIRS CO

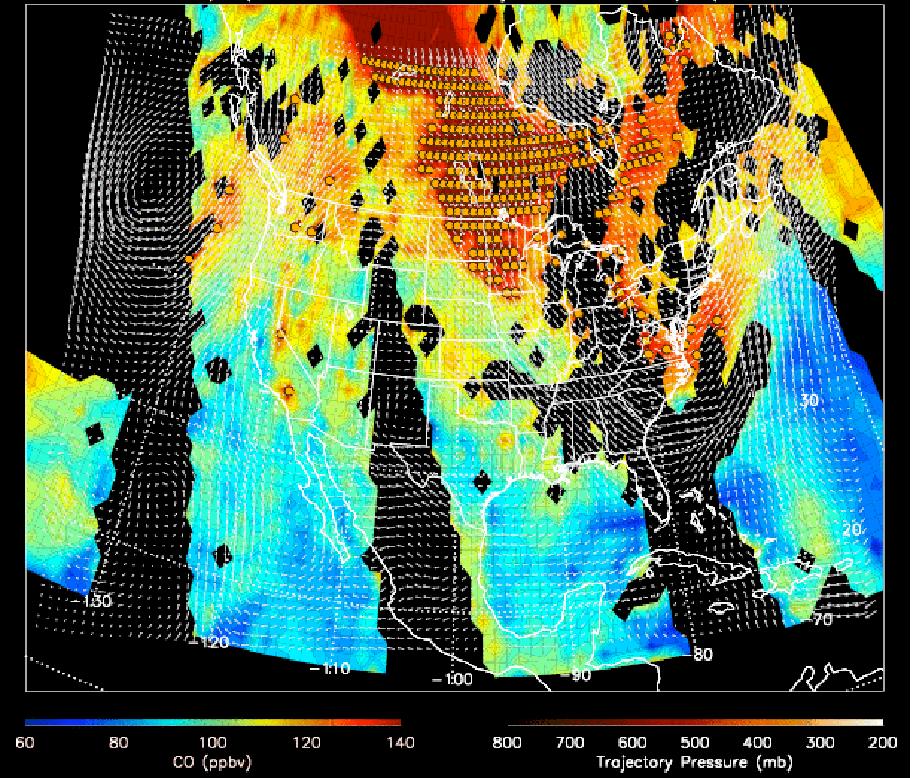
- In situ CO profiles for validation
- Intensive modeling collaborations for analysis and interpretation
- Process studies in global context

# INTEX-A: AIRS Daily Products

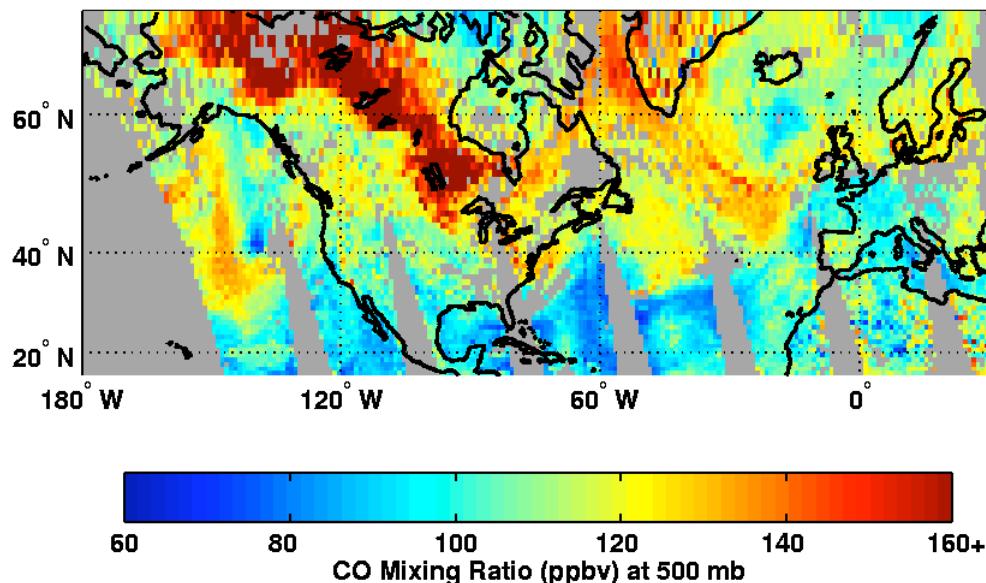
Local AM (descending) AIRS CO at 500 mb on 20040716



AIRS 2004/07/16 500mb CO & CO Trajectories on 2004/07/16 19Z

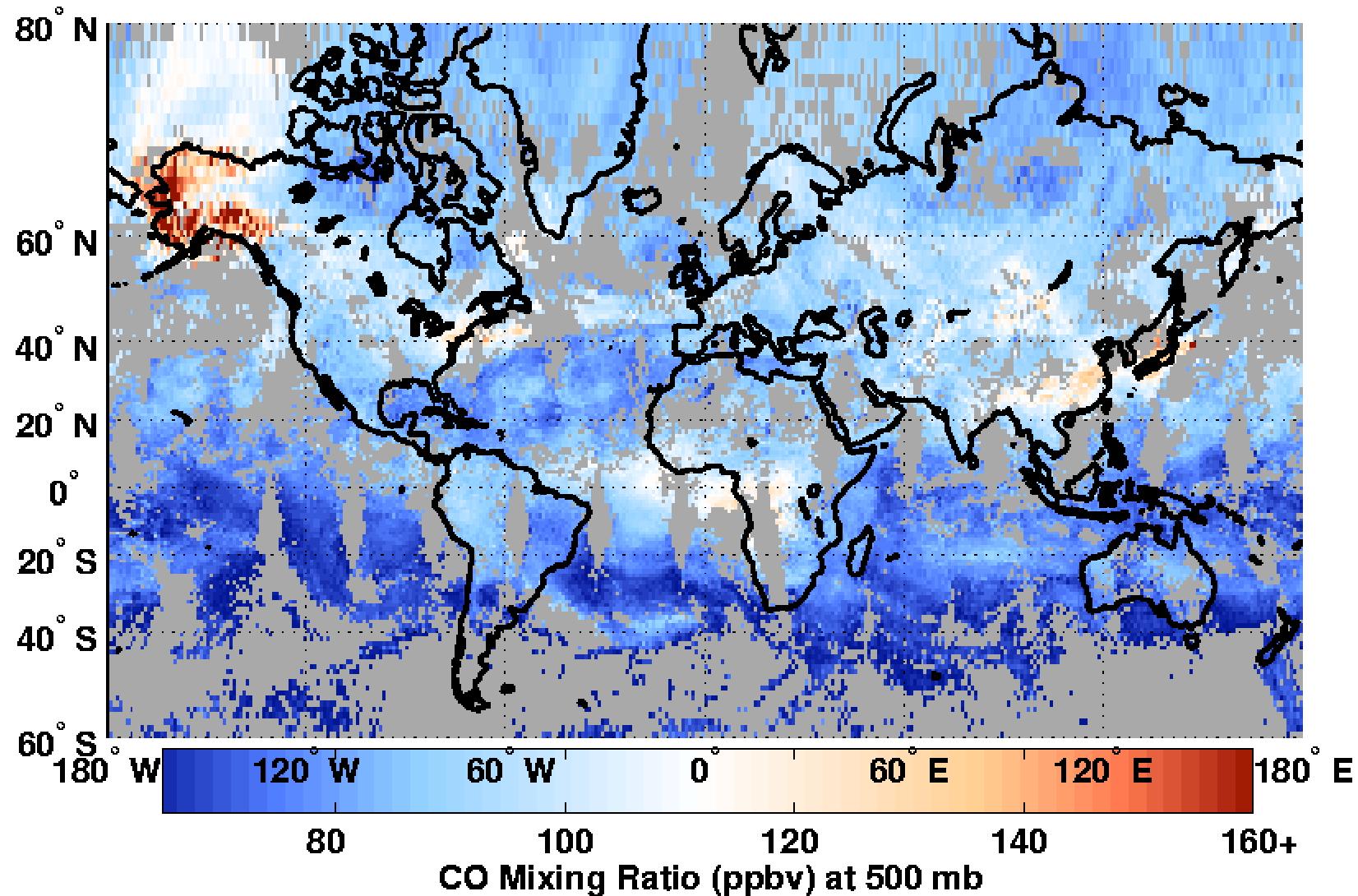


Local PM (ascending) AIRS CO at 500 mb on 20040716



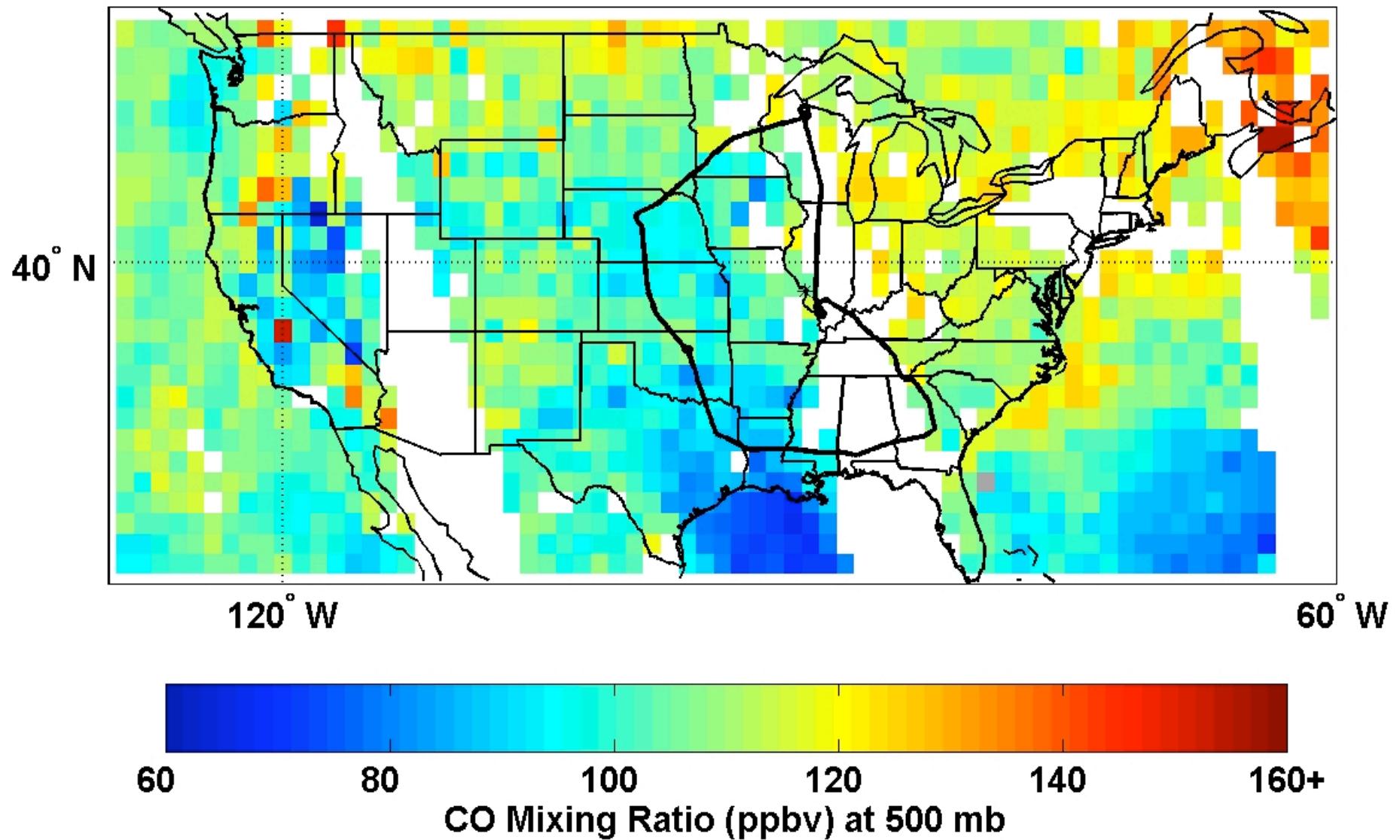
# July 2004 AIRS Daily Global CO

AIRS CO at 500 mb on 20040701

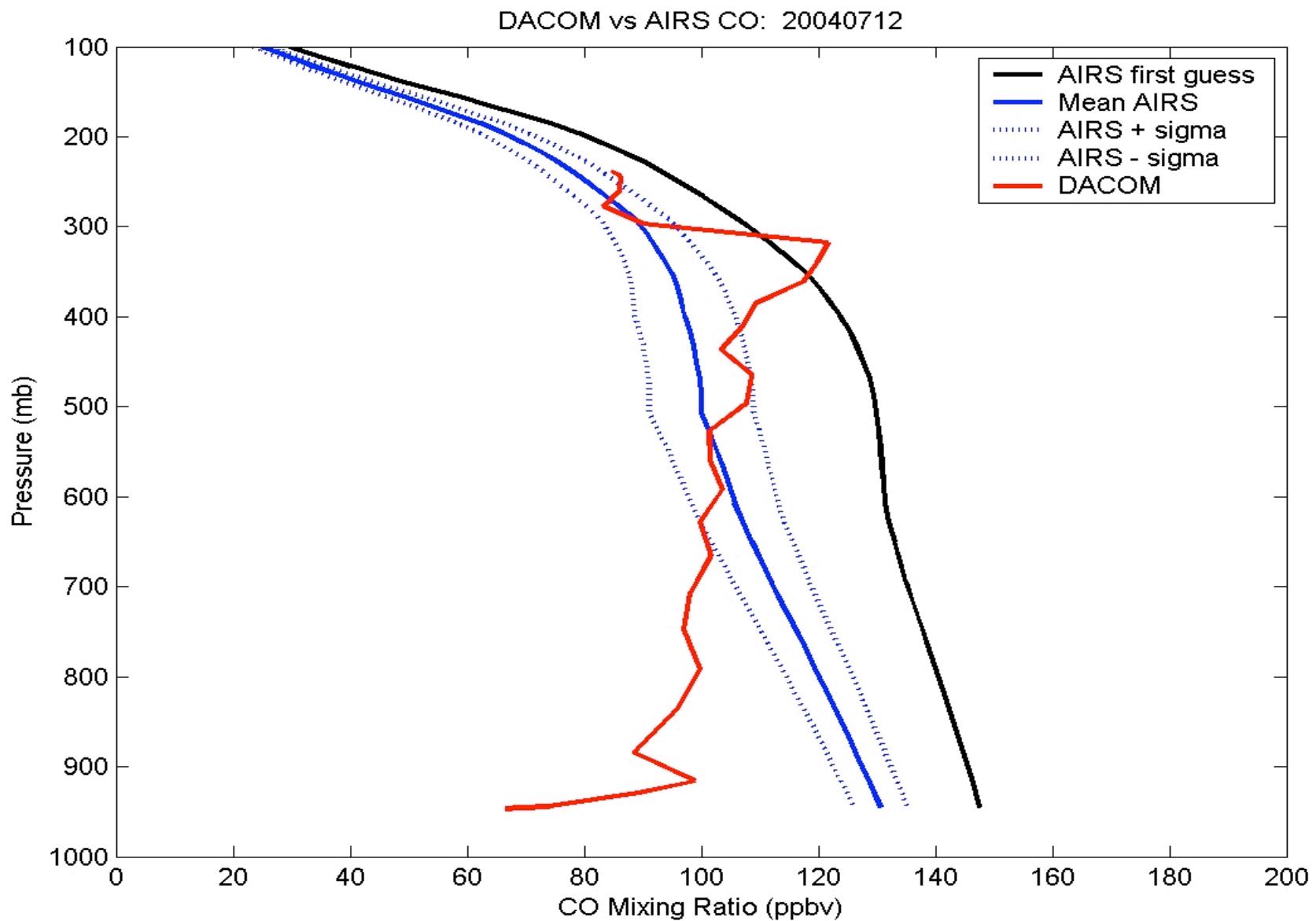


# First INTEX AIRS Validation

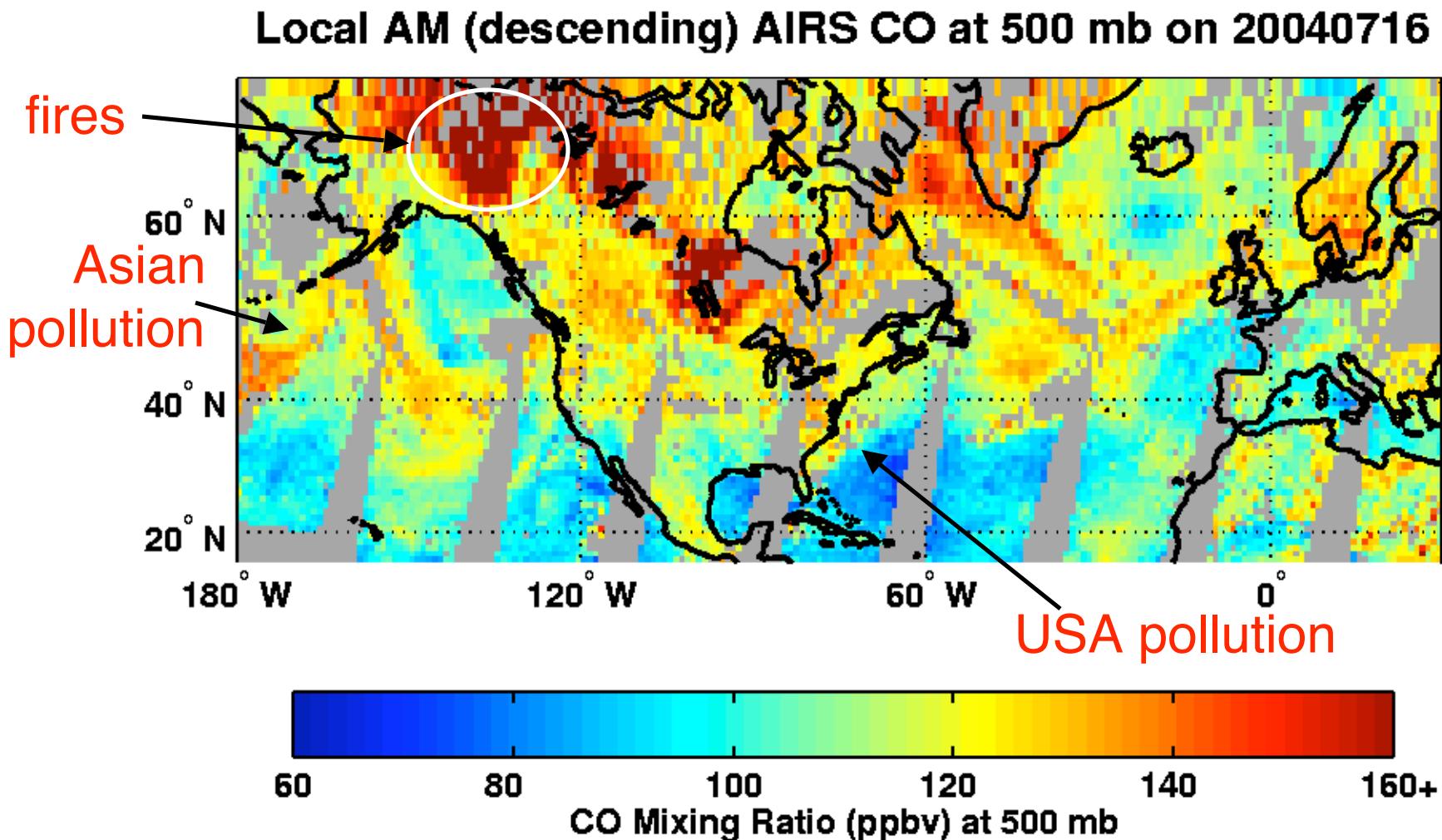
Local PM AIRS CO at 500 mb on 20040712



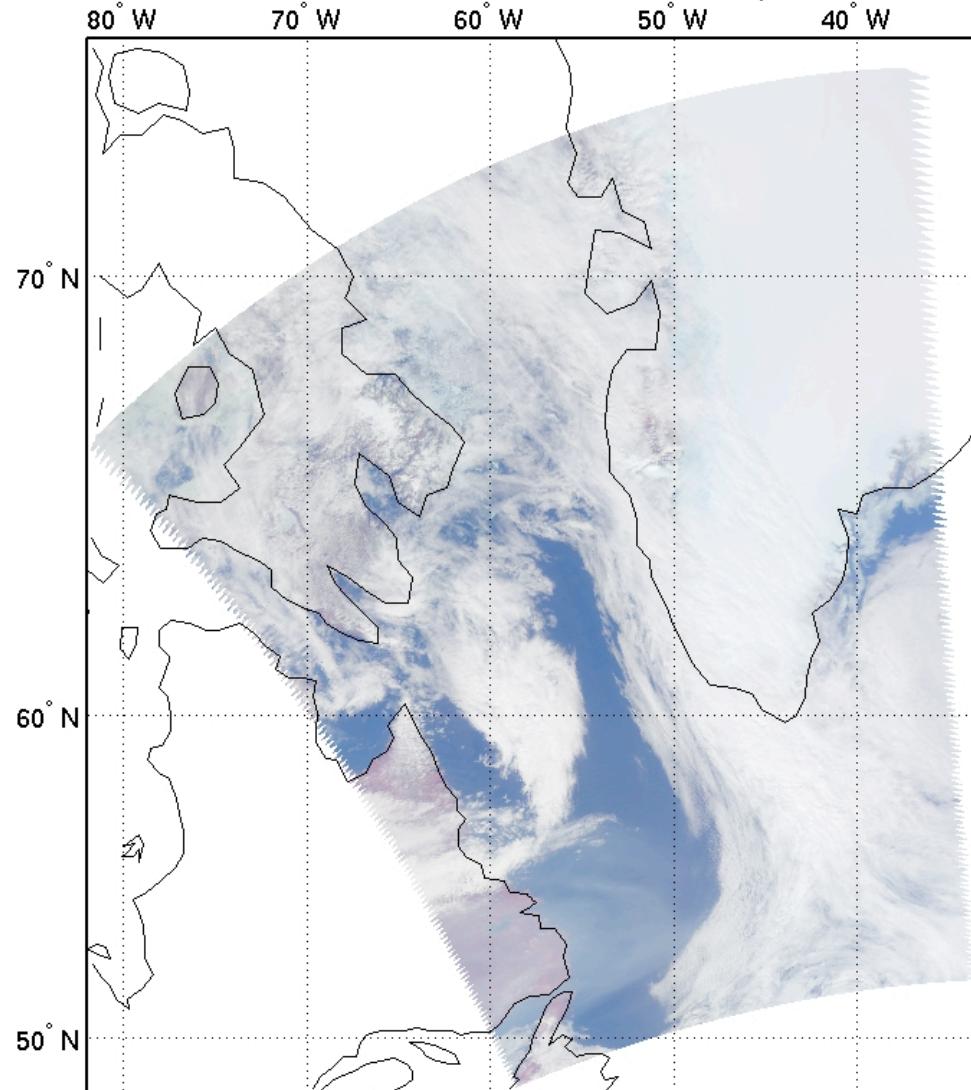
# First INTEX AIRS Validation



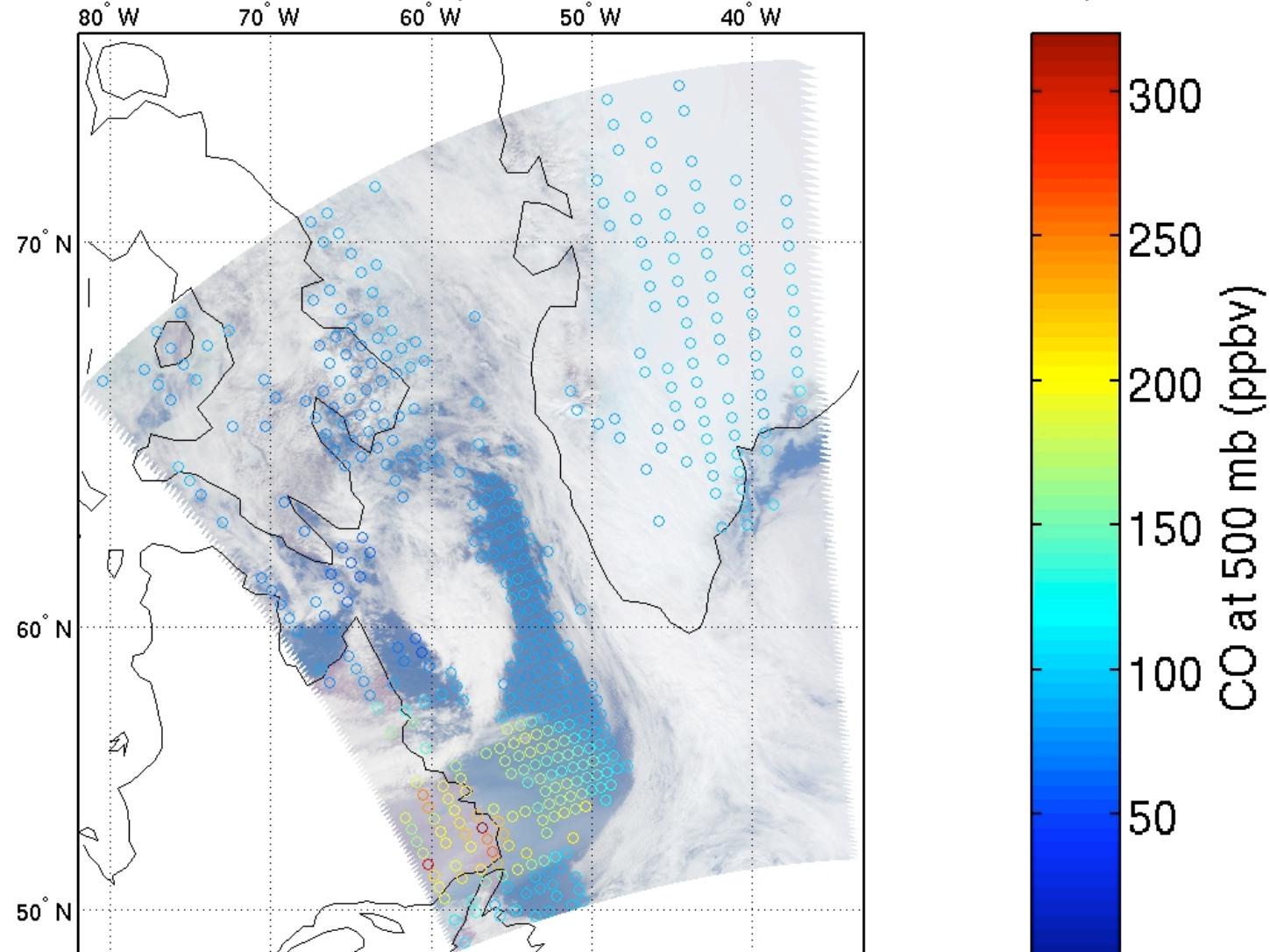
# INTEX-A: July 16-23 CO Event



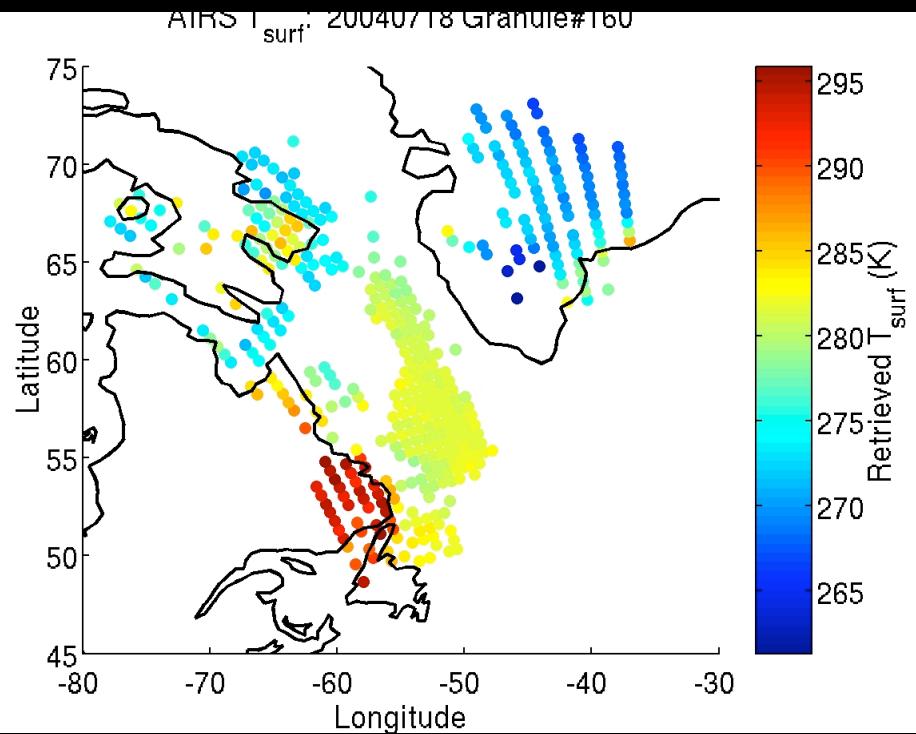
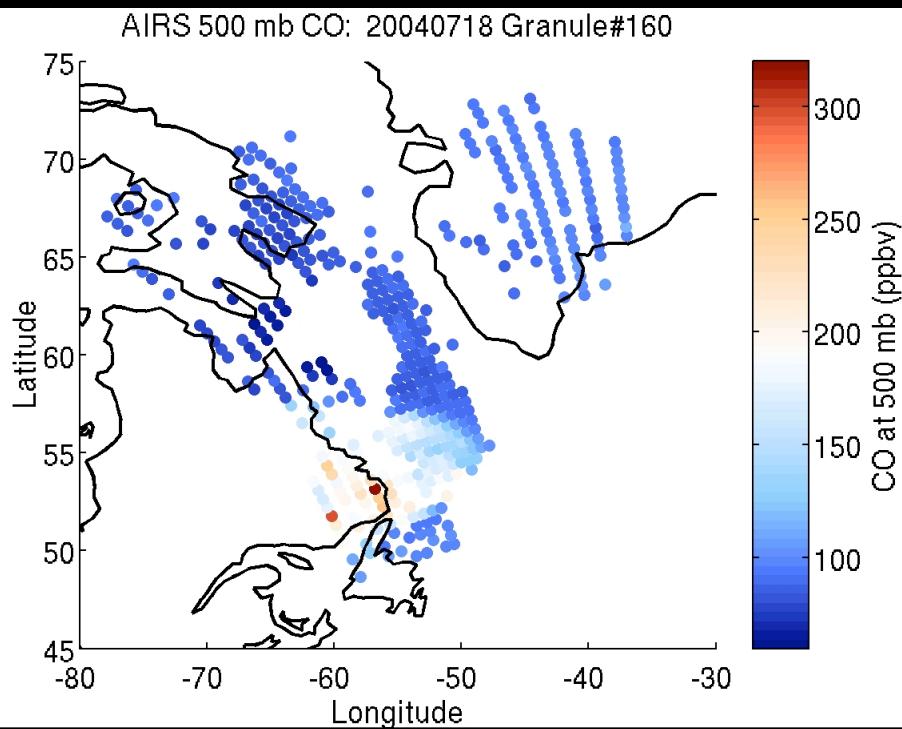
AIRS.2004.07.18.160.L1B.VIS, RGB=321

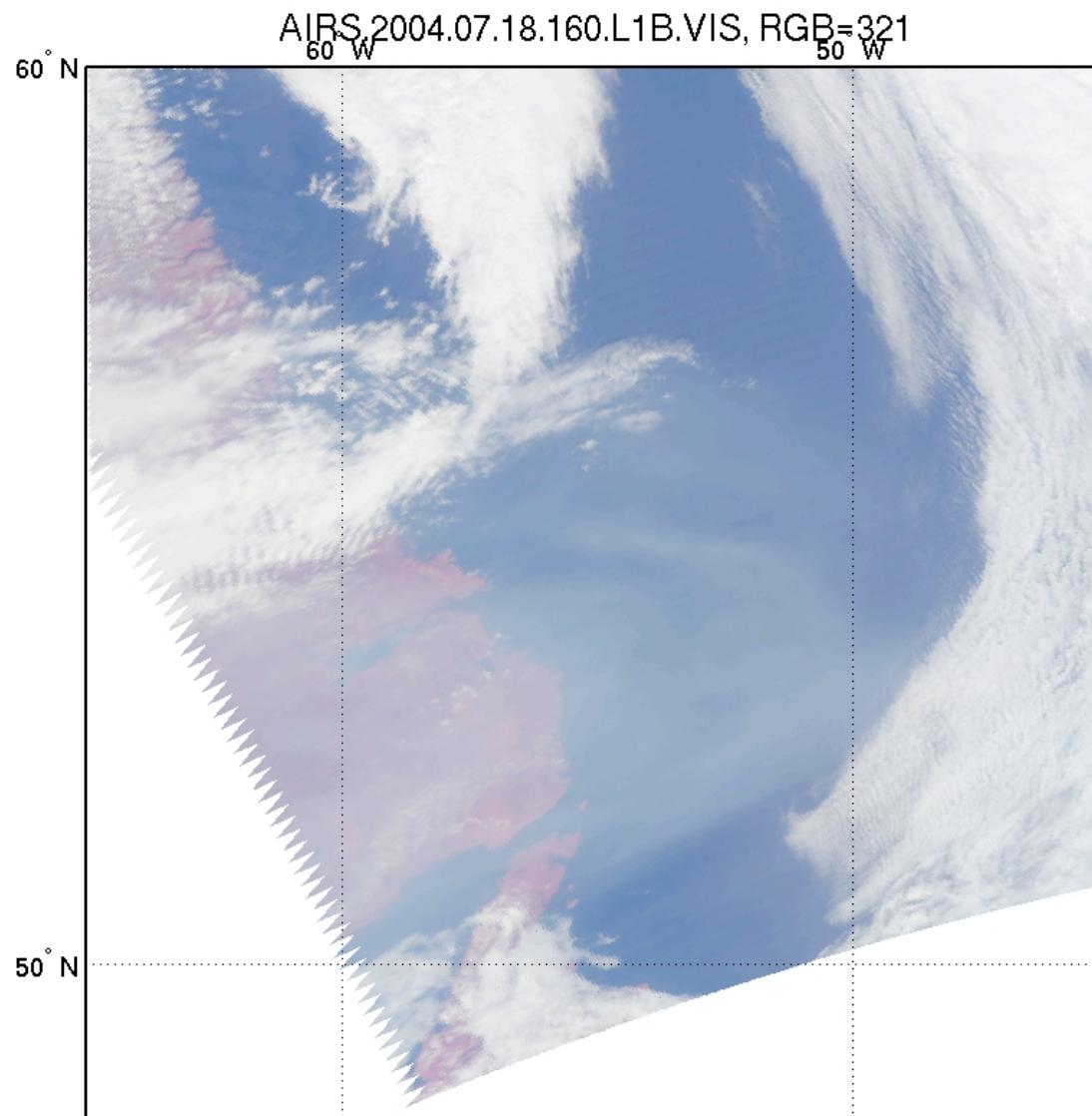


AIRS.2004.07.18.160.L1B.VIS, RGB=321 & AIRS 500mb CO,

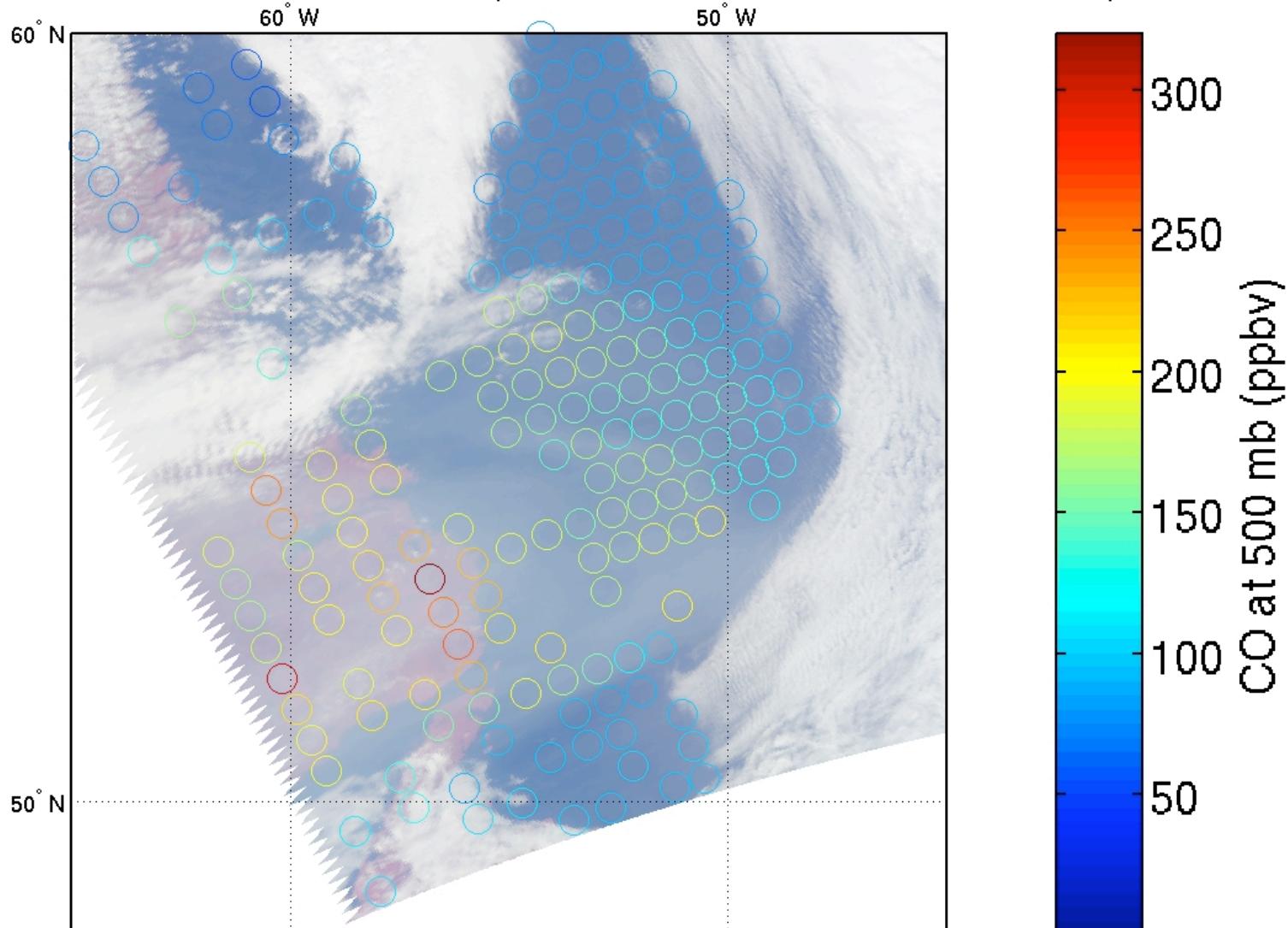


# SST depression: real or artifact?

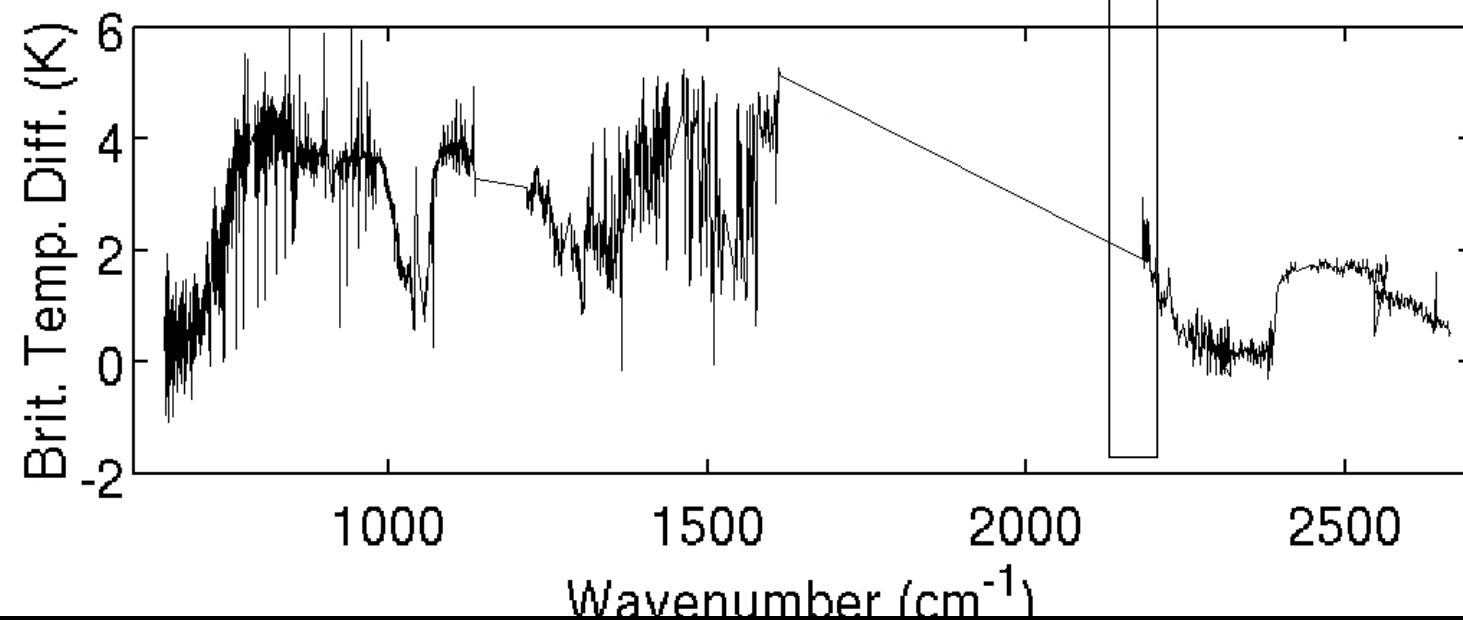
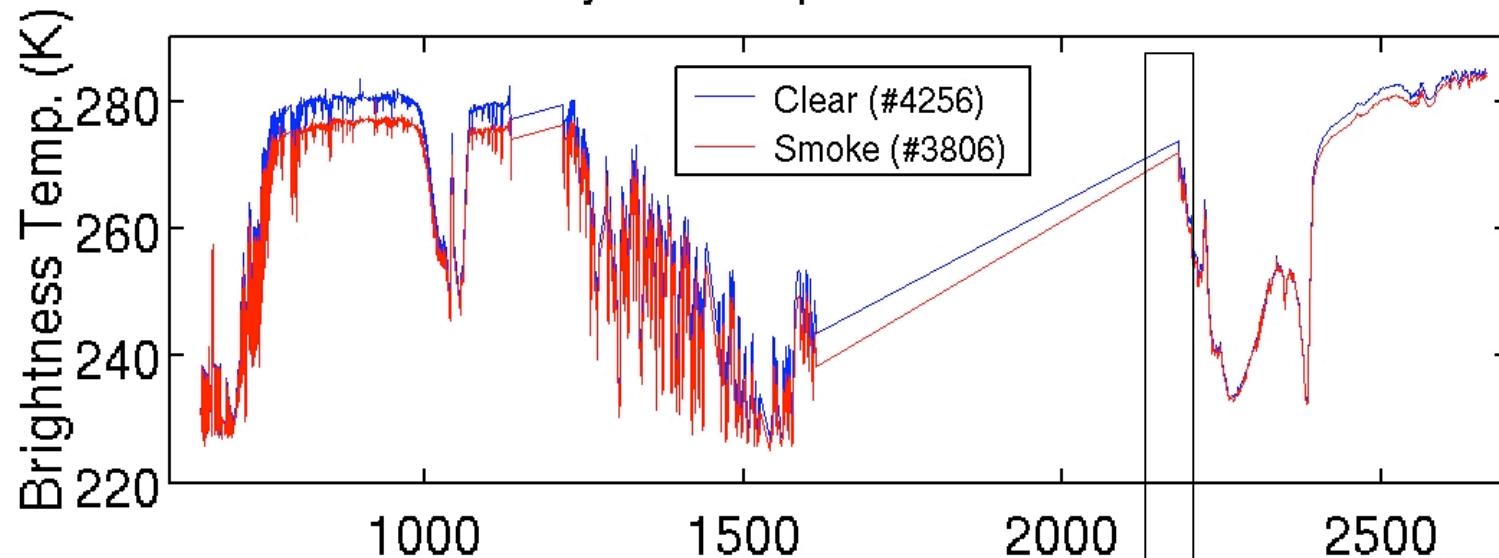




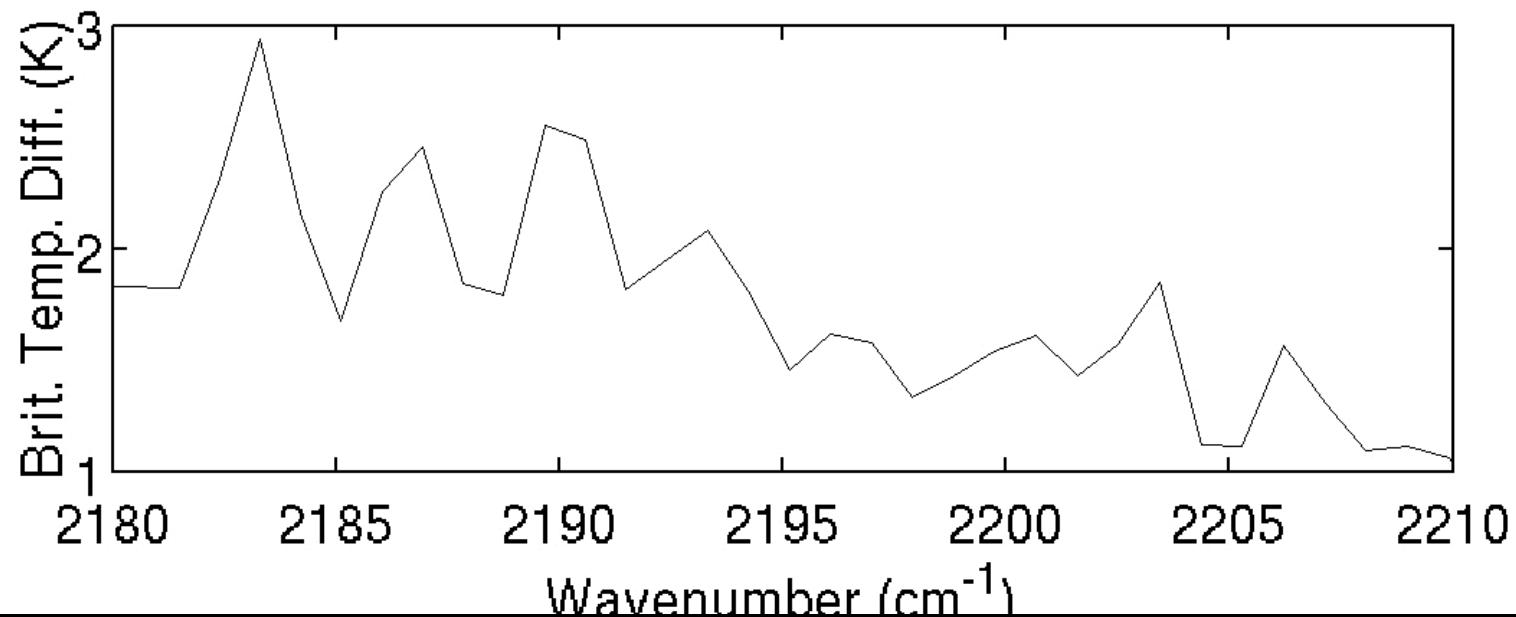
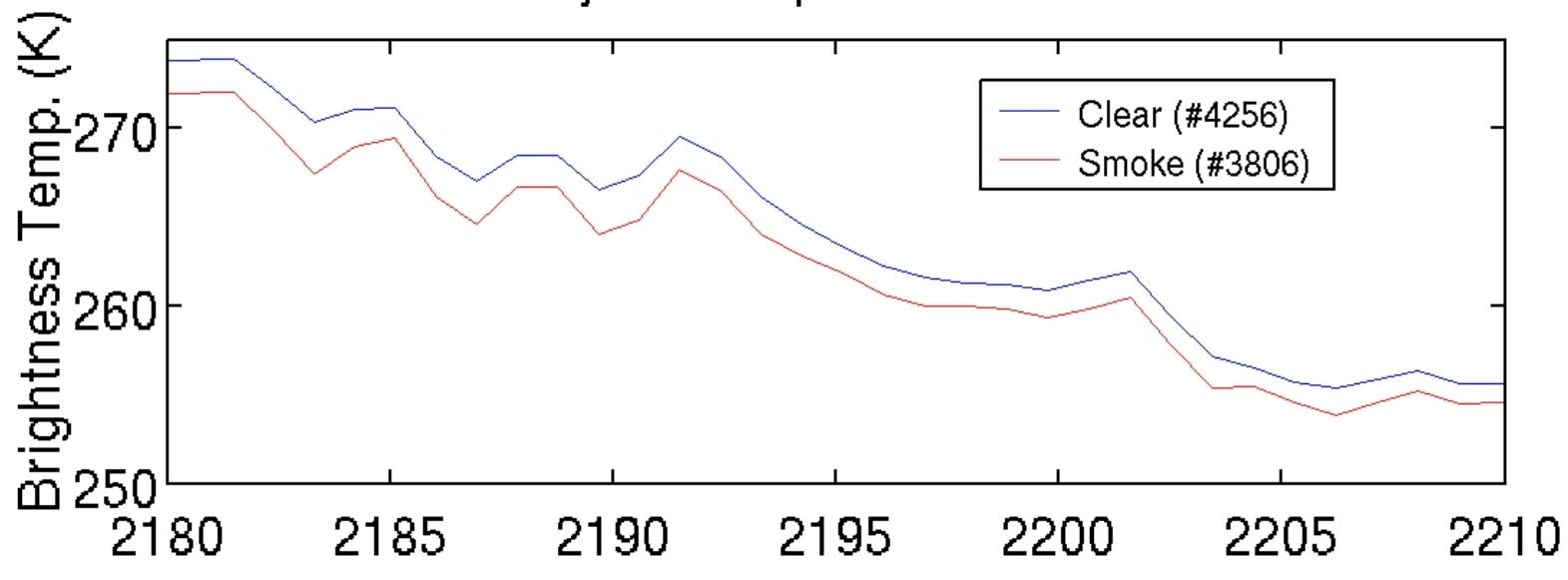
AIRS.2004.07.18.160.L1B.VIS, RGB=321 & AIRS 500mb CO,



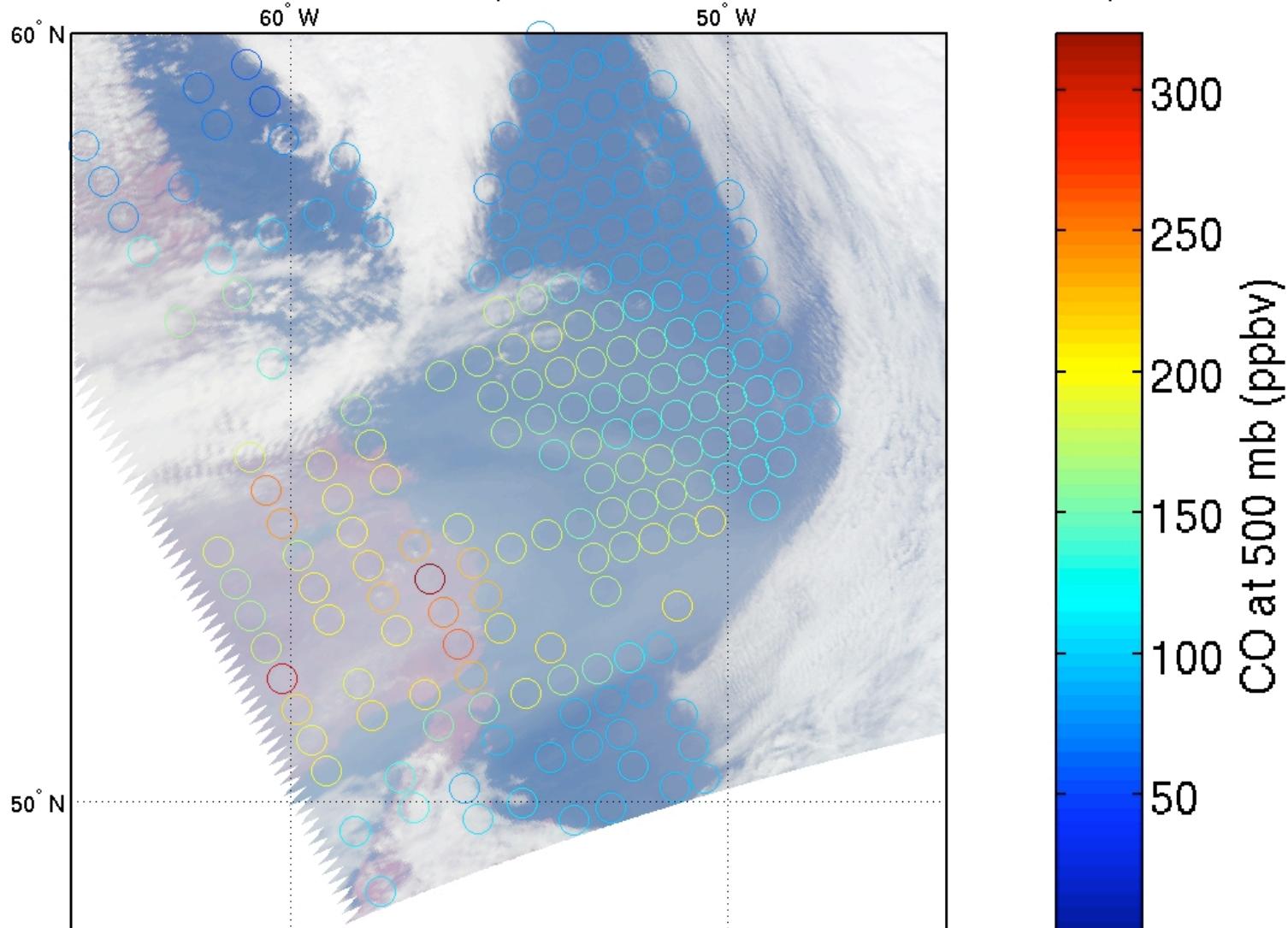
Clear vs. Smoky AIRS Spectra: 20040718 Gran#160



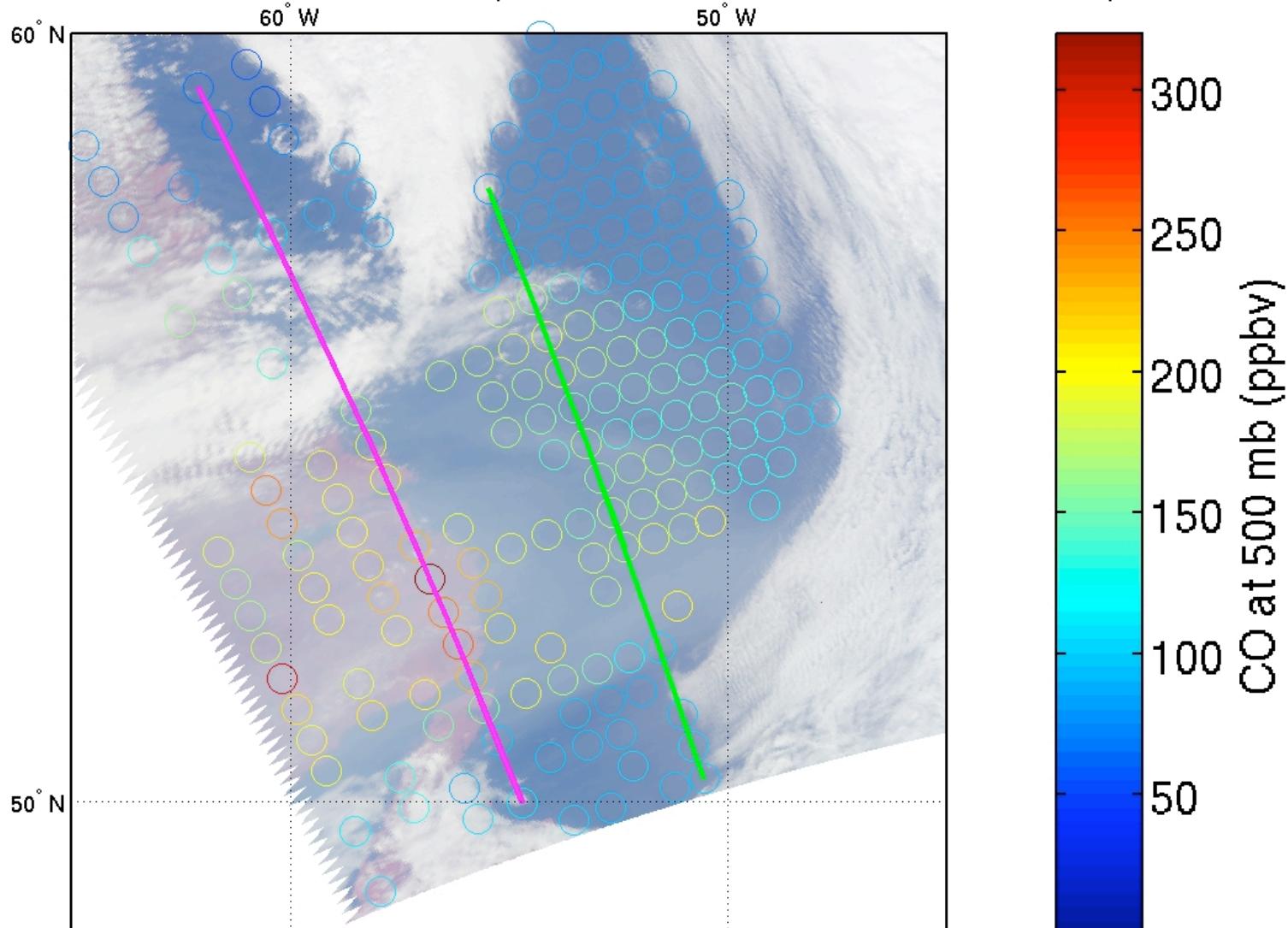
Clear vs. Smoky AIRS Spectra: 20040718 Gran#160



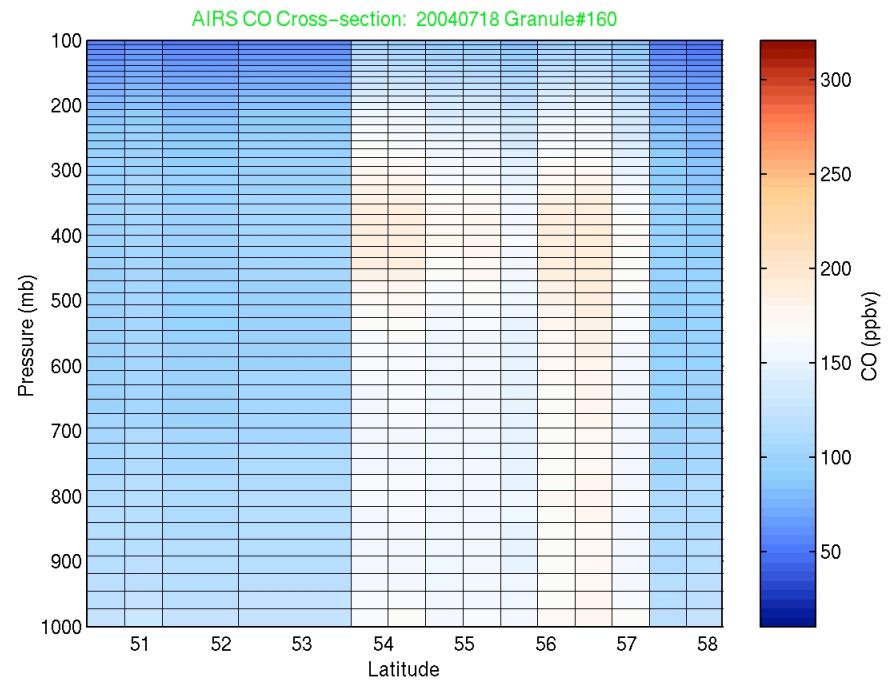
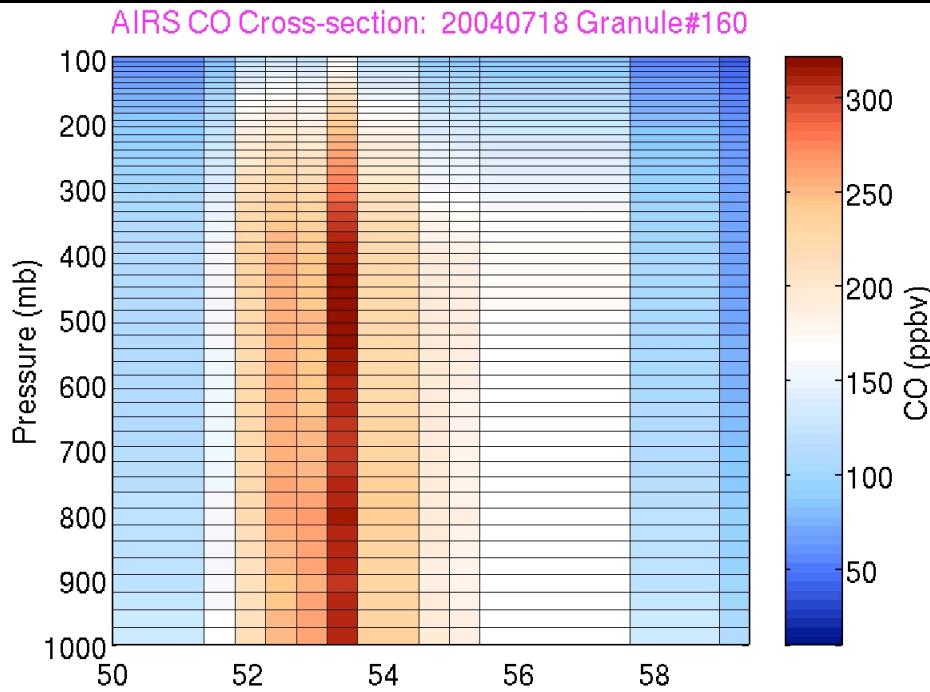
AIRS.2004.07.18.160.L1B.VIS, RGB=321 & AIRS 500mb CO,



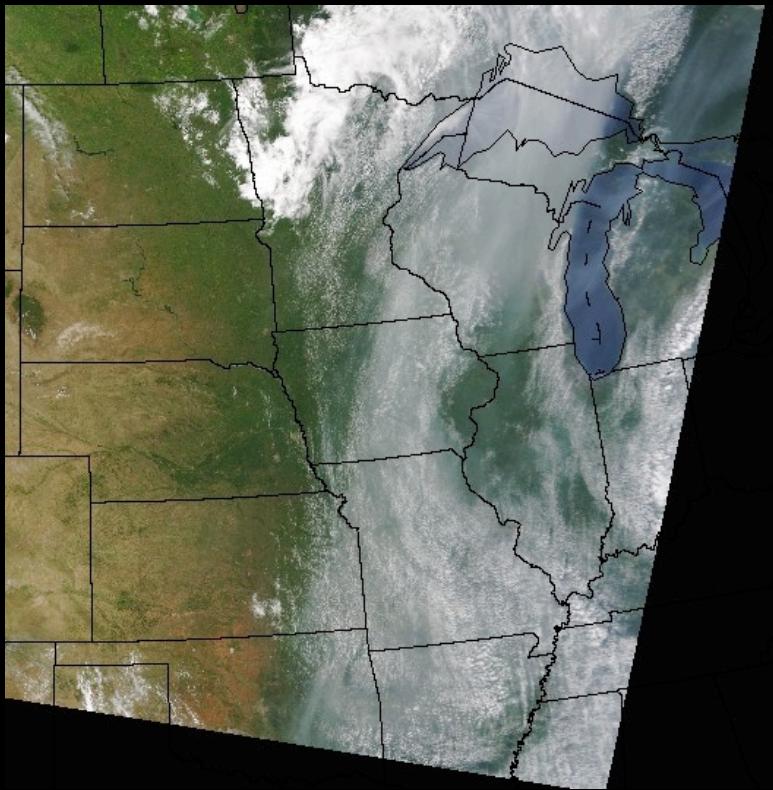
AIRS.2004.07.18.160.L1B.VIS, RGB=321 & AIRS 500mb CO,



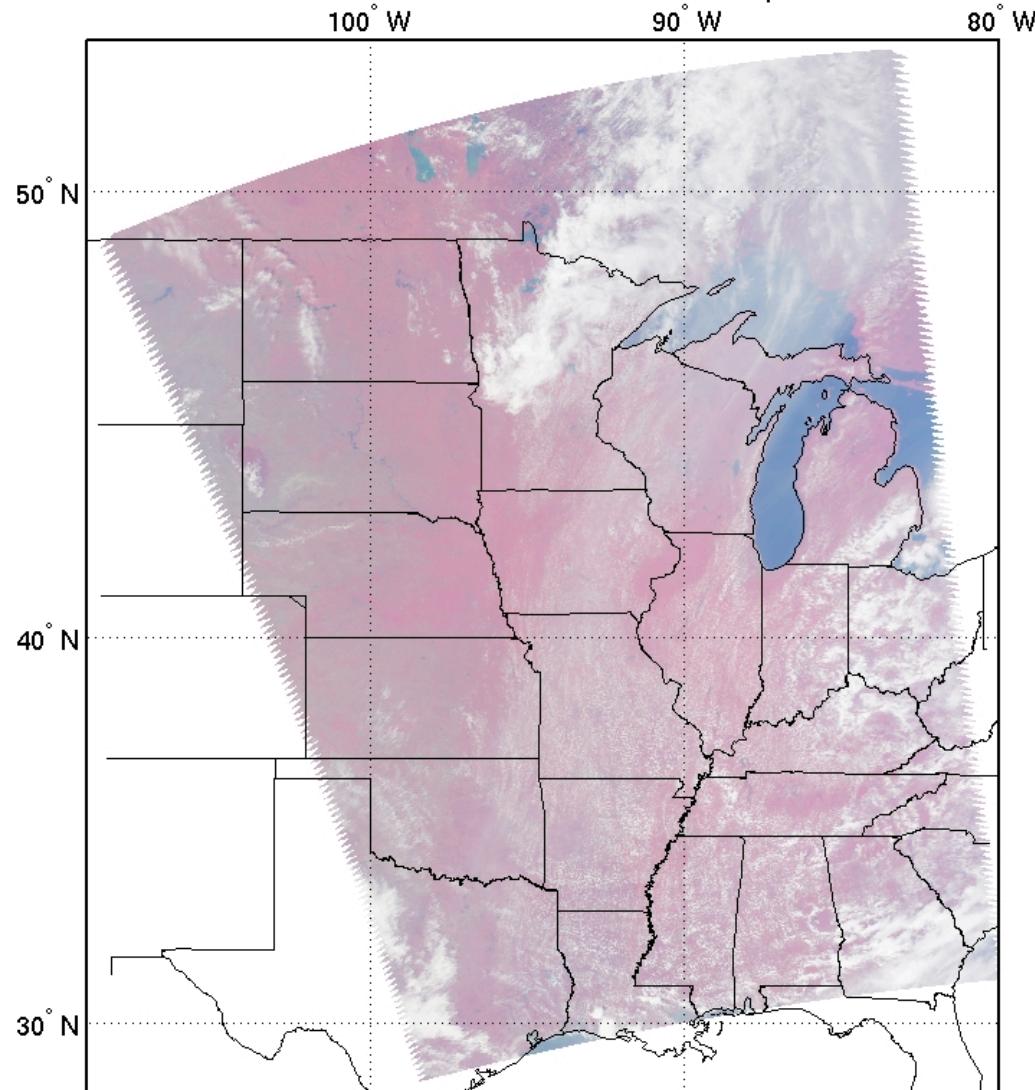
# CO Cross-sections: Vertical information?



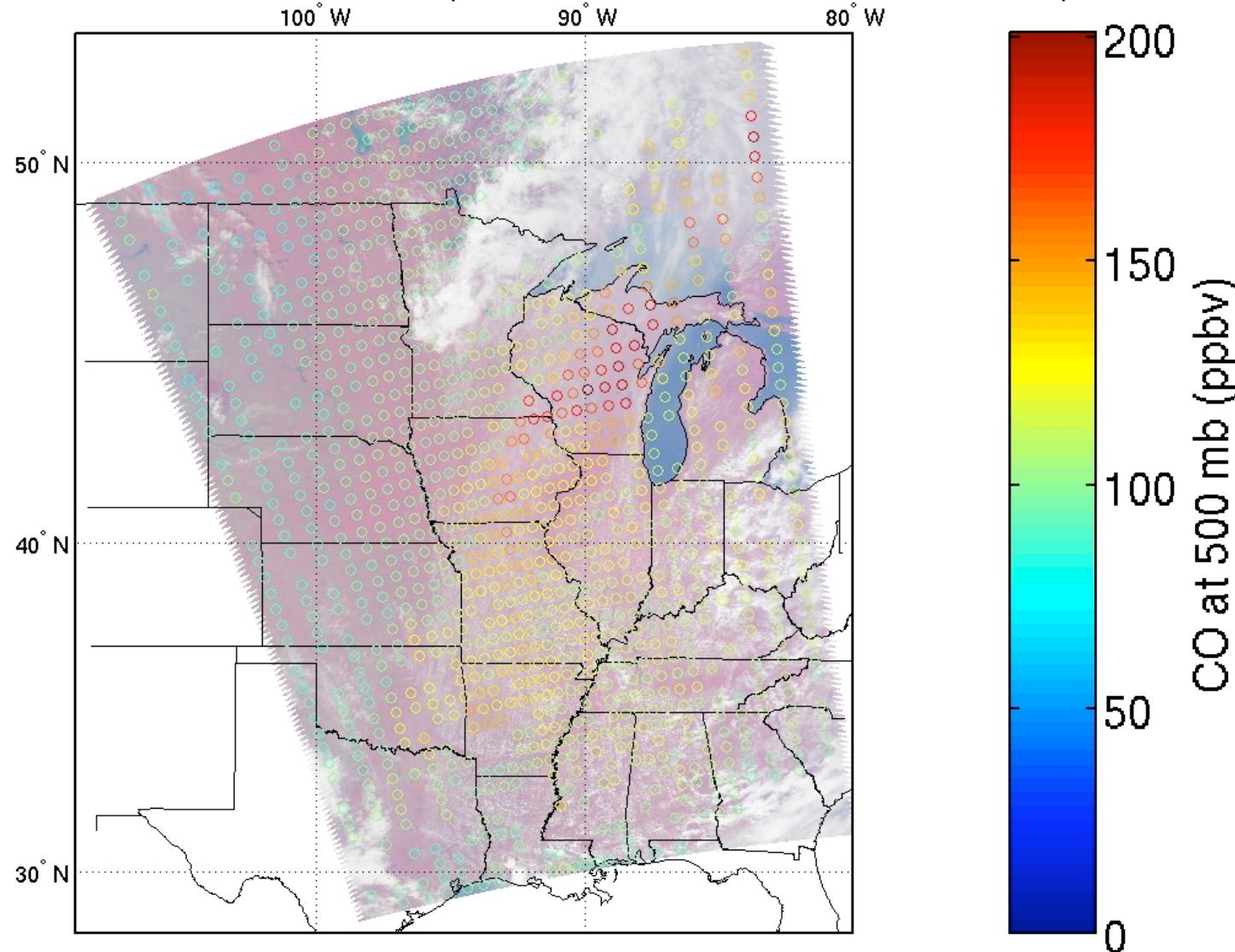
# MODIS Terra 7/18 1728UT



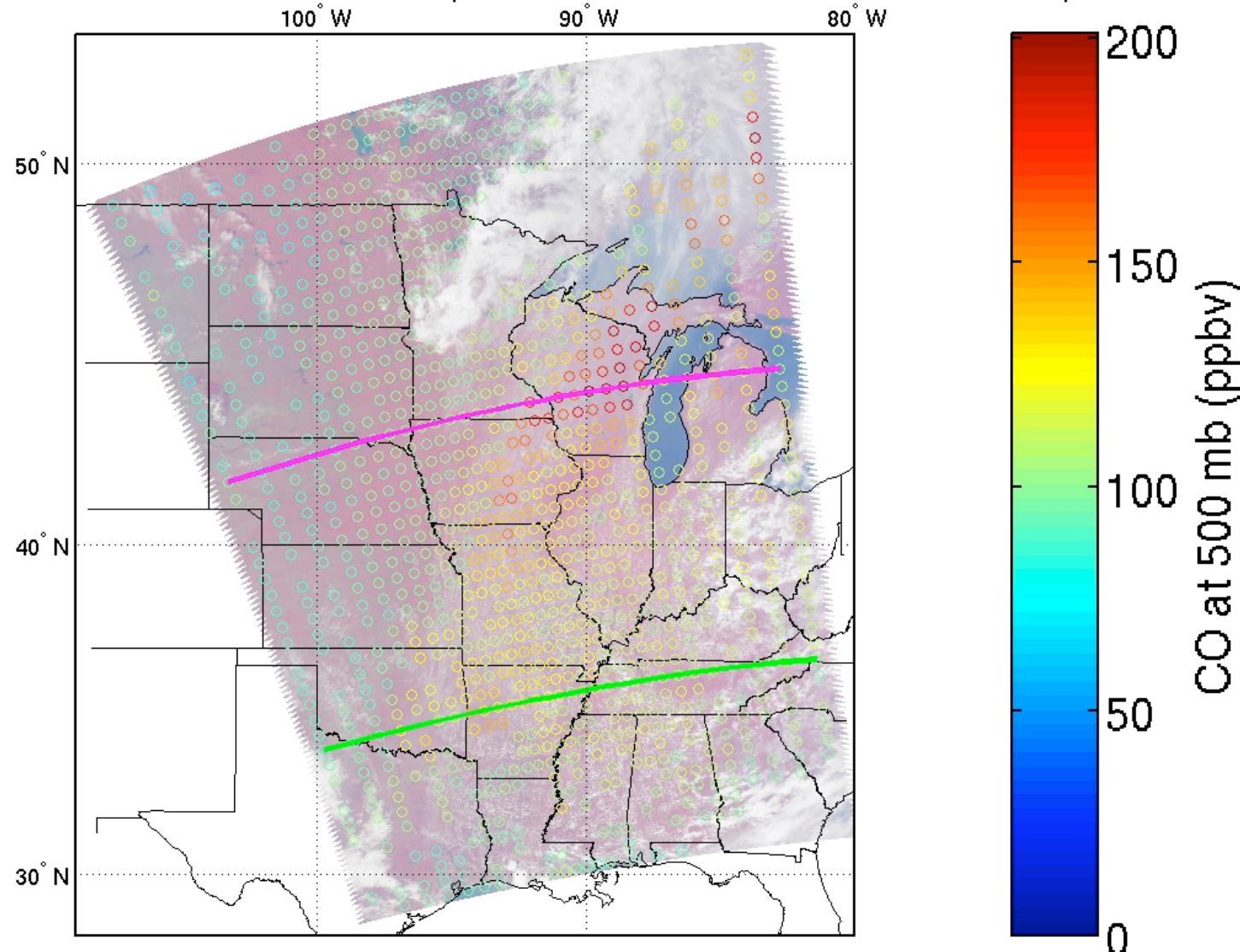
AIRS.2004.07.18.192.L1B.VIS, RGB=321



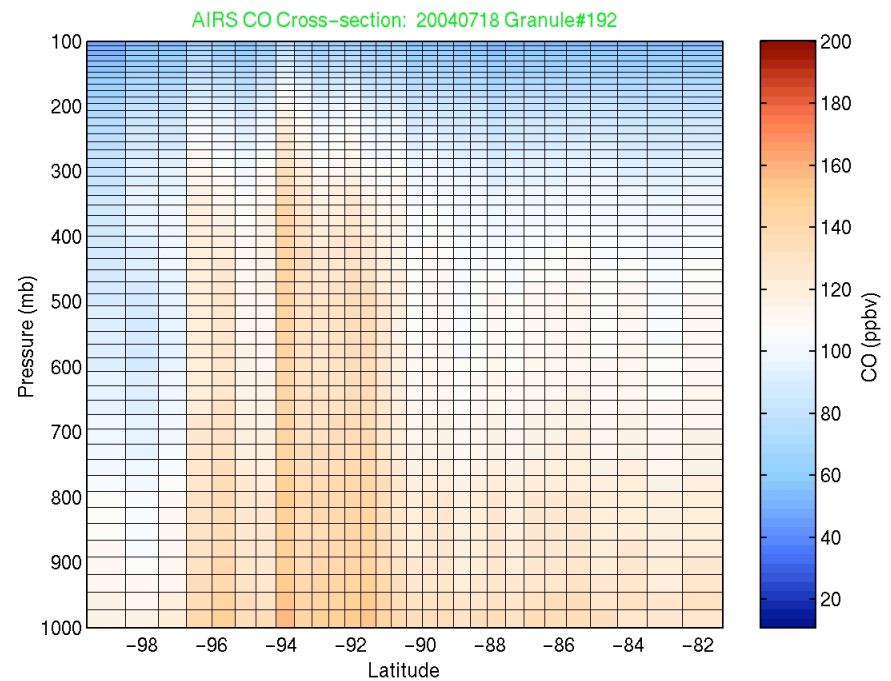
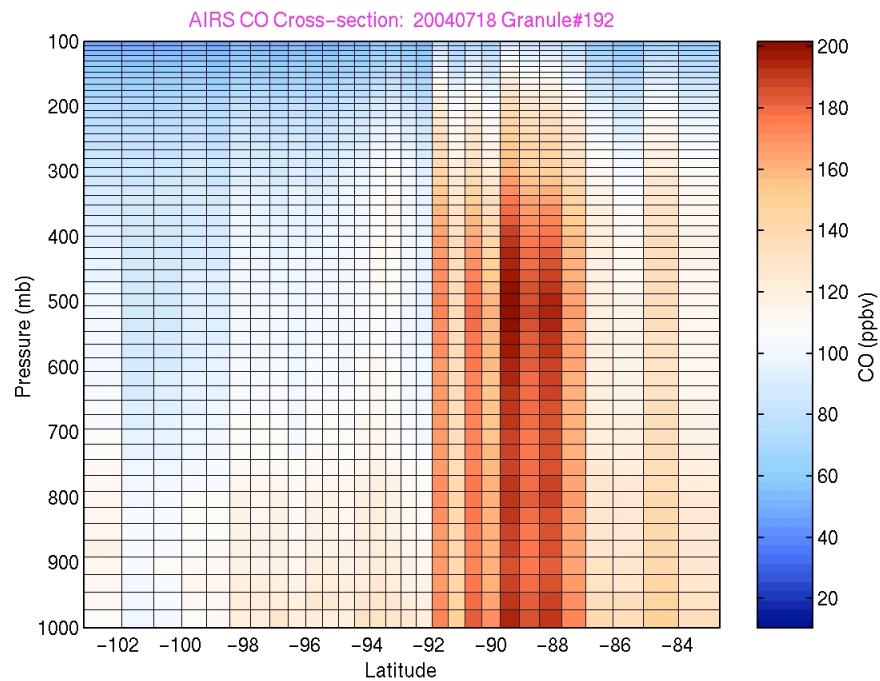
AIRS.2004.07.18.192.L1B.VIS, RGB=321 & AIRS 500mb CO,



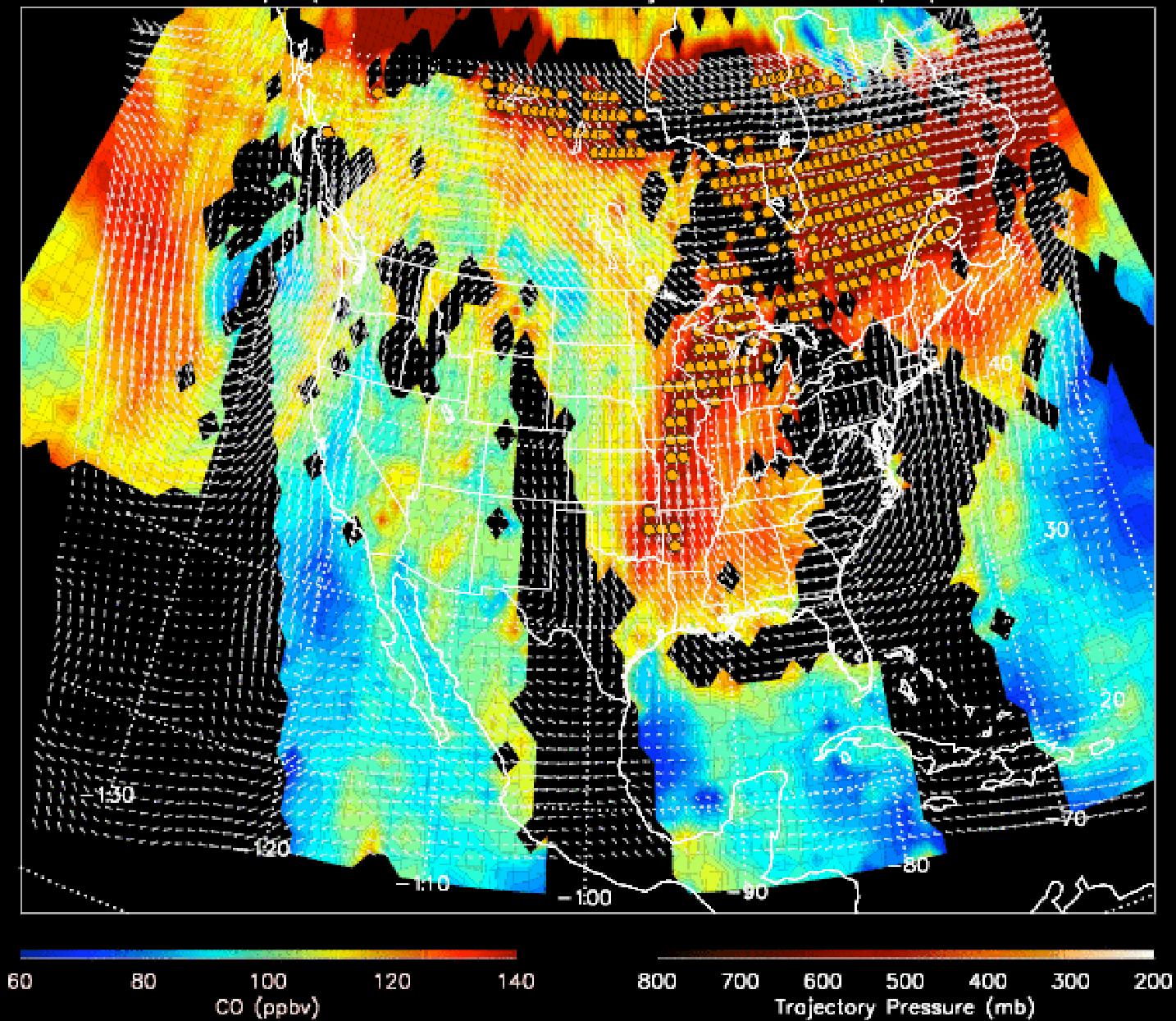
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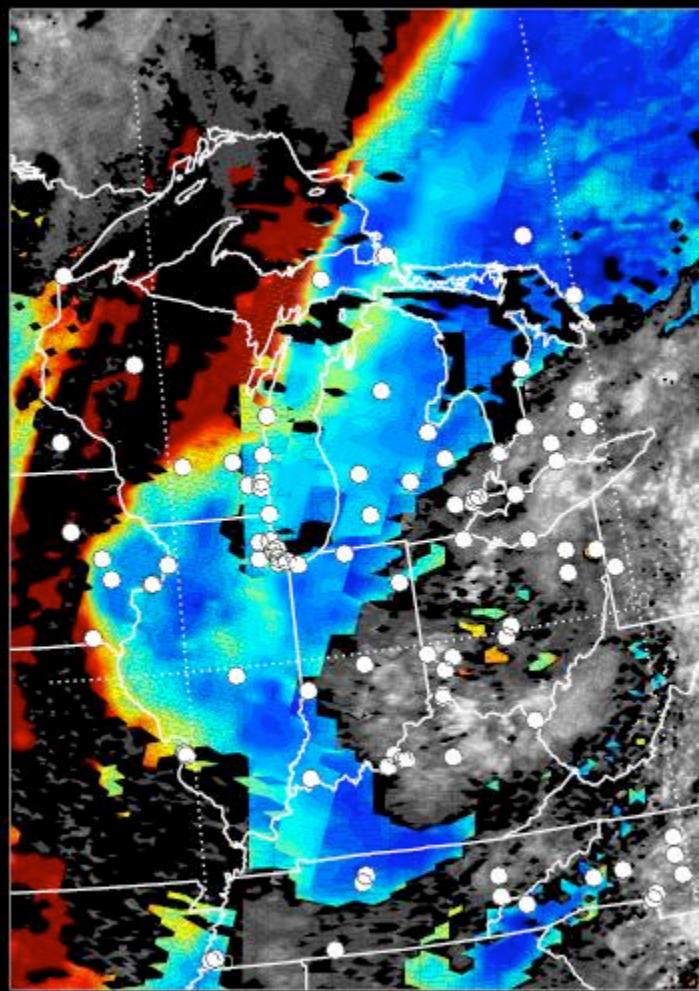


AIRS 2004/07/18 500mb CO & CO Trajectories on 2004/07/18 192

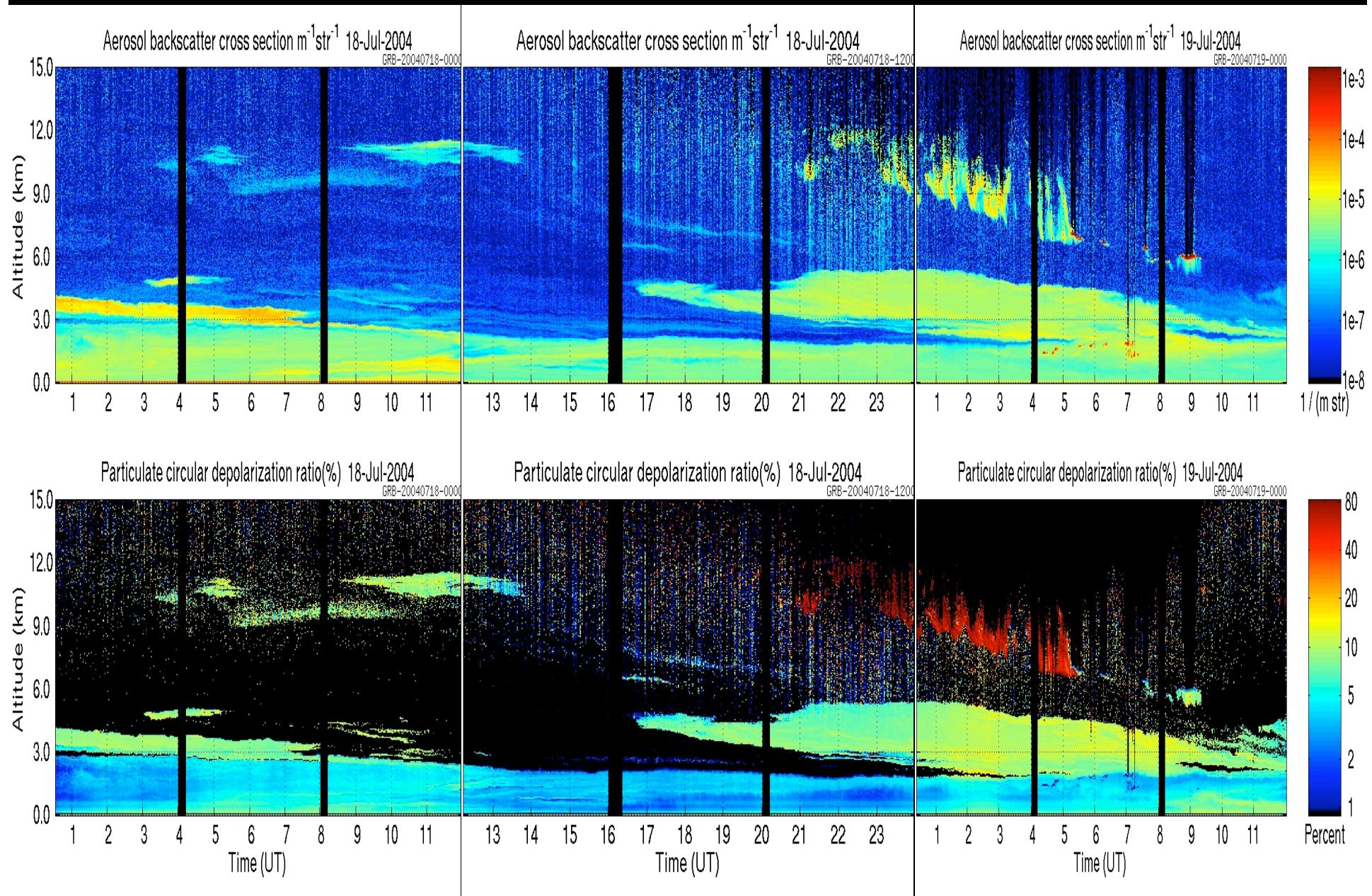


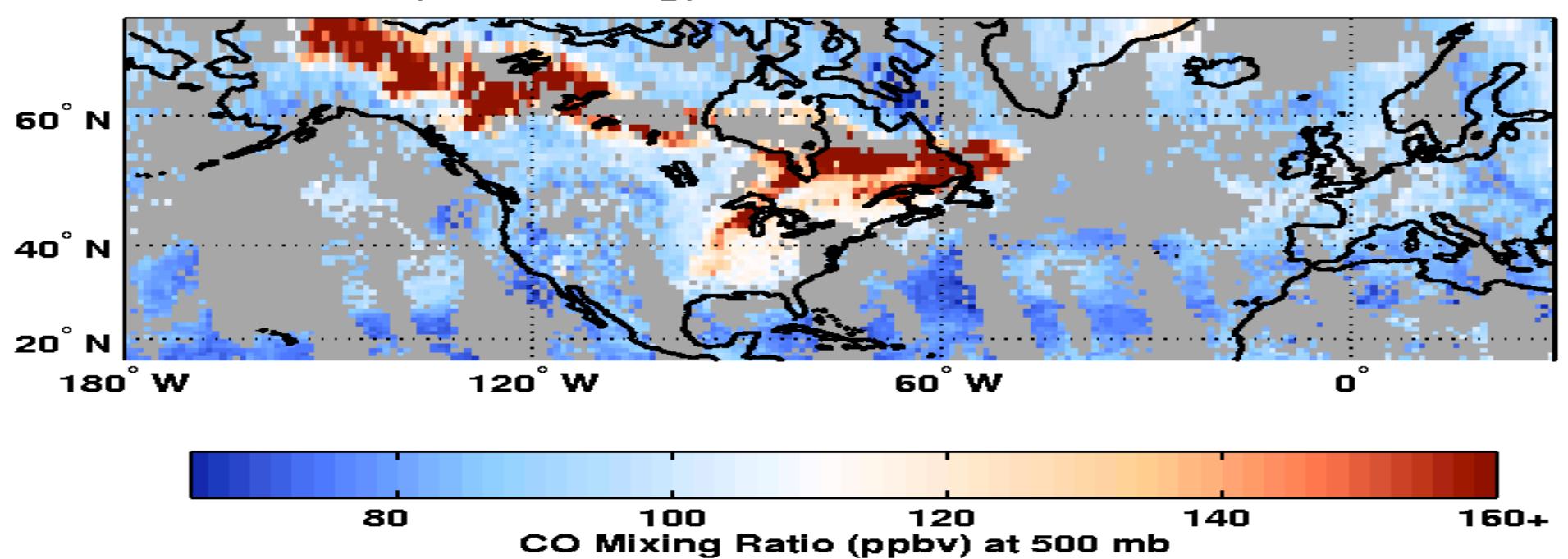
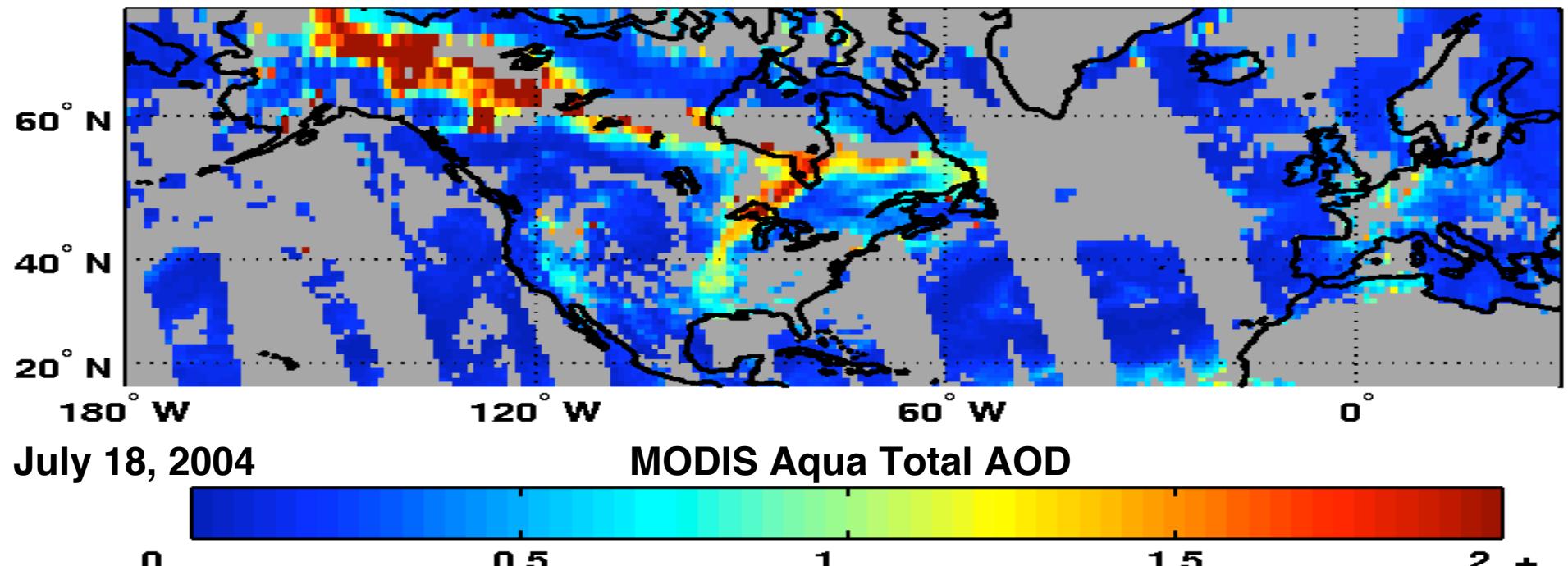
# MODIS Terra AOD 7/18 1728UT

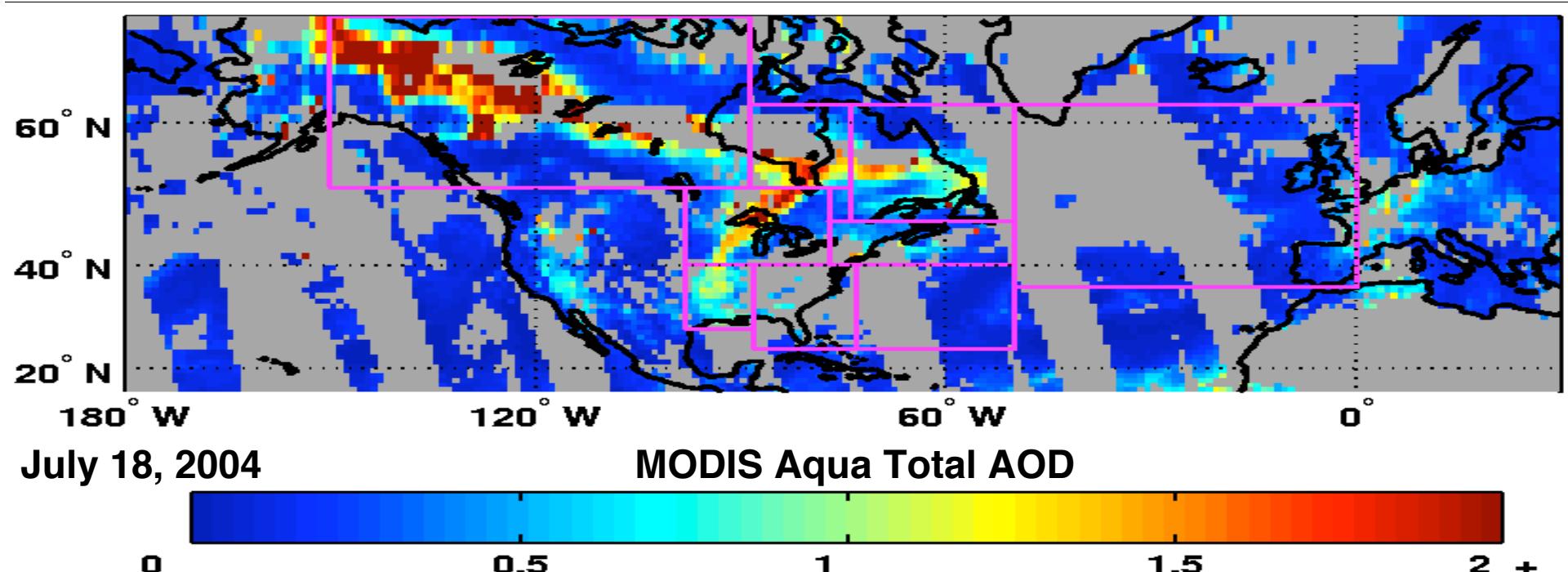
MODIS Aerosol Optical Depth 2004 07 18 EPA Region 5



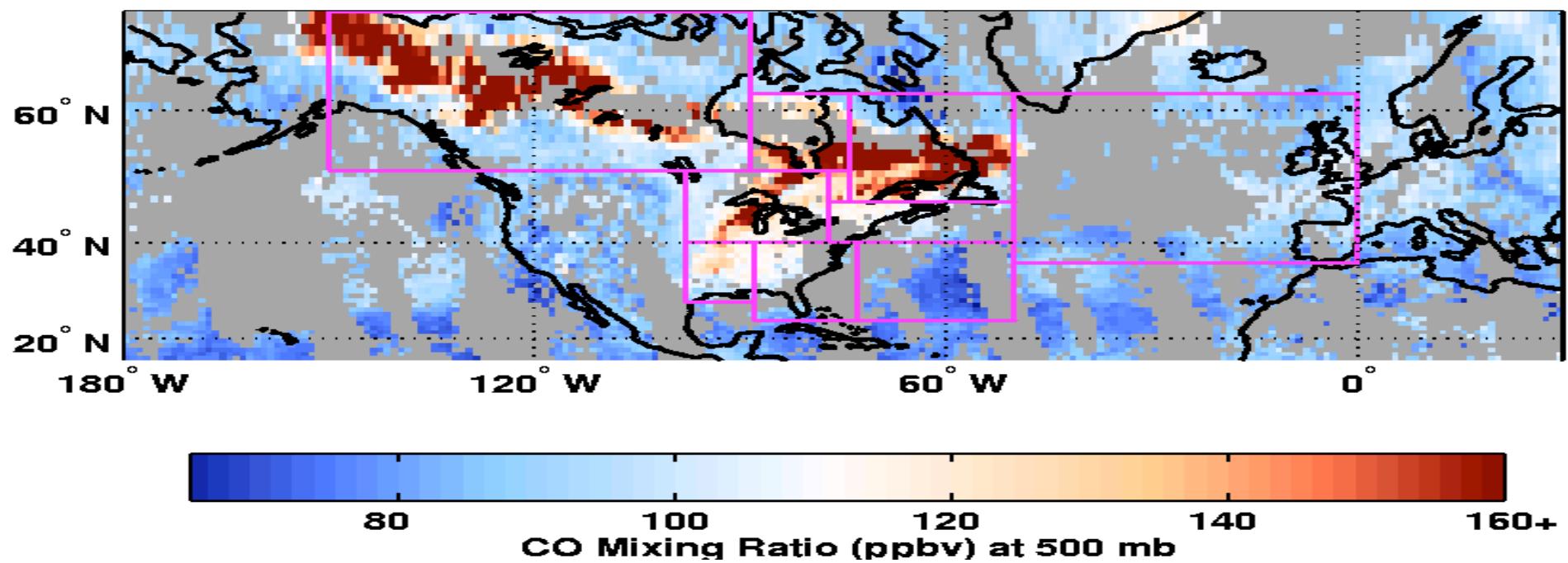
# U. Wisconsin Lidar (E. Eloranta)

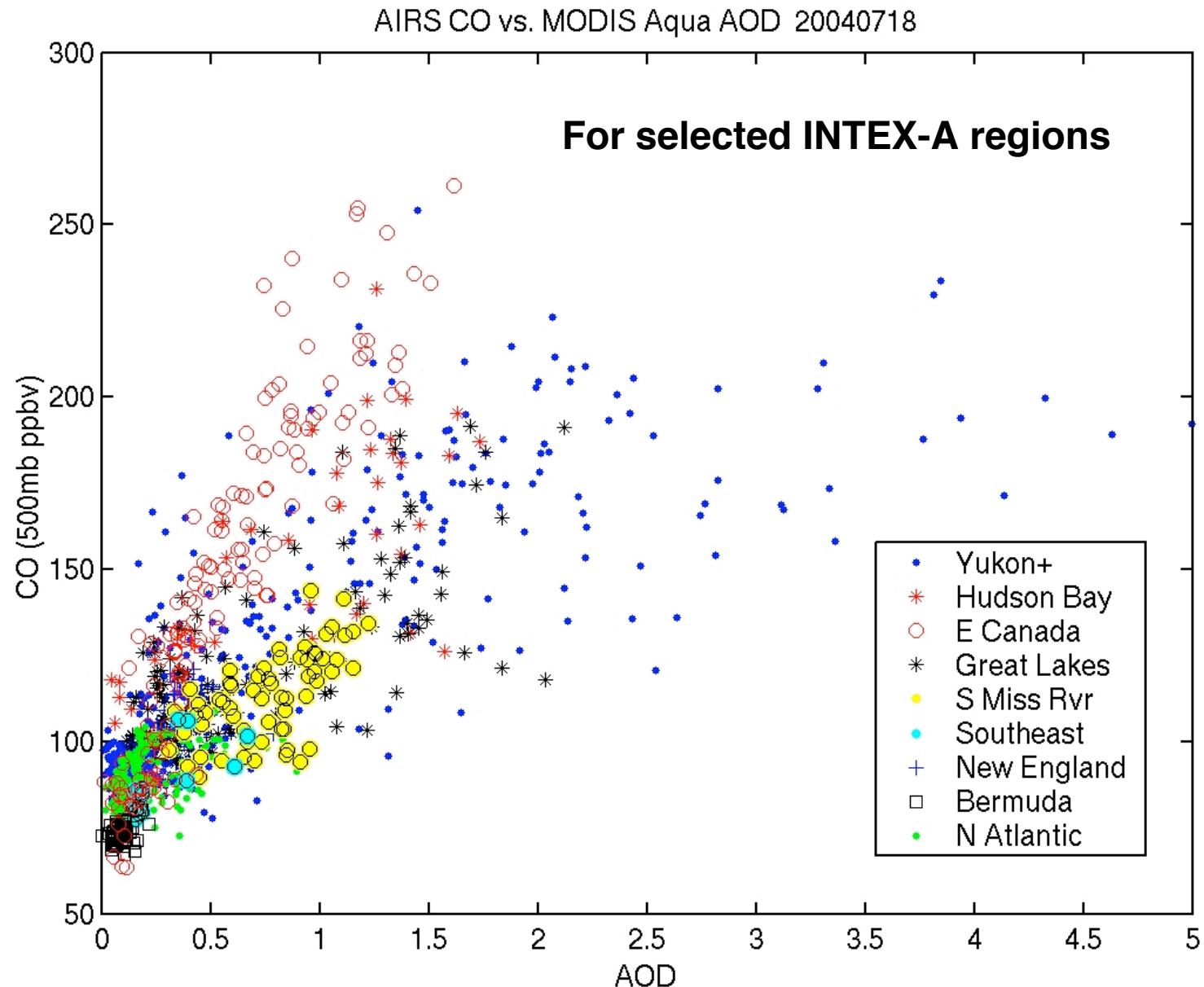


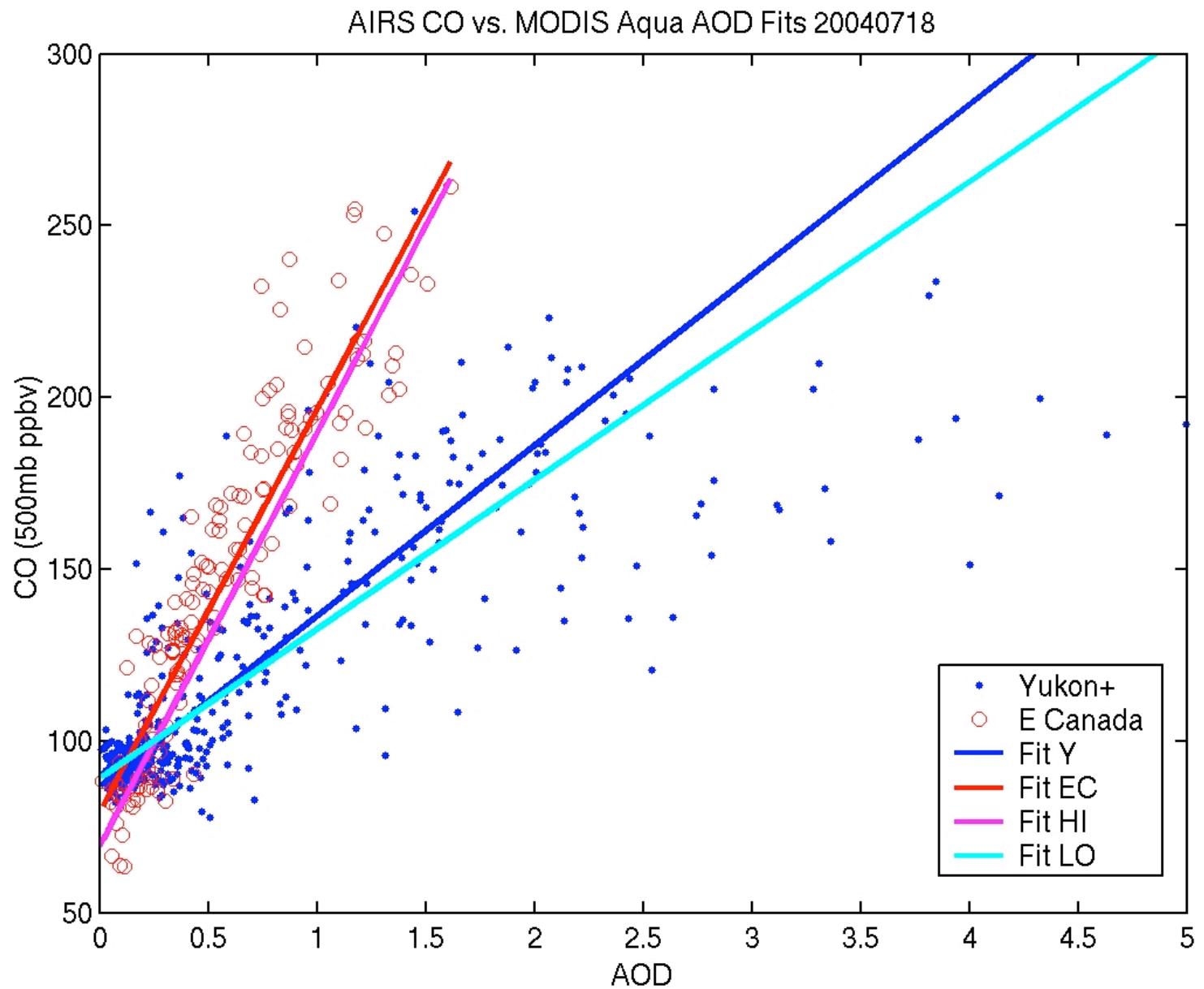


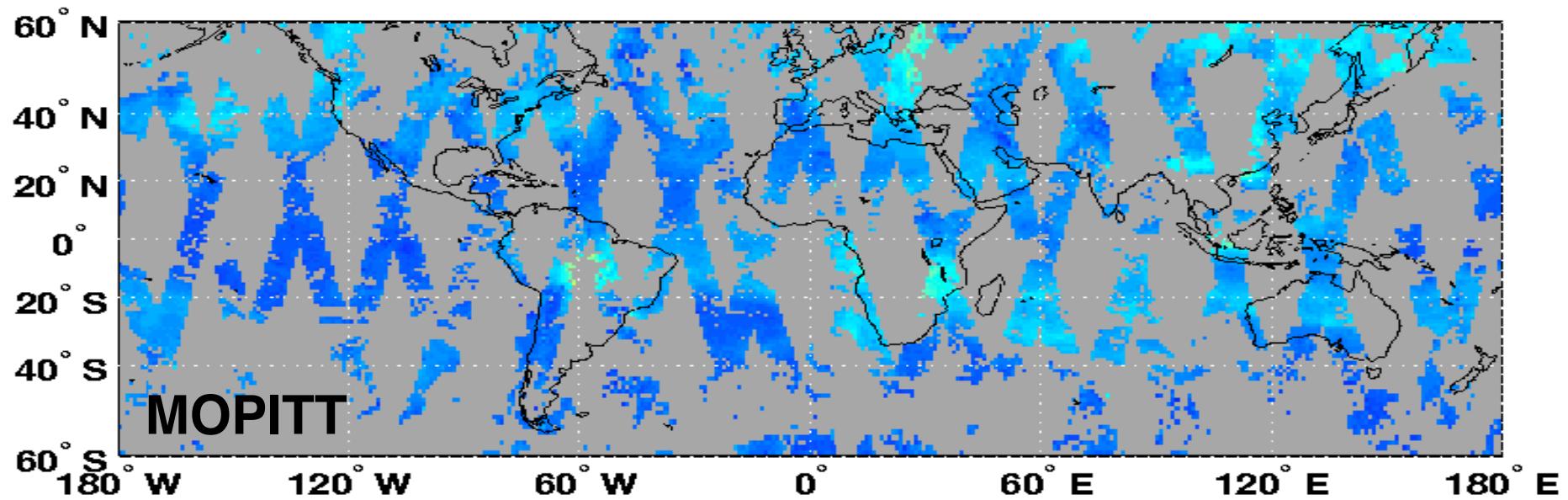
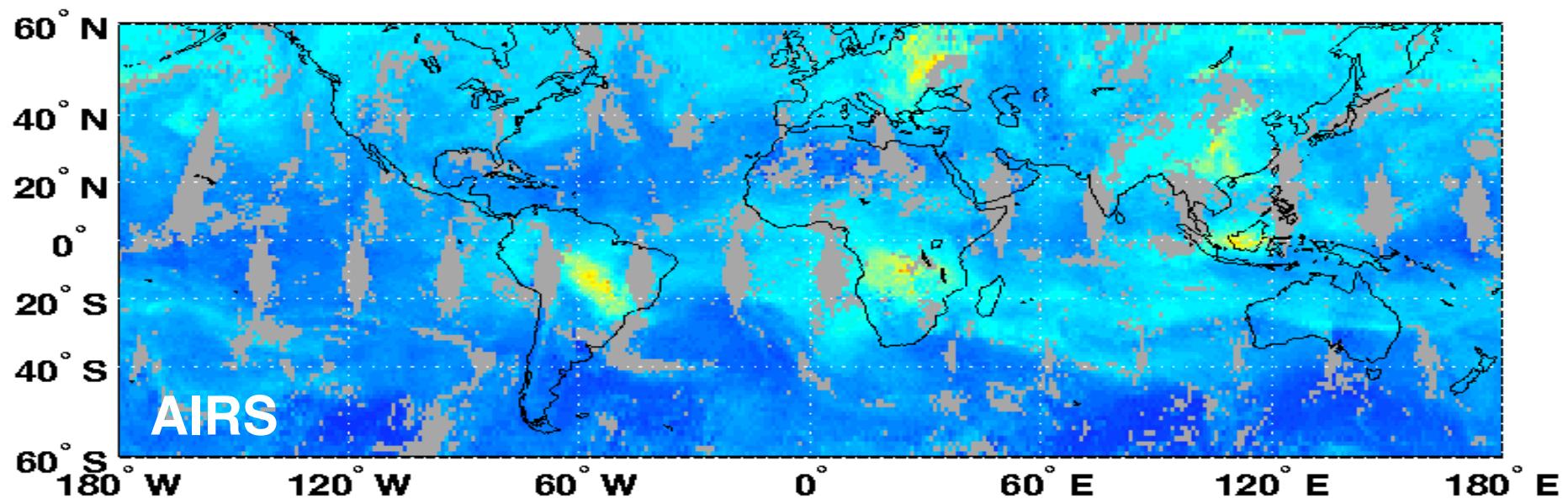


**Local PM (ascending) AIRS CO at 500 mb on 20040718**

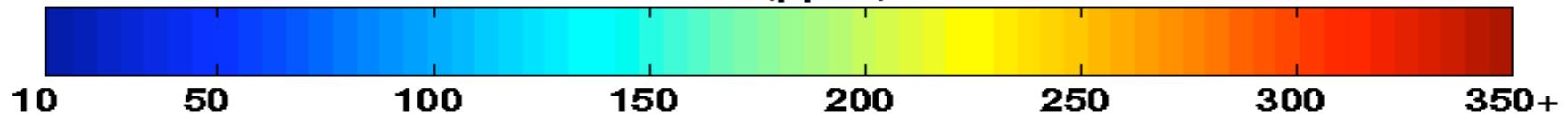




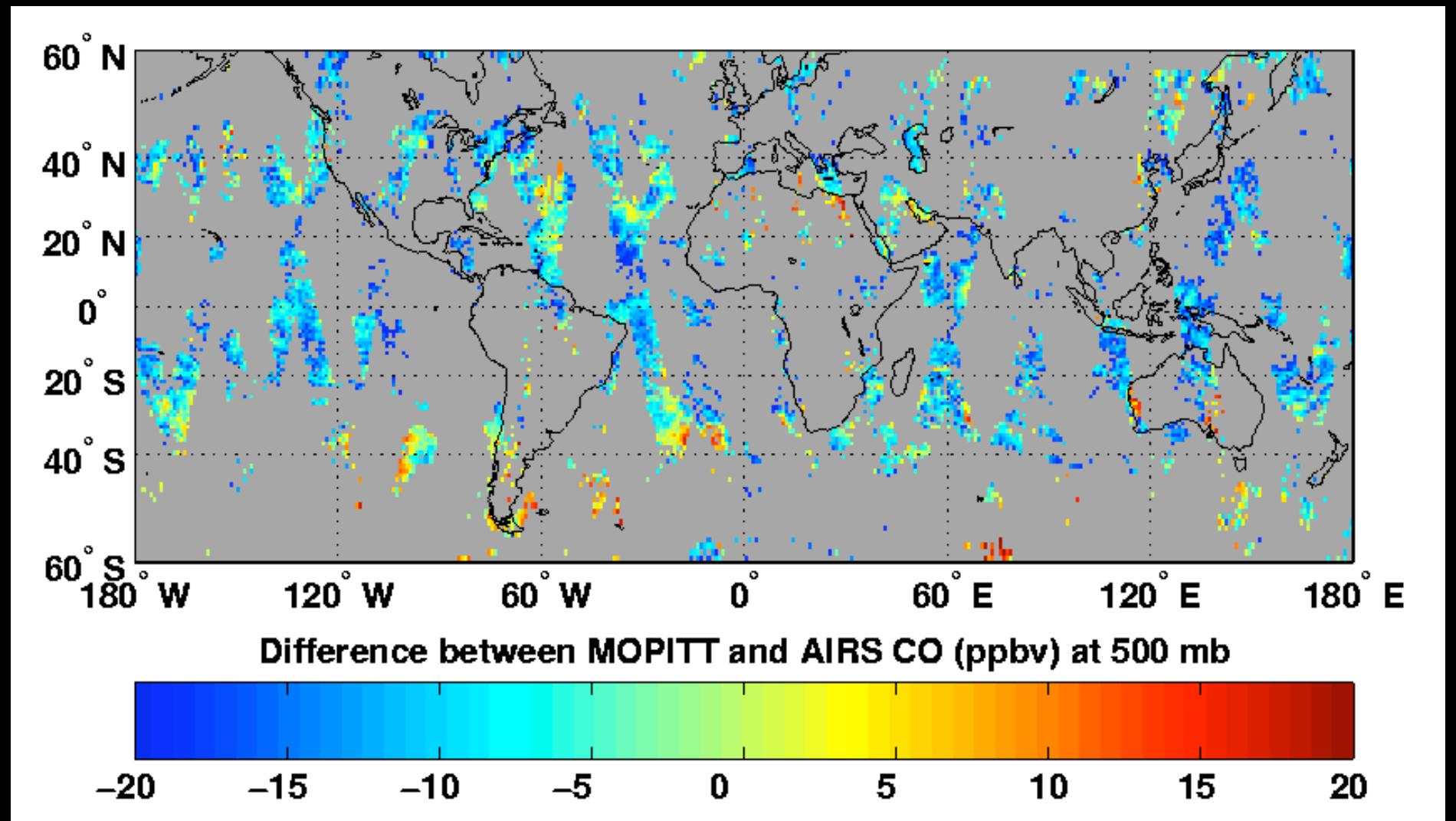




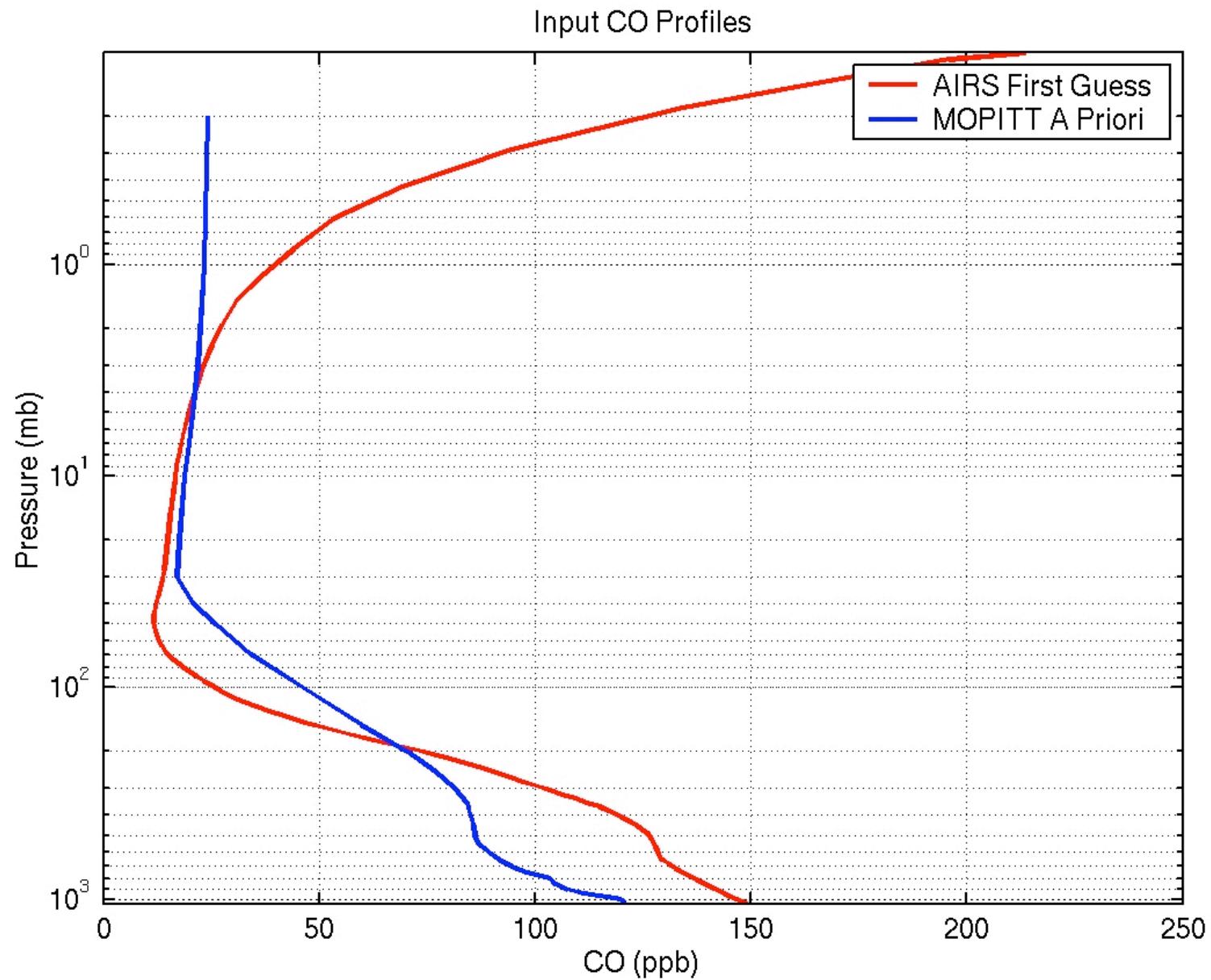
20020906: CO (ppbv) at 500 mb



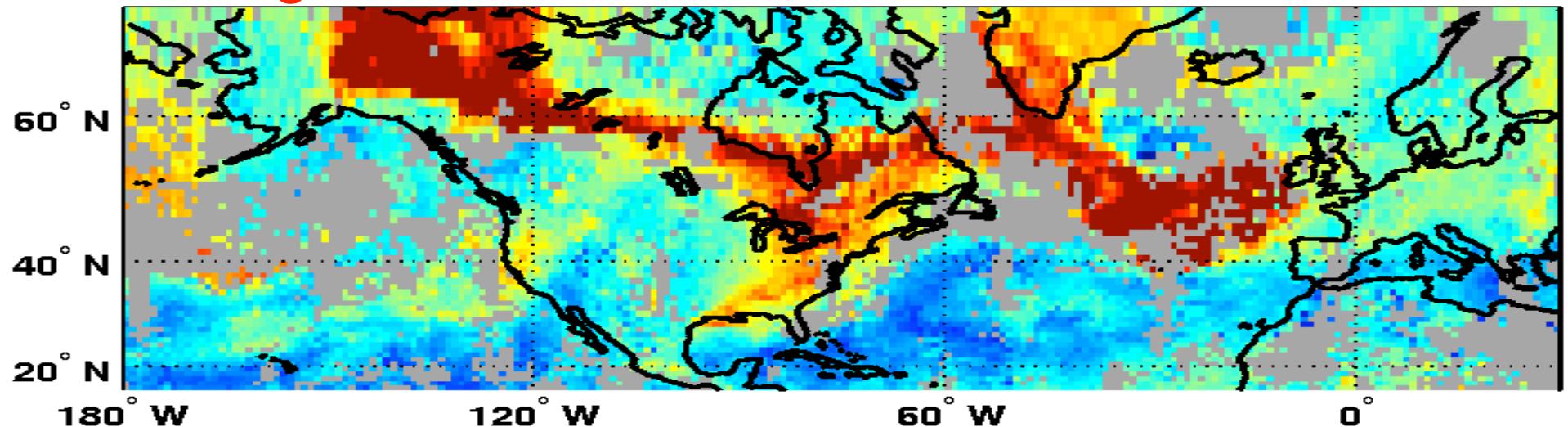
# MOPITT - AIRS at 500 mb



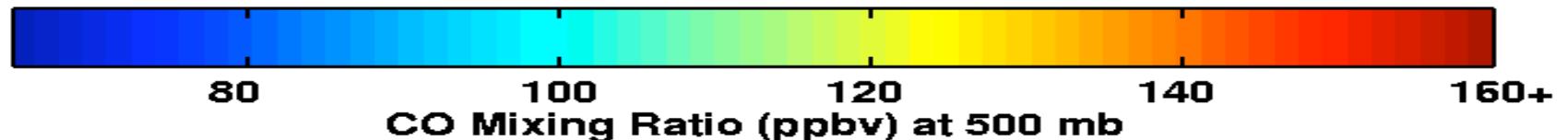
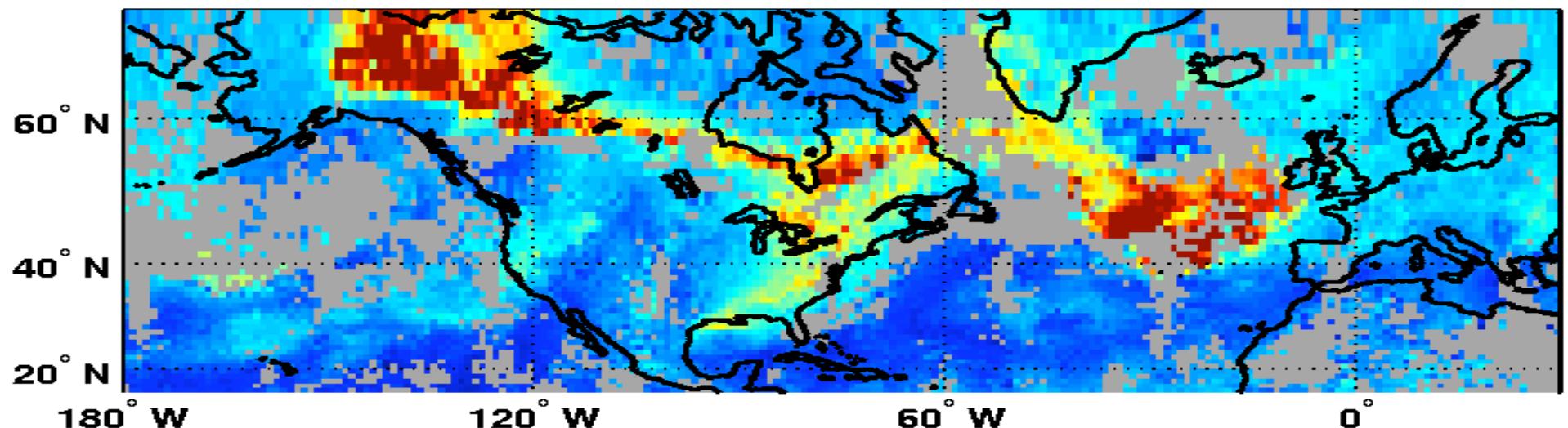
Mean Bias = -12.3, RMS = 10.7,  
79% of 7603 matchups within  $\pm 20$  ppbv



**AFGL first guess** AIRS CO at 500 mb on 20040720

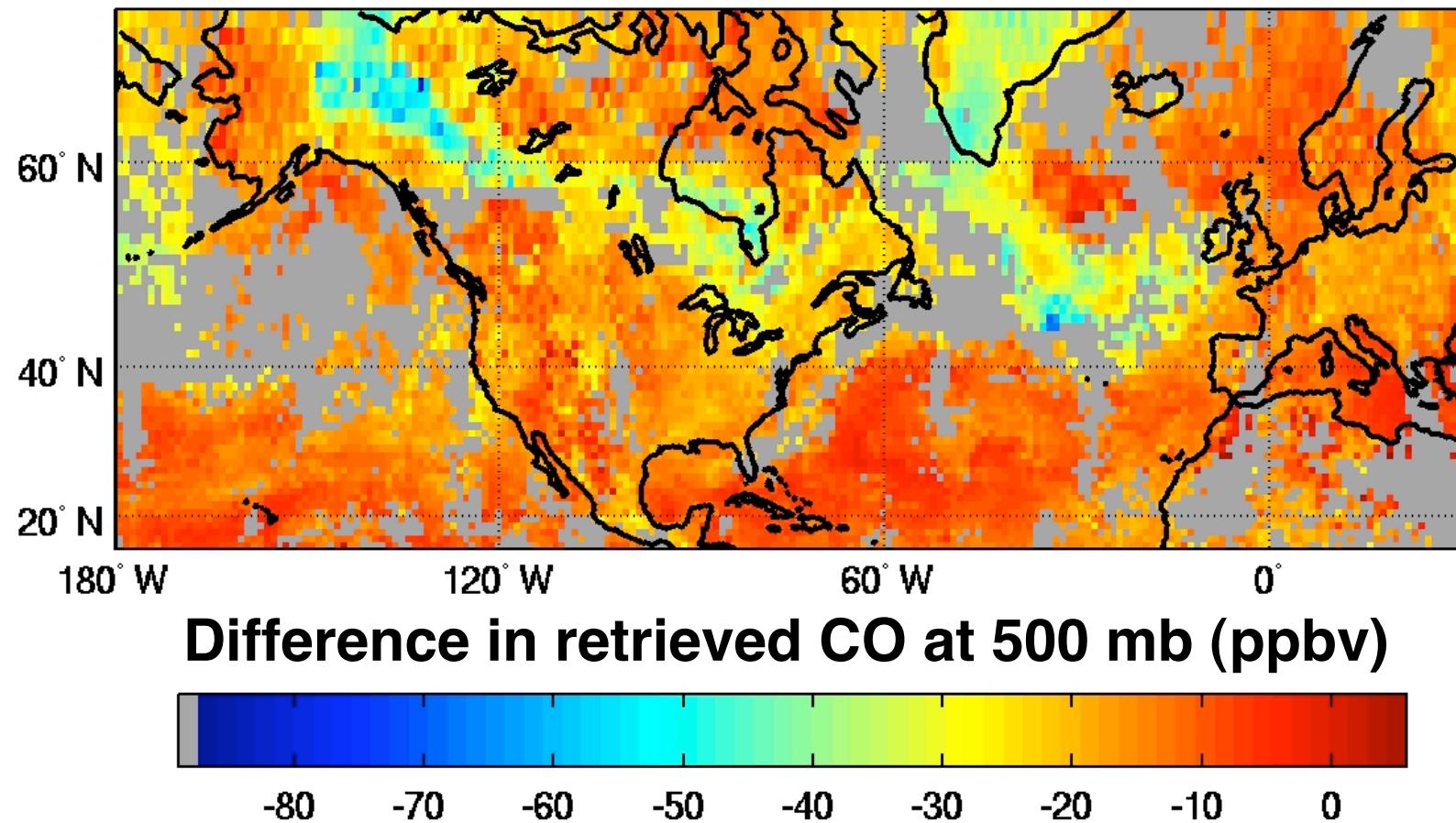


**MOPITT apriori** AIRS CO at 500 mb on 20040720

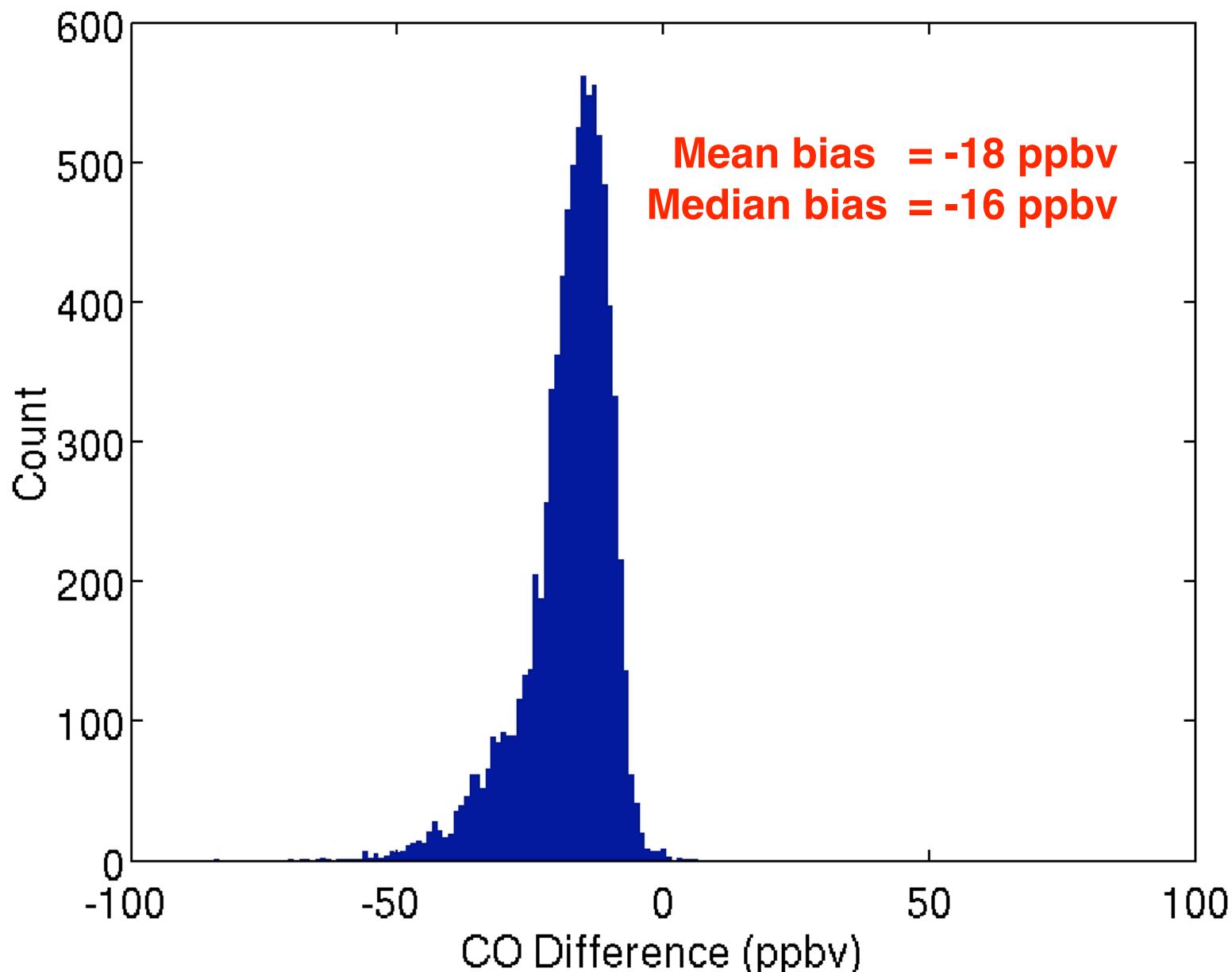


# Effect of first guess CO profile

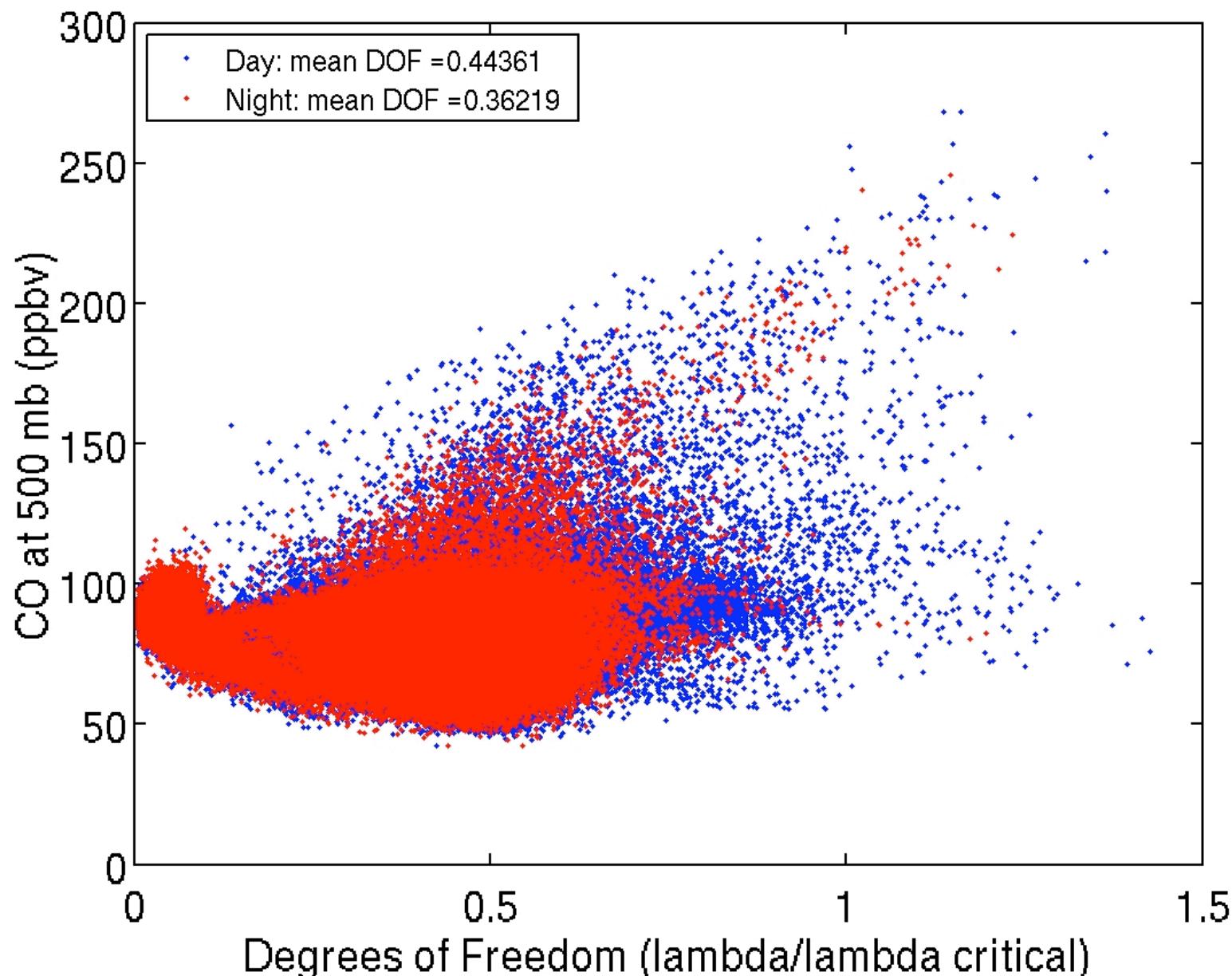
AIRS CO Differences (AFGL-MOP) at 500 mb on 20040720

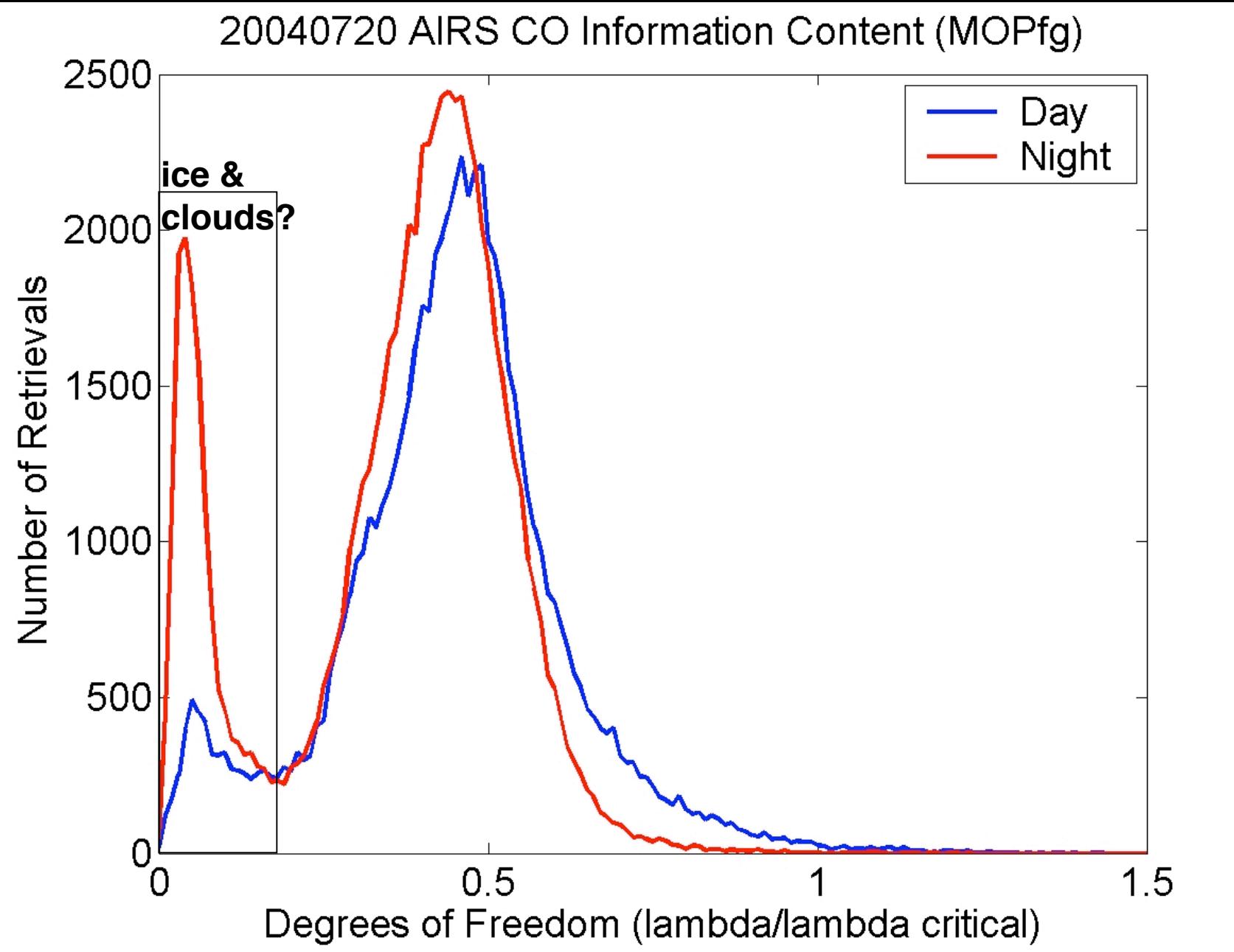


(AFGL fg - MOP fg) Statistics at 500 mb on 20040720

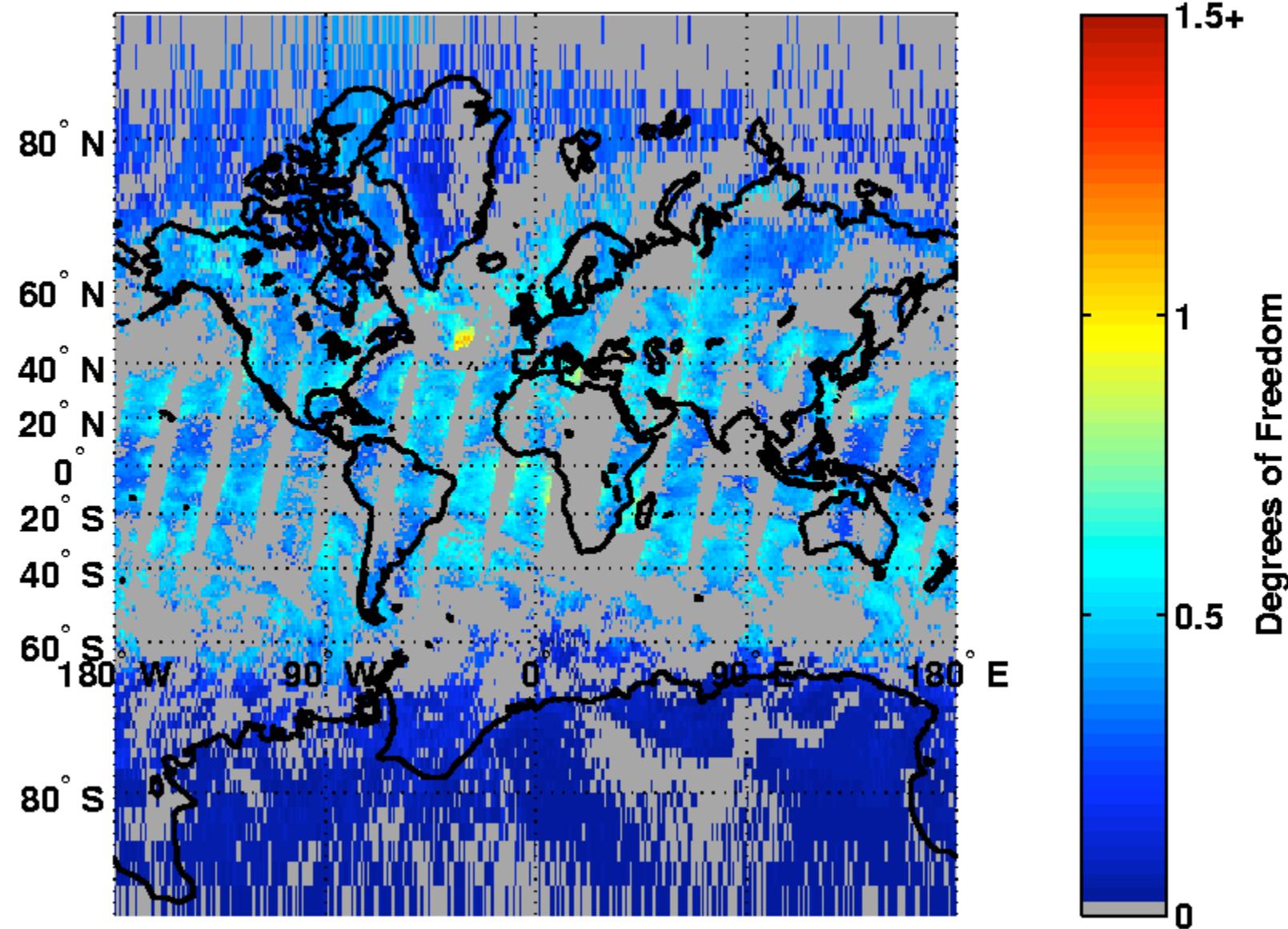


## 20040720 AIRS CO Information Content (MOPfg)

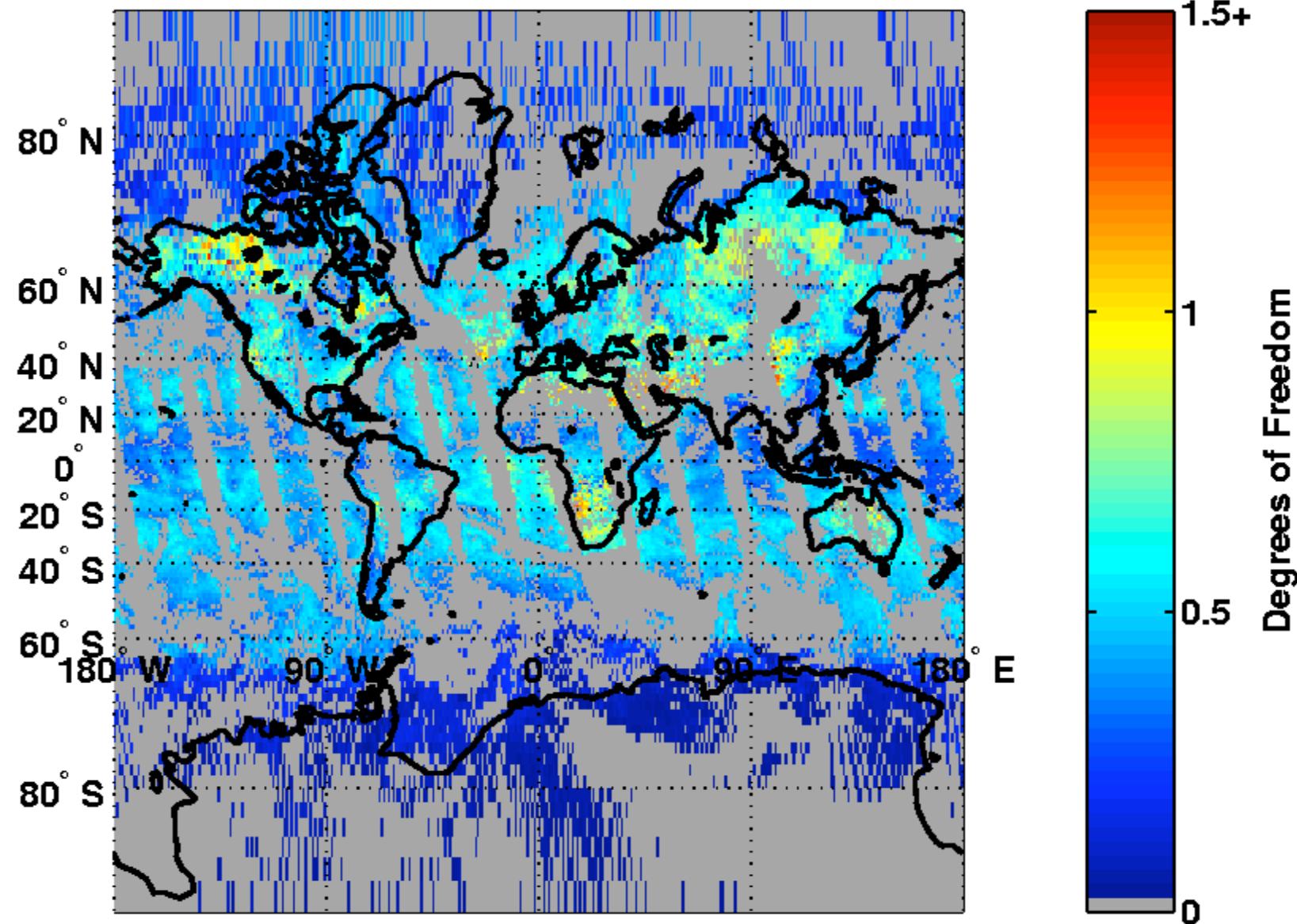




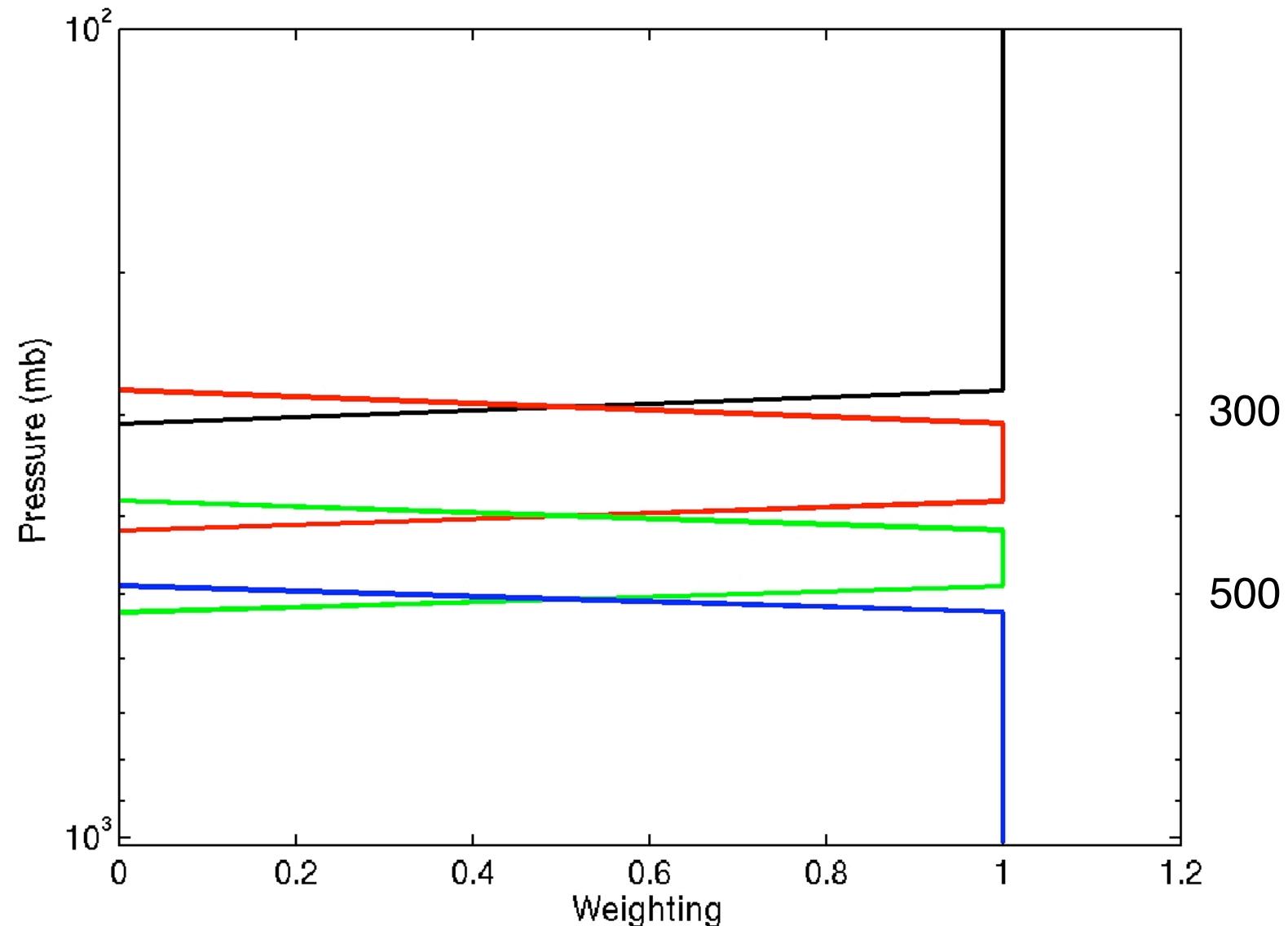
## AIRS CO Nighttime Degrees of Freedom on 20040720



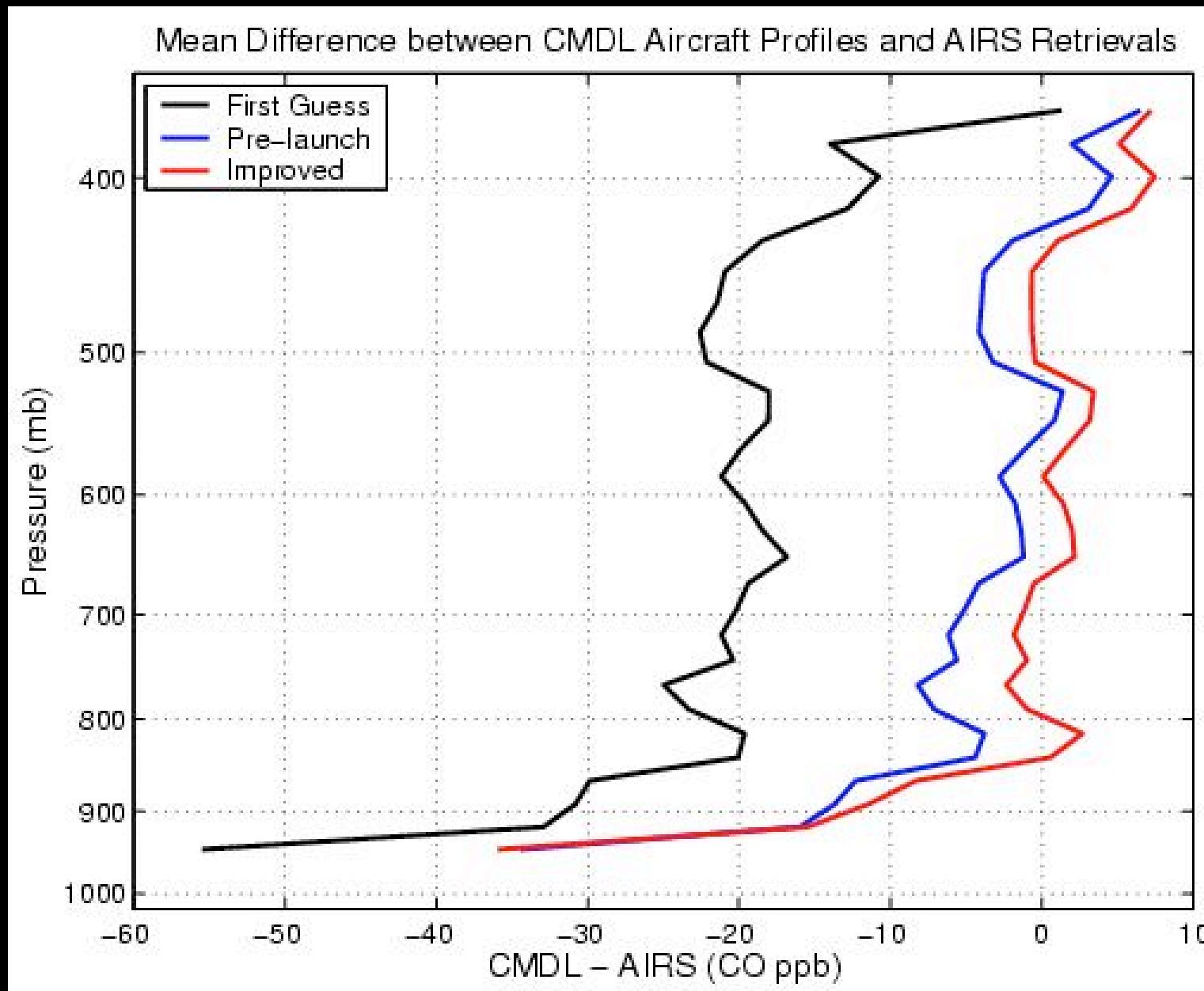
## AIRS CO Daytime Degrees of Freedom on 20040720



# AIRS CO Retrieval Trapezoids

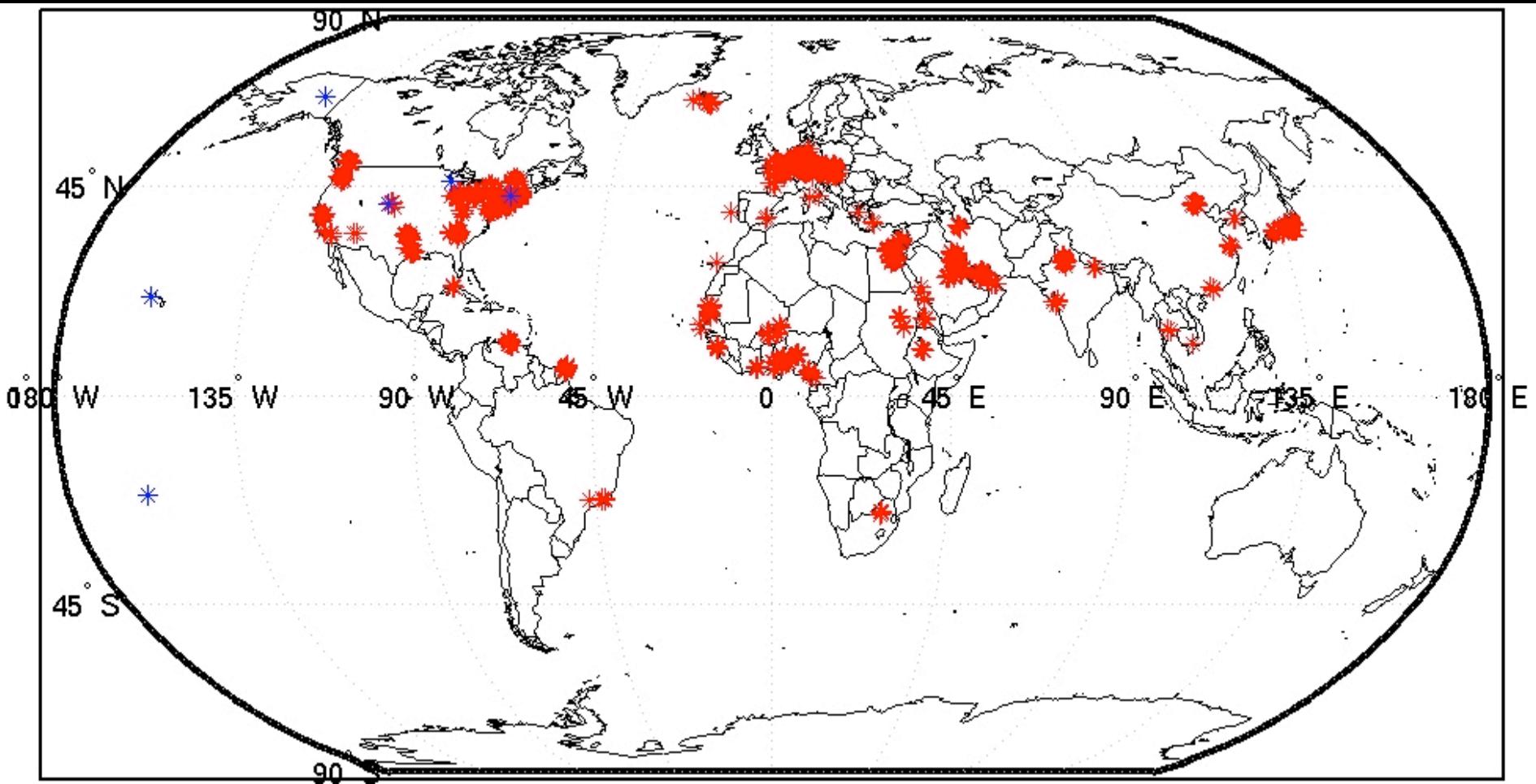


# AIRS CO Retrieval Optimization



# AIRS CO Retrieval Optimization: Profile Locations

## CMDL (~90) & MOZAIC (~5000)



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