AIRS CO:
Impact of v5 improvements Over v4:
working smarter…

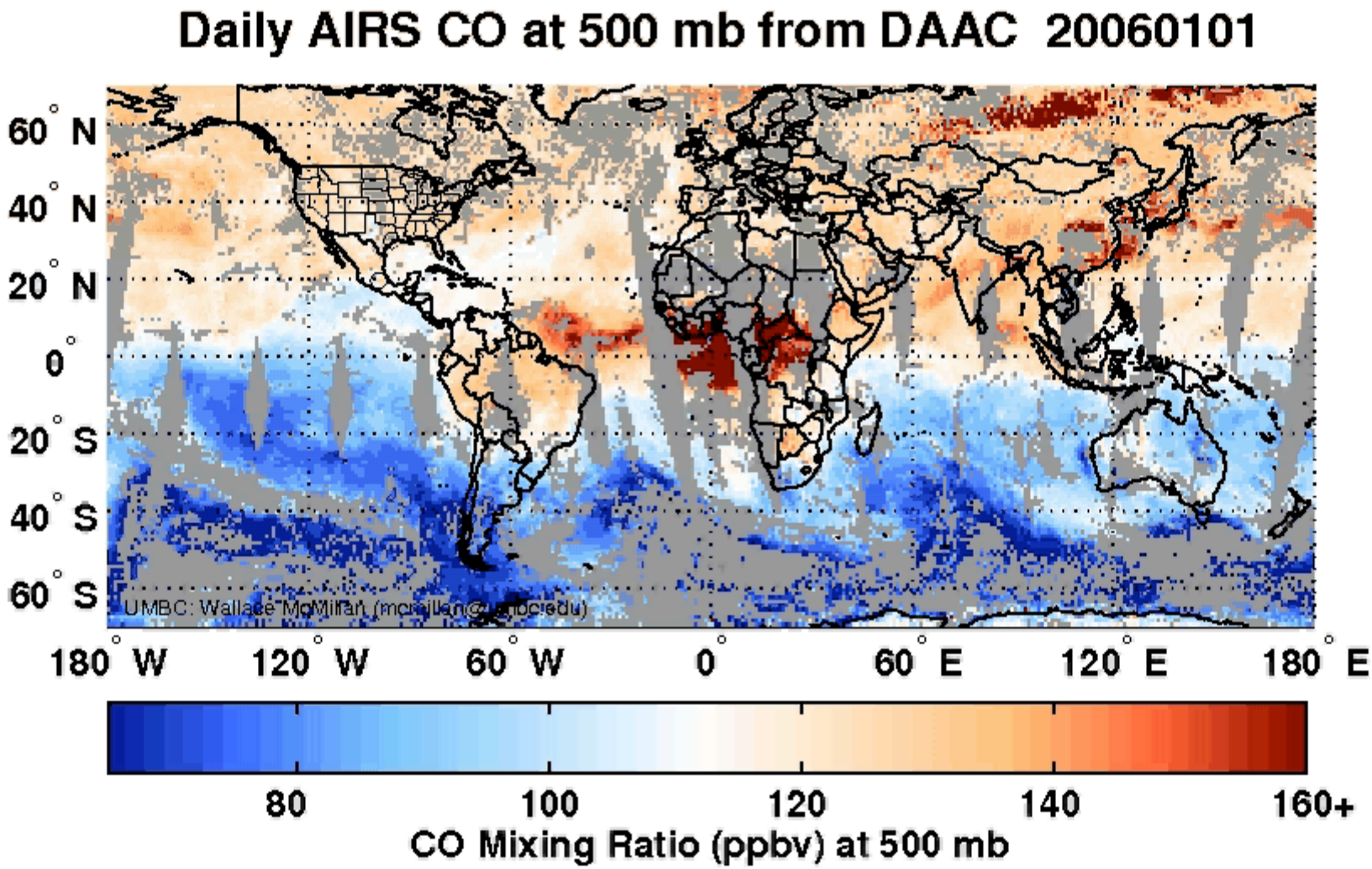
Wallace McMillan, J. Warner, K. Evans, D. Wicks,
M. Comer (UMBC), C. Barnet, Eric Maddy (NOAA/NESDIS),
L. Zhang, D. Jacob (Harvard), Greg Carmichael (U Iowa)
G. Sachse (NASA/LaRC), S. Granger, Evan Manning (JPL)

Supported by NASA AIRS, Validation, Tropospheric Chemistry
and Global Carbon Cycle Programs

Thanks to the entire AIRS Team!

v4.0.9.0 CO Movie: Jan-Nov 2006

1x1 deg grid



NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

Animation by Stephanie Grainger

Summary: AIRS CO v5

- Optimized (Michele McCourt Comer 2006)
  - 9 trapezoids (pre-launch used 4)
  - Trapezoid effective pressures match MOPITT
  - MOPITT a priori profile as AIRS first guess
  - Averaging kernel output
  - More CO channels used
- PGE v5
  - Standard product:
    - Mixing ratio at 9 levels
    - total column
    - error estimates at 9 levels and total column
    - verticality function (total column averaging kernel)
  - Support product: full averaging kernels

AIRS CO v5 improvements

- 9 trapezoids (pre-launch used 4)
  - Improves vertical specificity
- Trapezoid effective pressures match MOPITT
  - Easier to compare to MOPITT
- MOPITT a priori profile as AIRS first guess
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- More CO channels used
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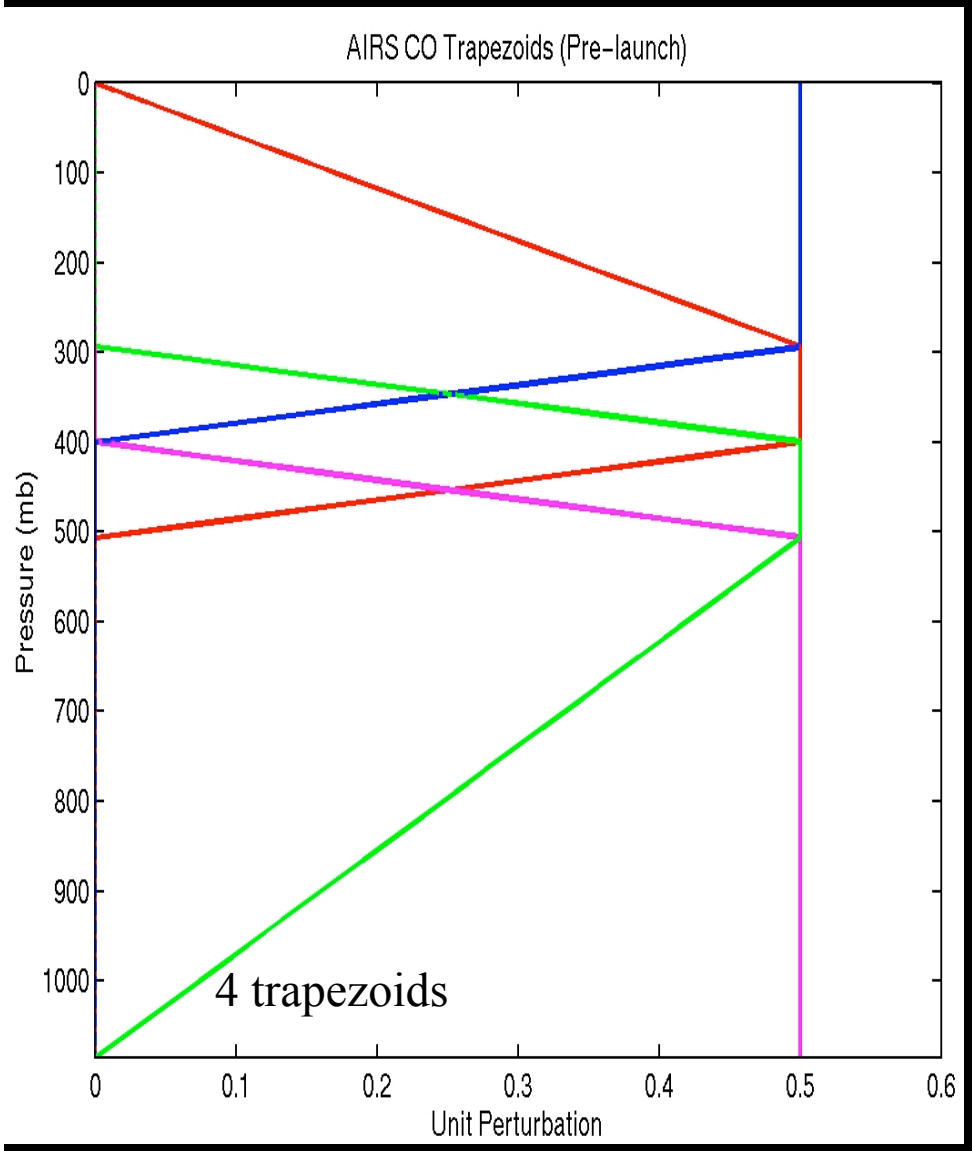
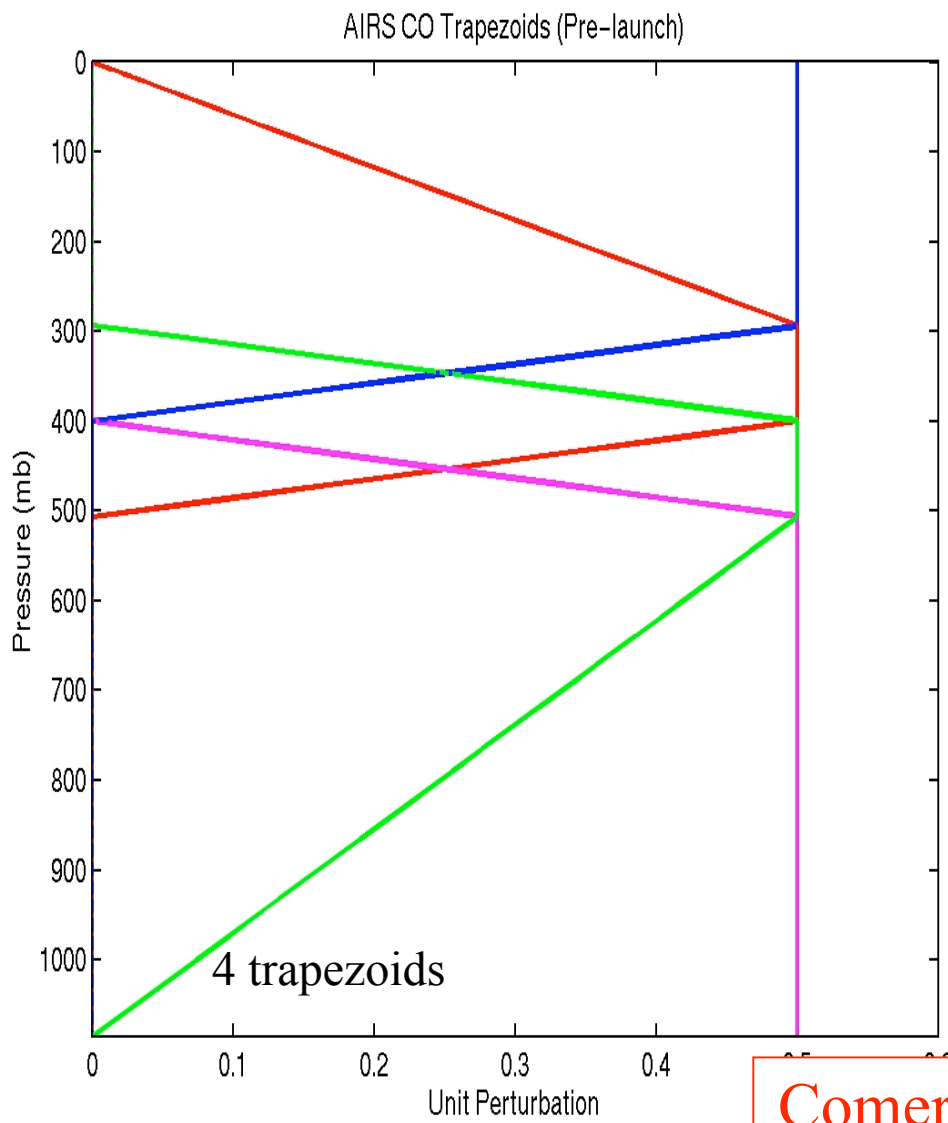
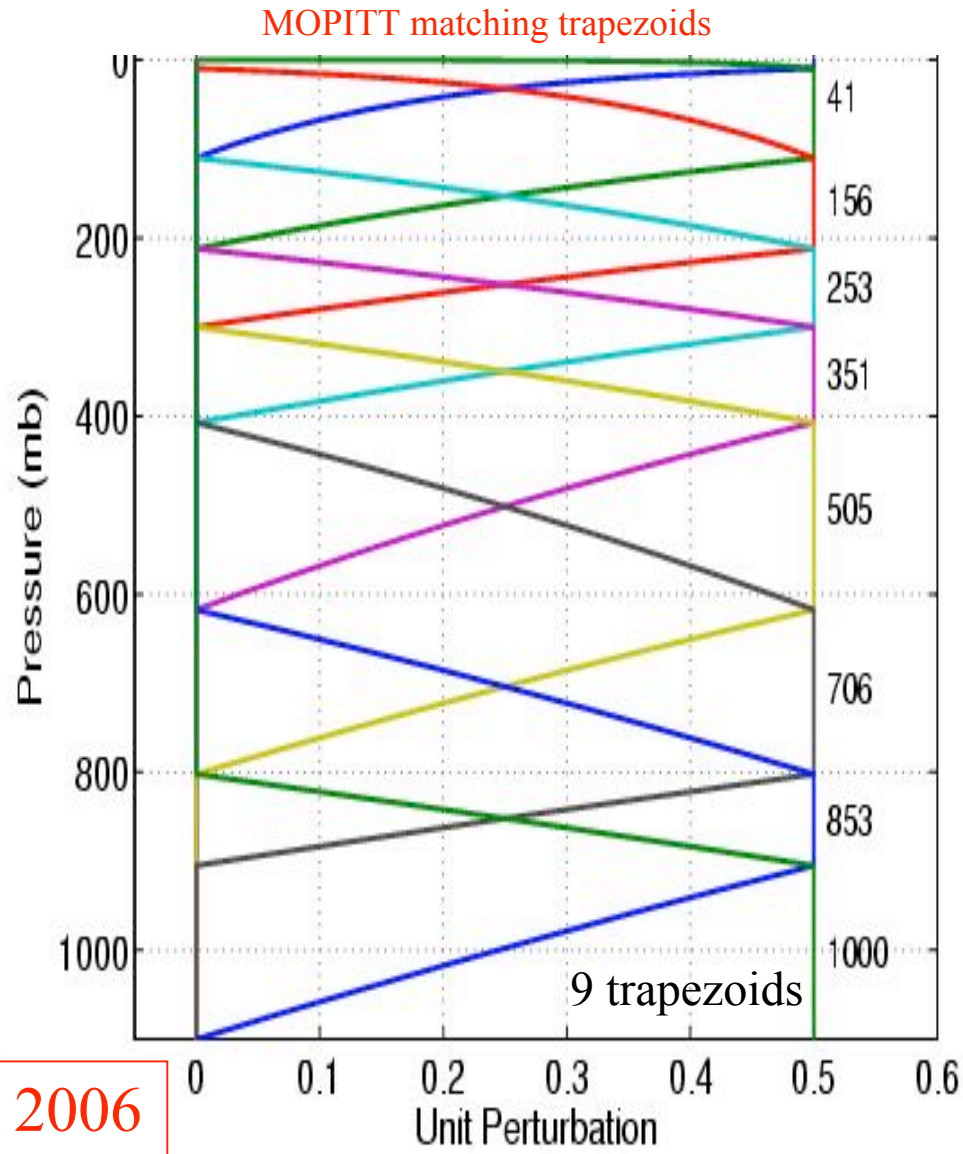
- Ad-hoc error term removed
  - With same damping increases dynamic range
- Crude error estimates

AIRS CO Retrieval Vertical Functions



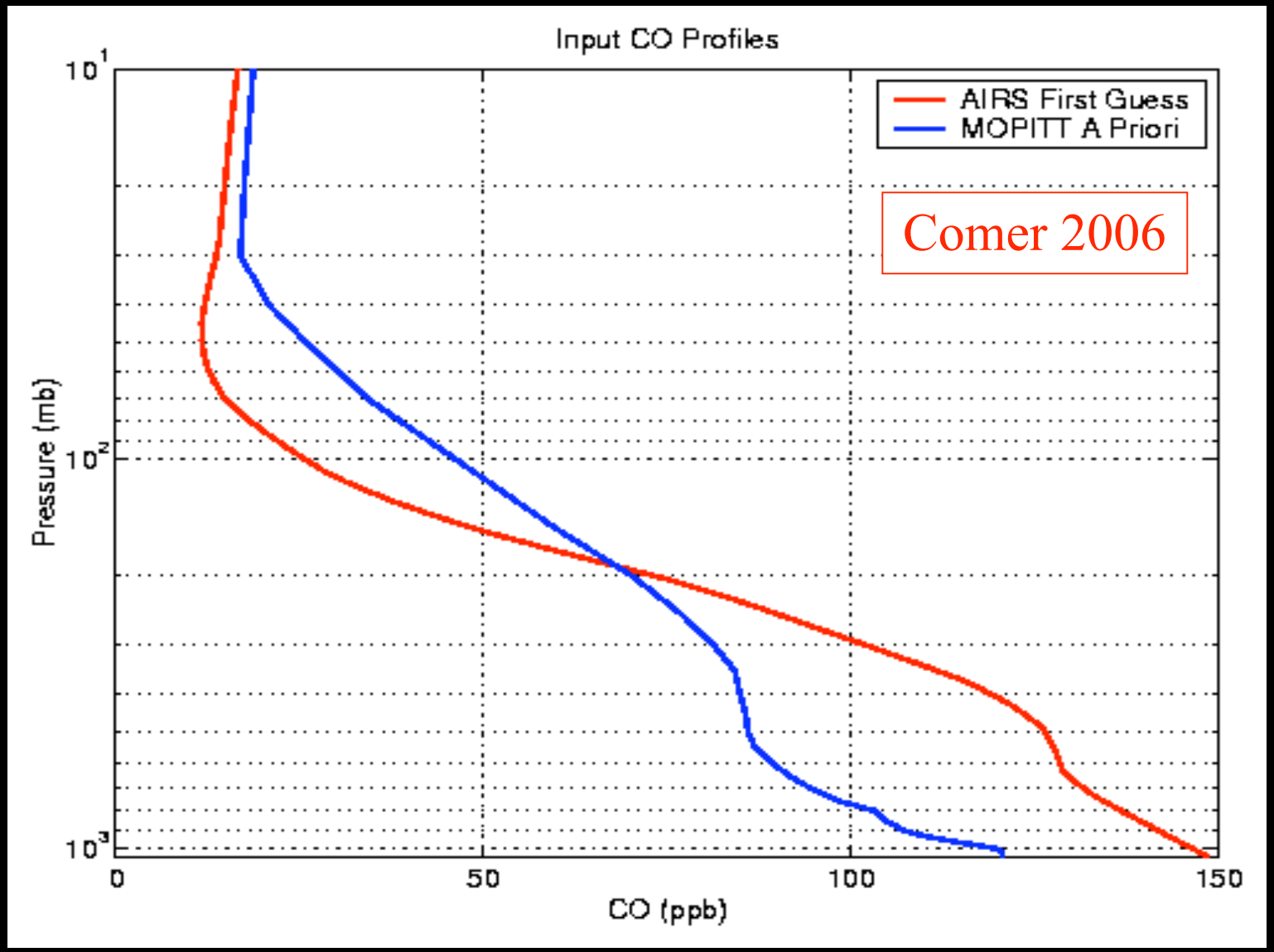
AIRS CO: v5 improvements



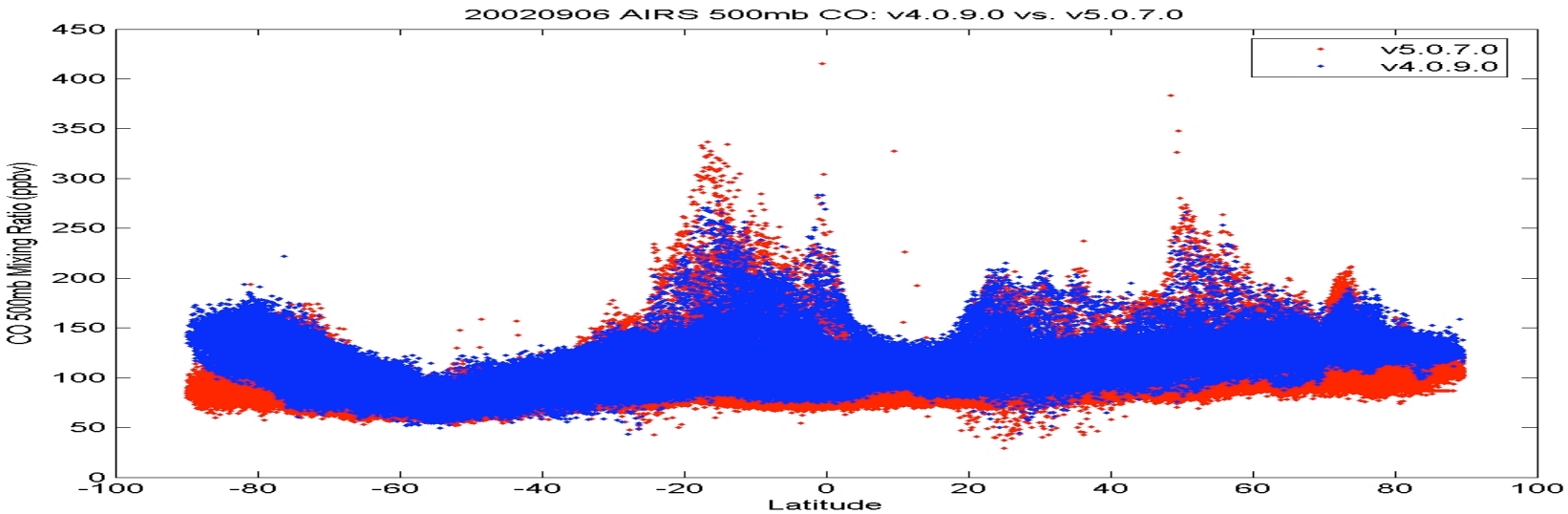


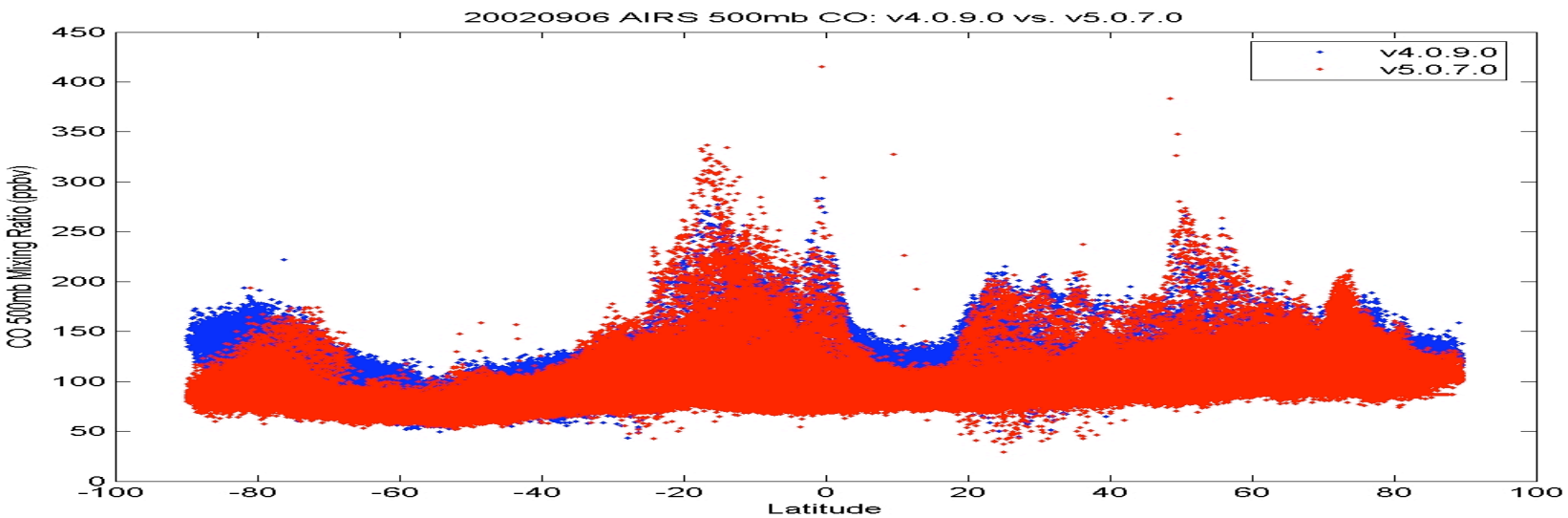
Comer 2006

AIRS CO: v5 improvements

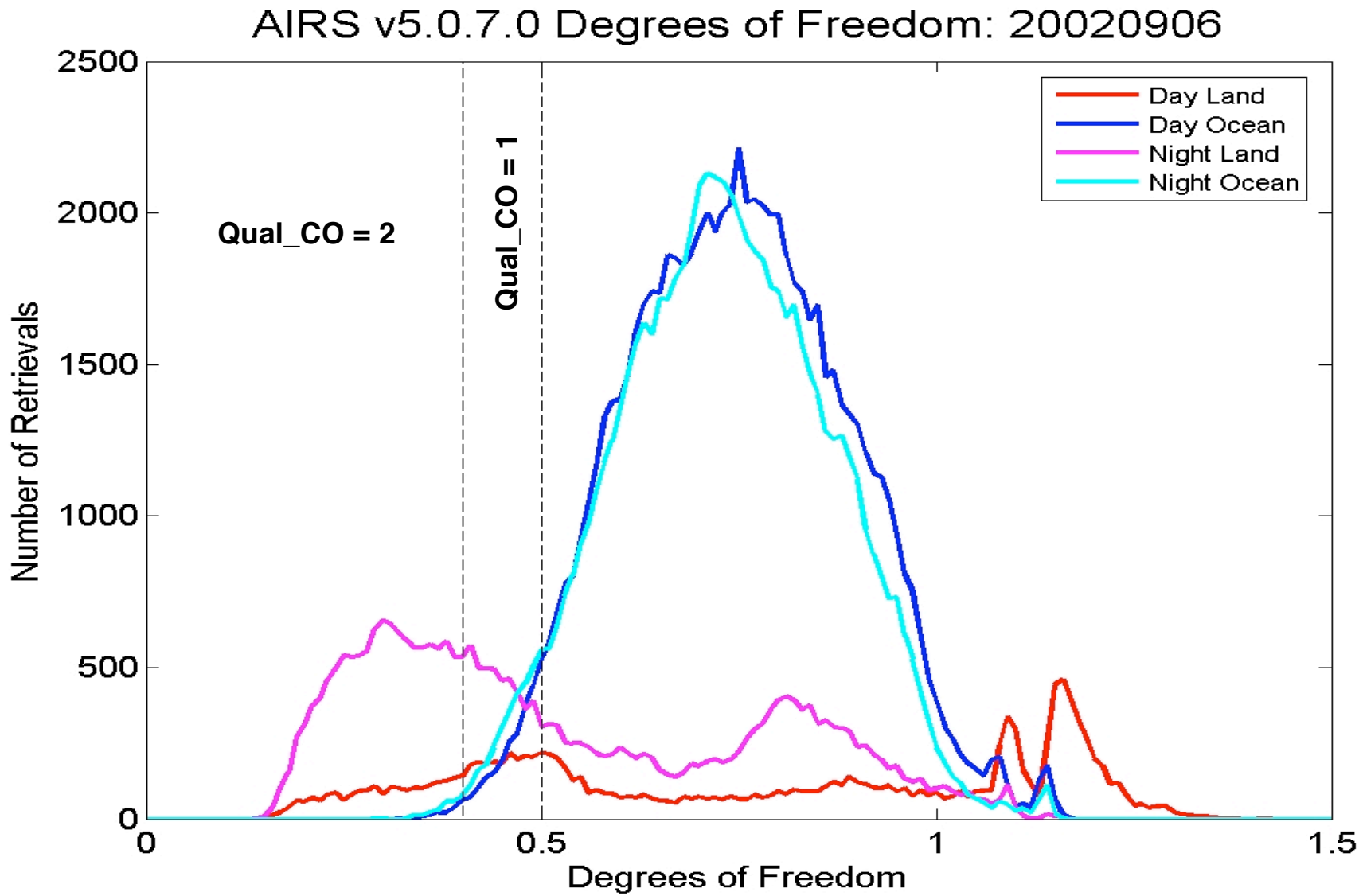


v4.0.9.0 vs. v5.0.7.0: Dynamic Range





Degrees of Freedom: v5.0.7.0



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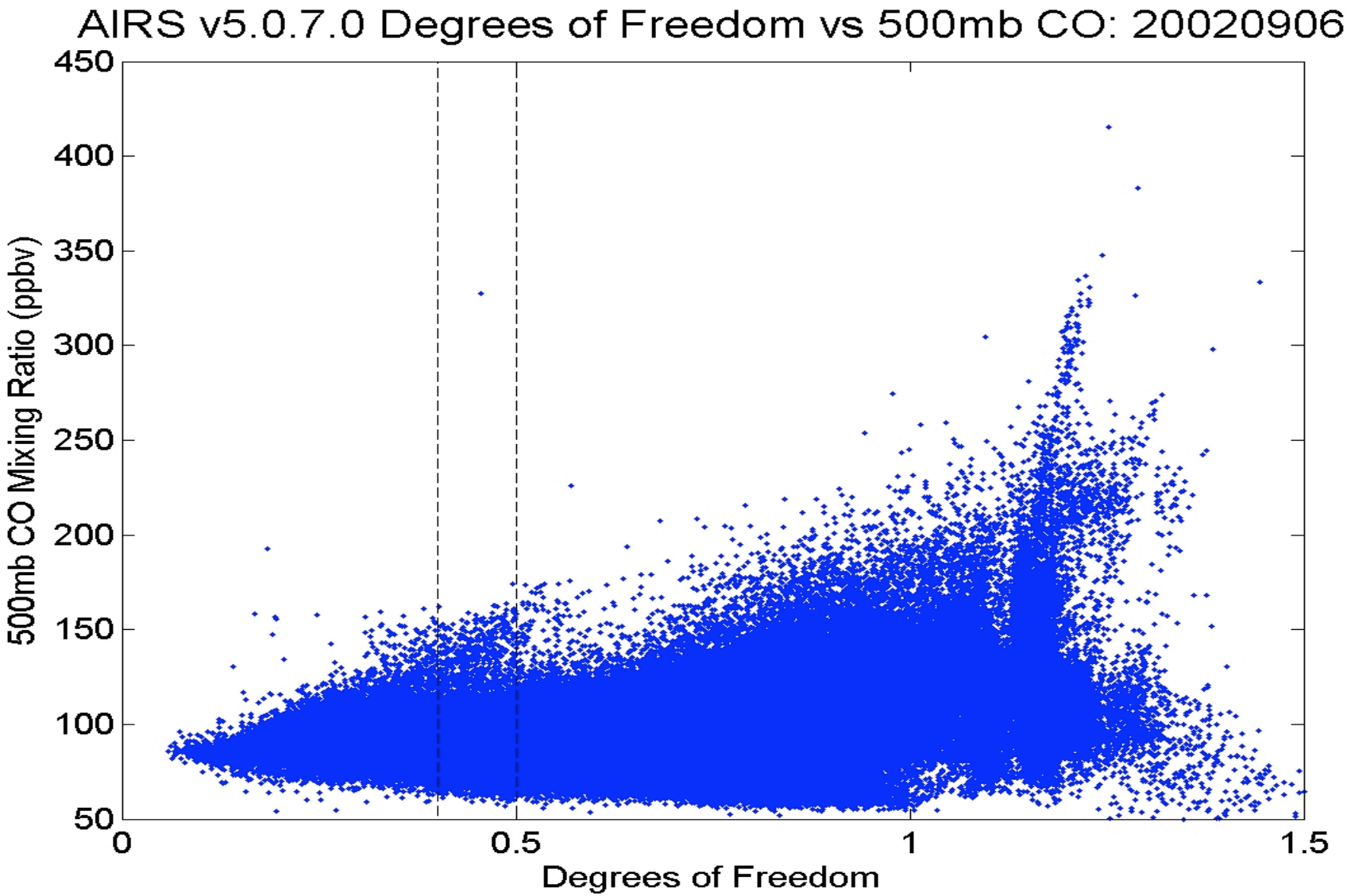

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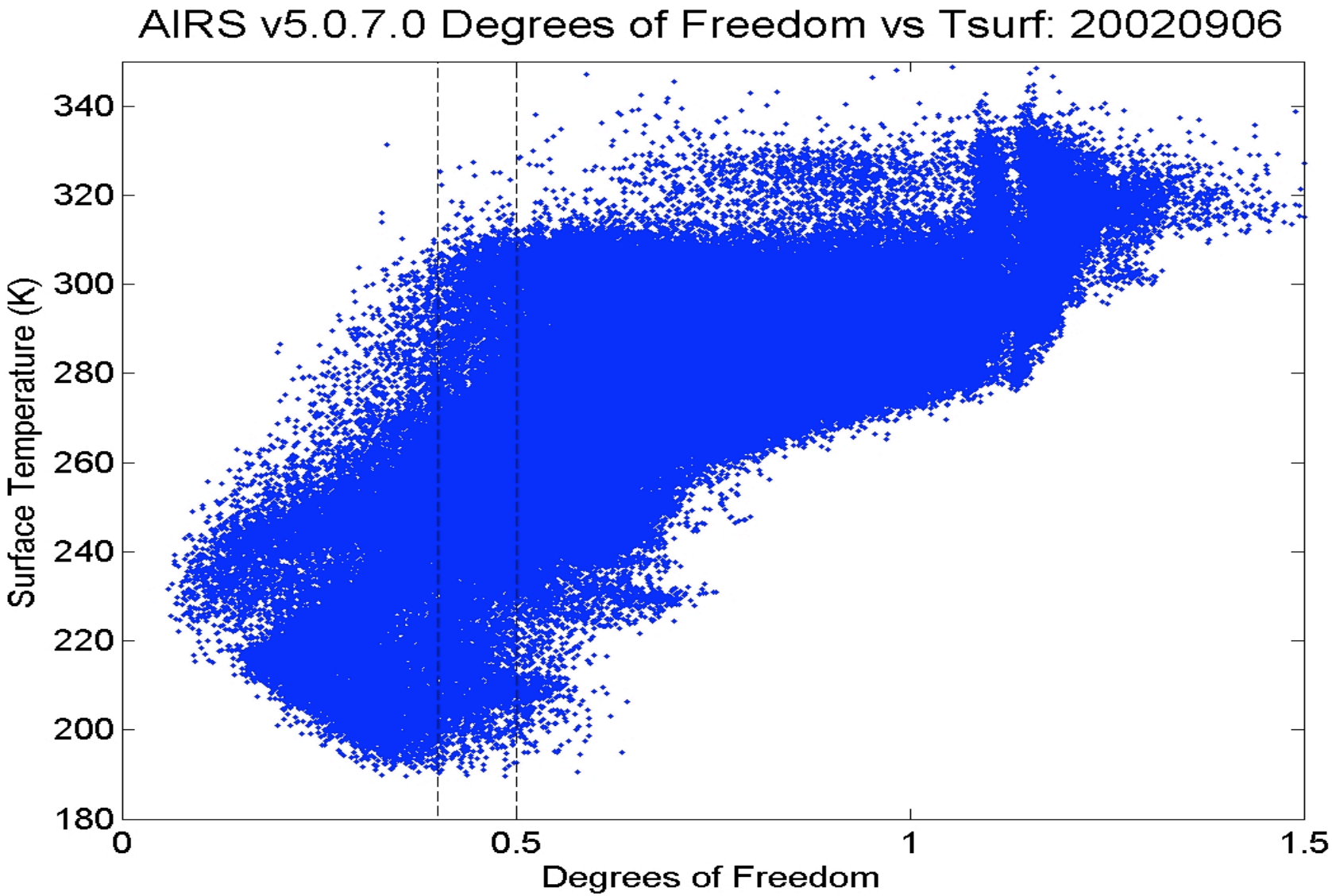

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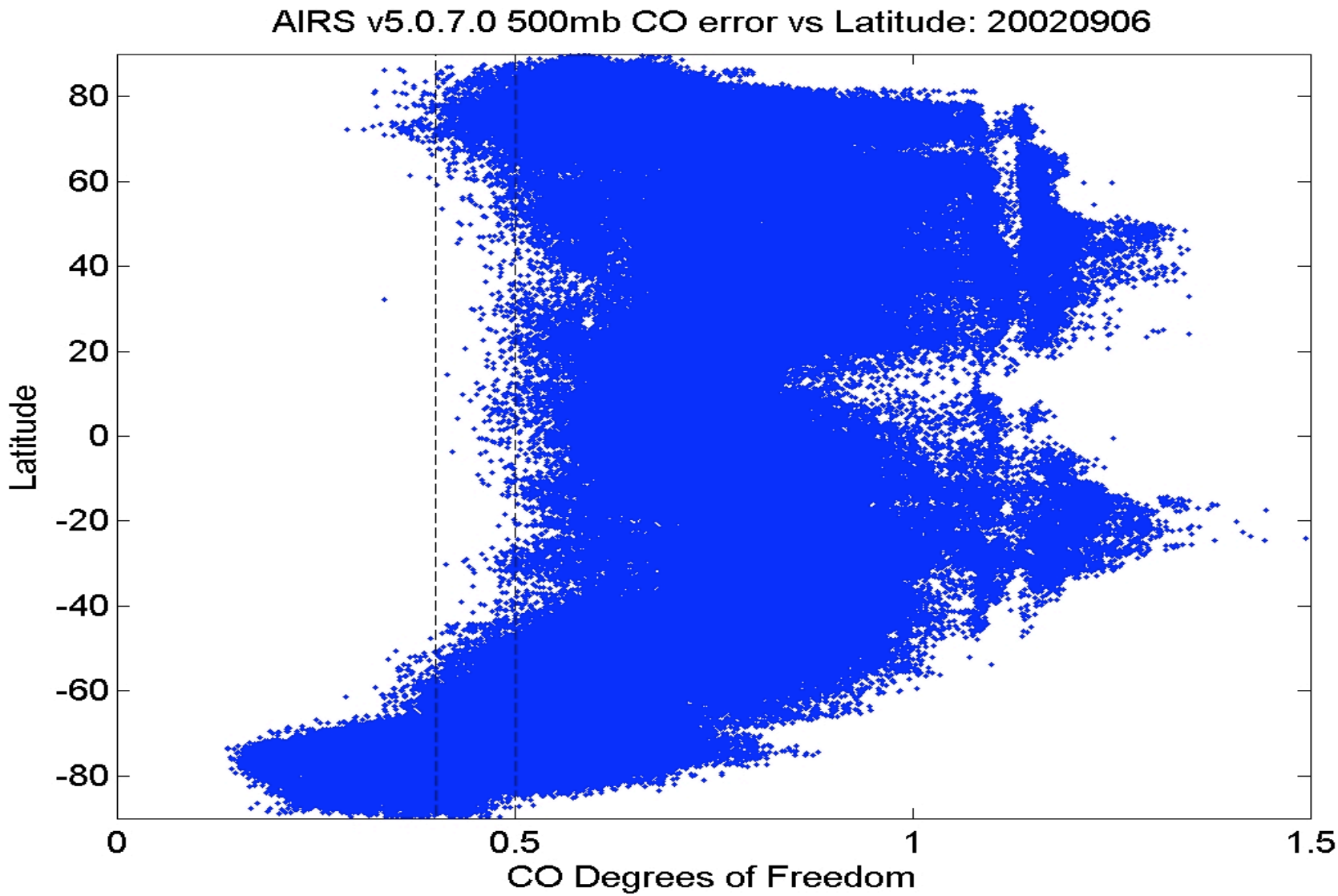

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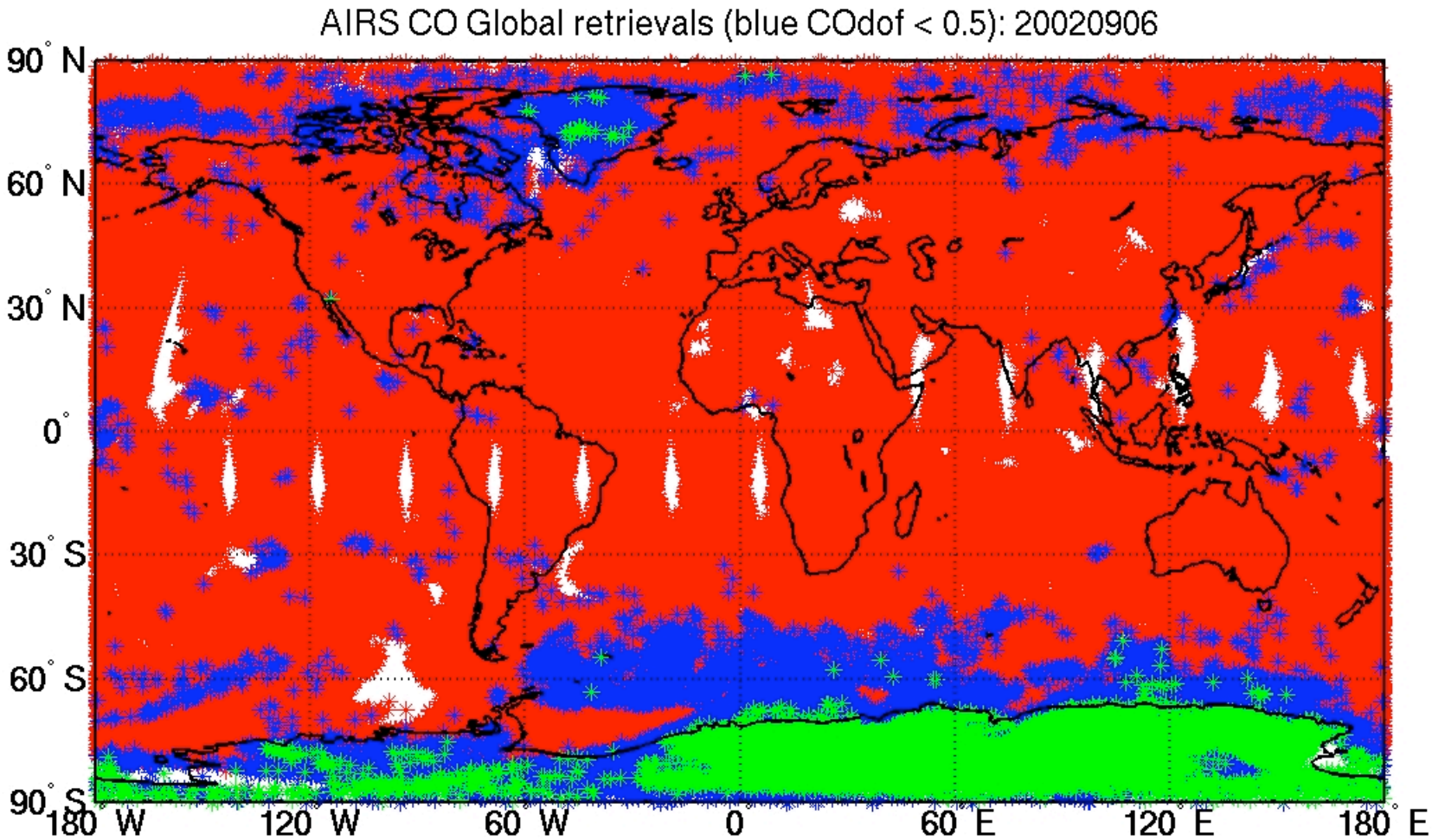

COdof > 0.5 COdof < 0.5 COdof < 0.4

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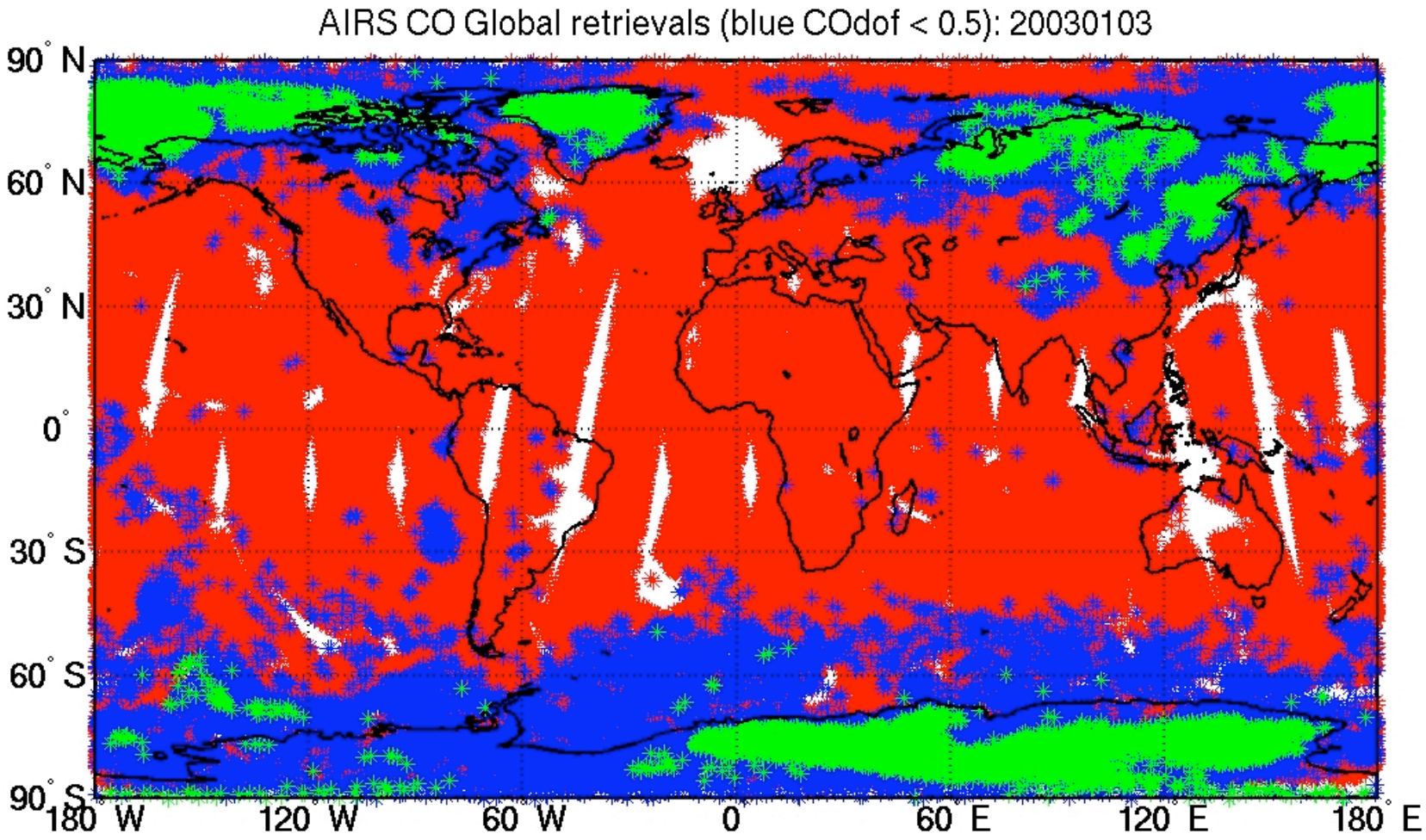

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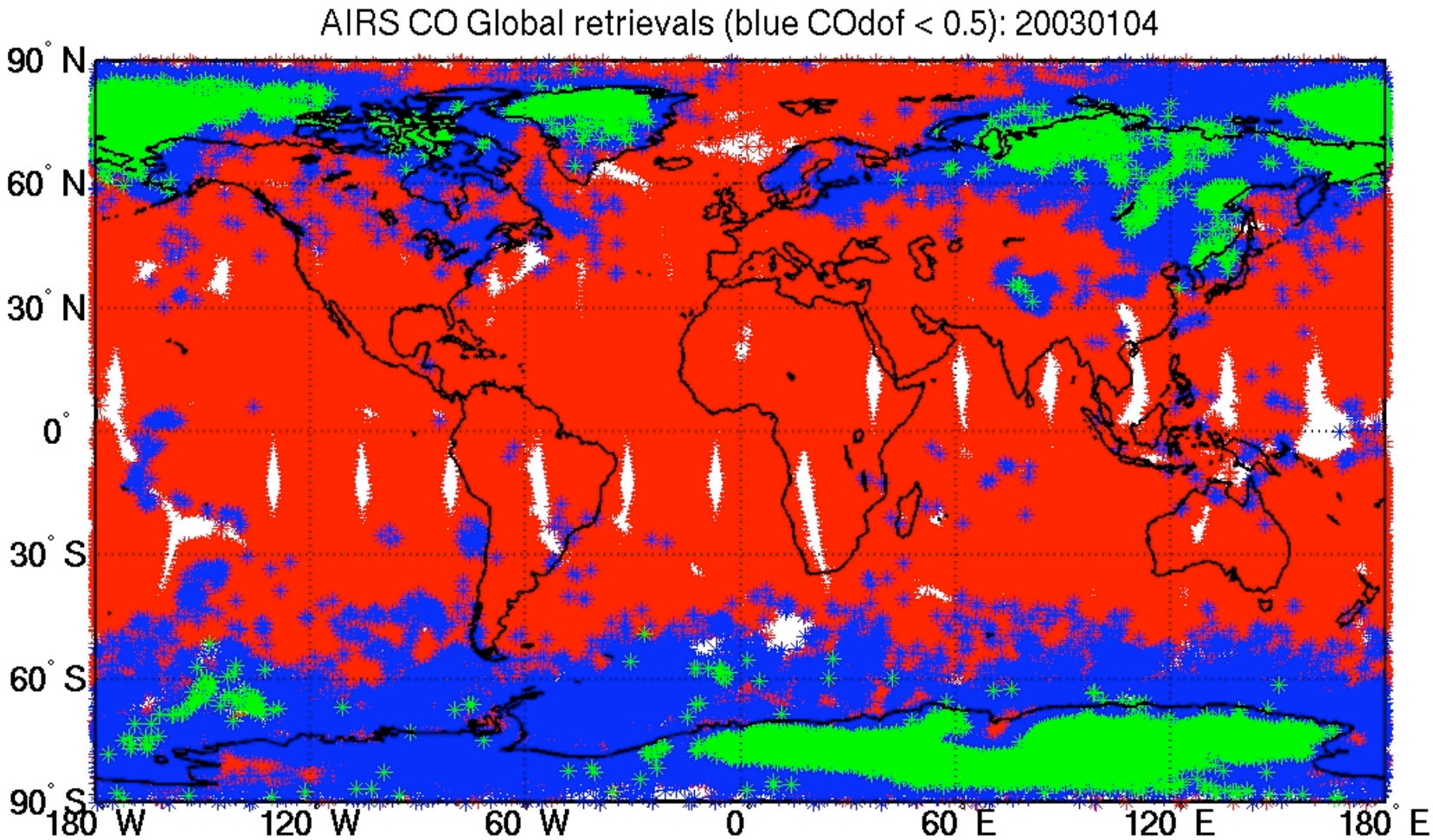

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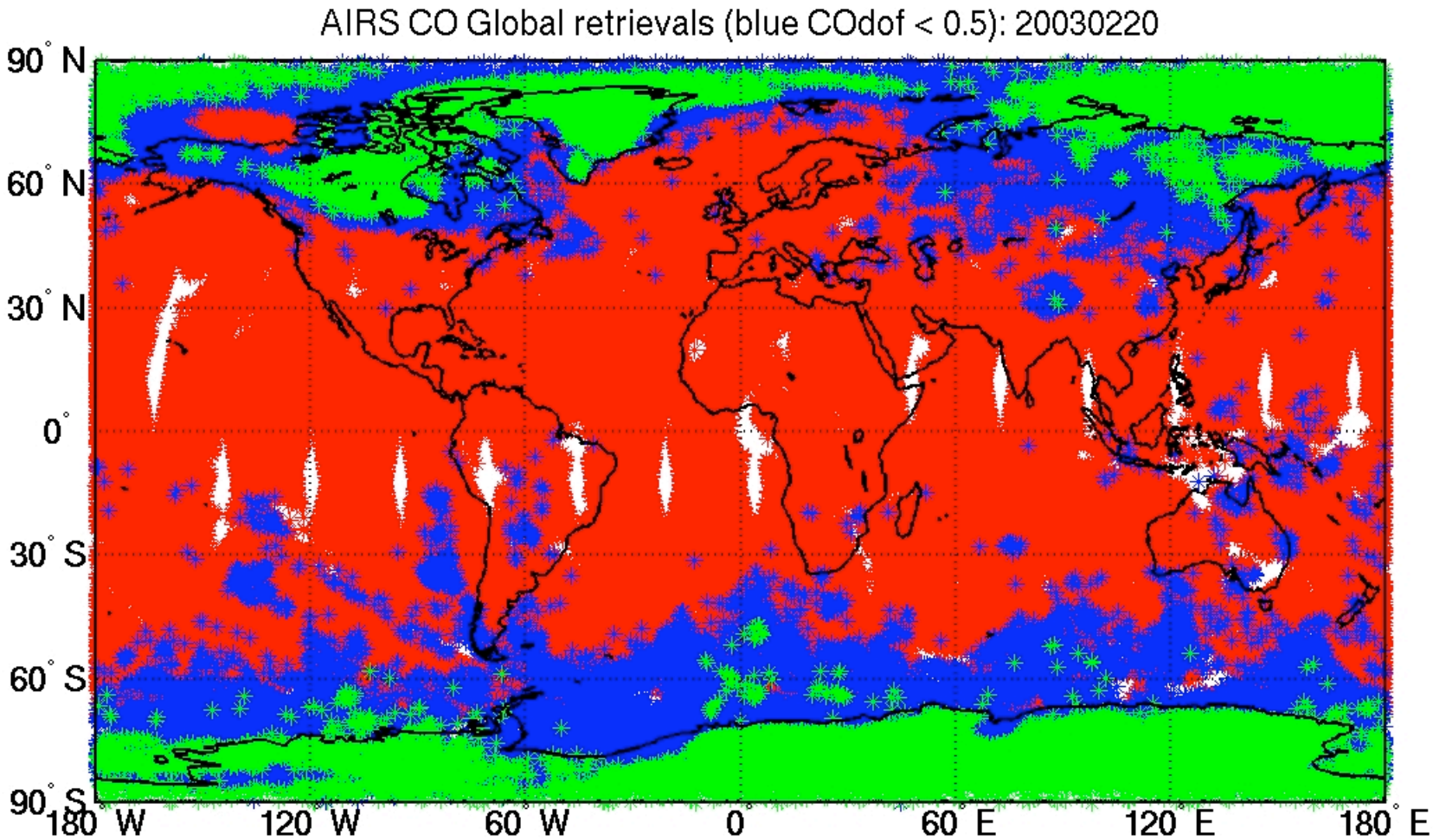

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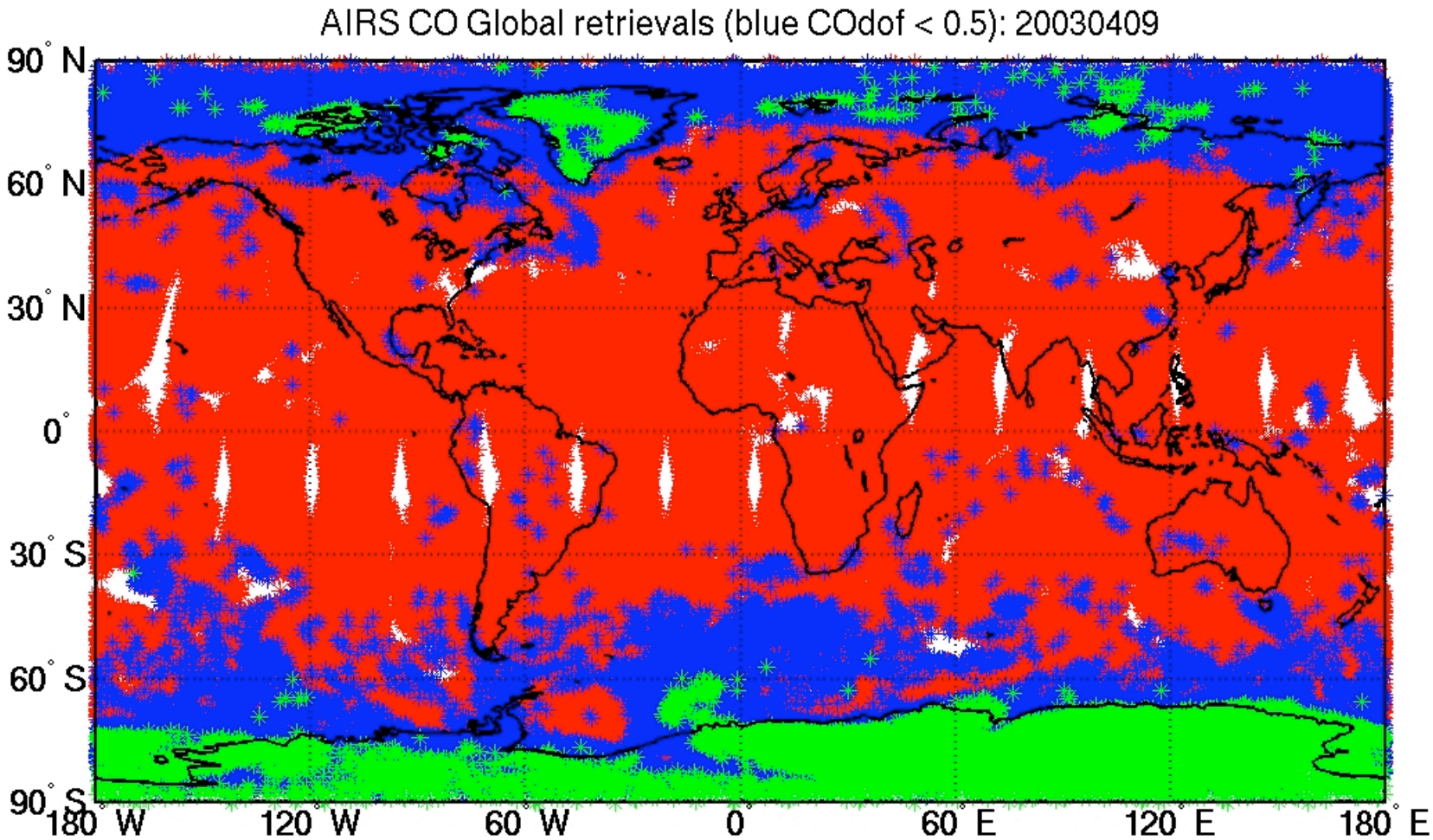

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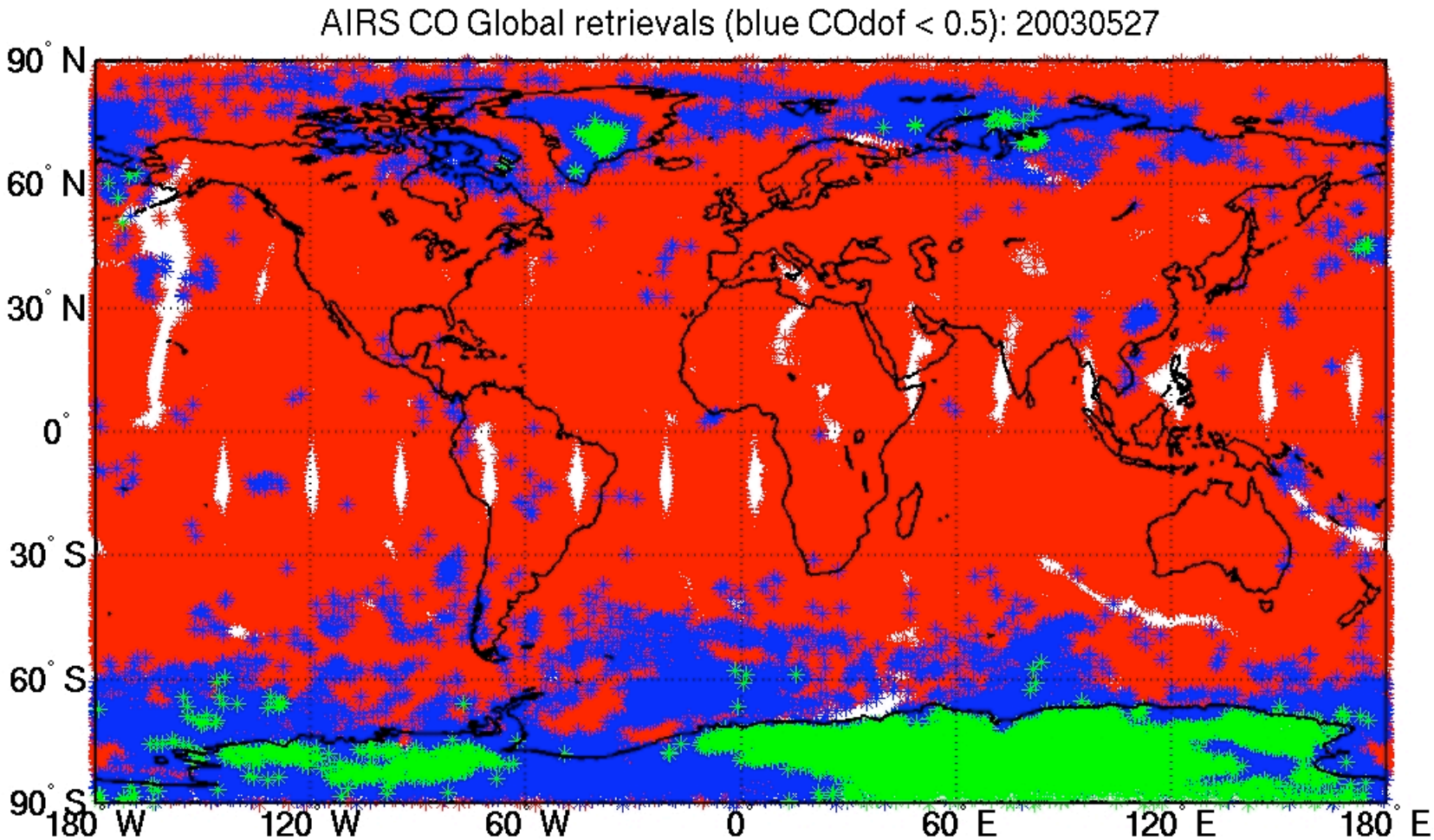

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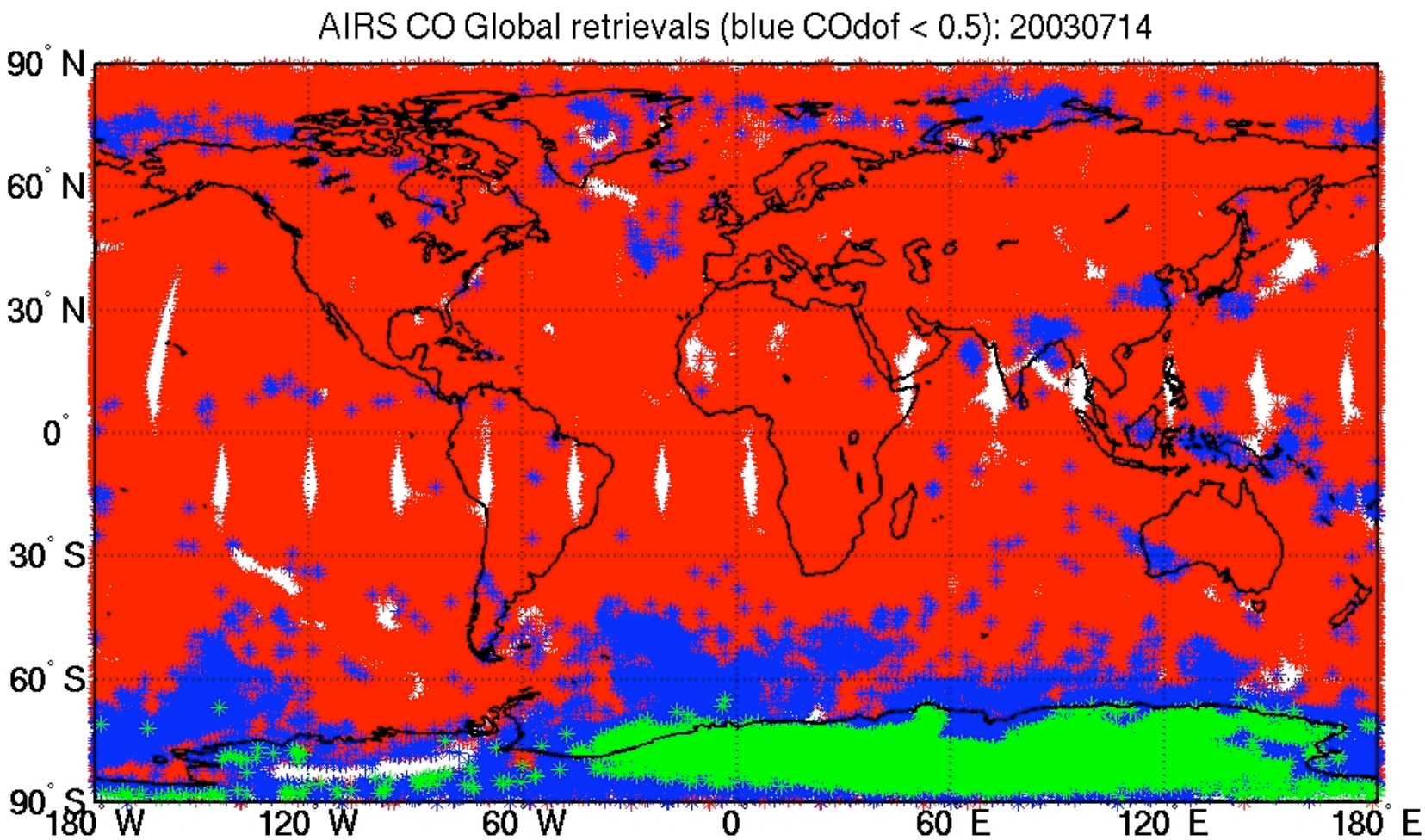

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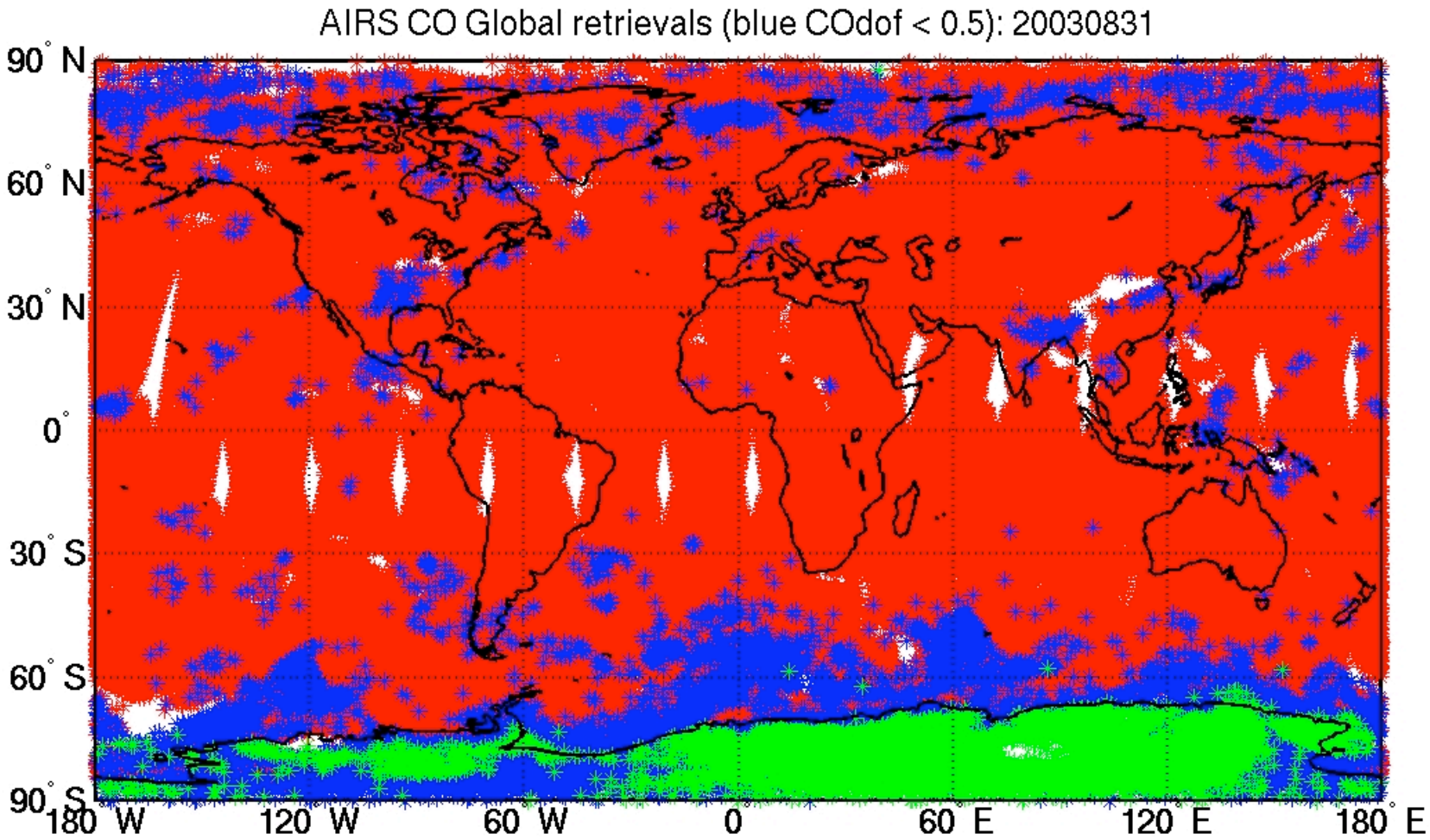

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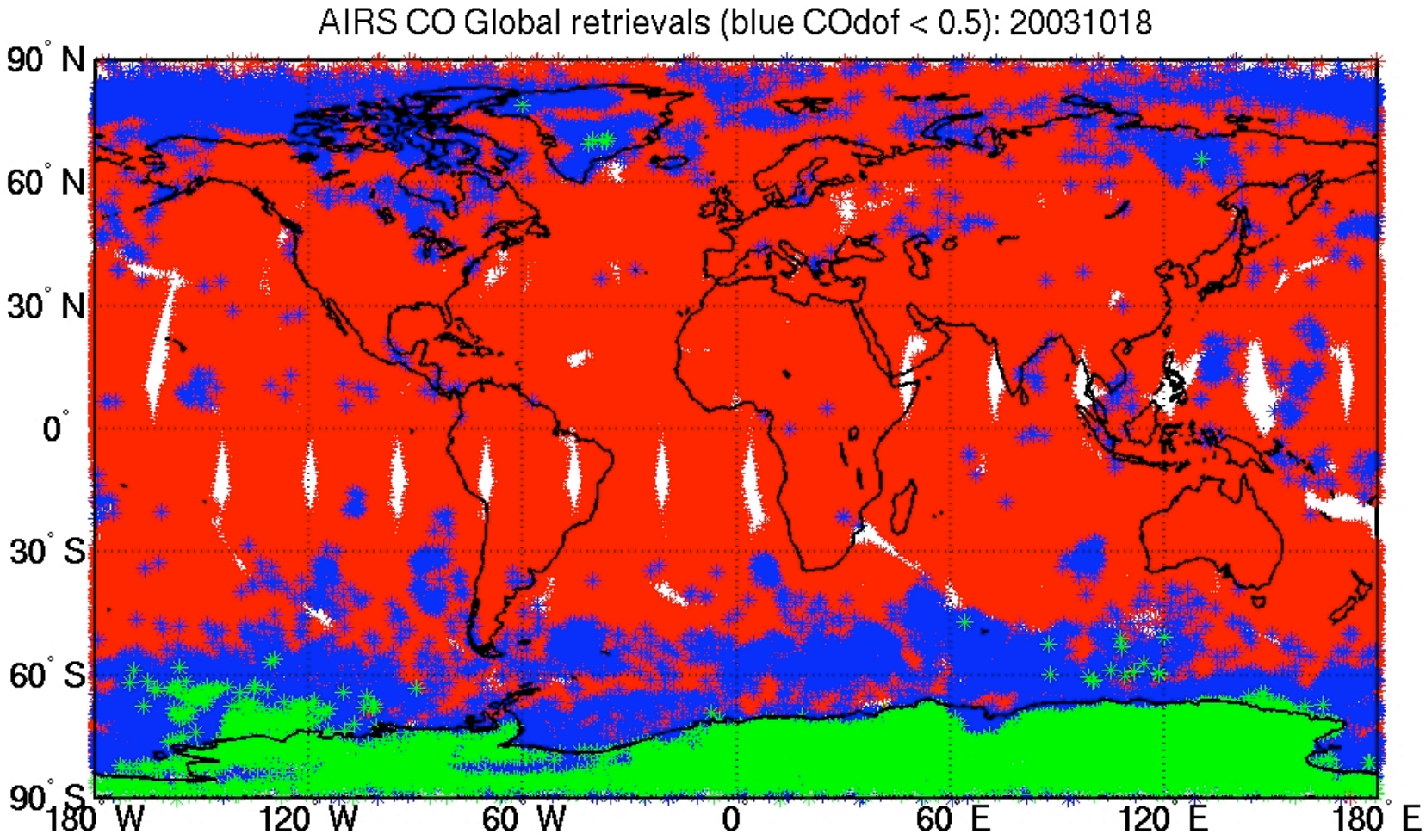

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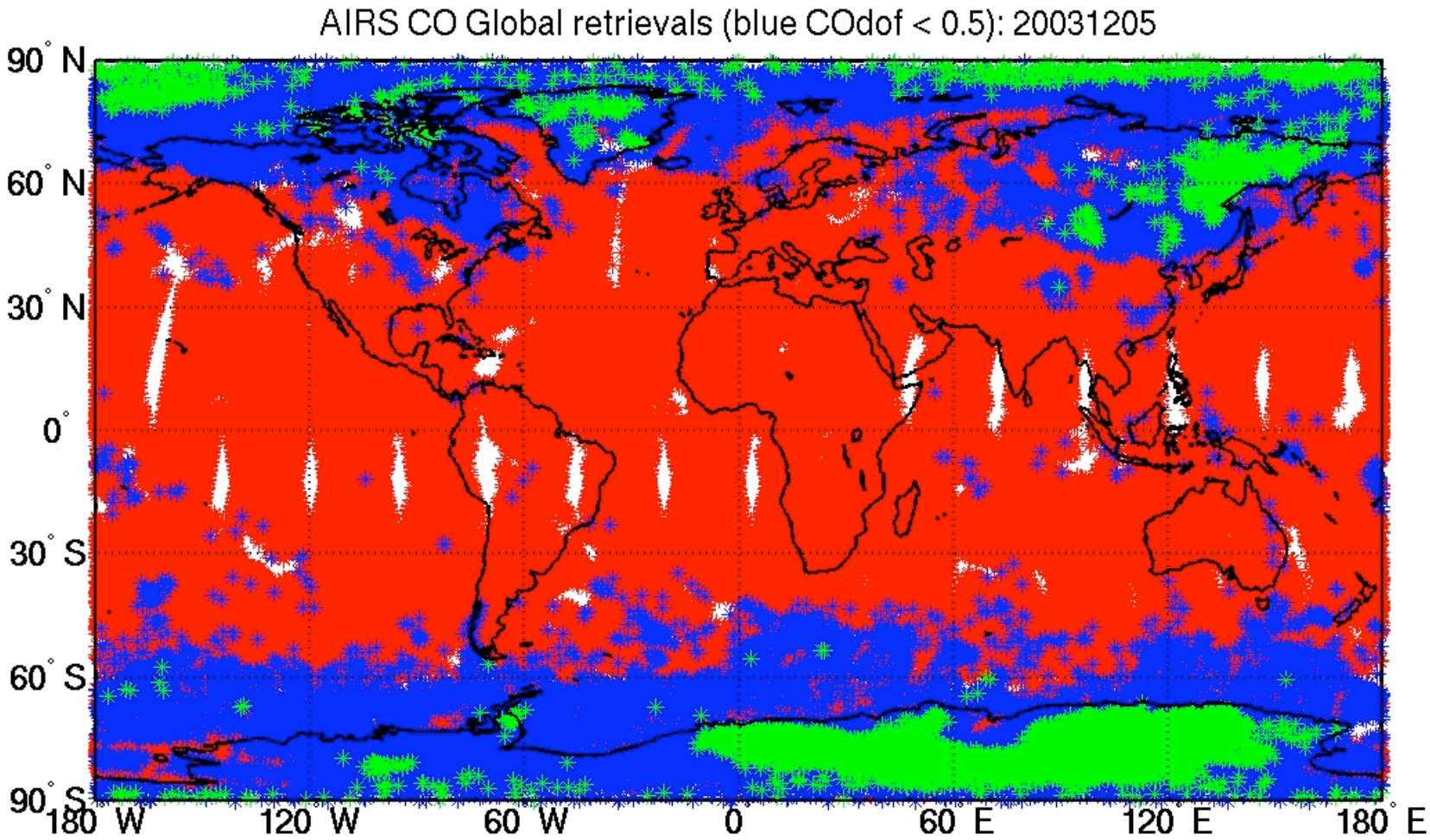

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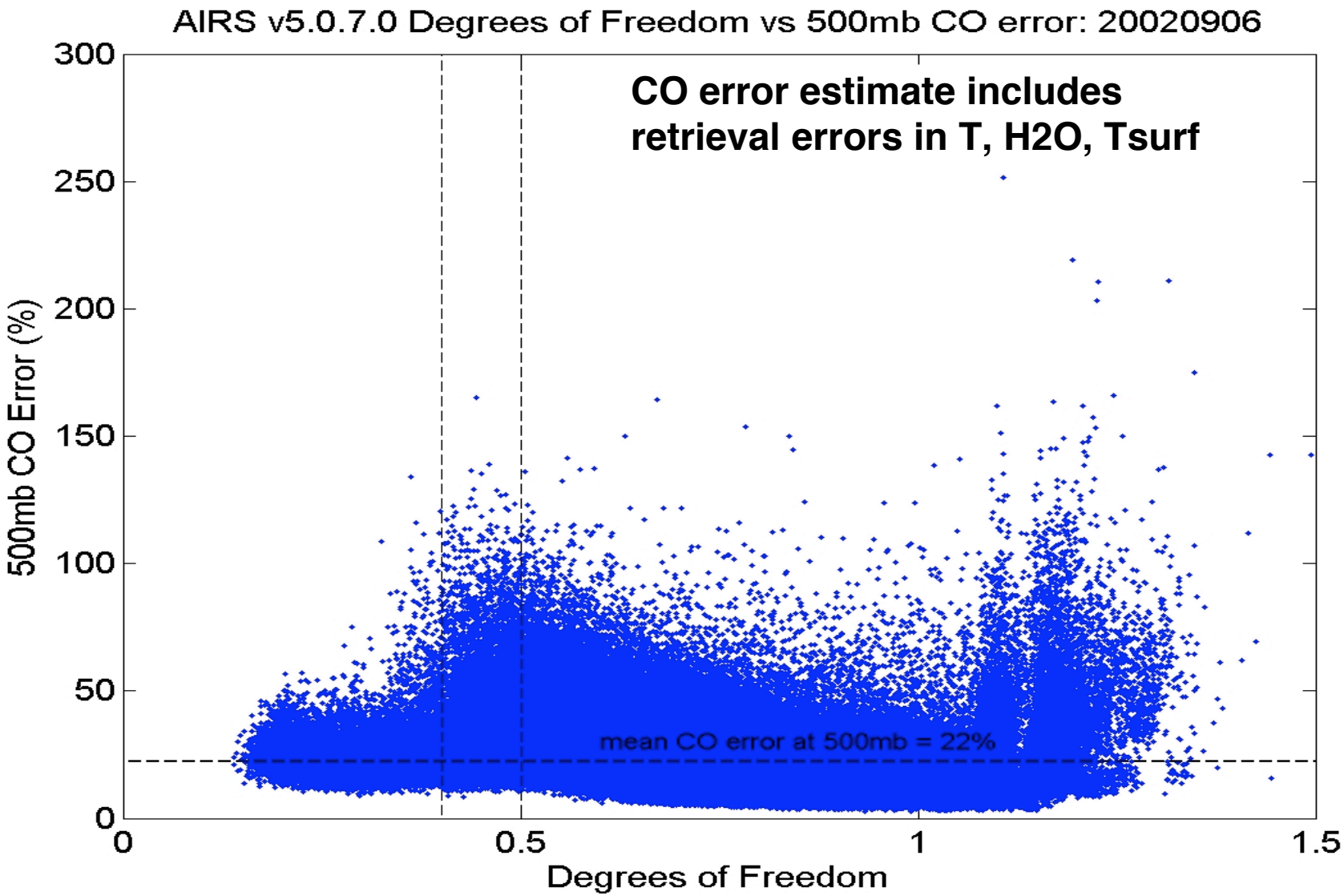

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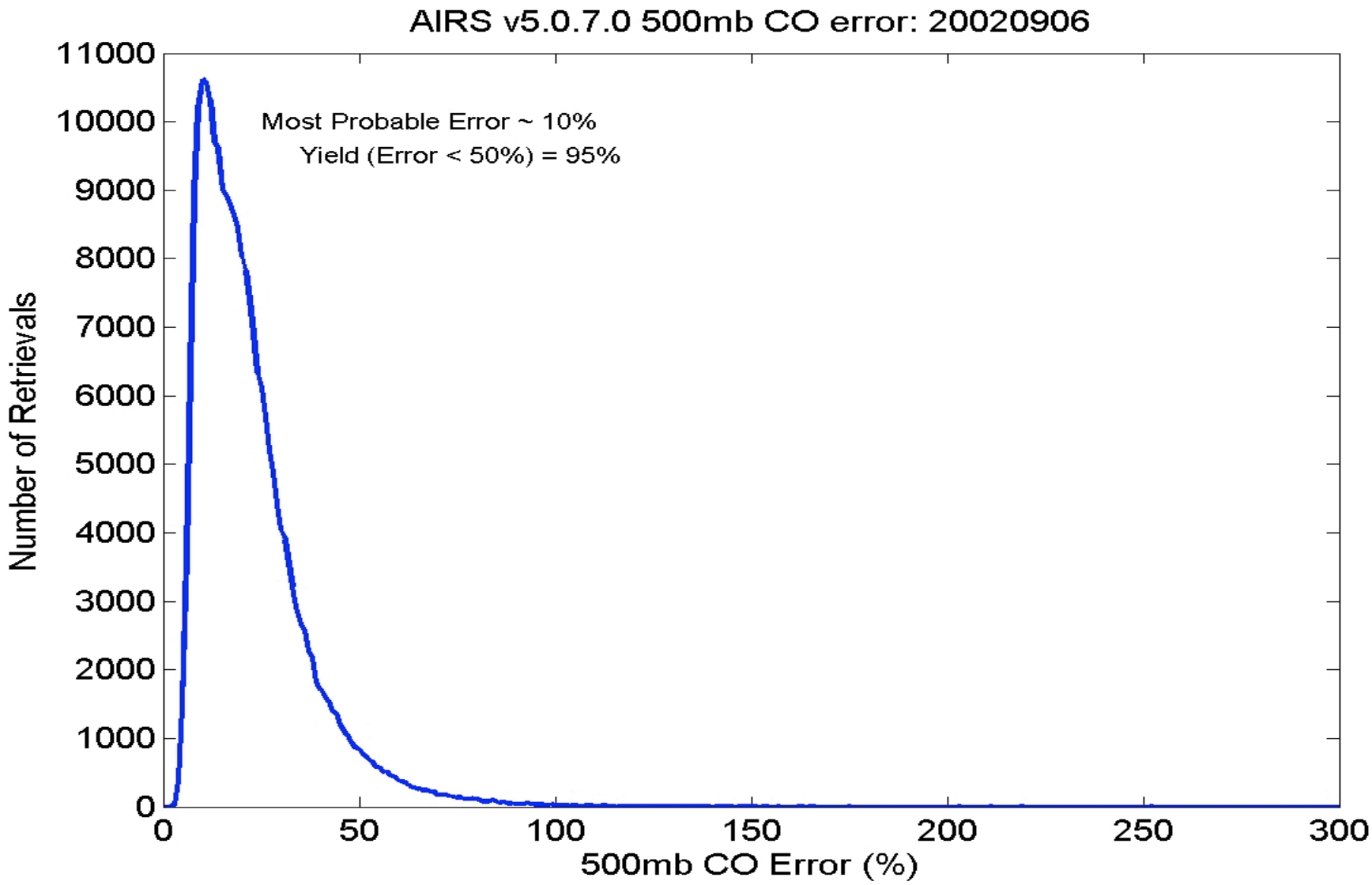

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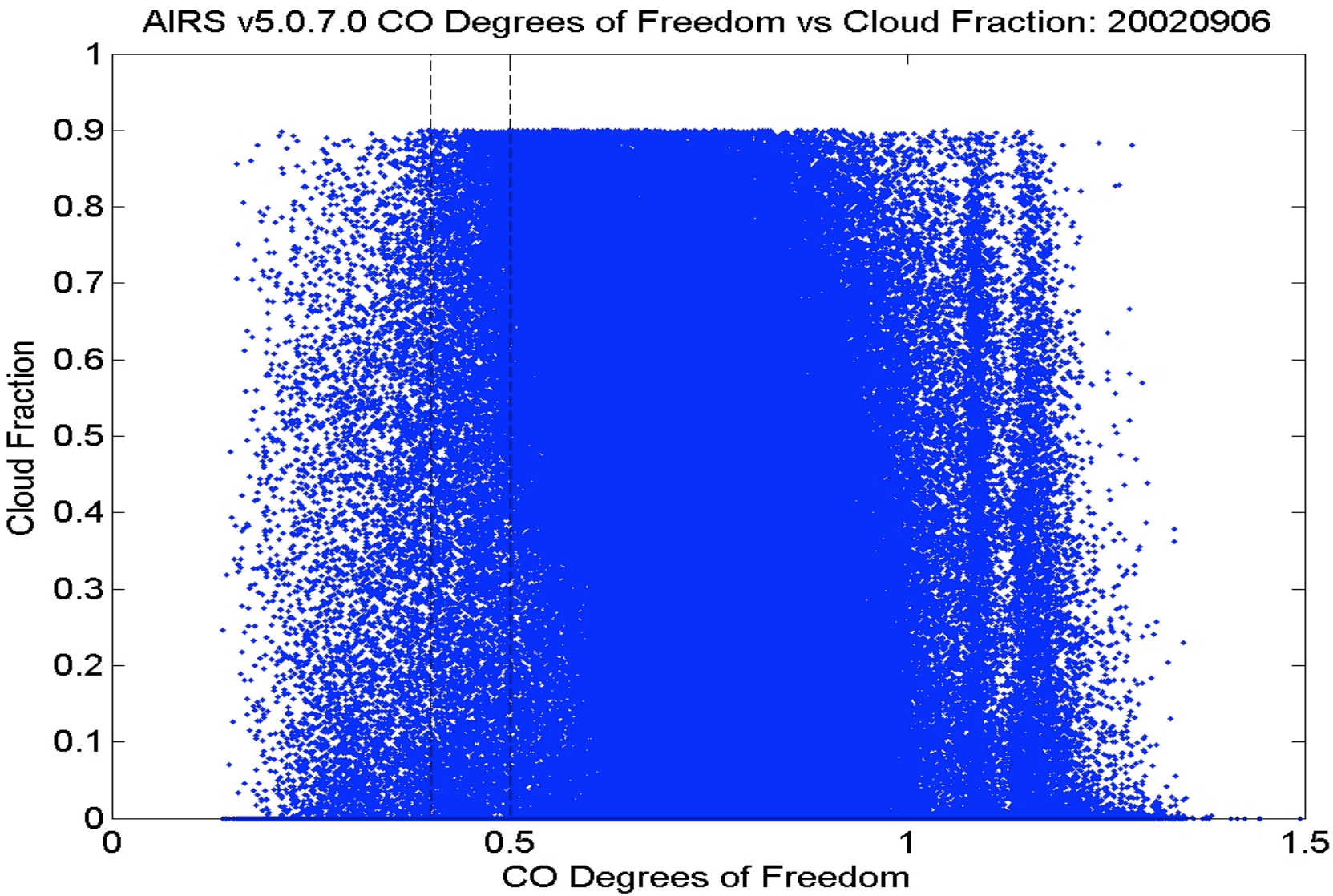
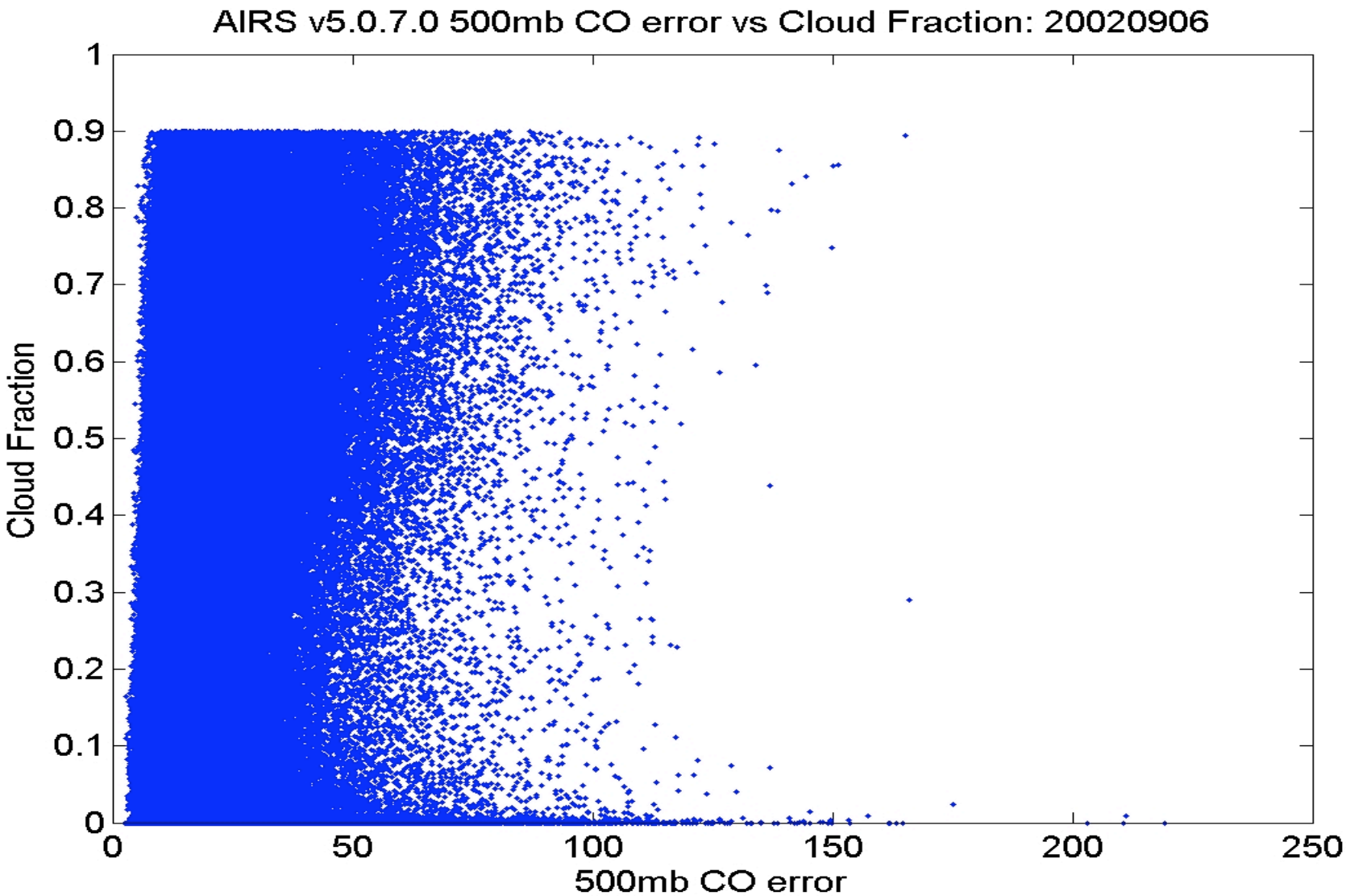
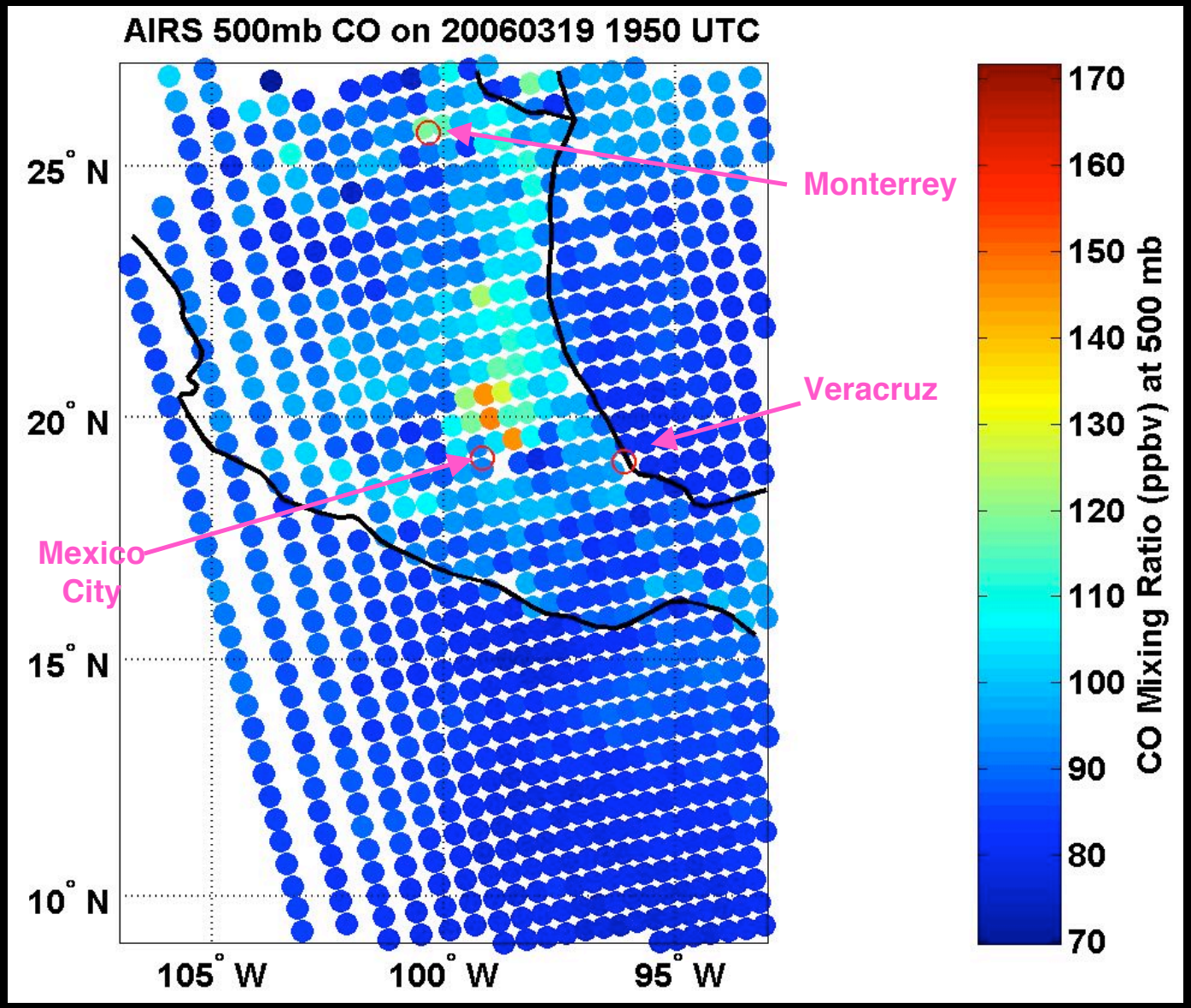


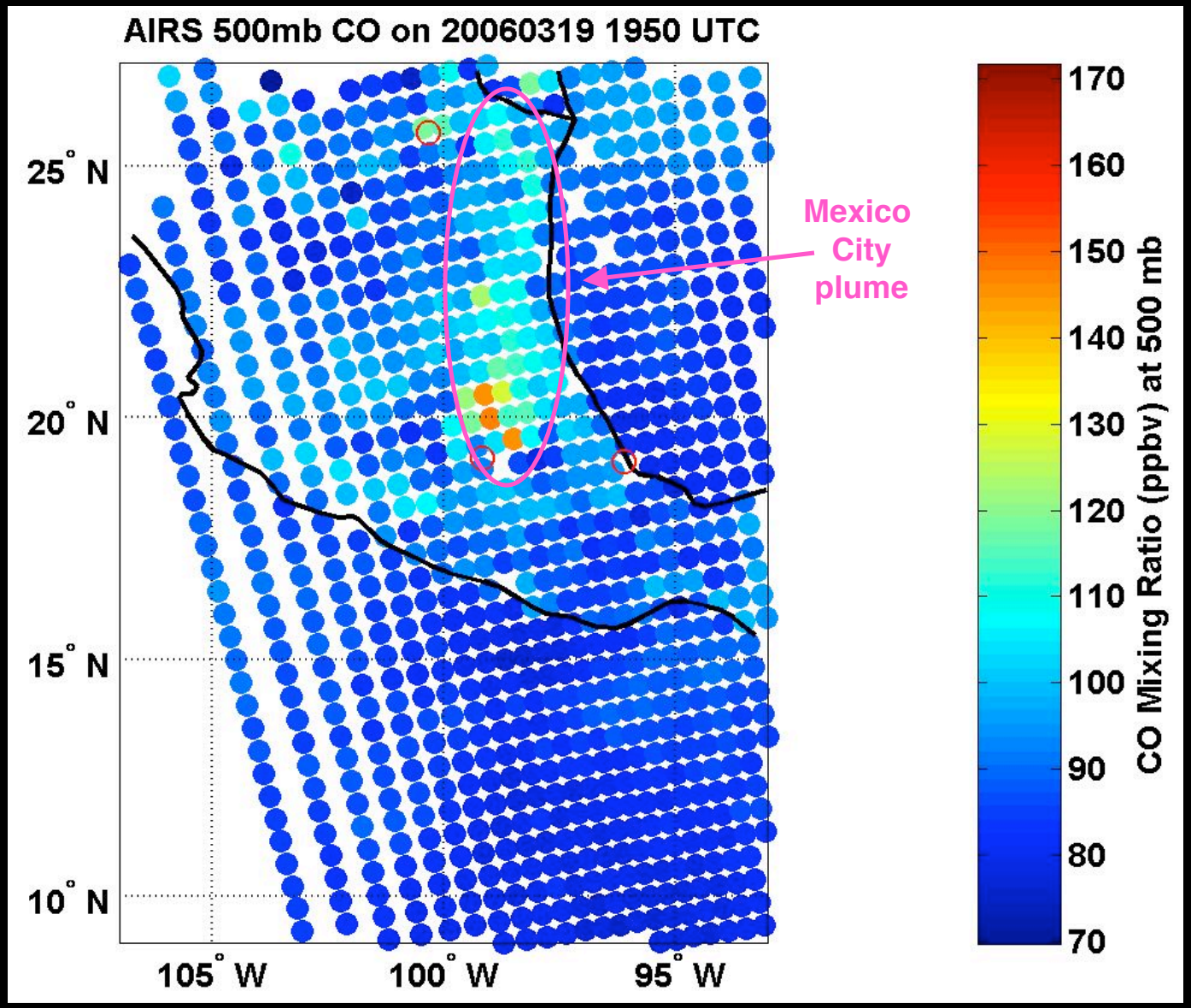
Cloud Fraction Impacts



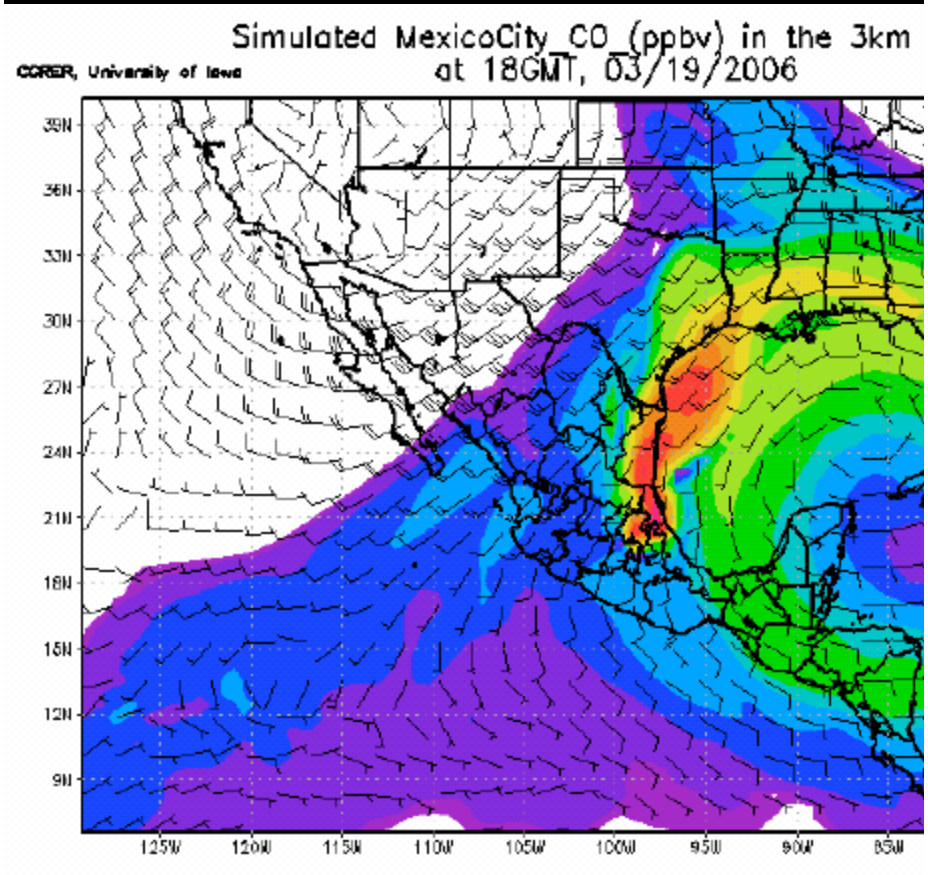
AIRS CO v5.0.2.0: MILAGRO Case



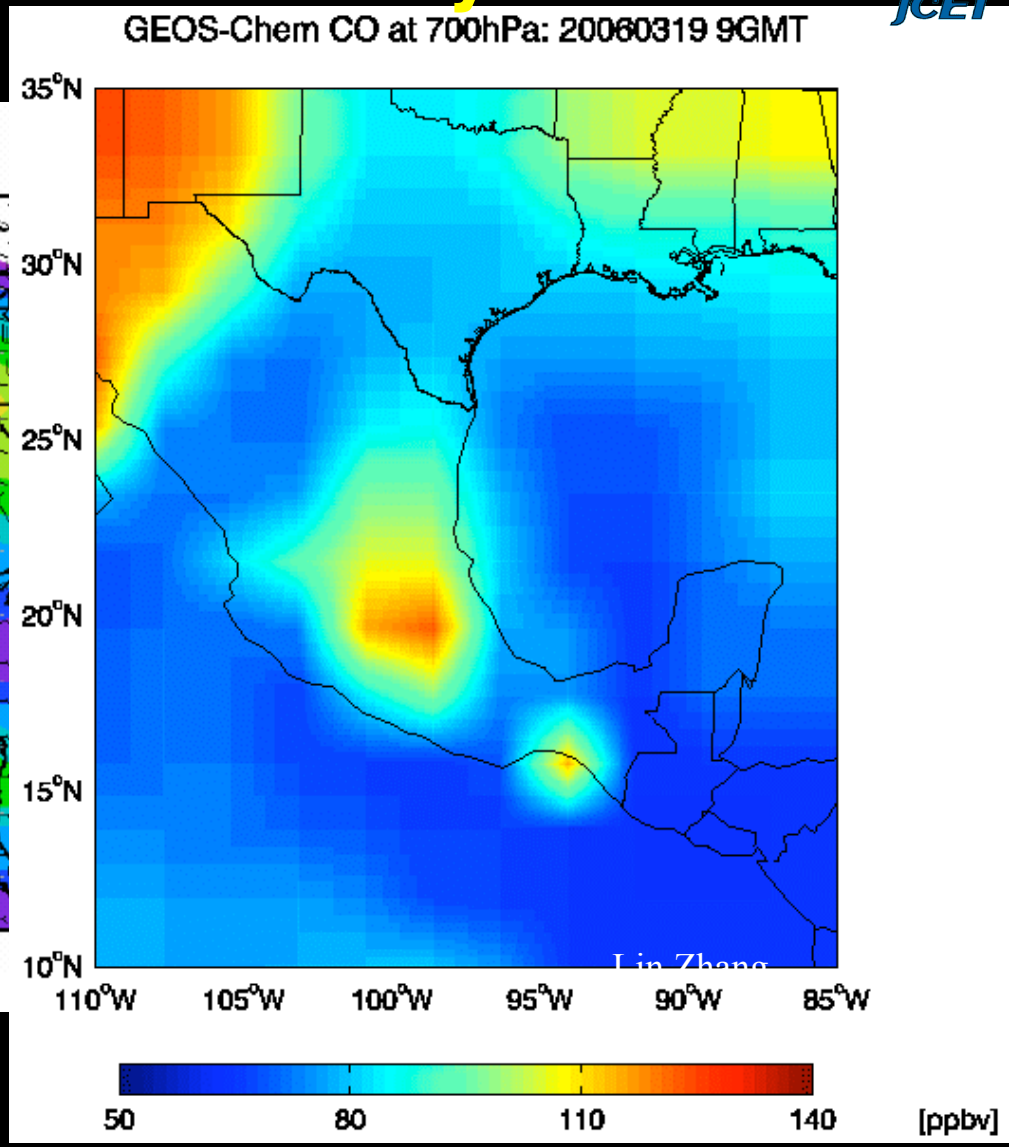
AIRS CO: MILAGRO



Models Forecast Mexico City Plume

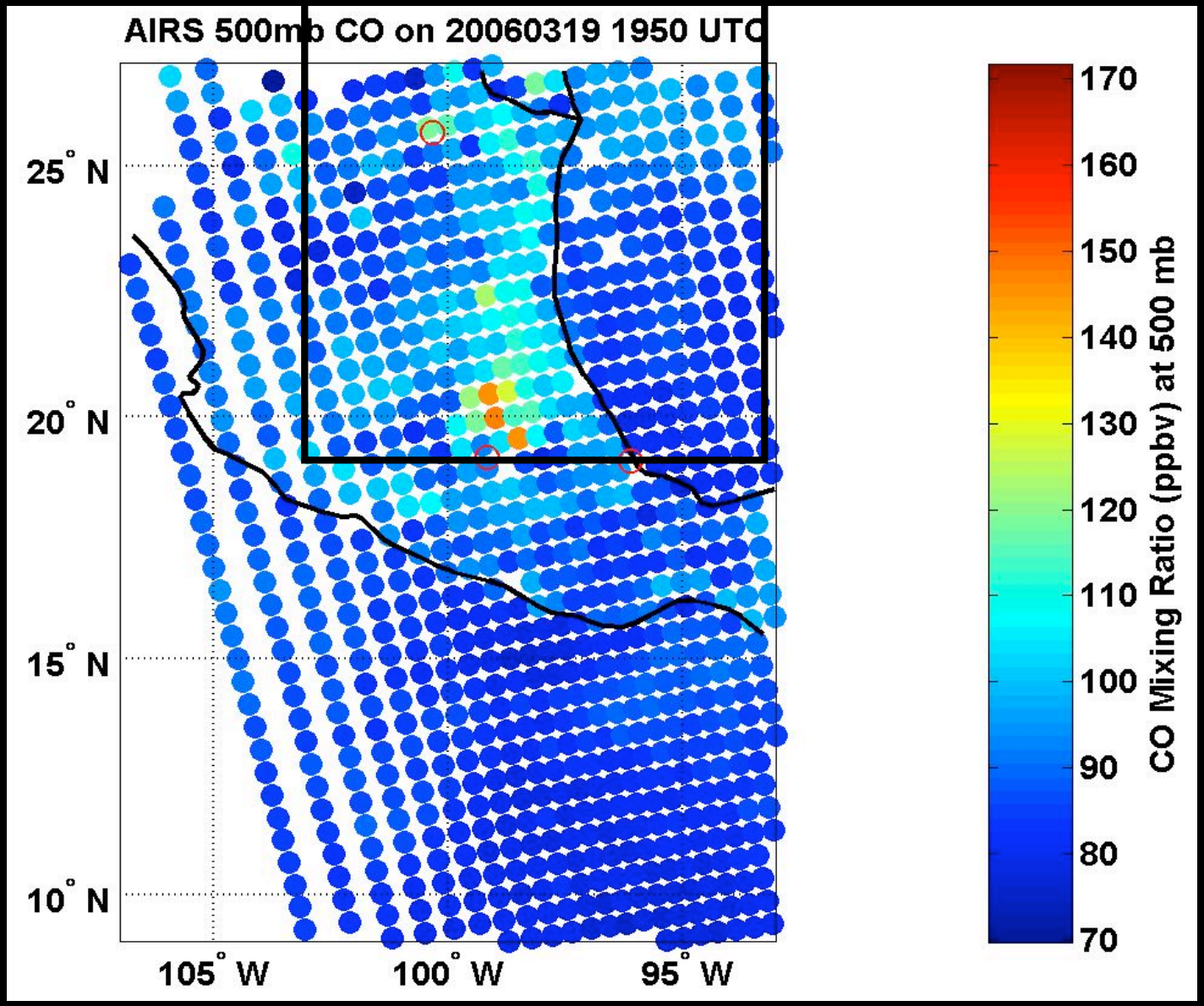


STEM model courtesy of Greg Carmichael



GEOS-CHEM model courtesy of L. Zhang and D. Jacobs

AIRS CO: MILAGRO



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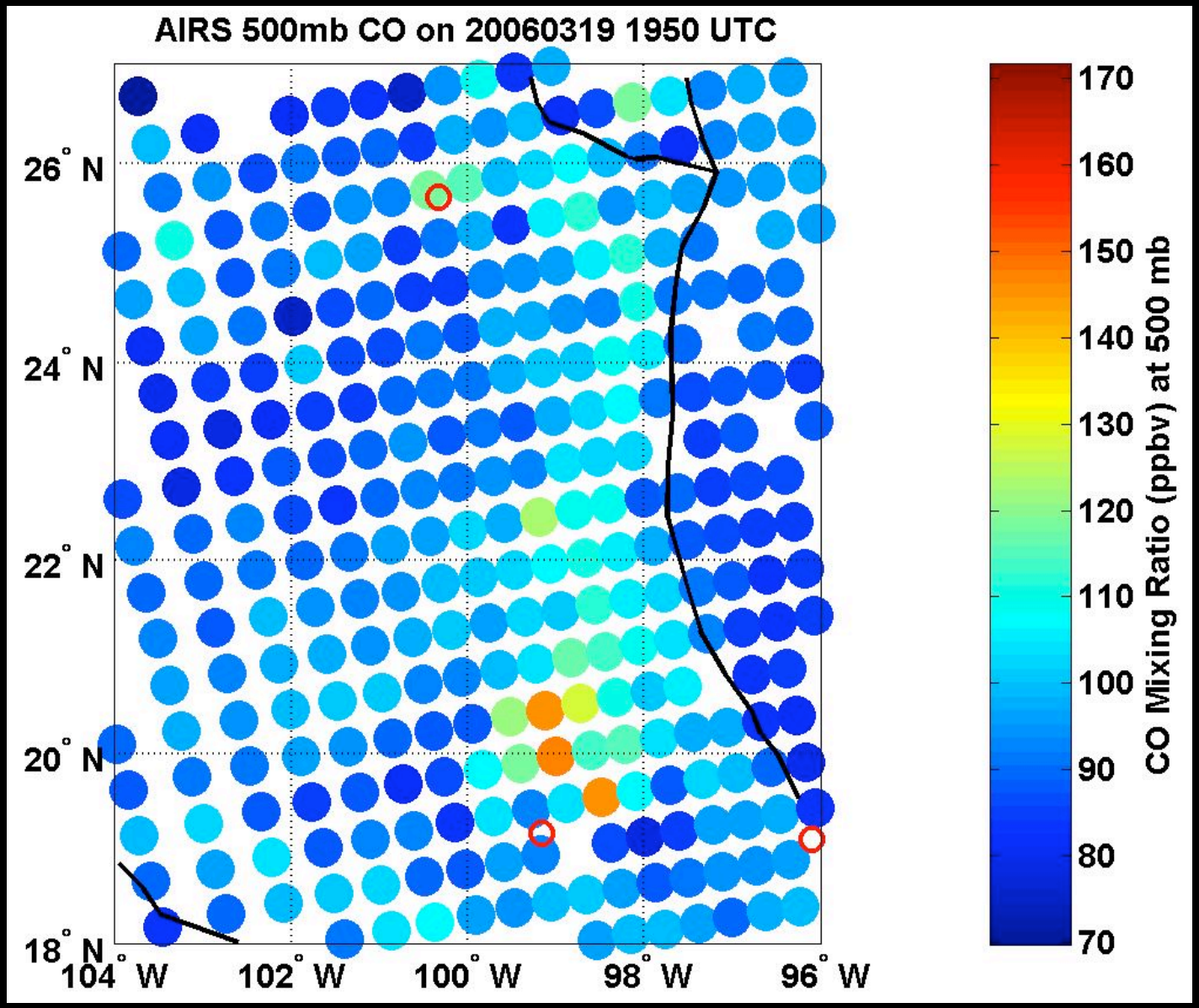
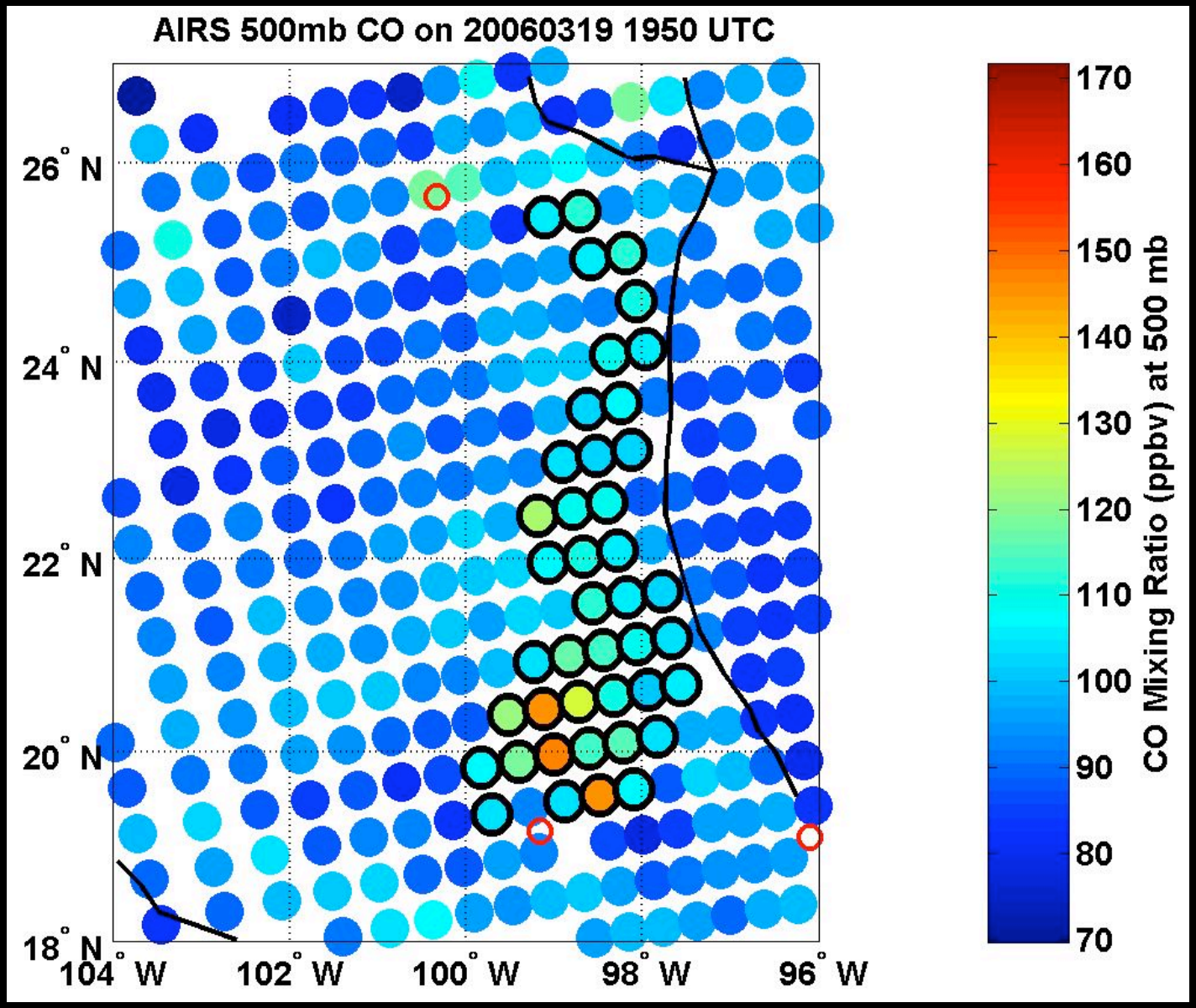
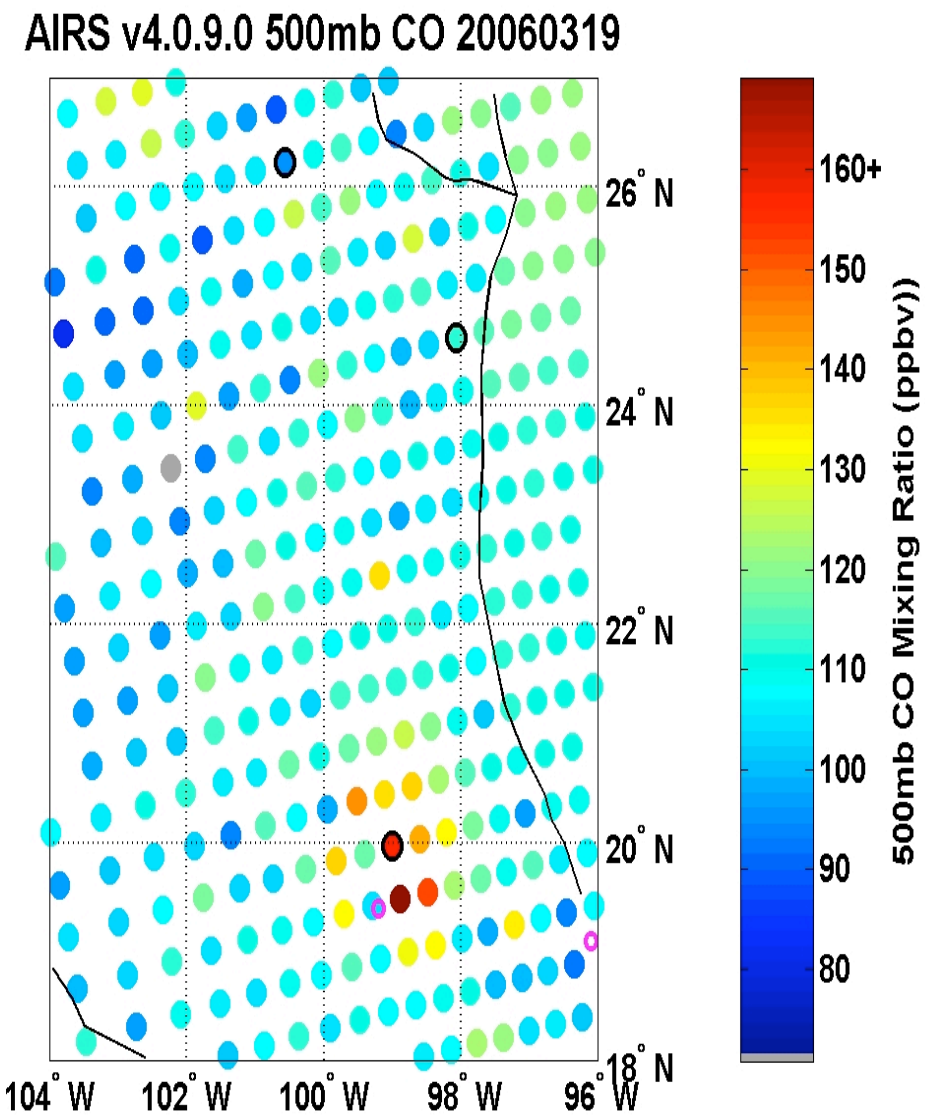
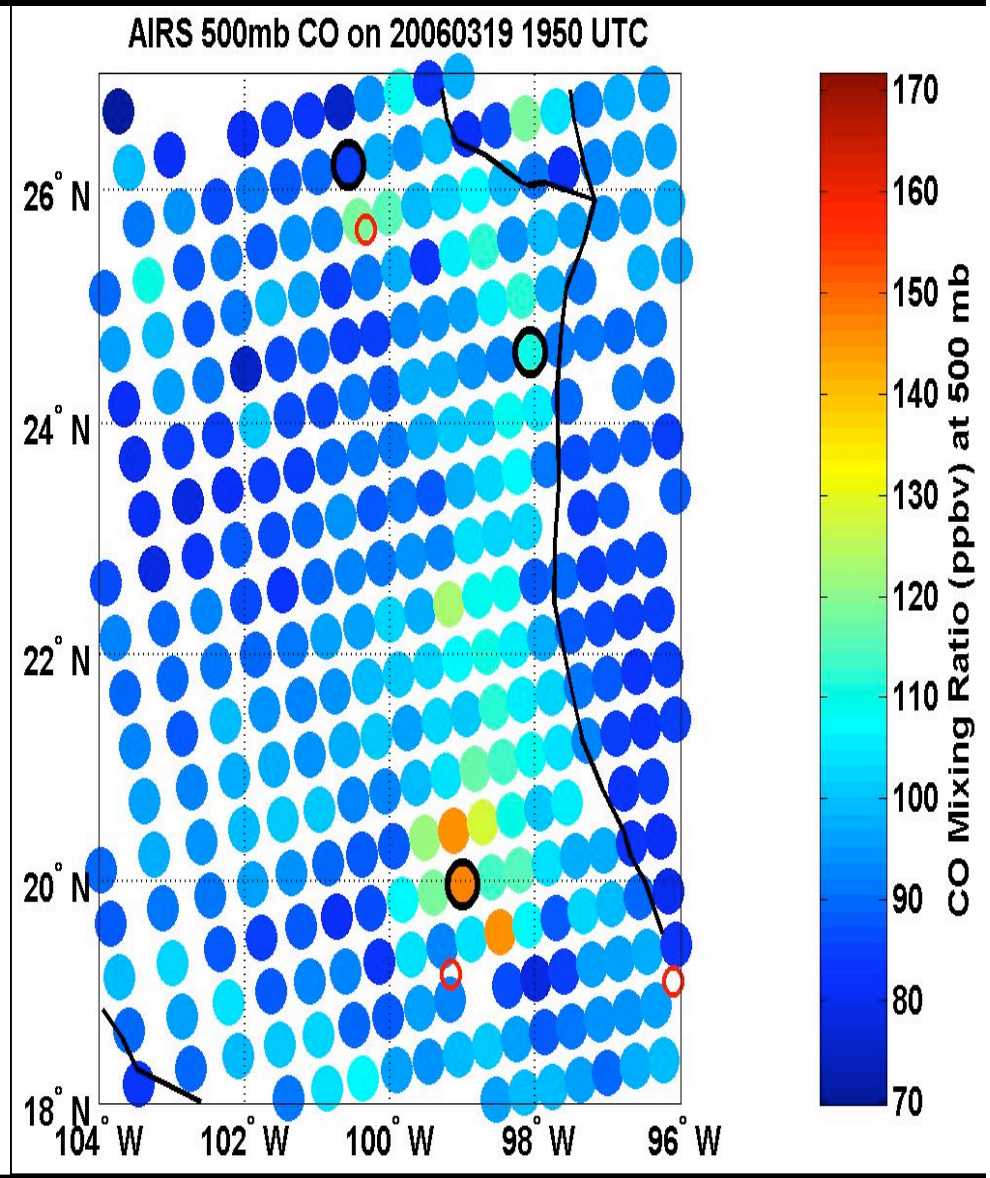


AIRS CO: Mexico City Plume



v4.0.9.0 vs. v5.0.2.0





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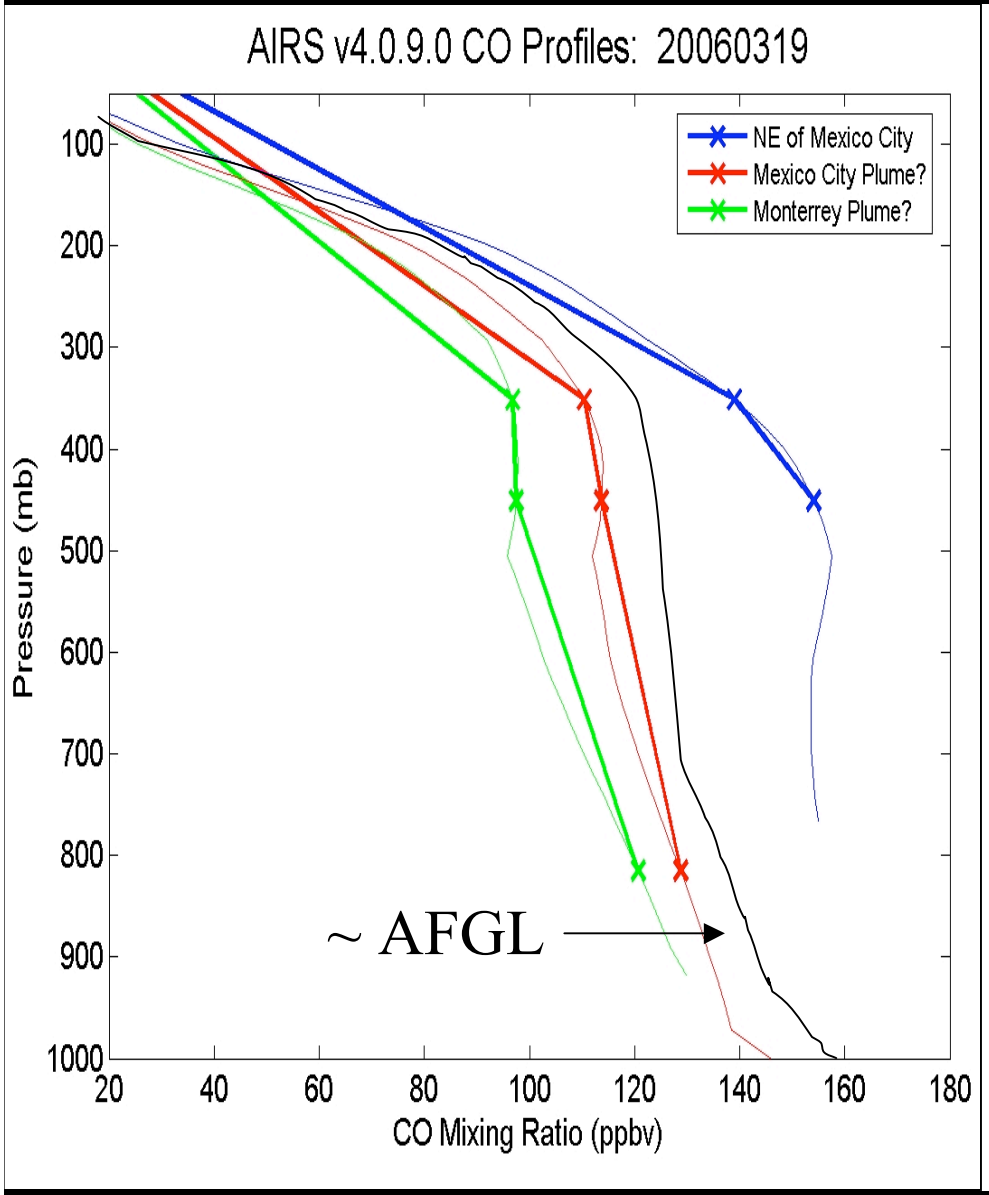

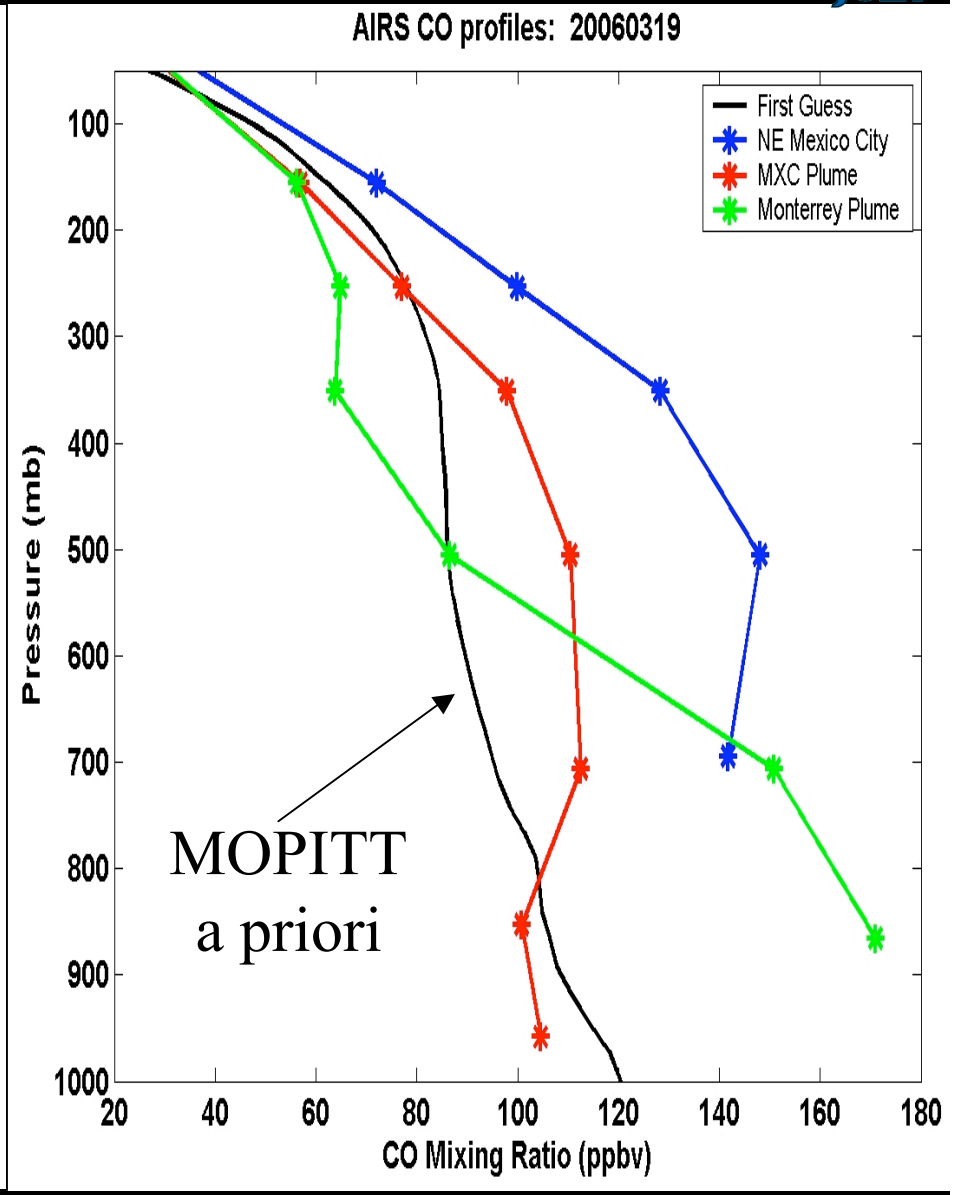

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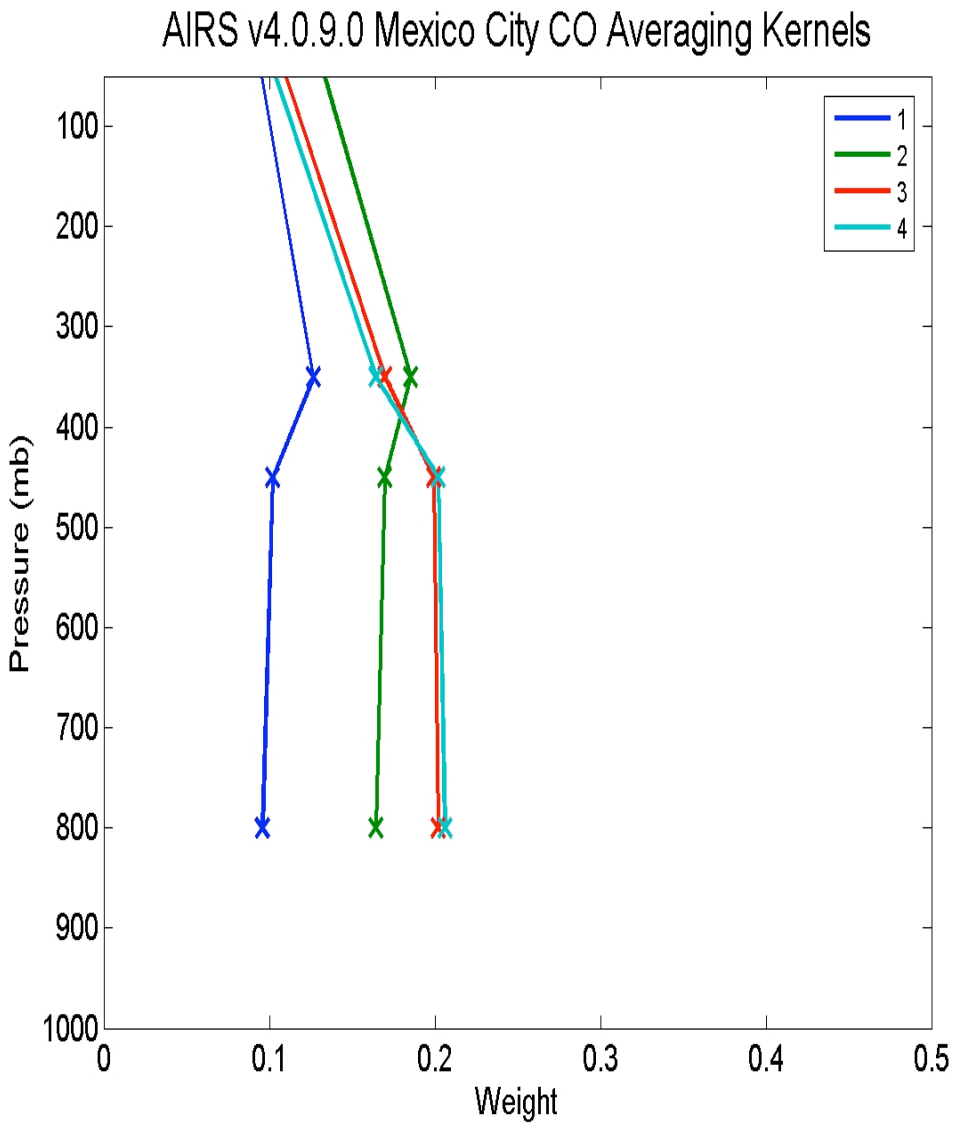

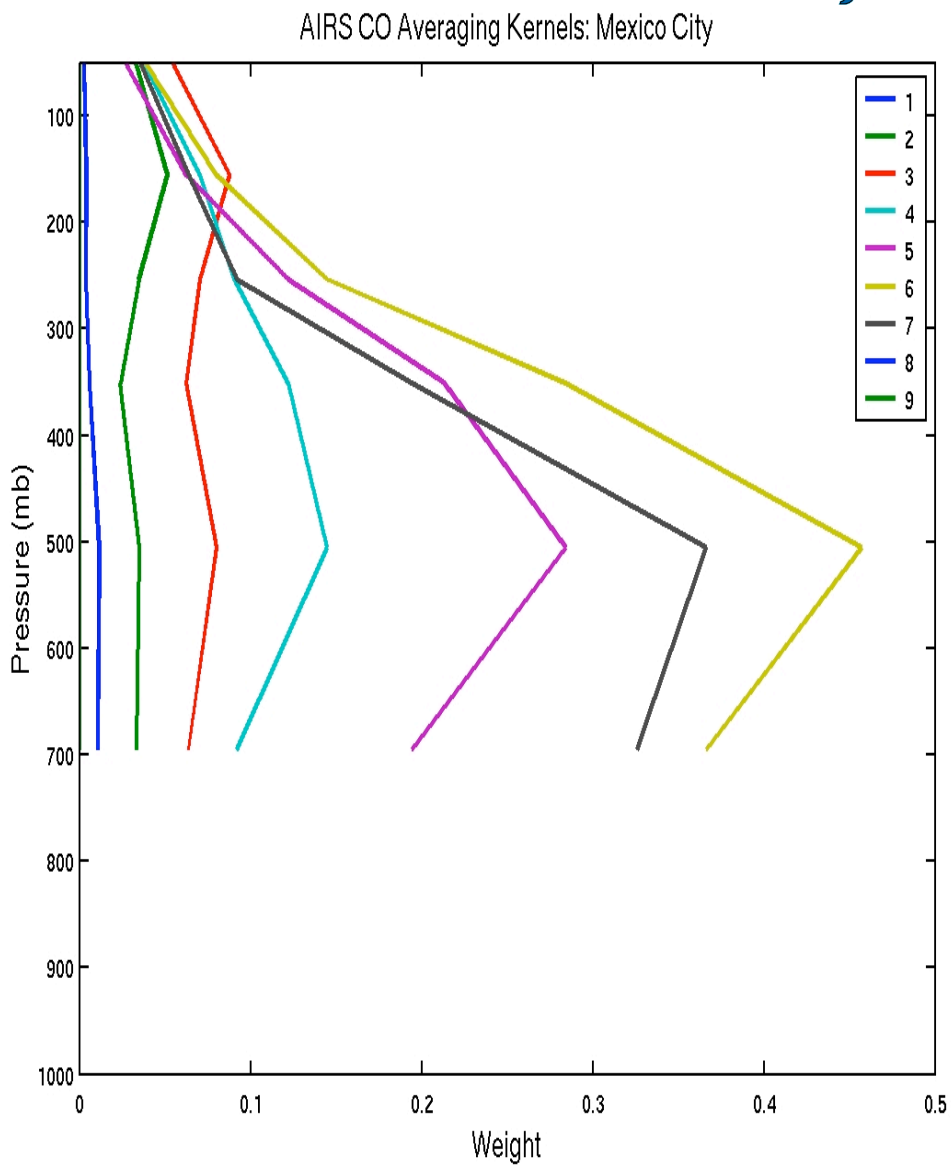

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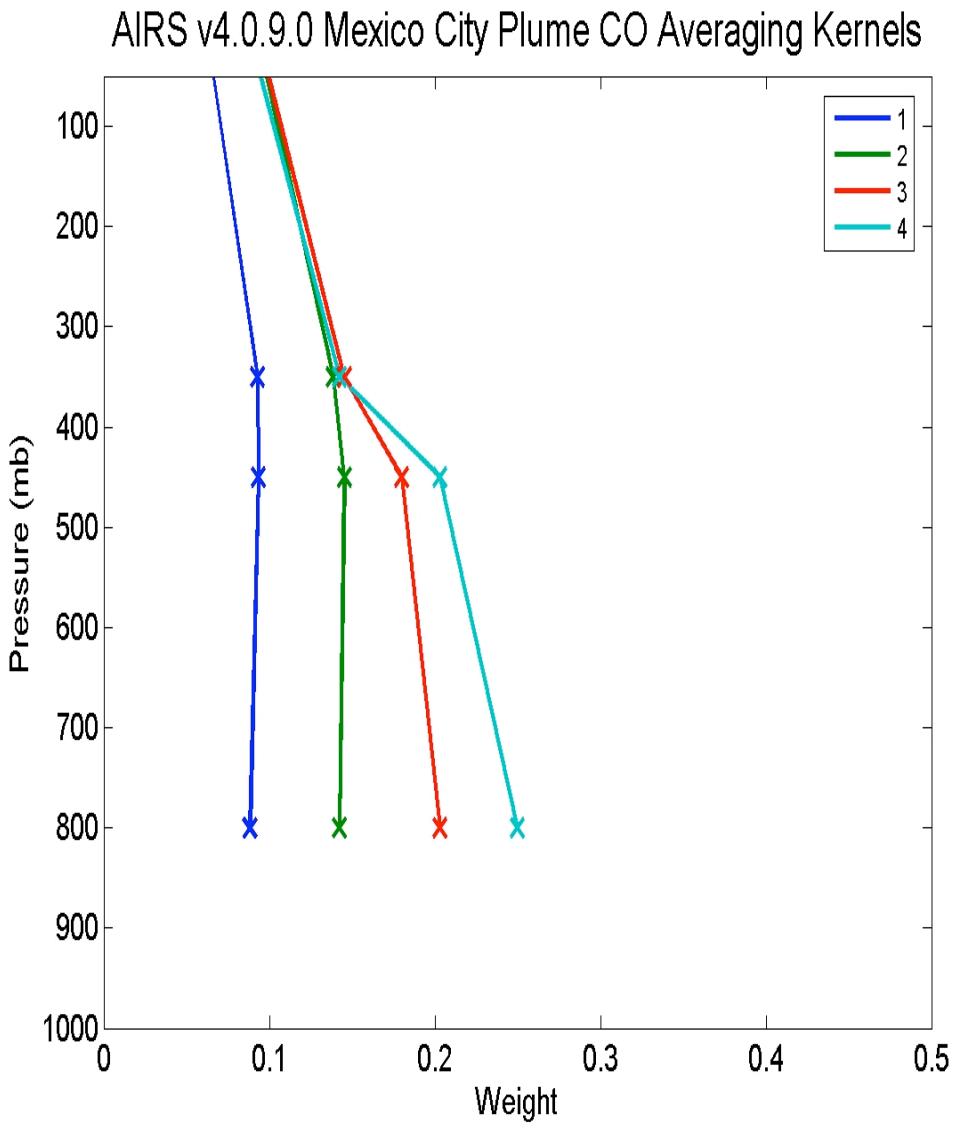

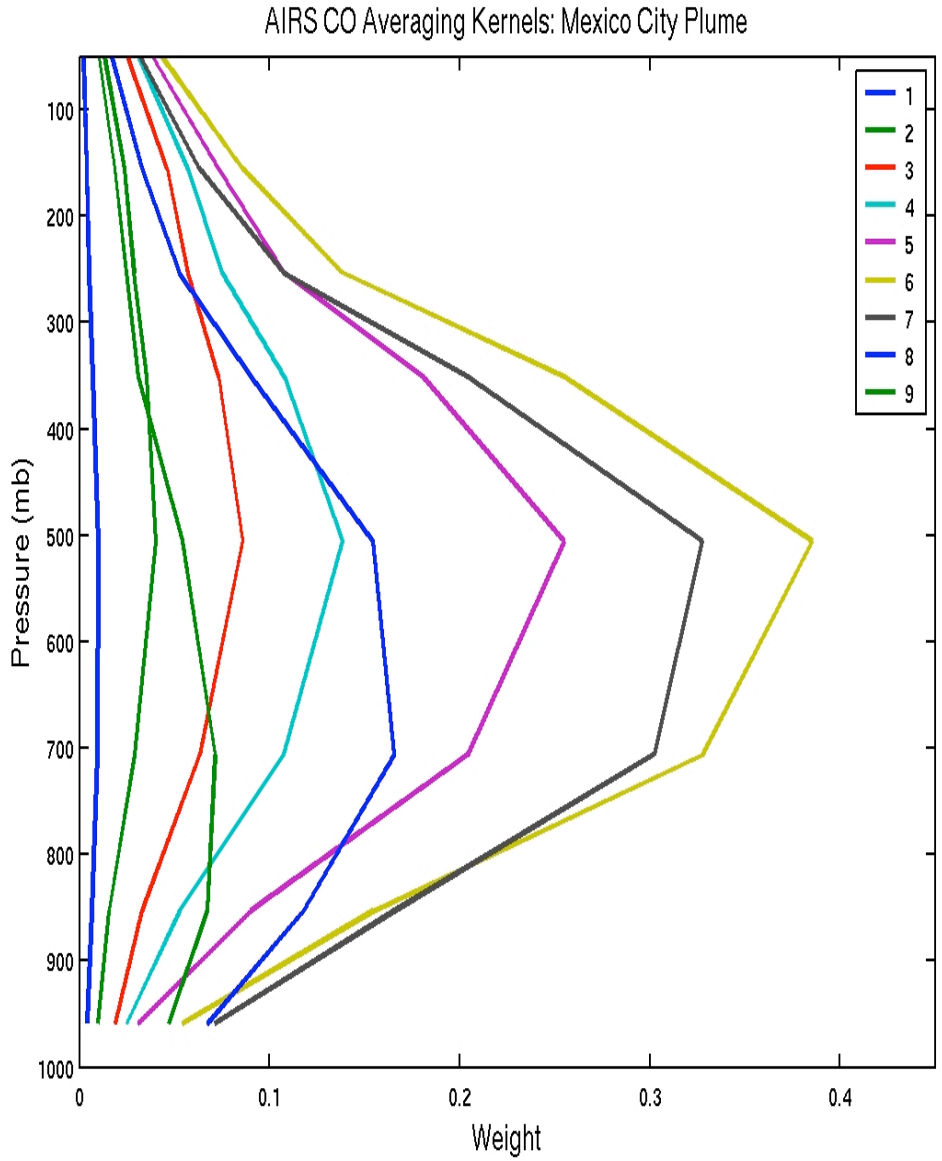

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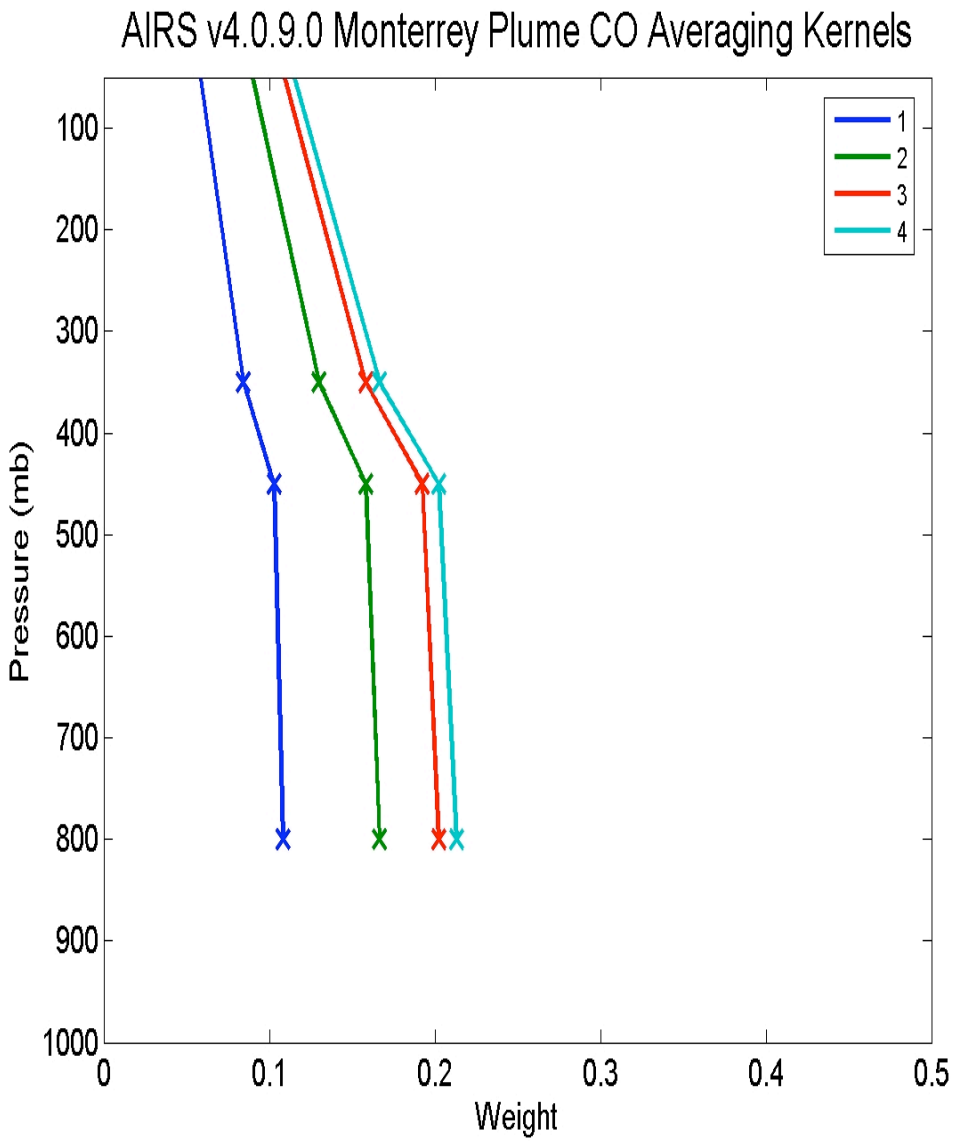

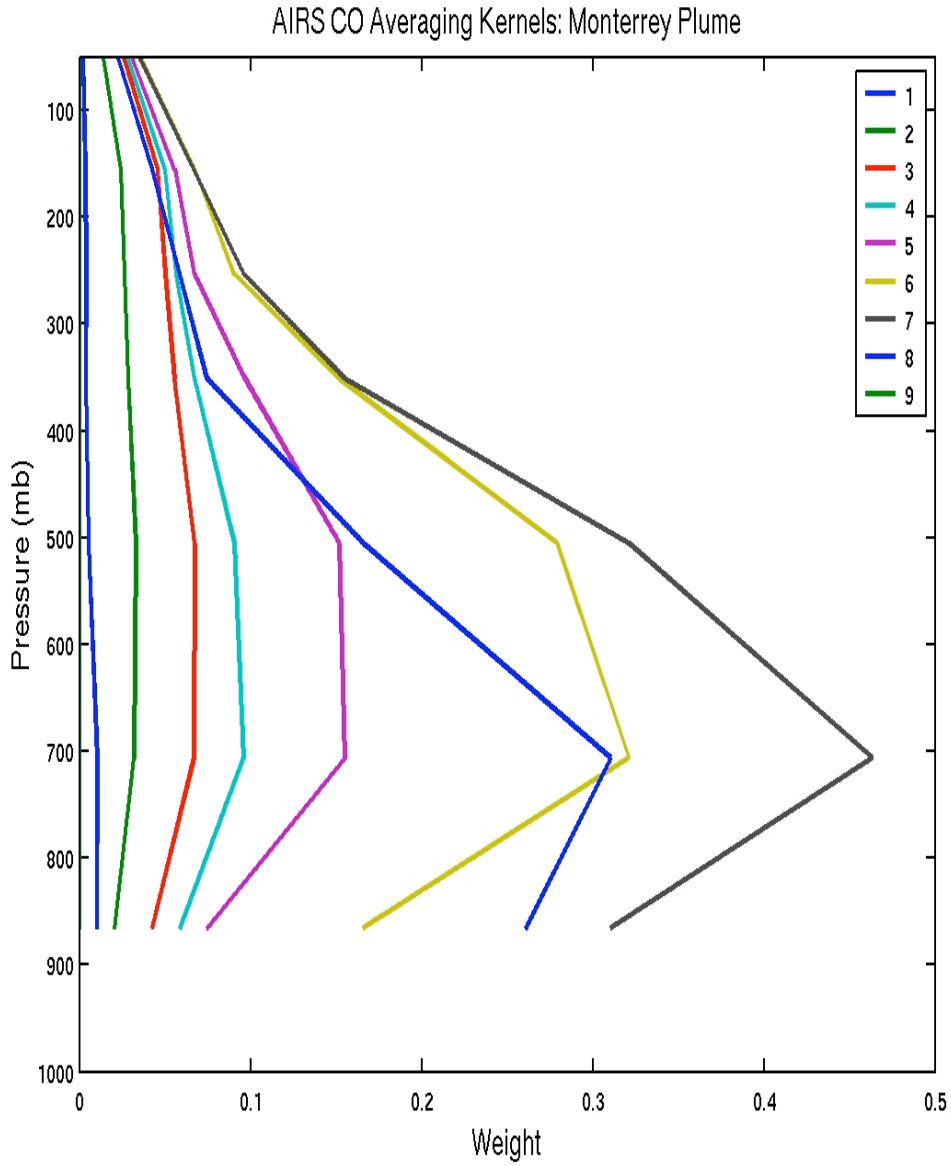

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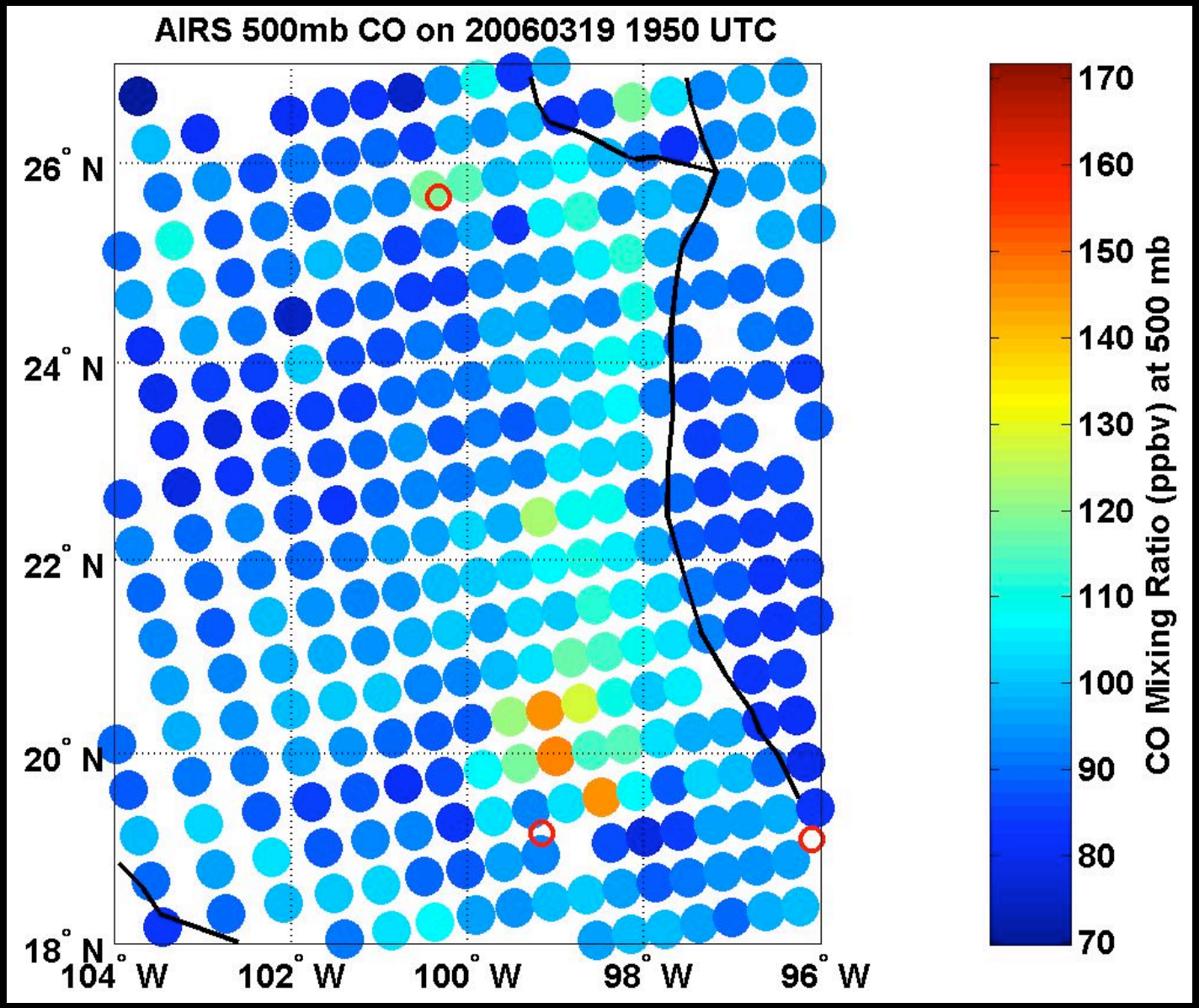
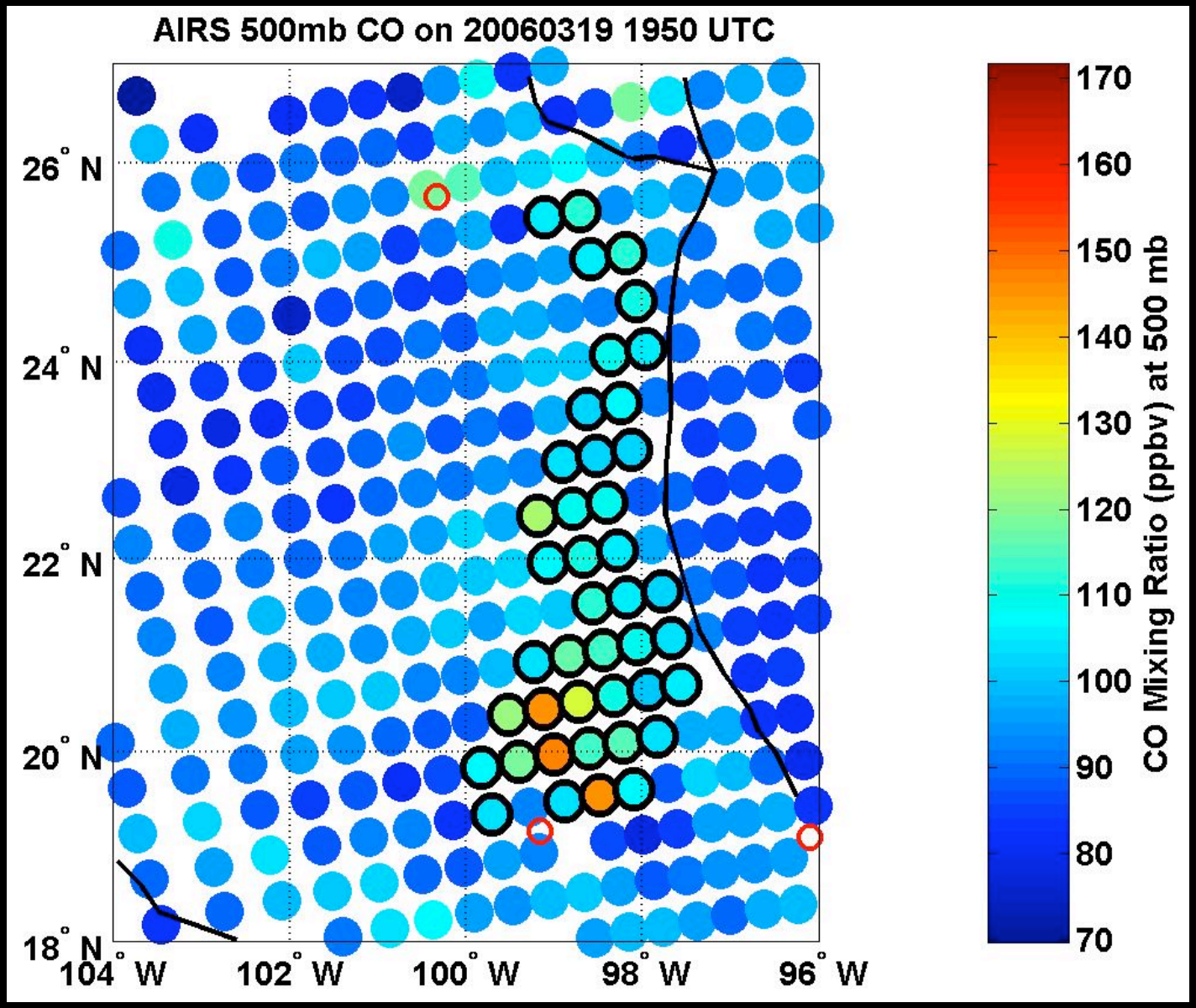


AIRS CO: Mexico City Plume



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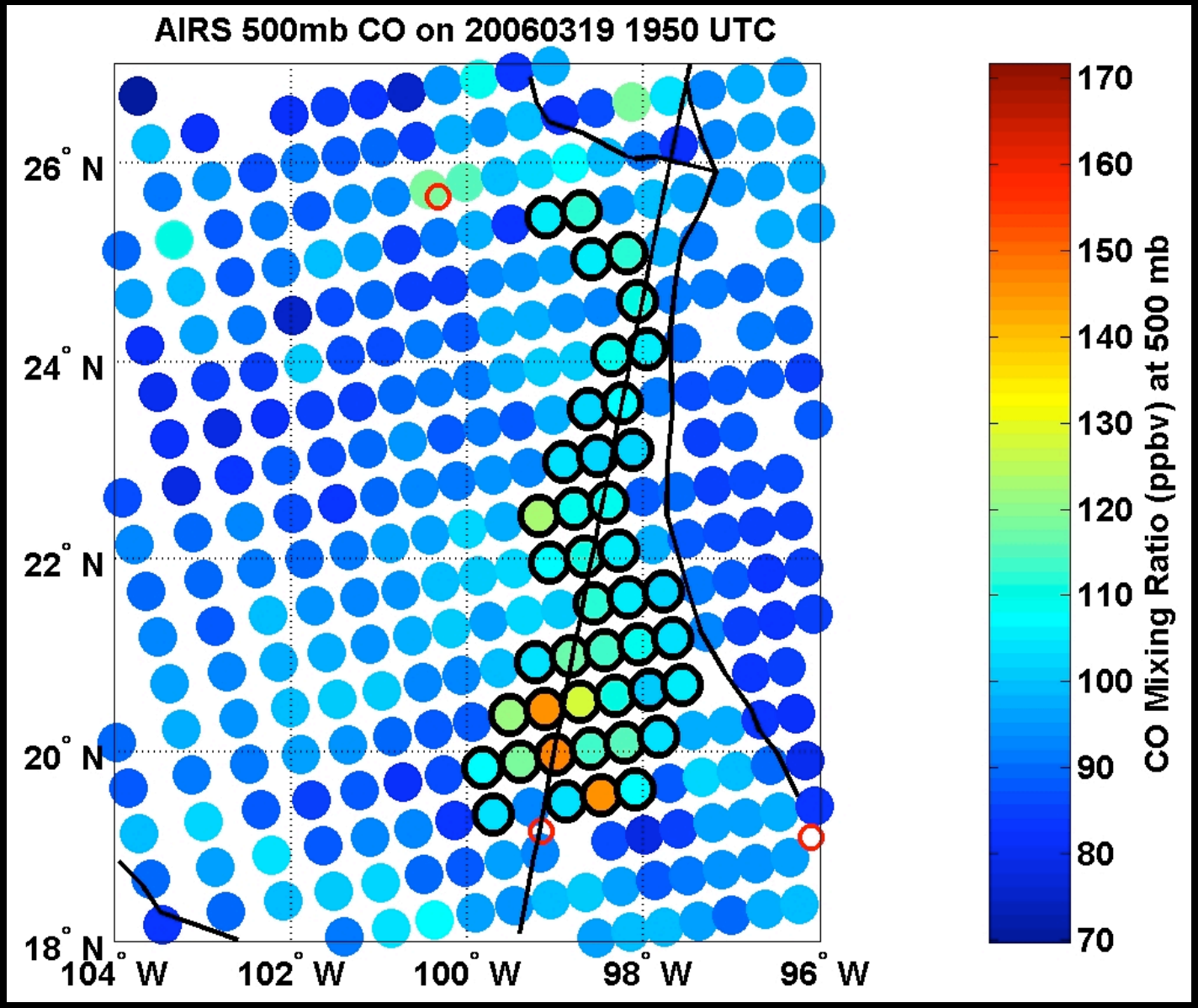

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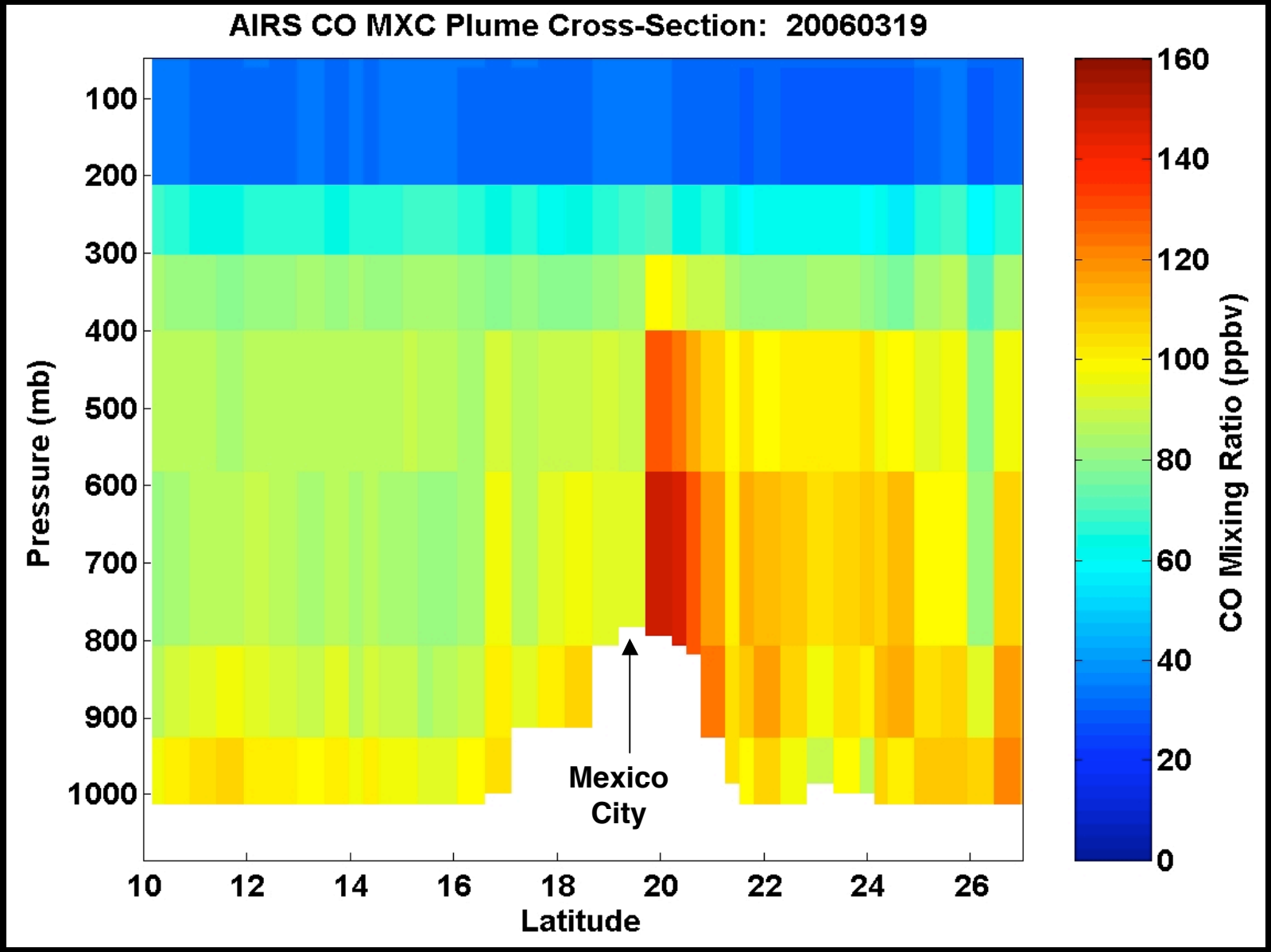

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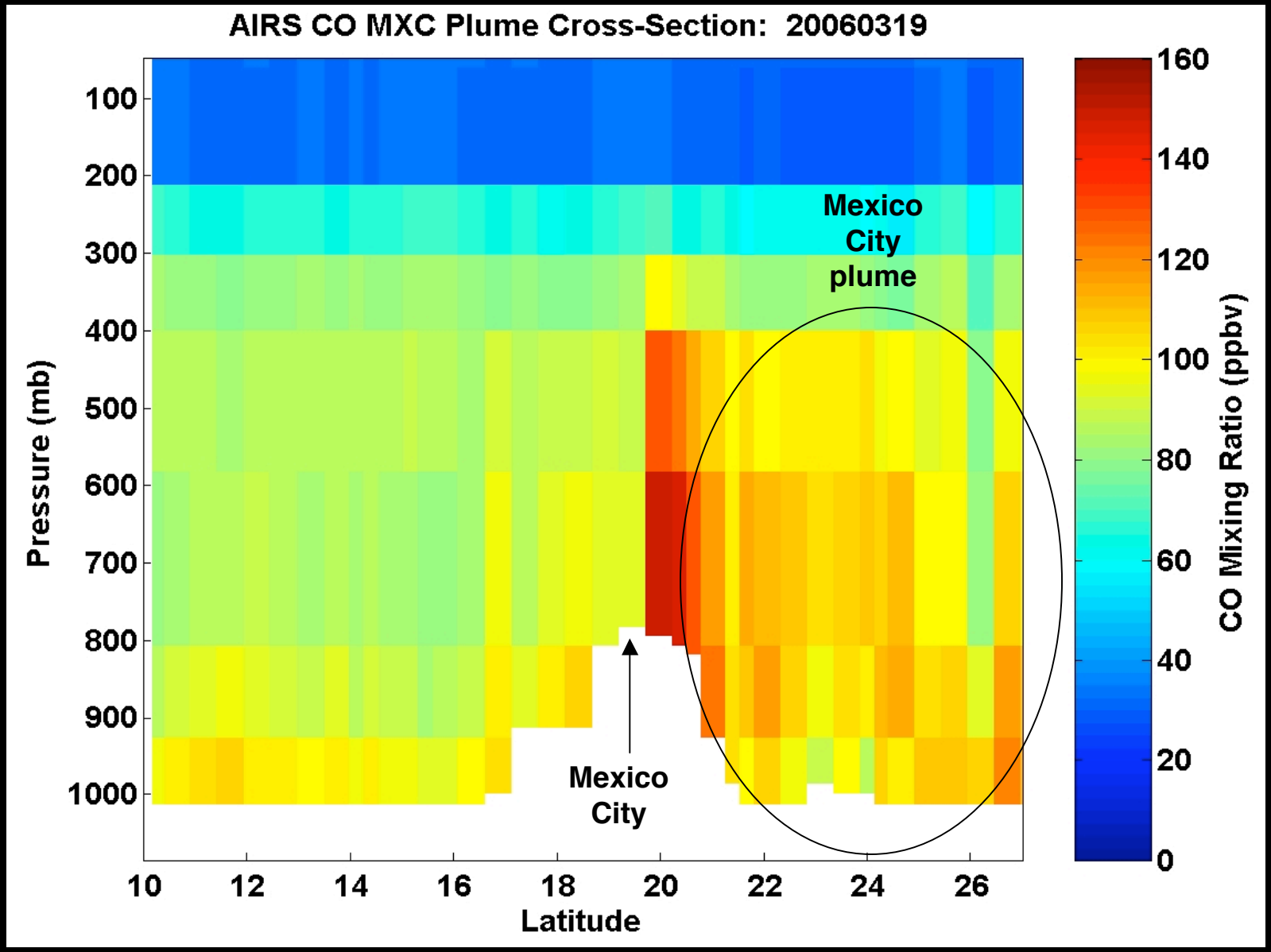
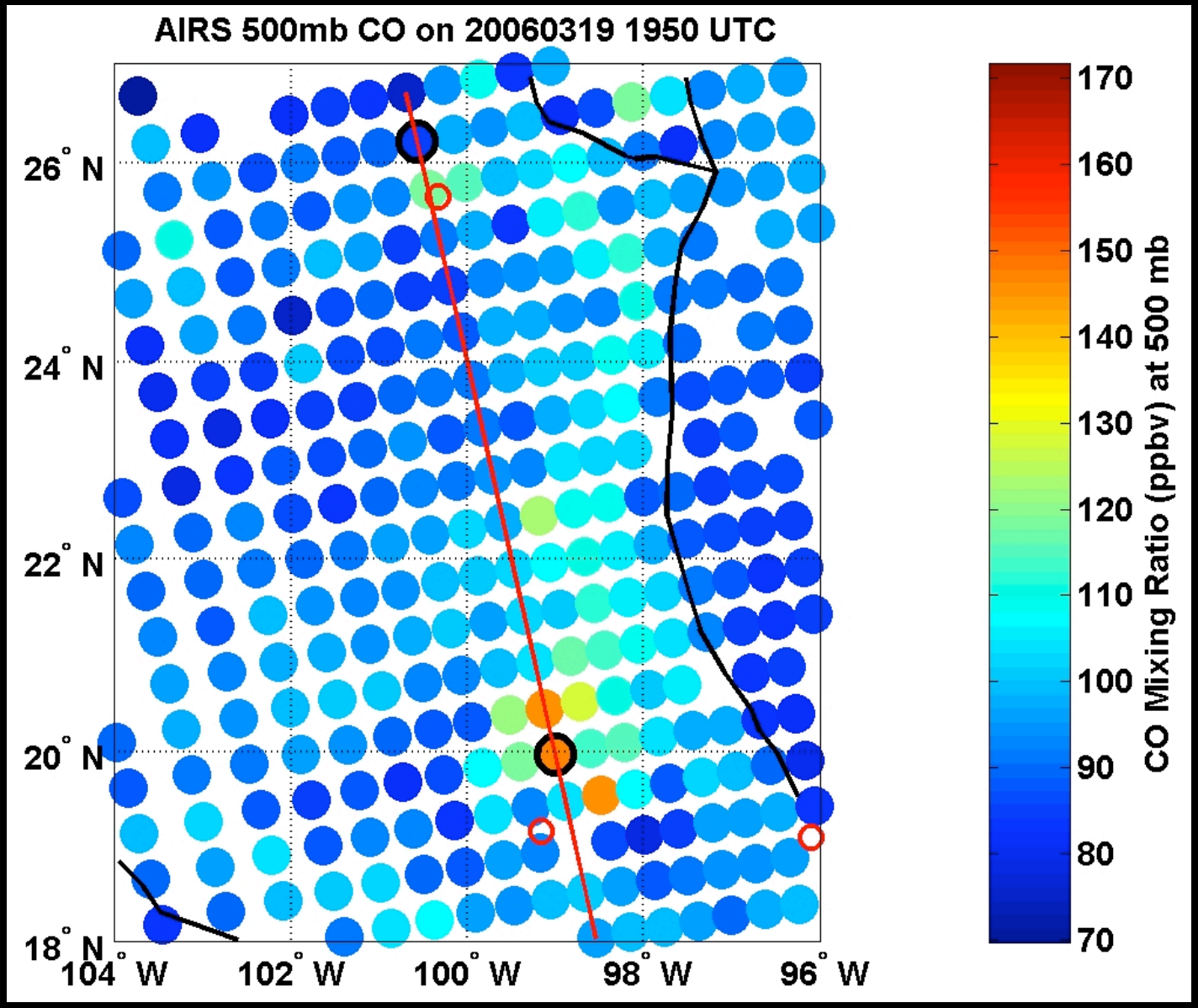


AIRS CO: Mexico City to Monterrey



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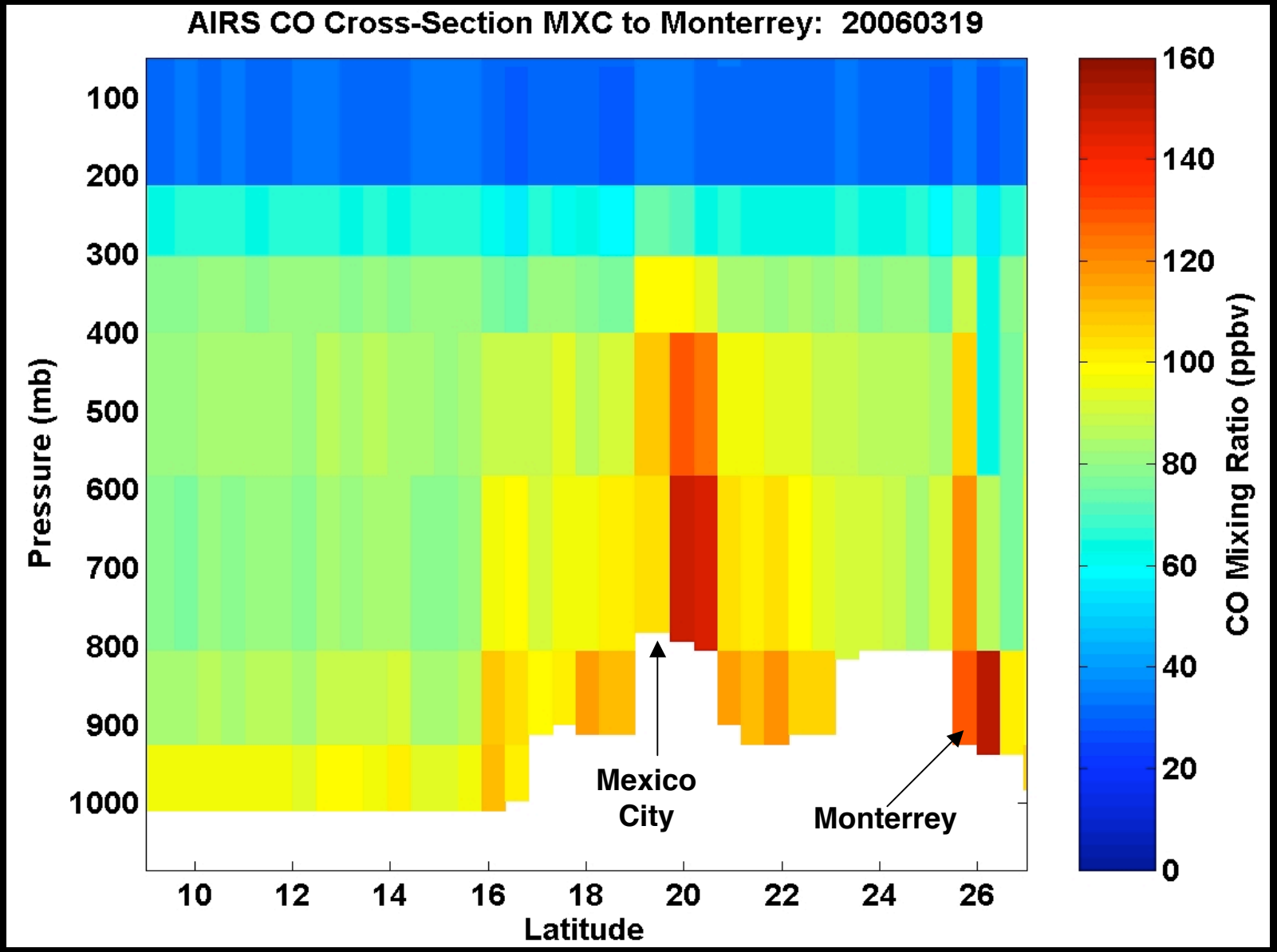
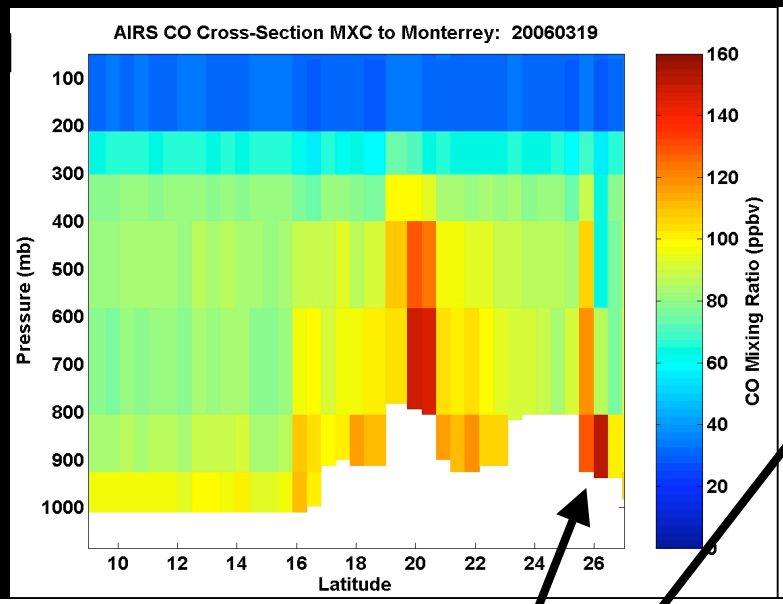
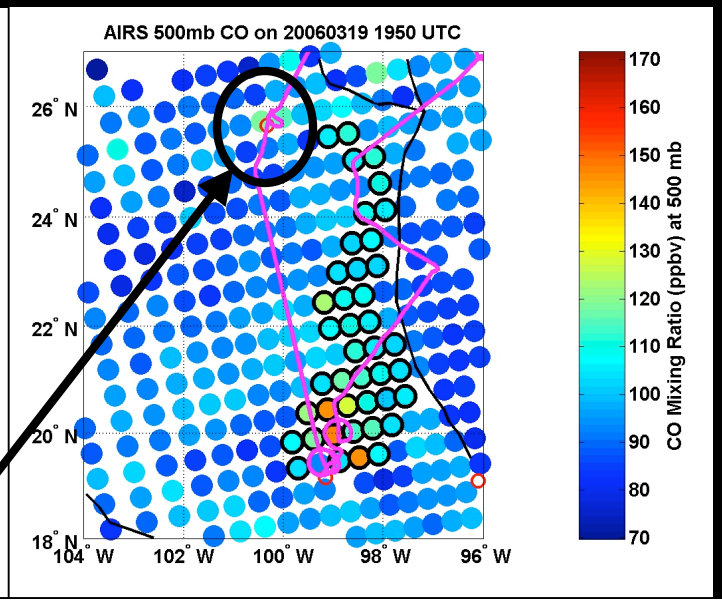
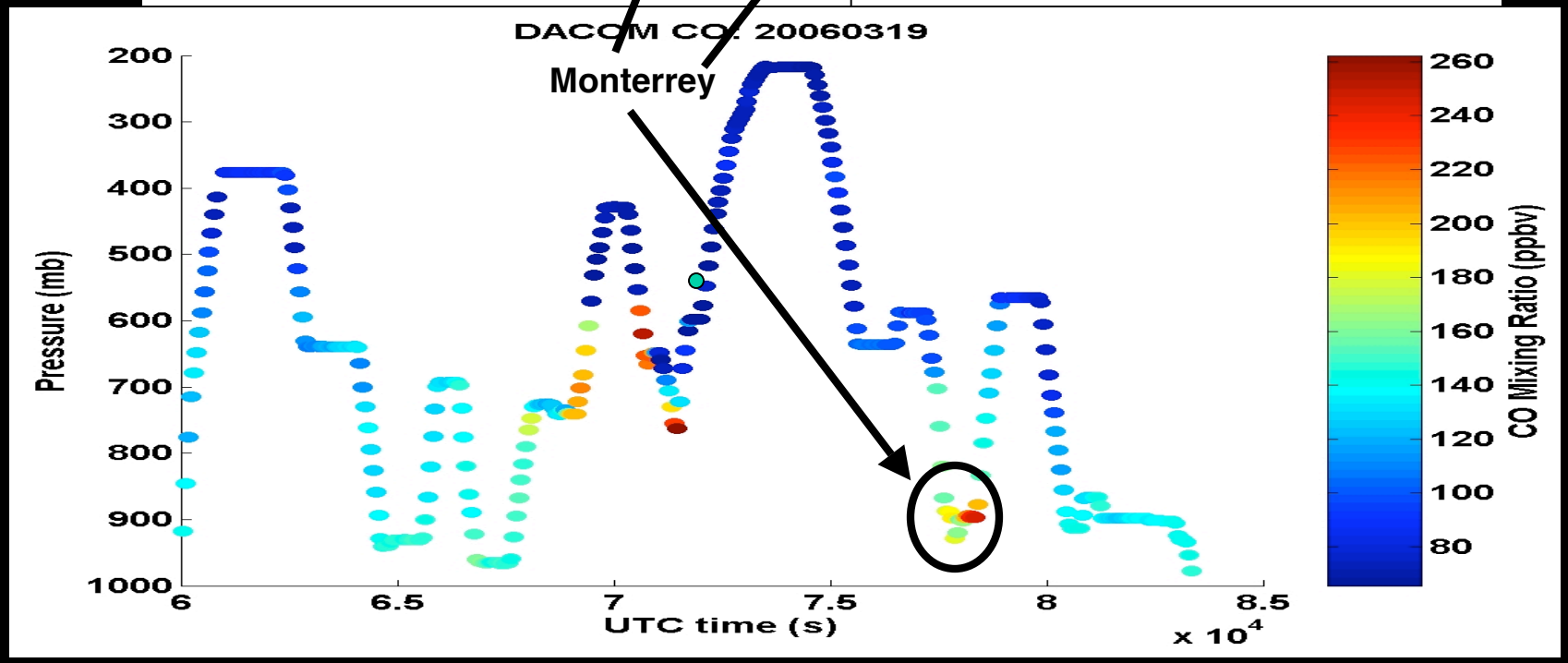
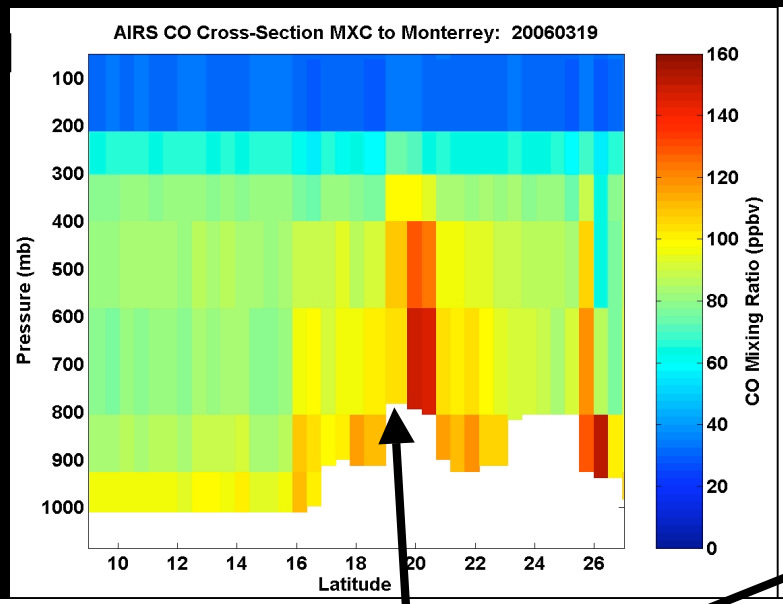
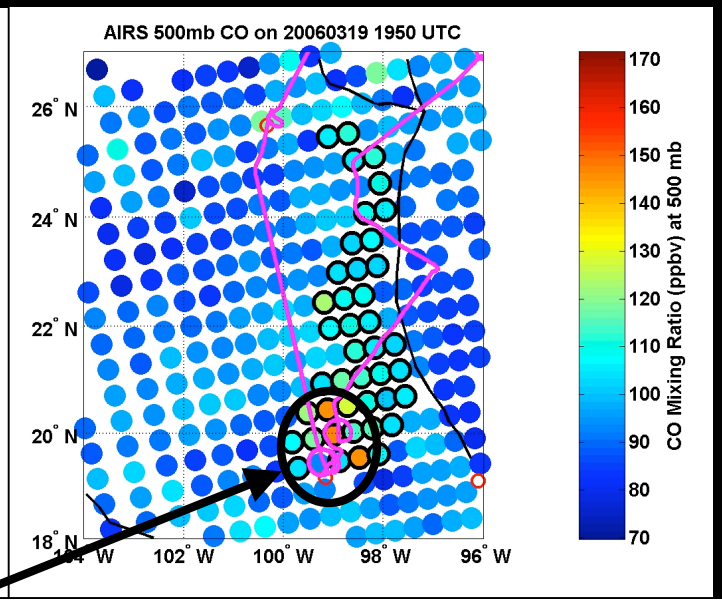


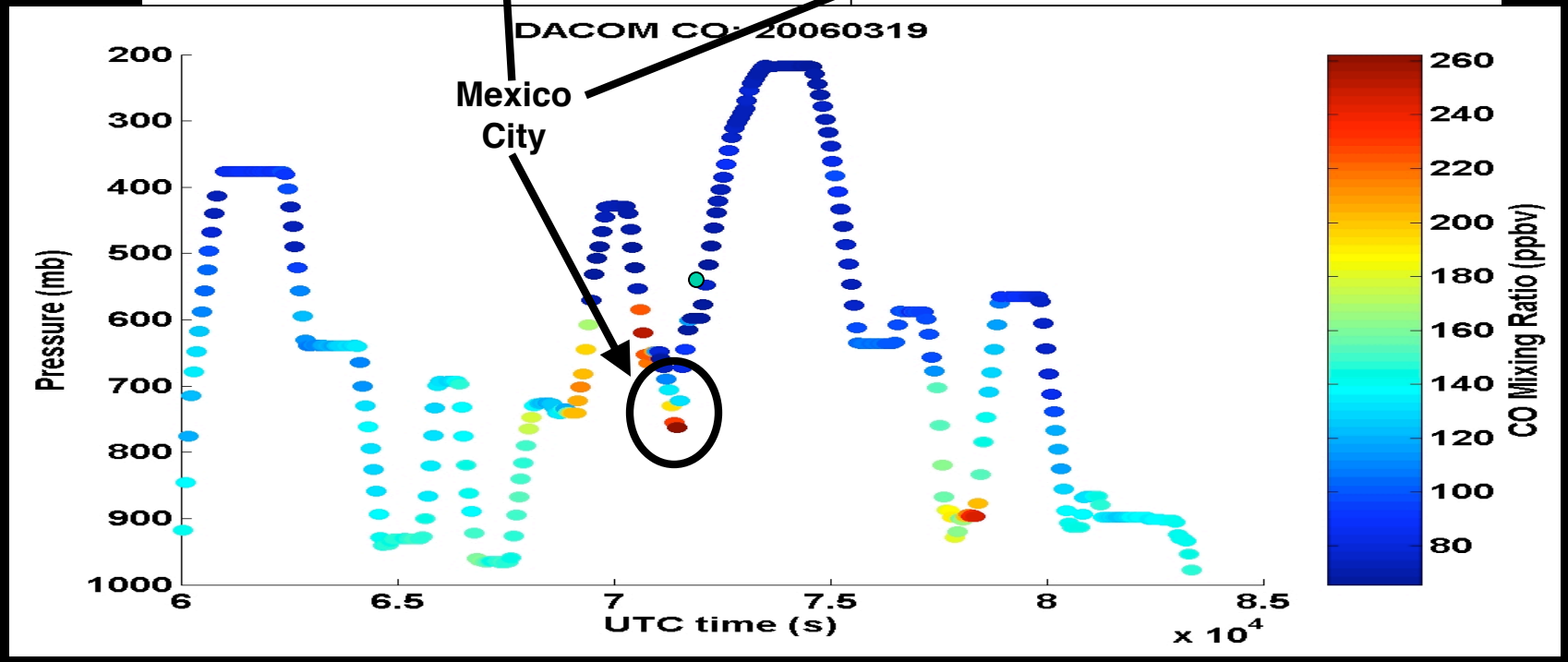

AIRS CO Cross-Section MXC to Monterrey: 20060319
Pressure (mb)
Latitude
CO Mixing Ratio (ppbv)

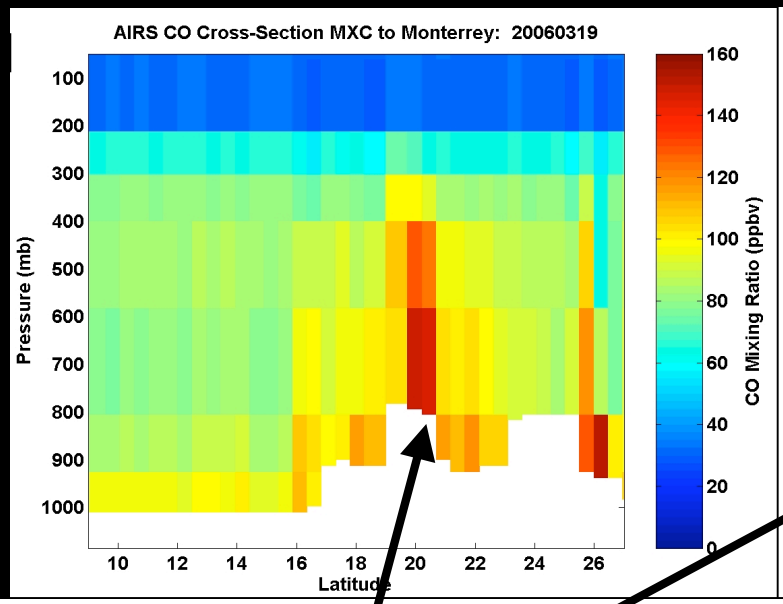

AIRS 500mb CO on 20060319 1950 UTC
CO Mixing Ratio (ppbv) at 500 mb

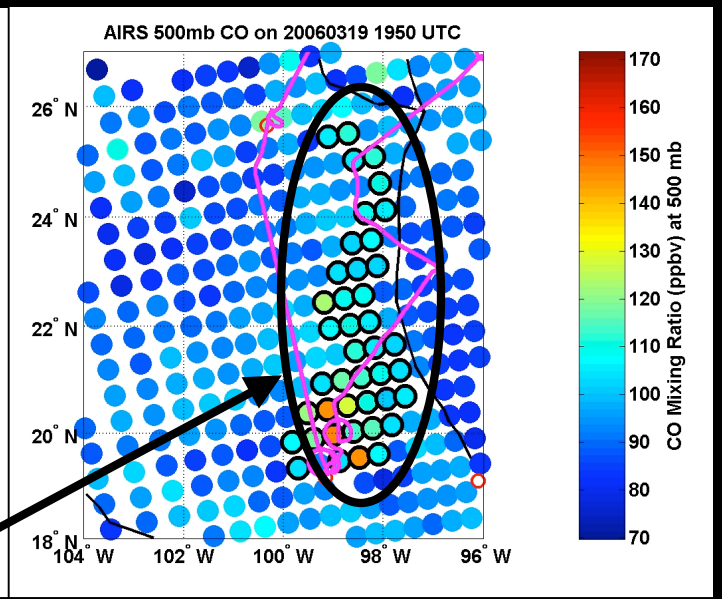

DACOM CO: 20060319
Monterrey
Pressure (mb)
UTC time (s)
x 10^4
CO Mixing Ratio (ppbv)

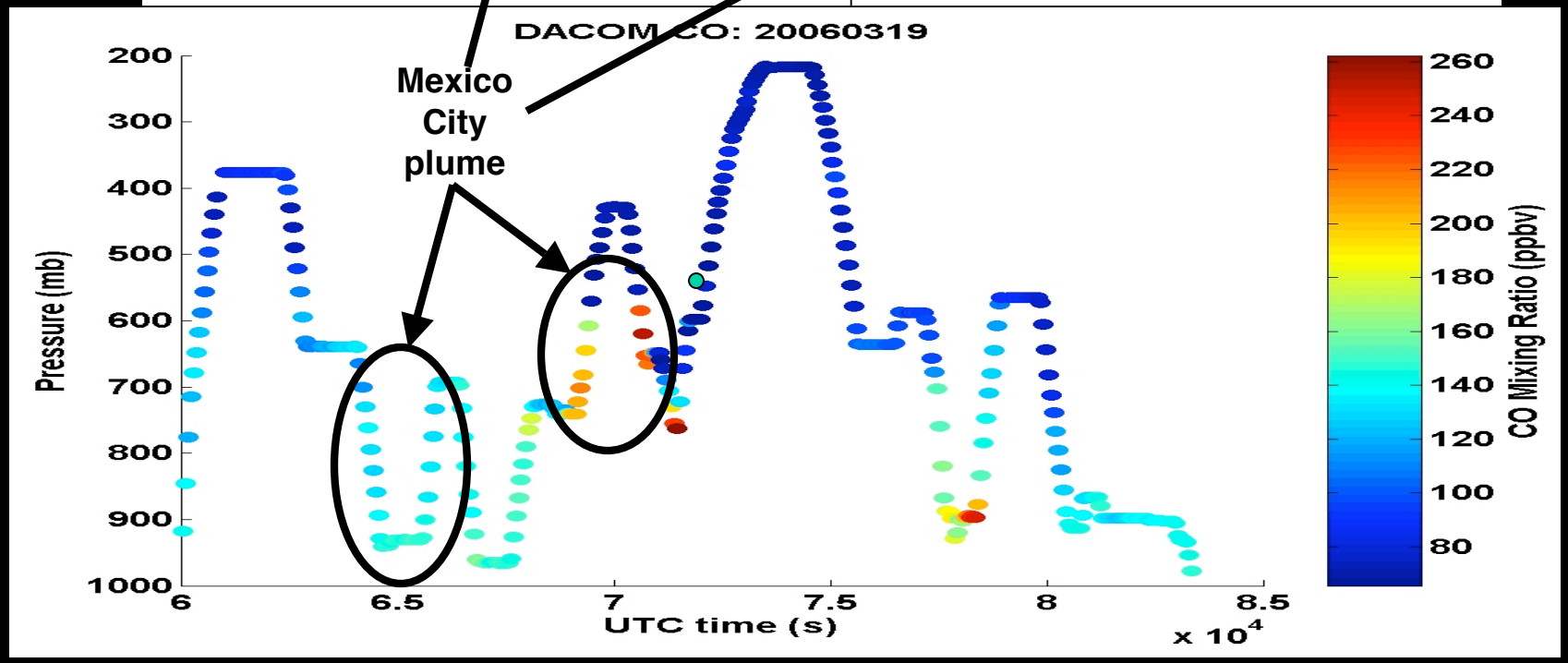

AIRS CO Cross-Section MXC to Monterrey: 20060319
Pressure (mb)
Latitude
CO Mixing Ratio (ppbv)


AIRS 500mb CO on 20060319 1950 UTC
CO Mixing Ratio (ppbv) at 500 mb


DACOM CO: 20060319
Mexico City
Pressure (mb)
UTC time (s)
x 10^4
CO Mixing Ratio (ppbv)


AIRS CO Cross-Section MXC to Monterrey: 20060319
Pressure (mb)
Latitude
CO Mixing Ratio (ppbv)


AIRS 500mb CO on 20060319 1950 UTC
CO Mixing Ratio (ppbv) at 500 mb


DACOM CO: 20060319
Mexico City plume
Pressure (mb)
UTC time (s)
x 10^4
CO Mixing Ratio (ppbv)