# v5.0.14.0 CO Validation Update

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Leonid Yurganov, Chris Wilson (UMBC),
Eric Maddy (PSGS, NOAA/NESDIS),
Glen Sachse, Glenn Diskin (LaRC),

Supported by NASA AIRS, EOS Validation, and Tropospheric Chemistry Programs

**Thanks to the entire AIRS Team and NDACC Colleagues**

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# Last STM Summary
# INTEX A and B Results

| trapezoid pressure | # profiles A/B | Bias (%) A/B | Std (%) A/B |
|---|---|---|---|
| 350 mb | 11/10 | -5.3/-10.3 | 4.2/6.3 |
| 500 mb | 12/10 | -6.5/-10.5 | 5.9/4.2 |
| 700 mb | 11/10 | -7.0/-6.9 | 4.6/4.3 |
| 850 mb | 11/NA* | -2.0/NA* | 2.8/NA* |

* UMBC processing error for INTEX-B lower trapezoids to be fixed

# Current Summary
# INTEX A and B Results

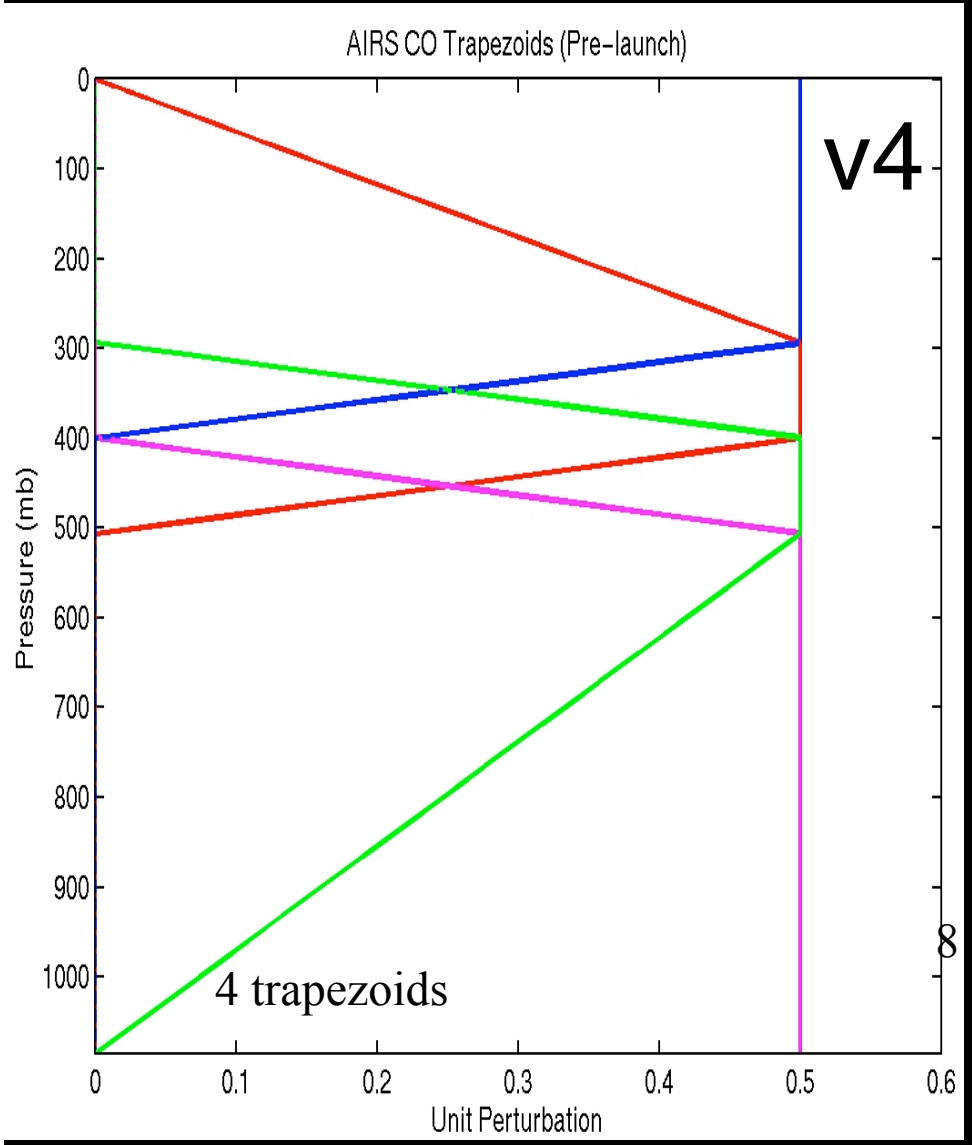
| trapezoid pressure | # profiles† A/B | Bias (%) A/B | Std (%) A/B |
|---|---|---|---|
| 350 mb | 64/36 | -7.7/-8.5 | 7.7/5.9 |
| 500 mb | 83/55 | -7.7/-10.7 | 7.5/7.3 |
| 700 mb | 84/54 | -6.4/-8.6 | 5.3/7.0 |
| 850 mb | 64/47 | -3.8/-5.1 | 3.2/6.4 |

† Spiral validation profiles + in transit science profiles

# SUMMARY

- v5 improved over v4!
  - v4: only 500 mb validatable: 8% high ± 5%
  - v5: 350, 500, 700, 850 mb: 4-11% high ± 7%
- AIRS 500 mb vs. in situ
  - INTEX: AIRS 9% high bias ± 7.5%
  - ESRL (2005): AIRS 6% high bias ± 12.5%
- AIRS total column vs. ground-based FTIR
  - AIRS 10% high bias for DOF > 0.8
- AIRS near surface vs. AERI PBL
  - Still evaluating half-bottom = false

# AIRS CO Trapezoids



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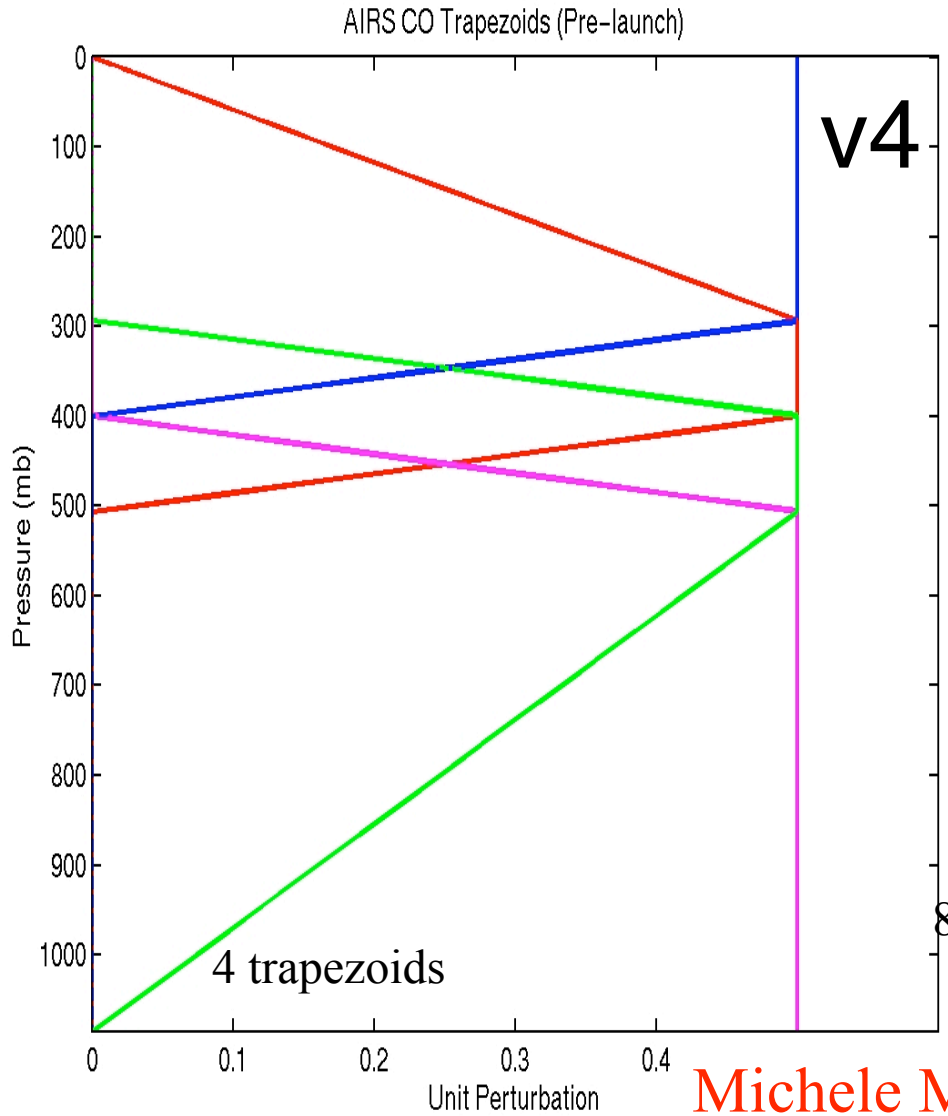


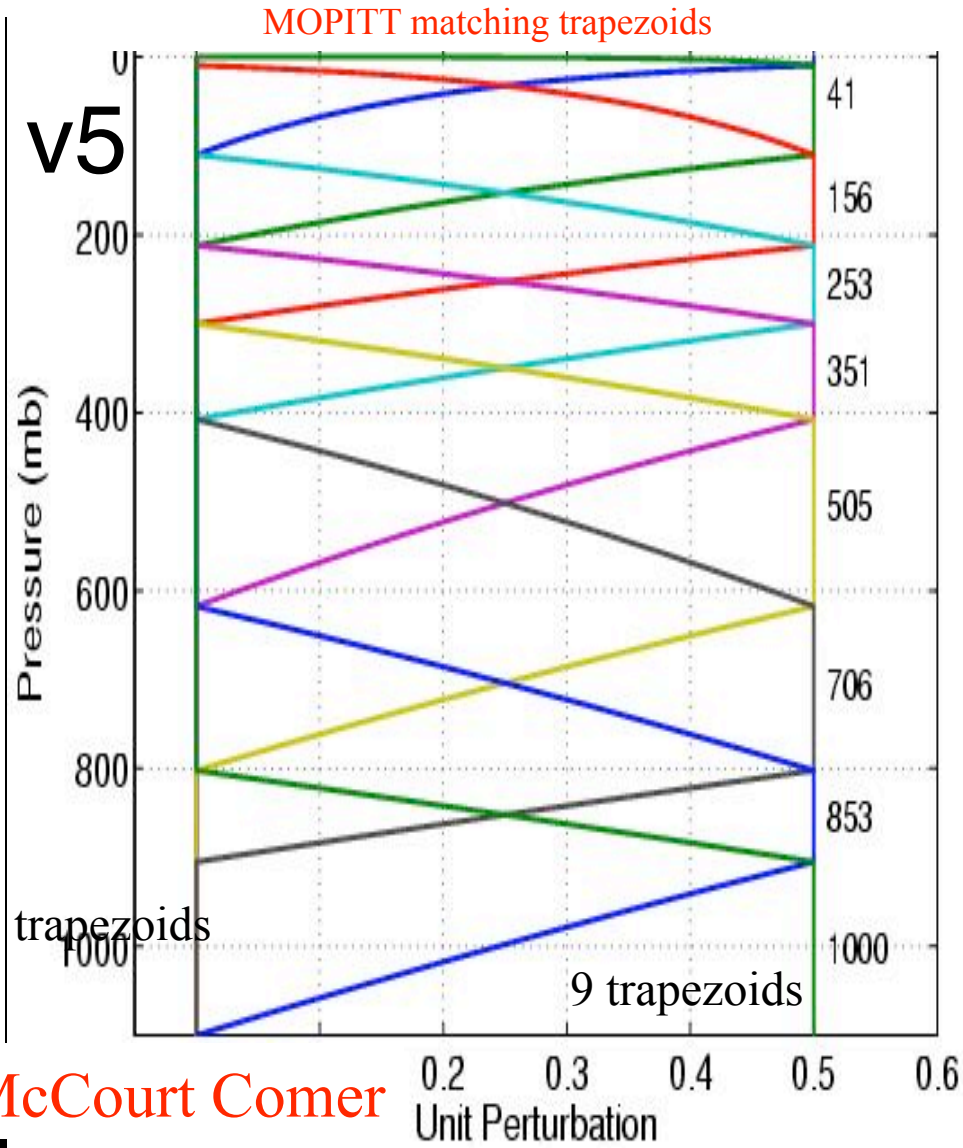


8 trapezoids

Michele McCourt Comer



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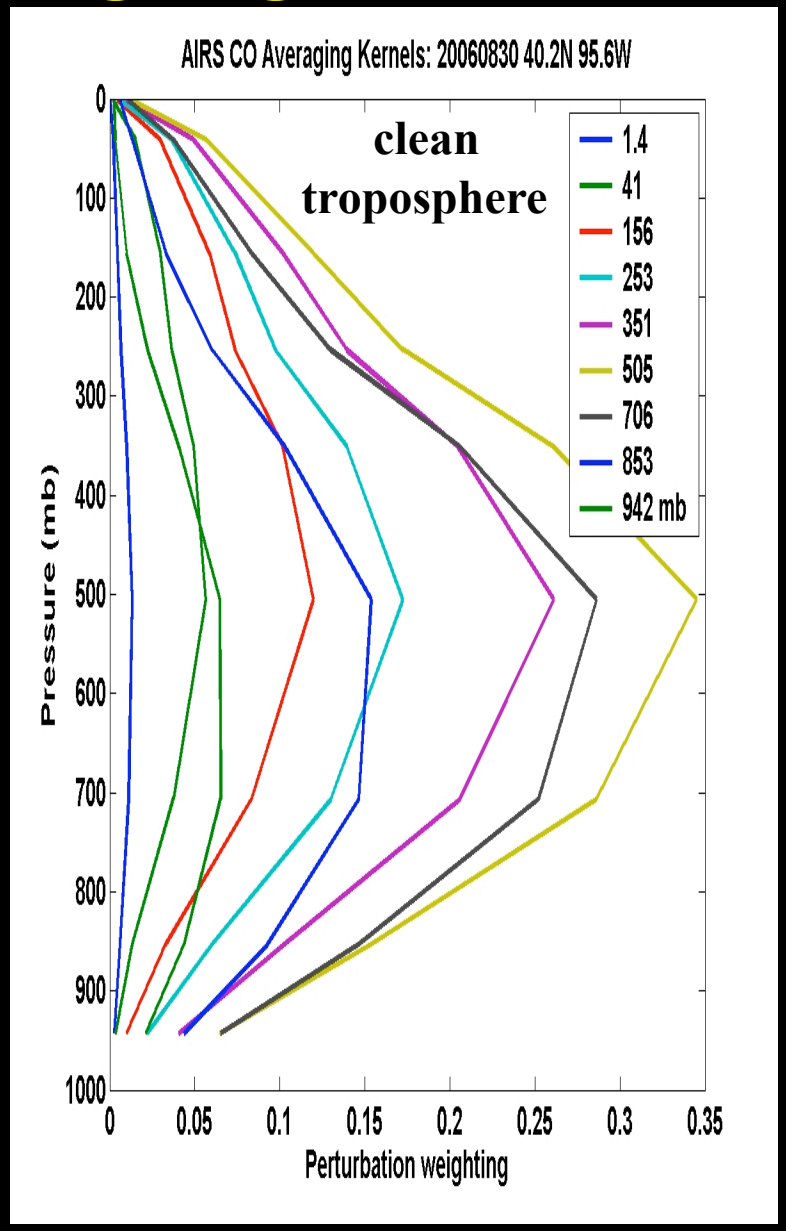
# AIRS CO Averaging Kernels



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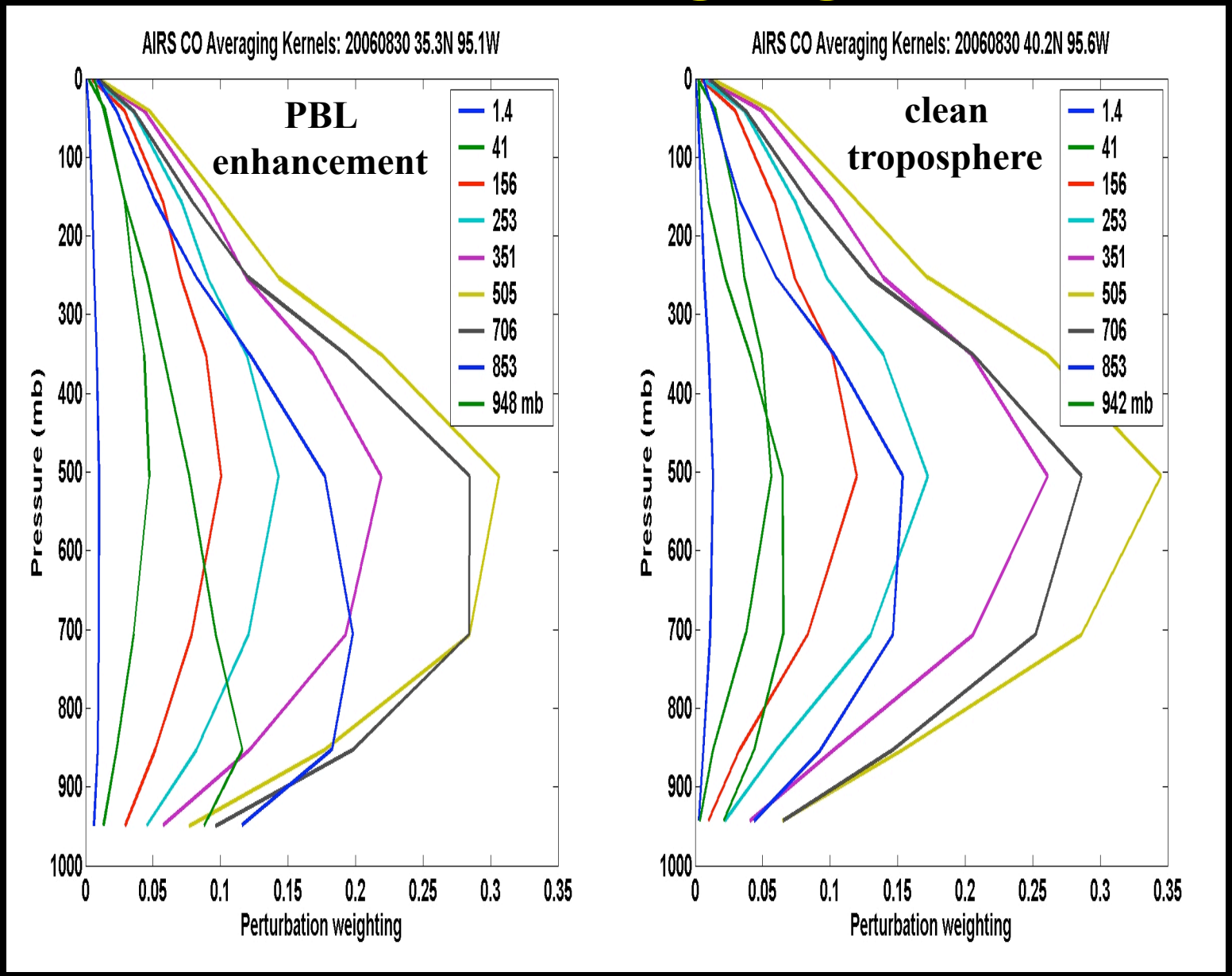
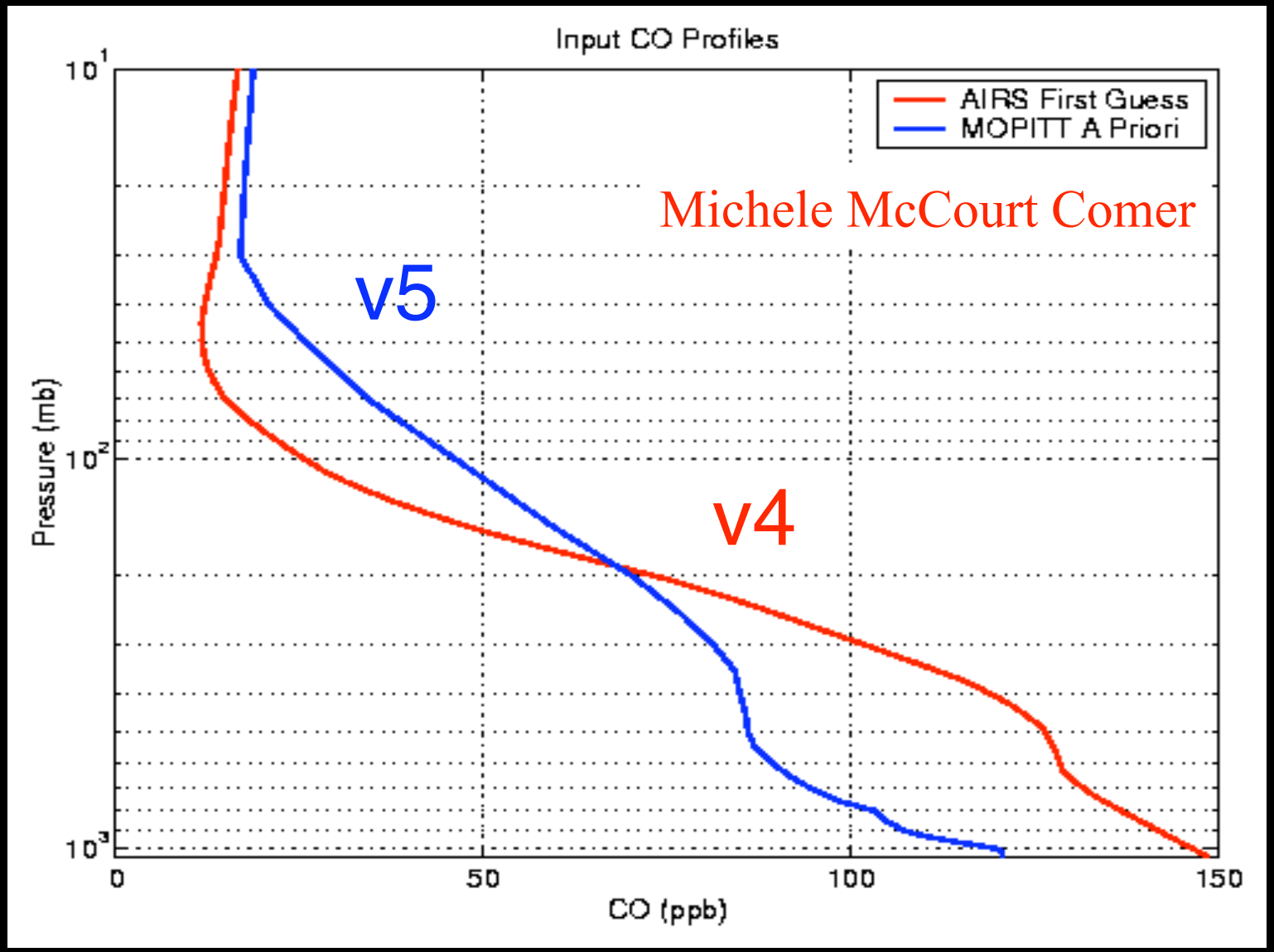


# AIRS CO First Guess Profile





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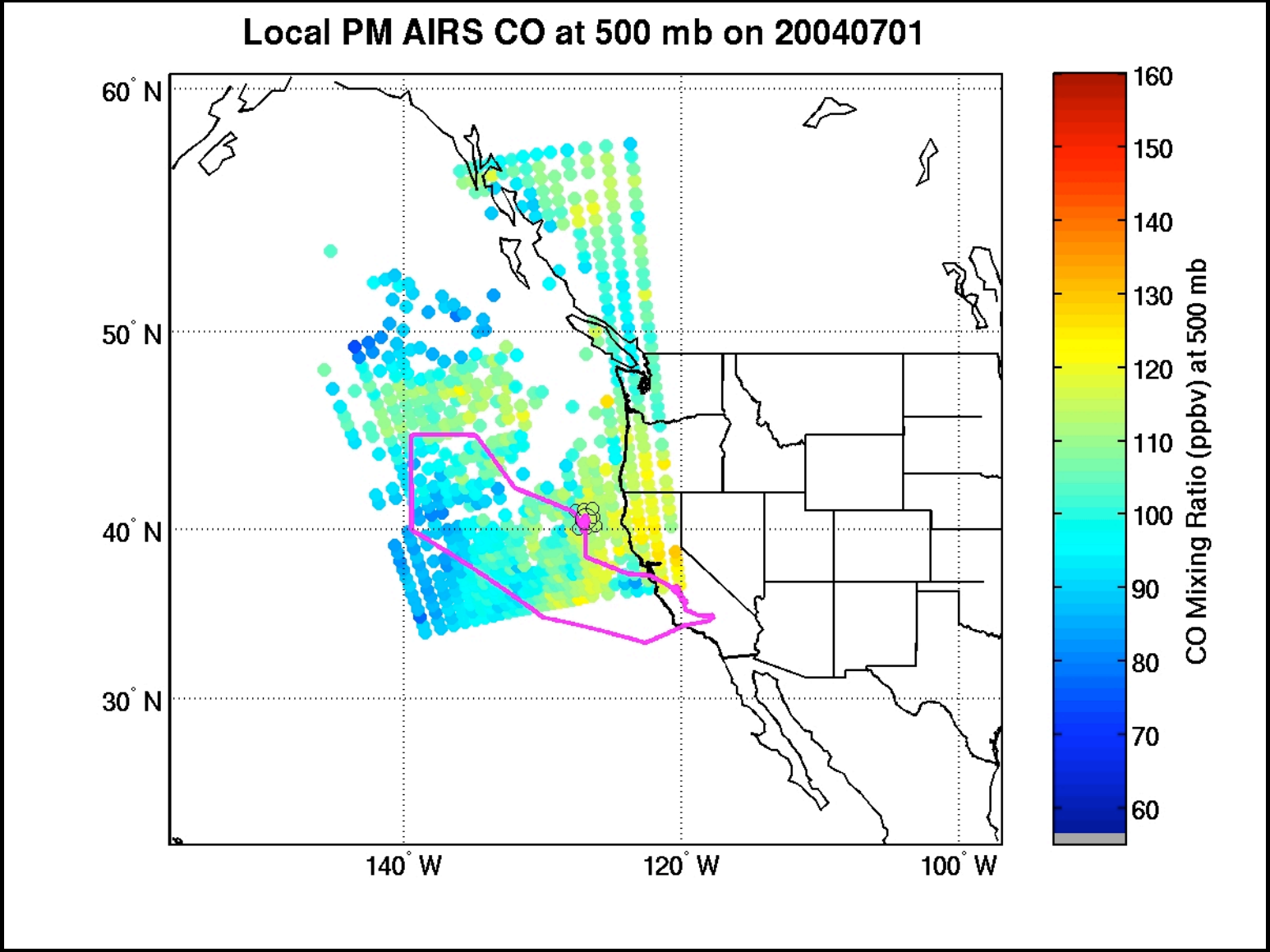
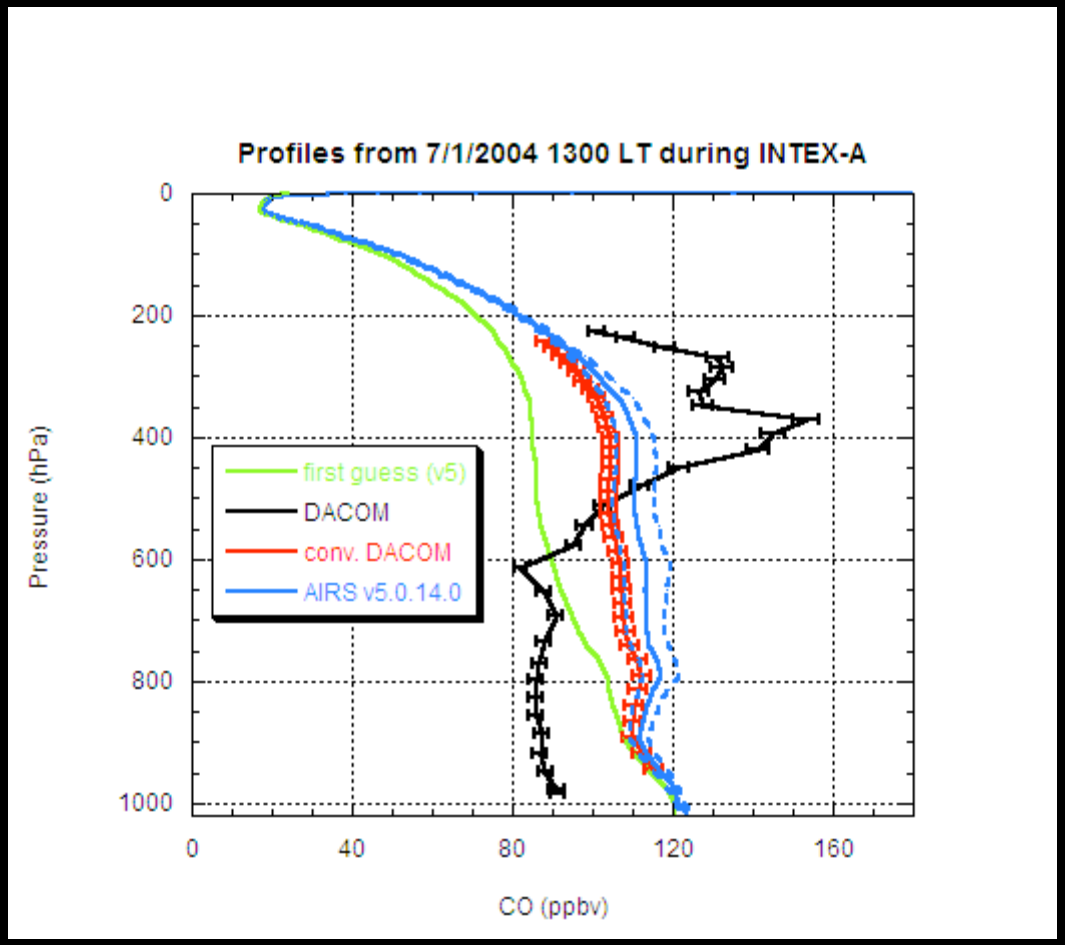
# INTEX-A


Local PM AIRS CO at 500 mb on 20040701
60° N
50° N
40° N
30° N
140° W
120° W
100° W
160
150
140
130
120
110
100
90
80
70
60
CO Mixing Ratio (ppbv) at 500 mb

# INTEX-A: AIRS vs. DC-8 in situ



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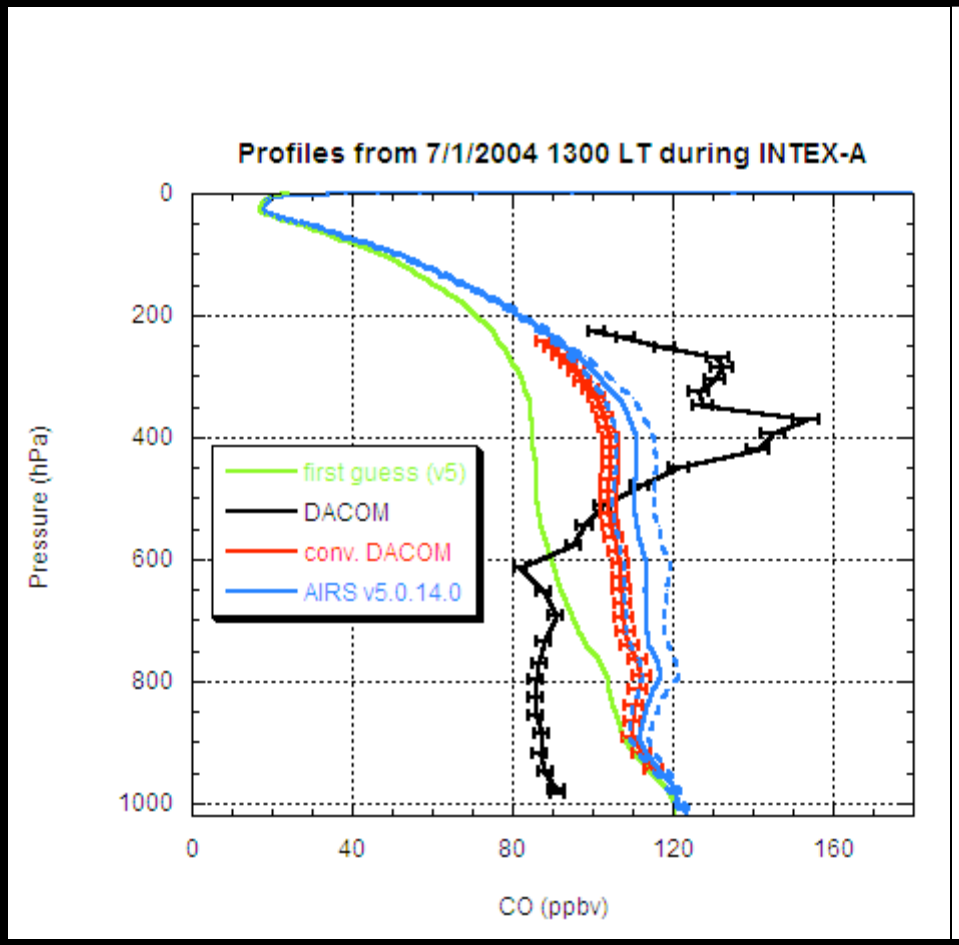
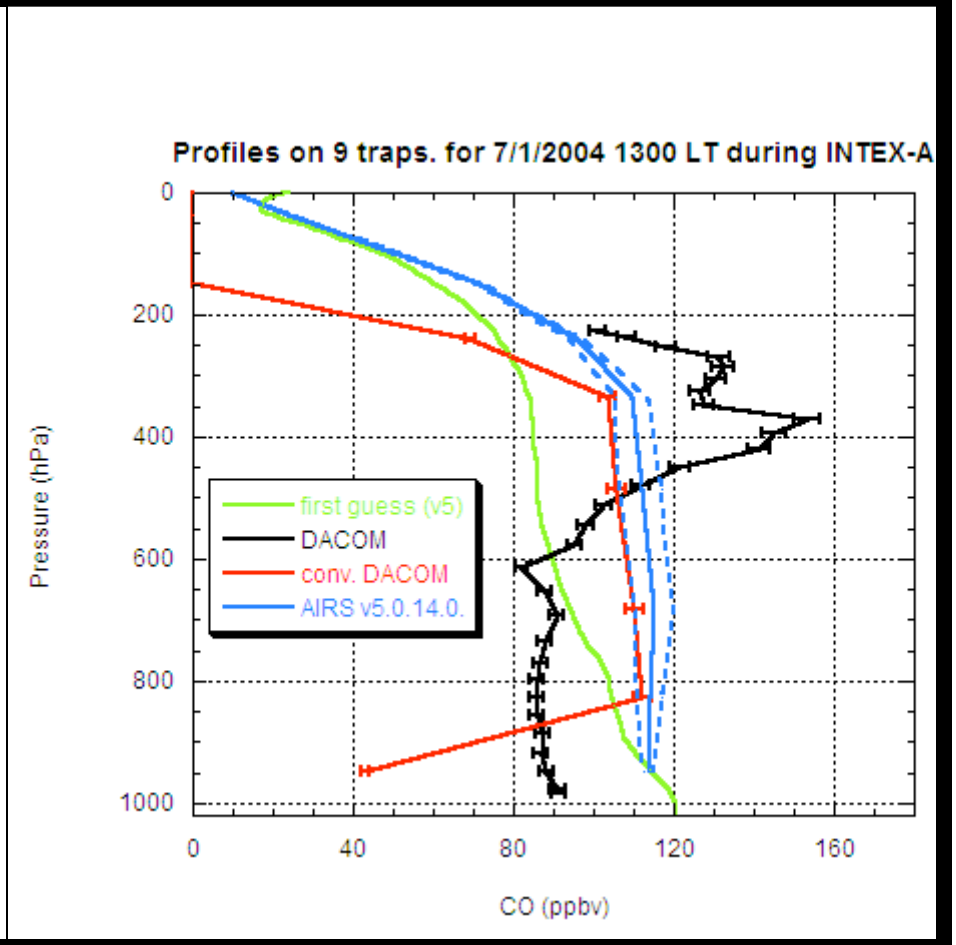
# INTEX-A: AIRS vs. DC-8 in situ



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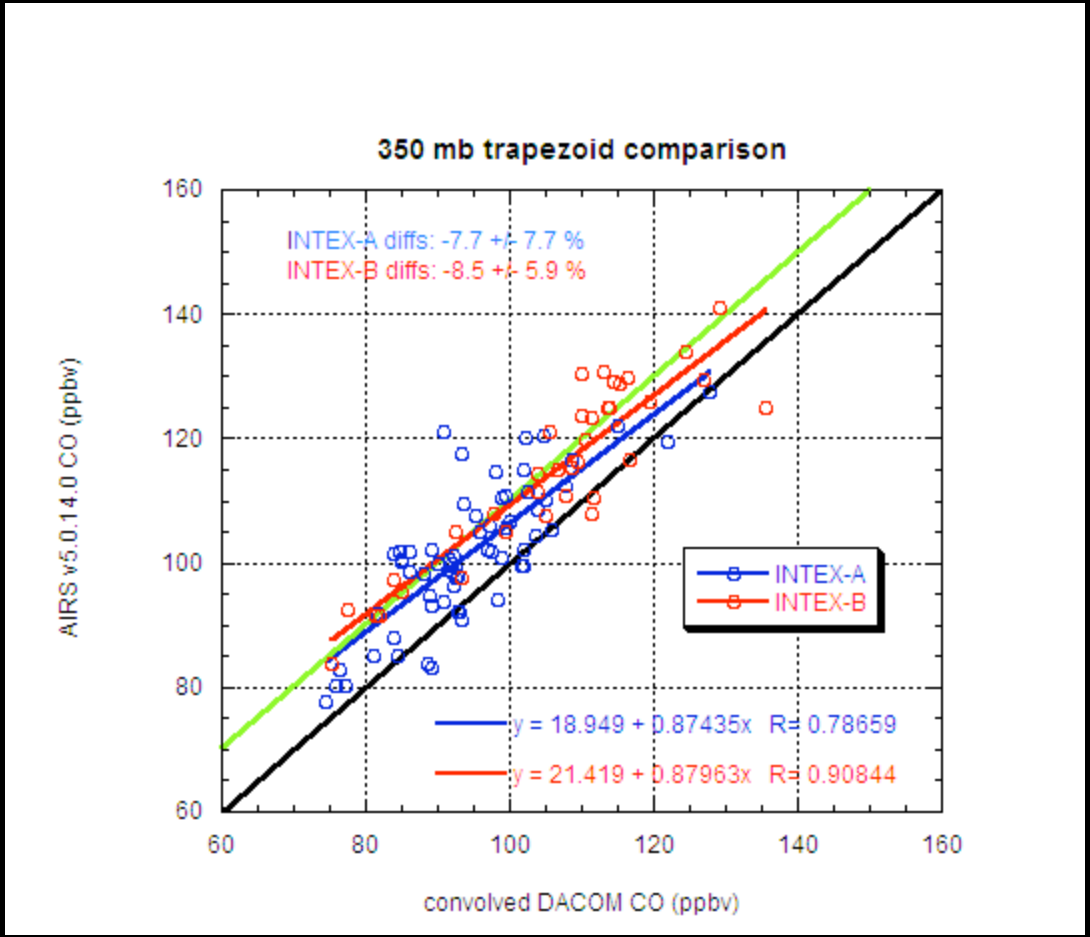

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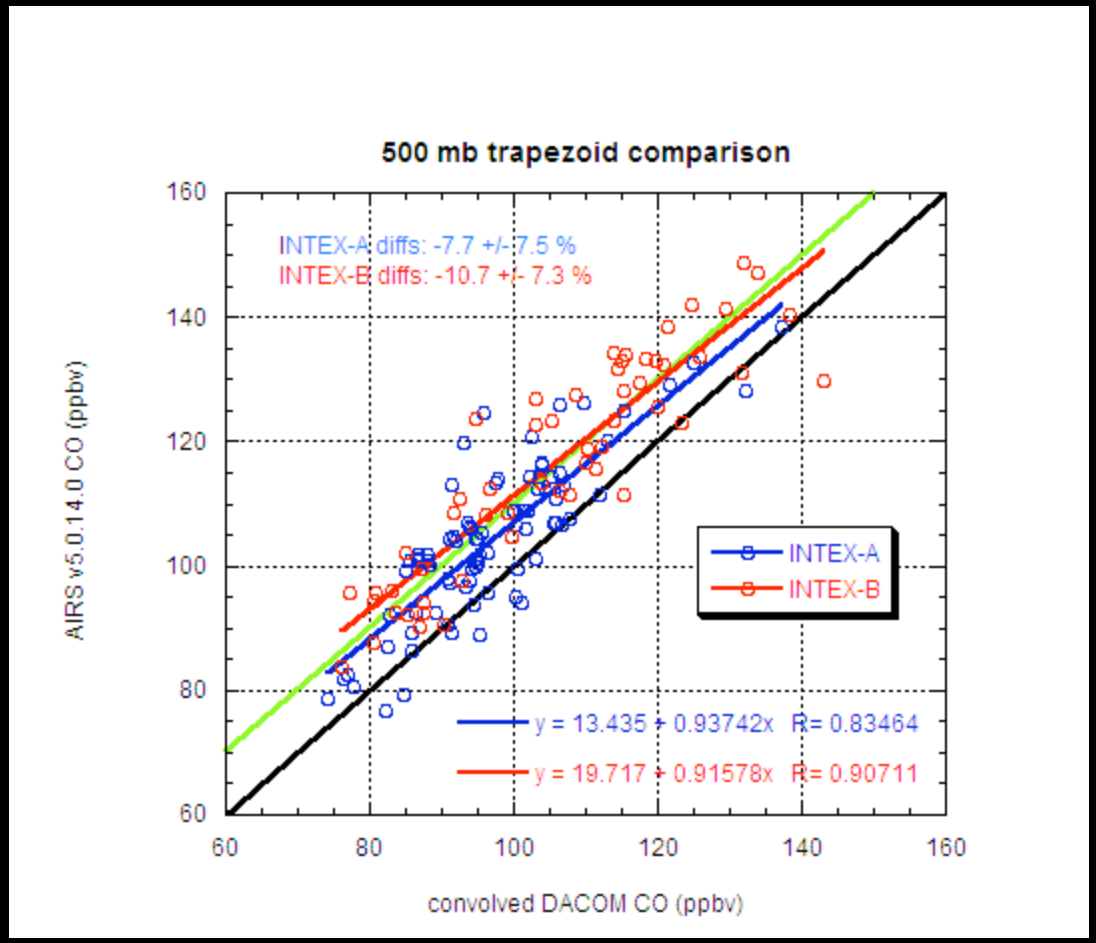

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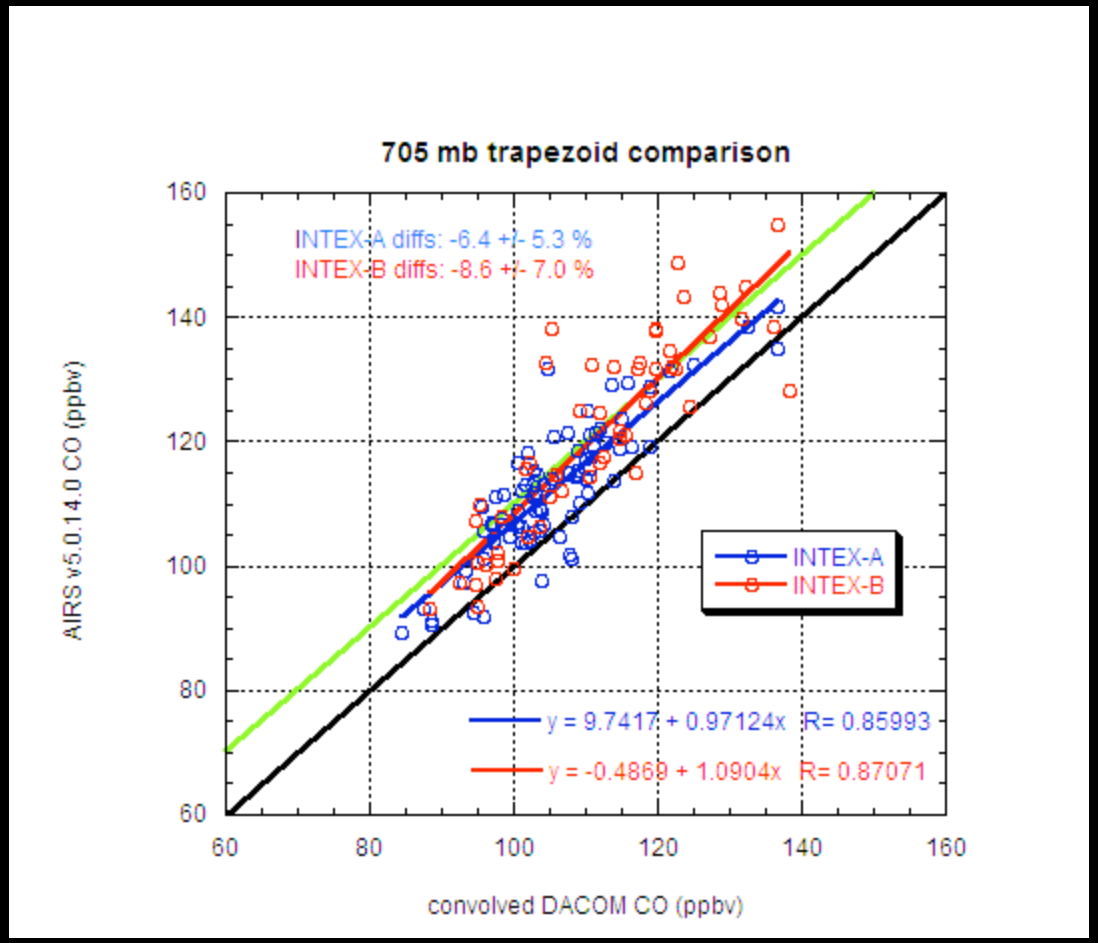

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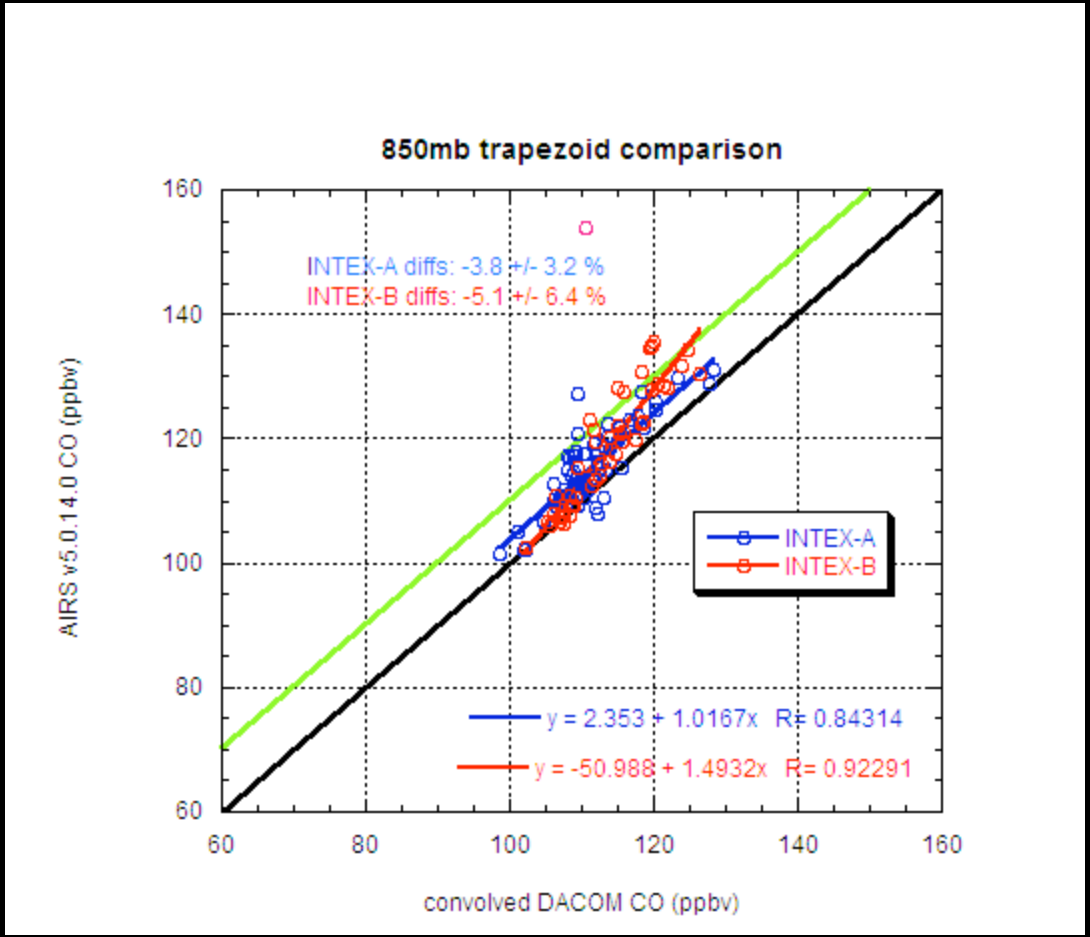

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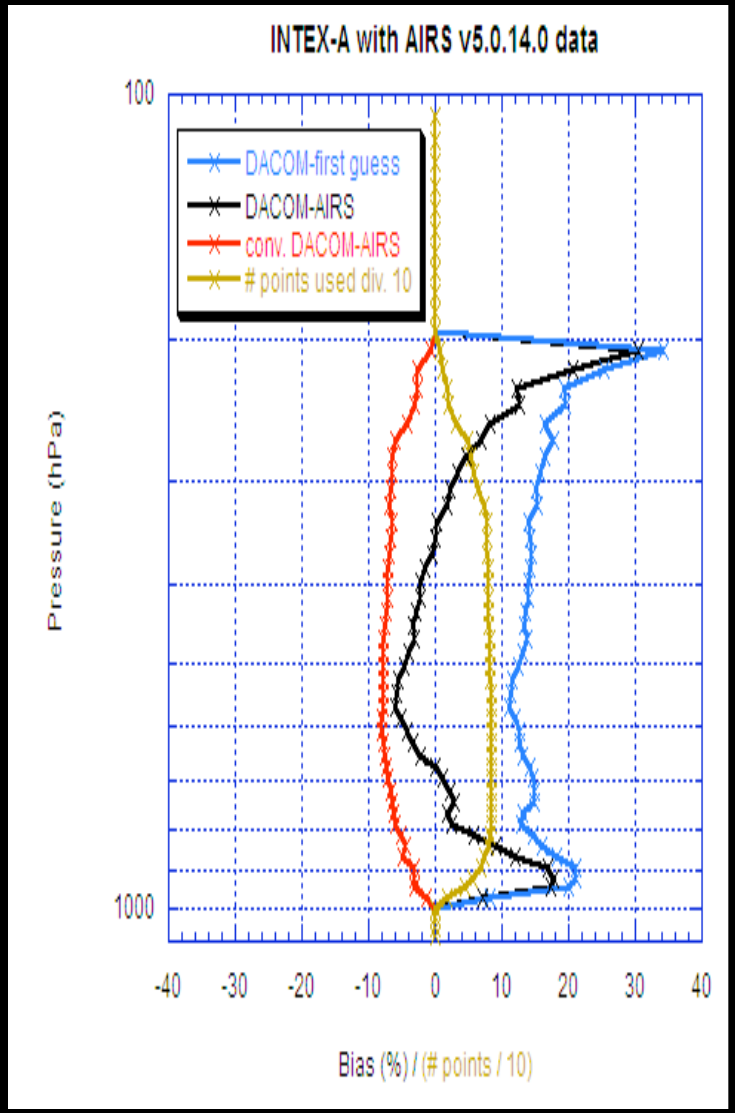


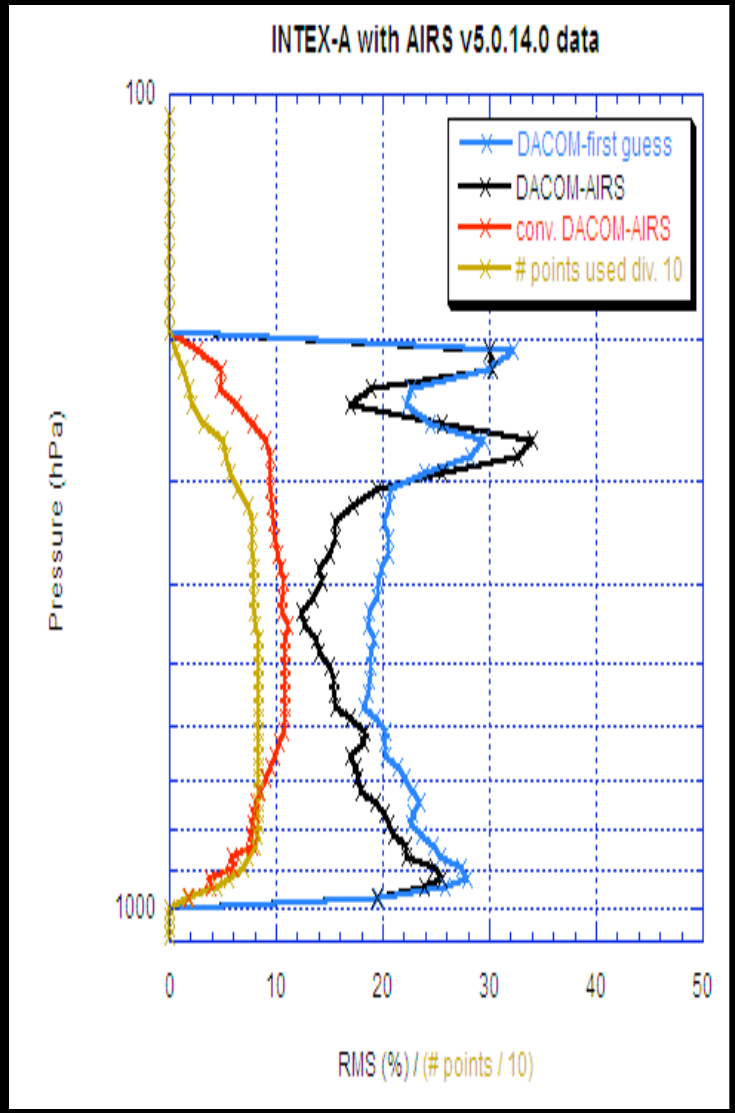




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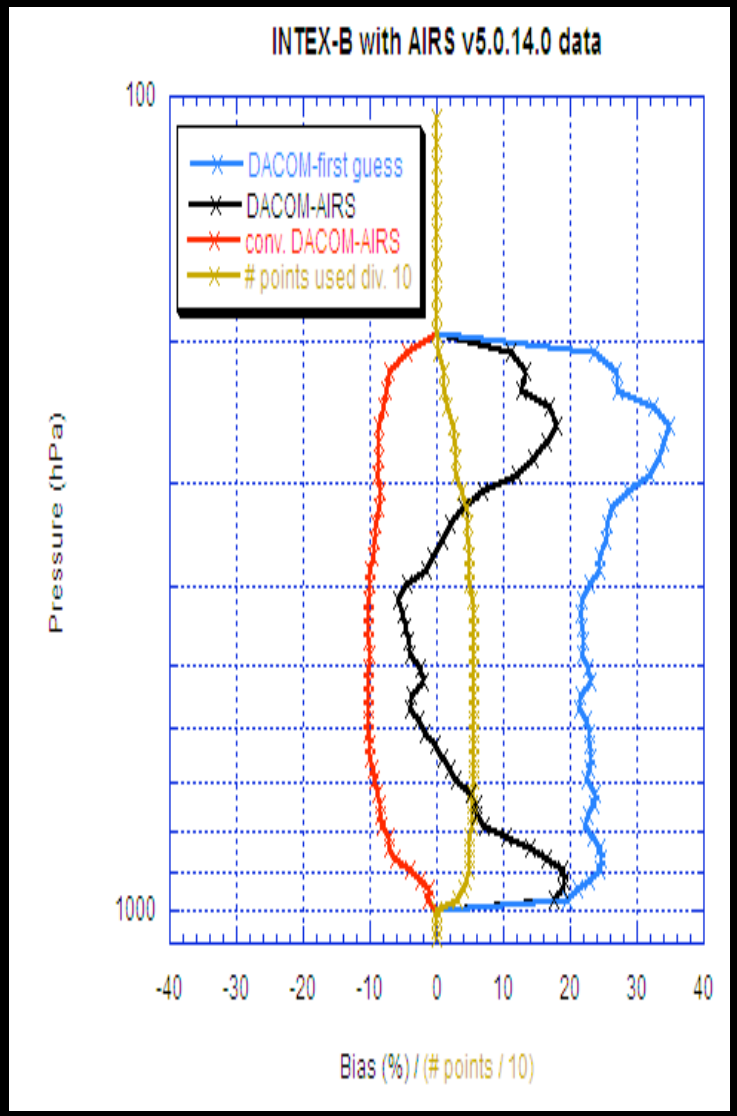
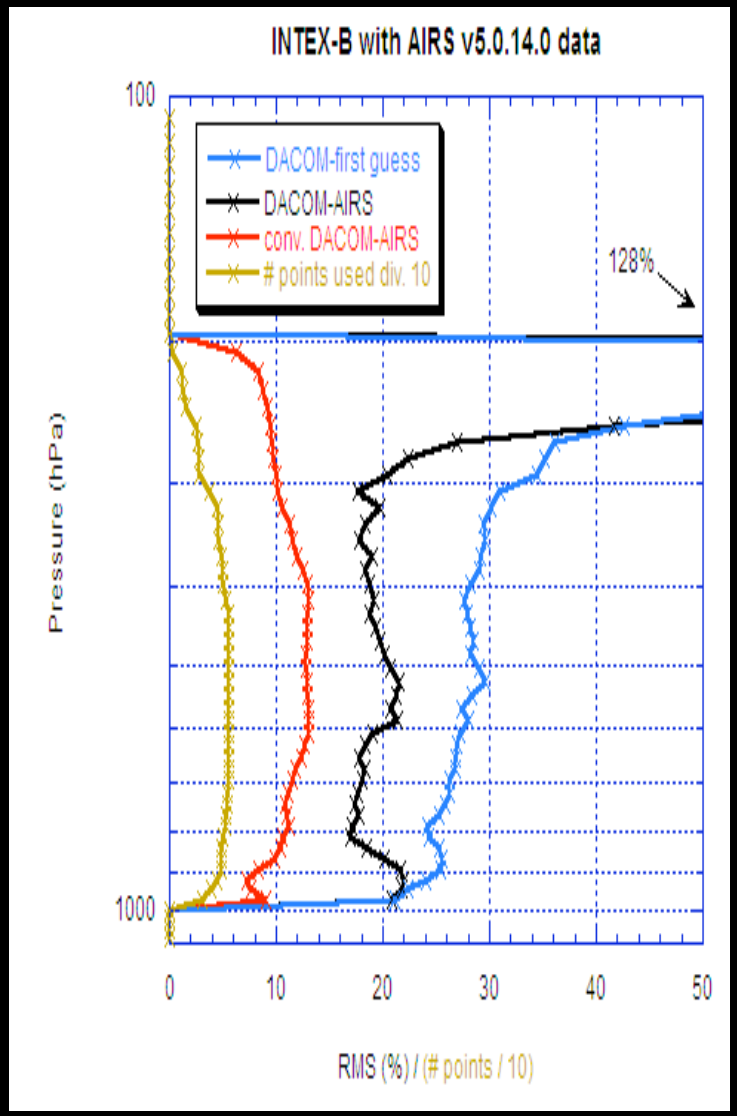
# INTEX-B: AIRS vs. DC-8 in situ





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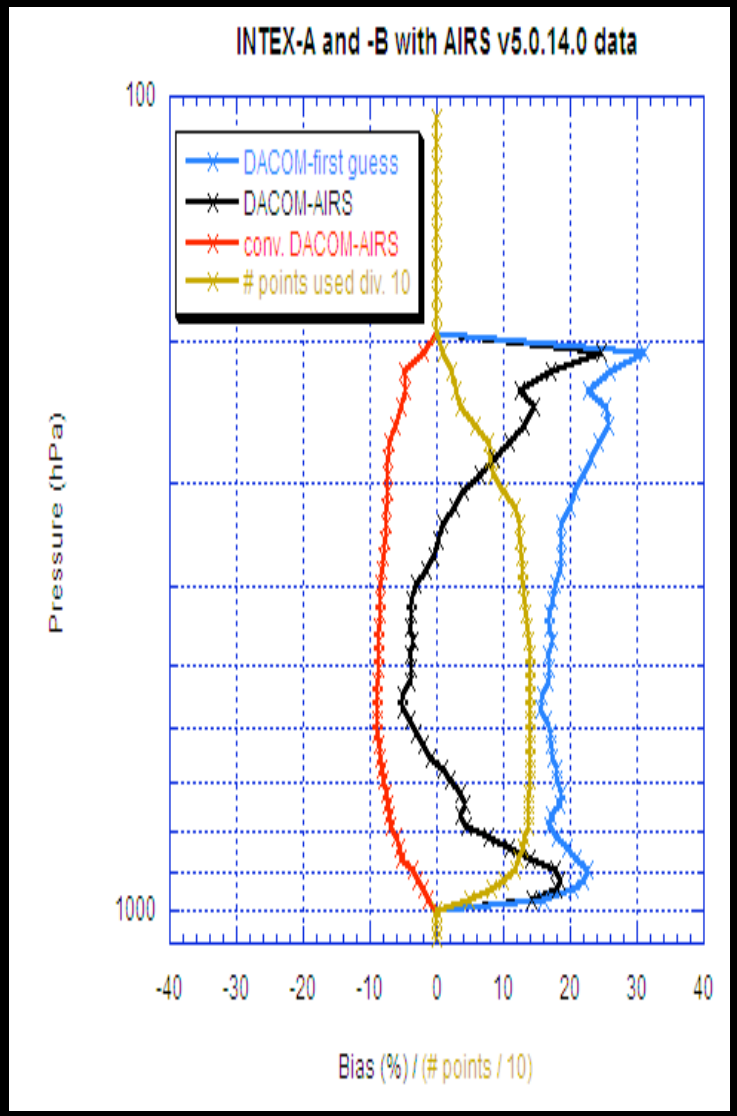


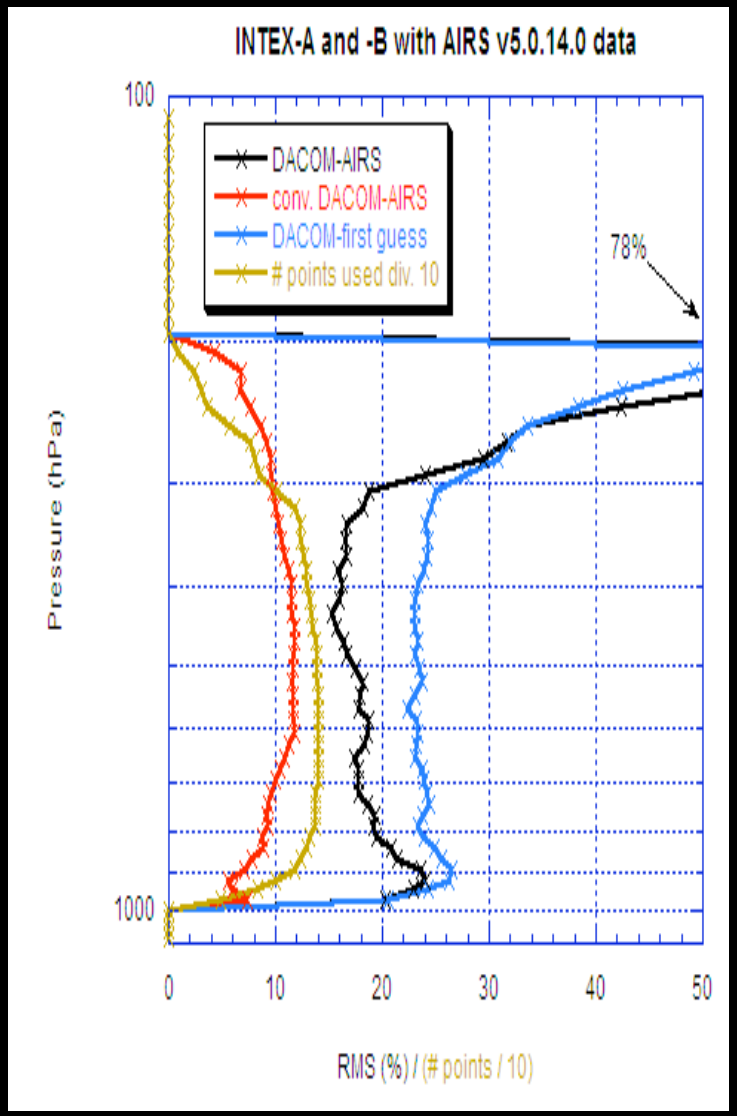

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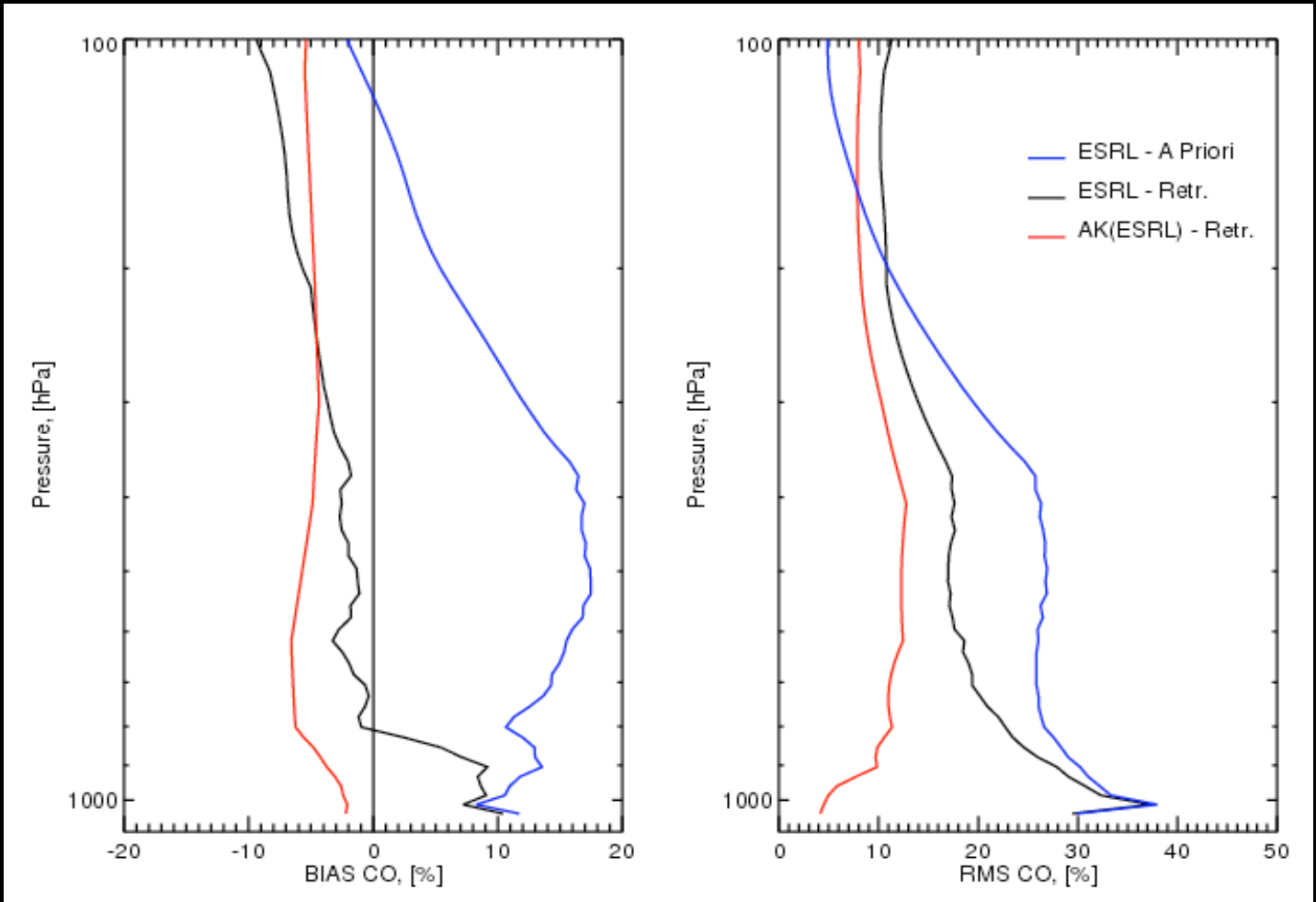
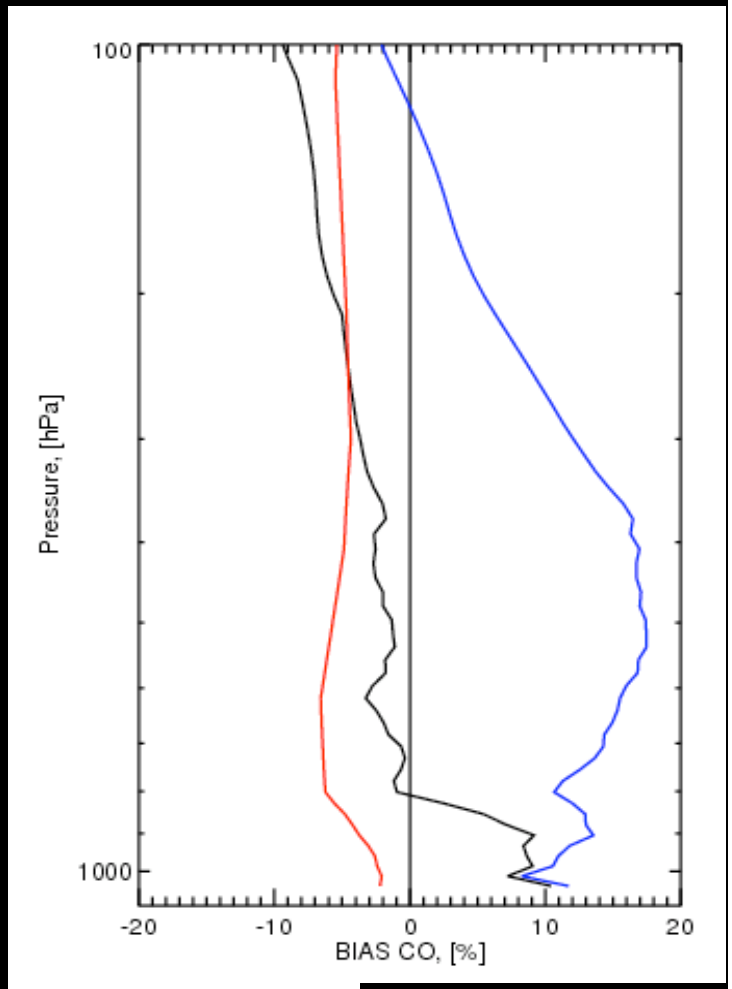
# AIRS vs. NOAA ESRL in situ

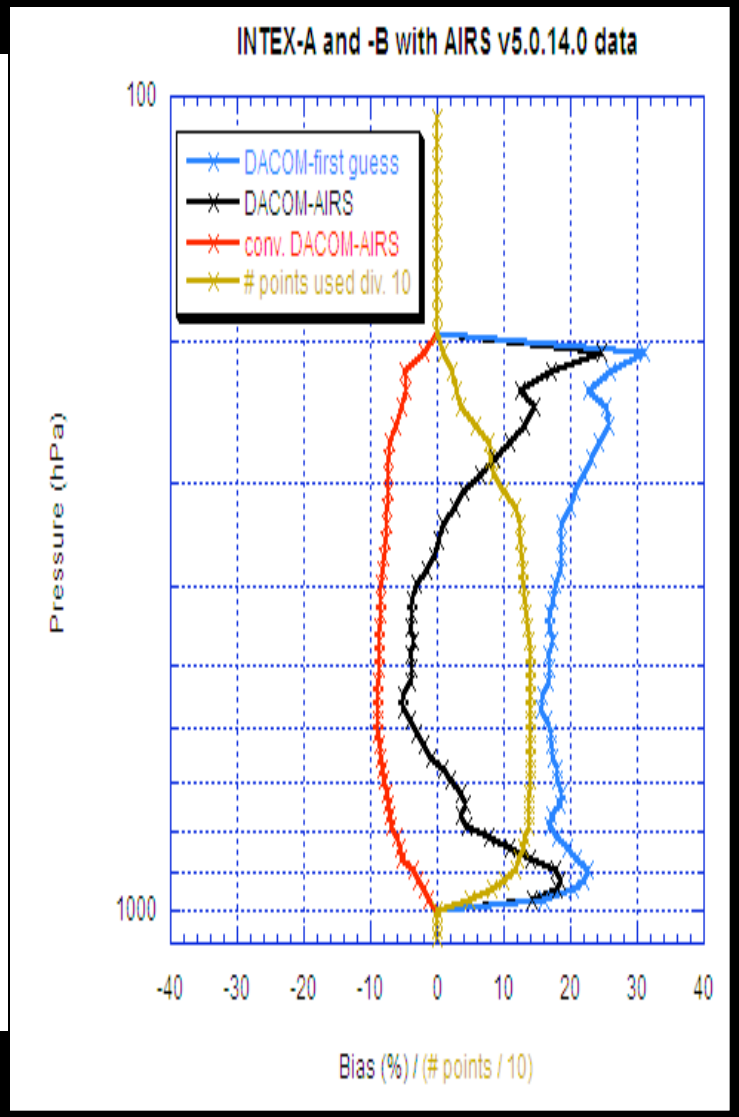



Eric Maddy (380 profiles, 24 sites 1/1/05-1/1/06)

# AIRS vs. NOAA & INTEX




Eric Maddy



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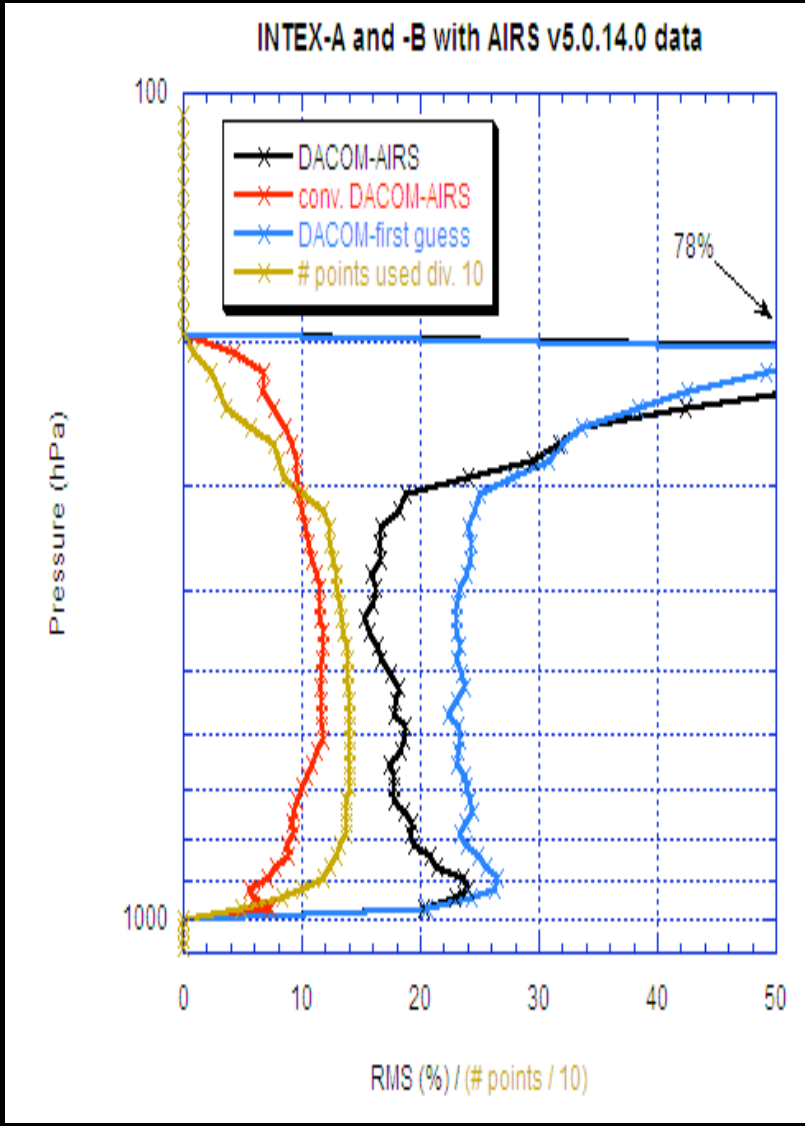


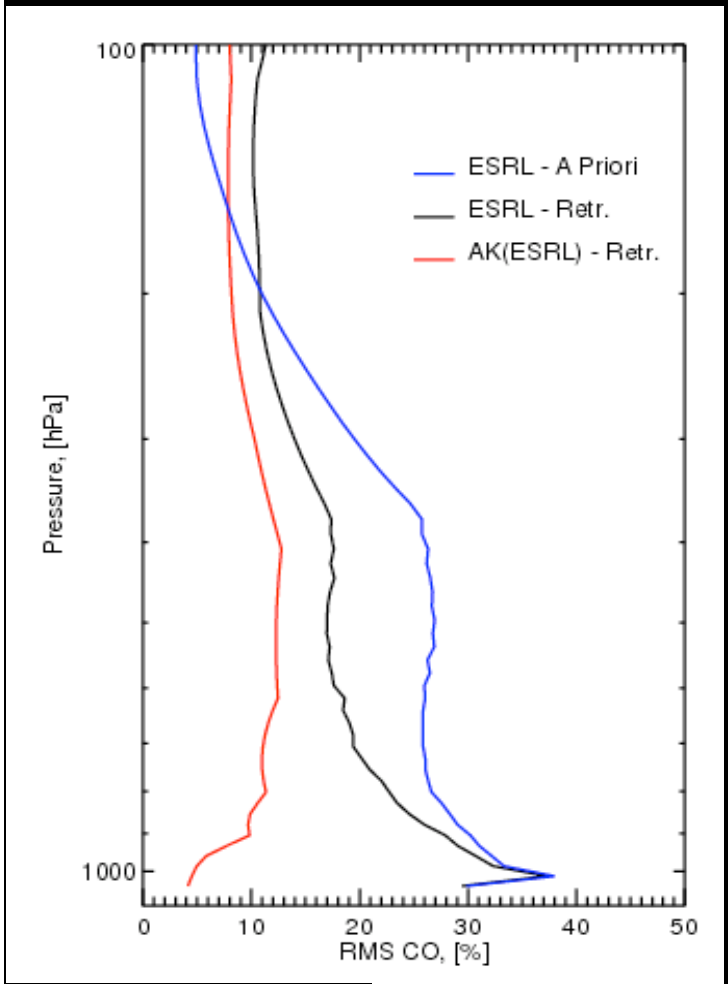


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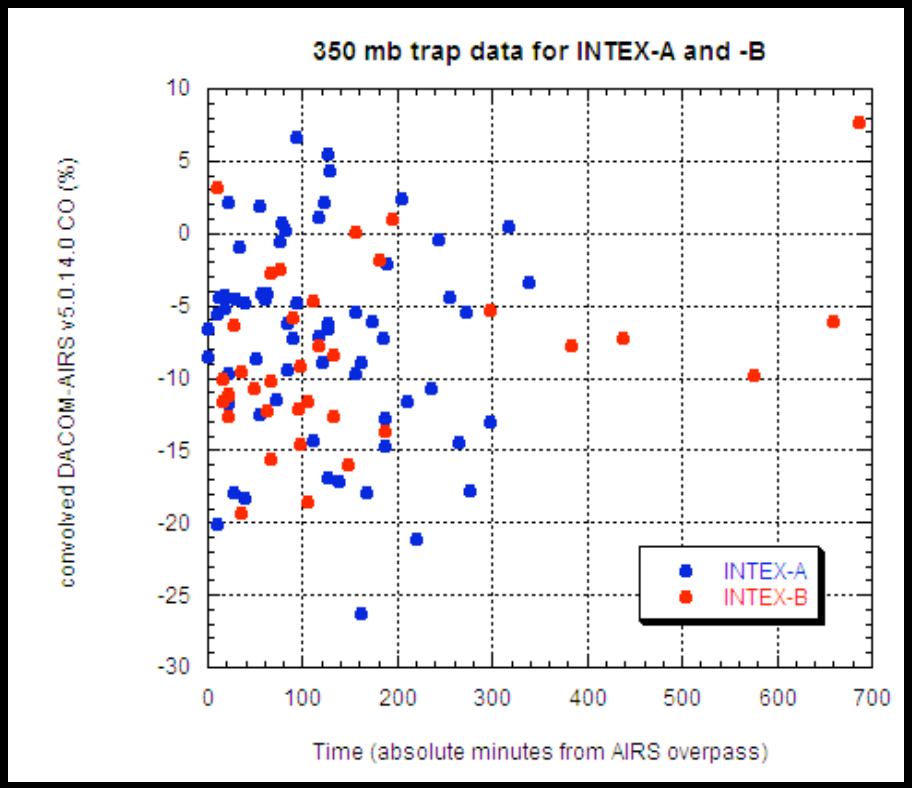
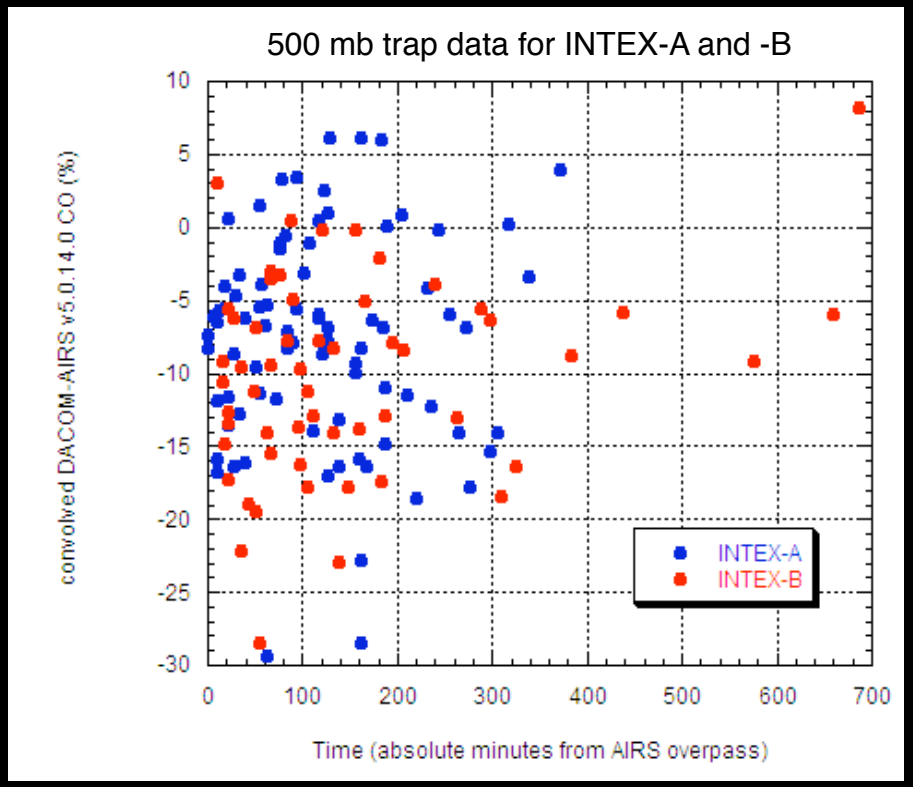
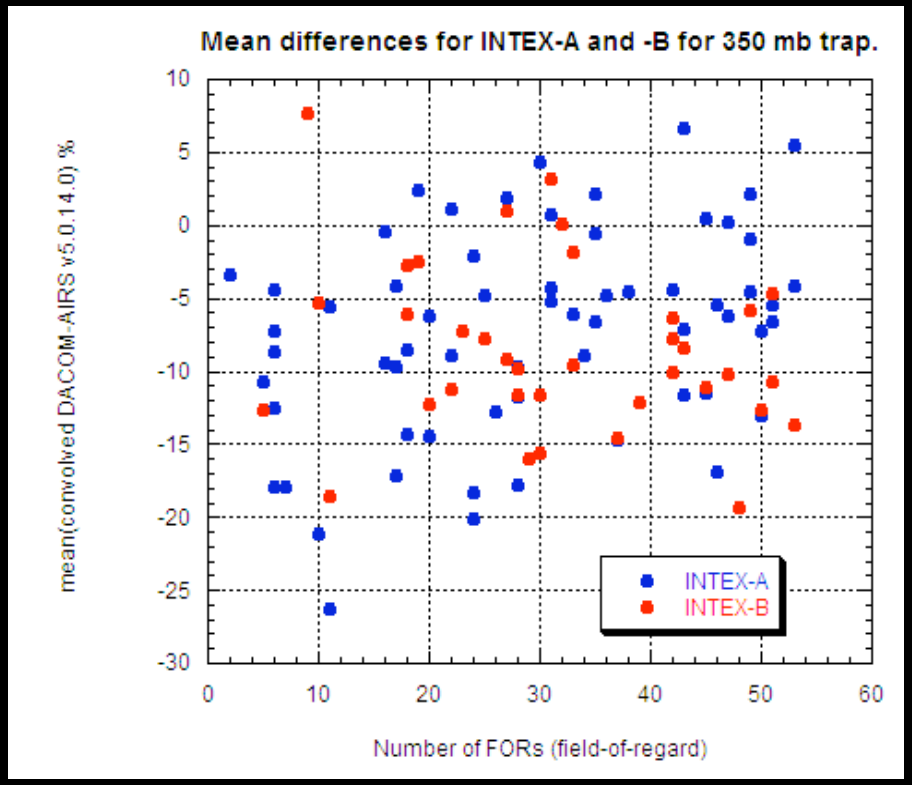
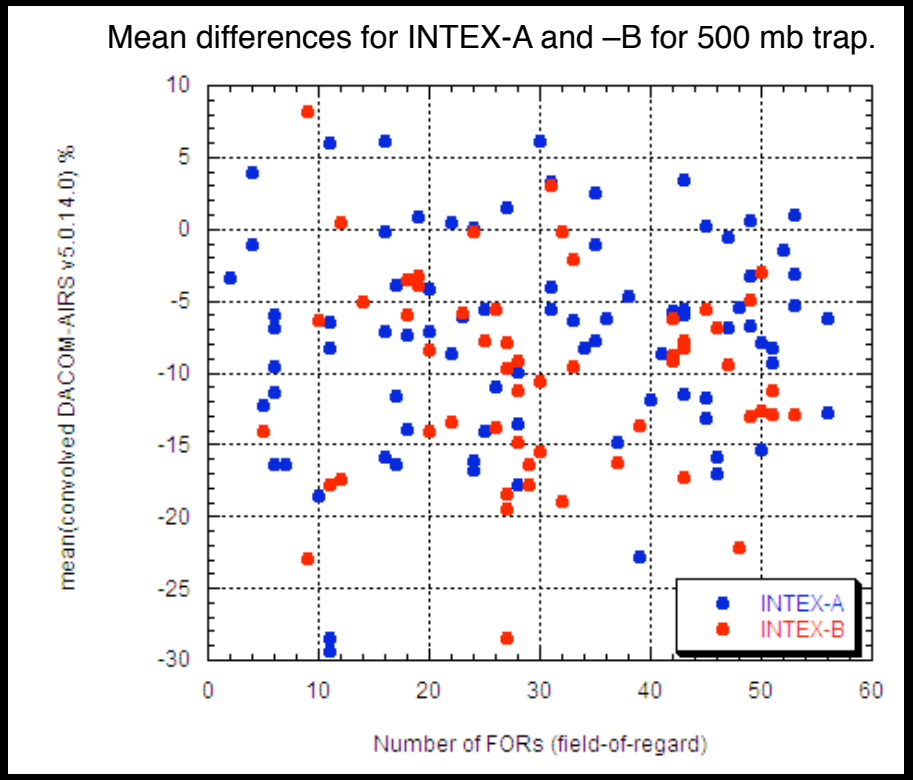
# INTEX: AIRS vs. DC-8 in situ
# No correlation with time difference



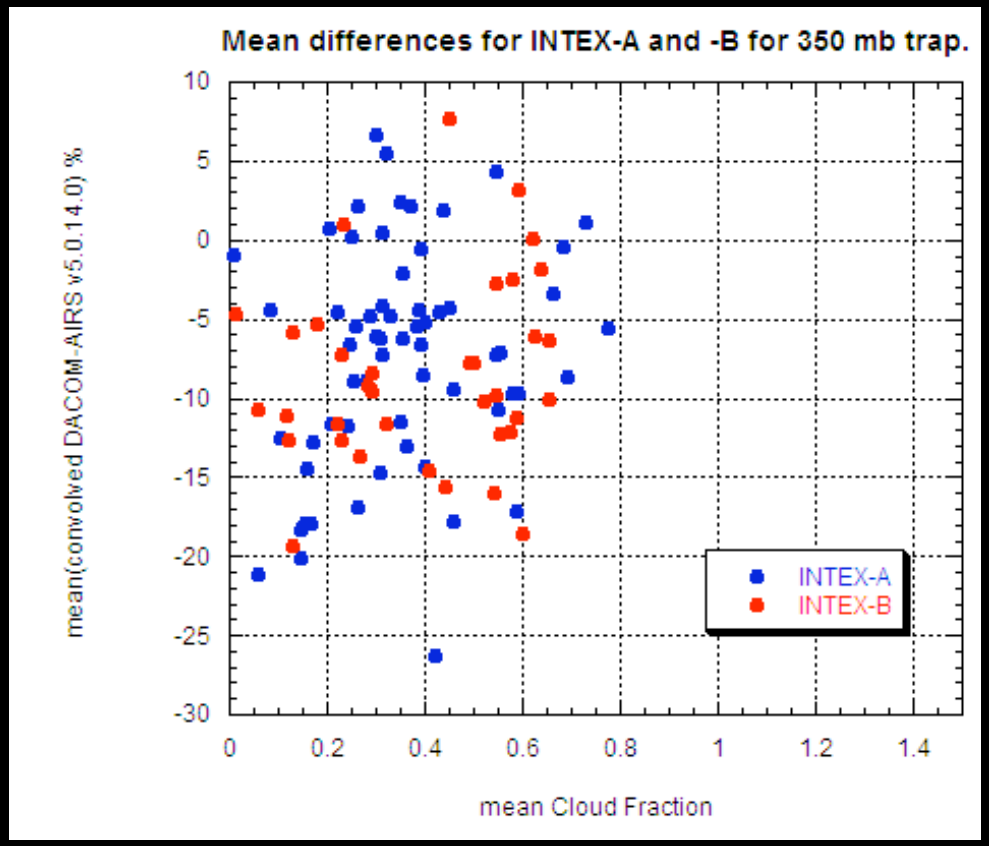



# INTEX: AIRS vs. DC-8 in situ
# No correlation with # FOR

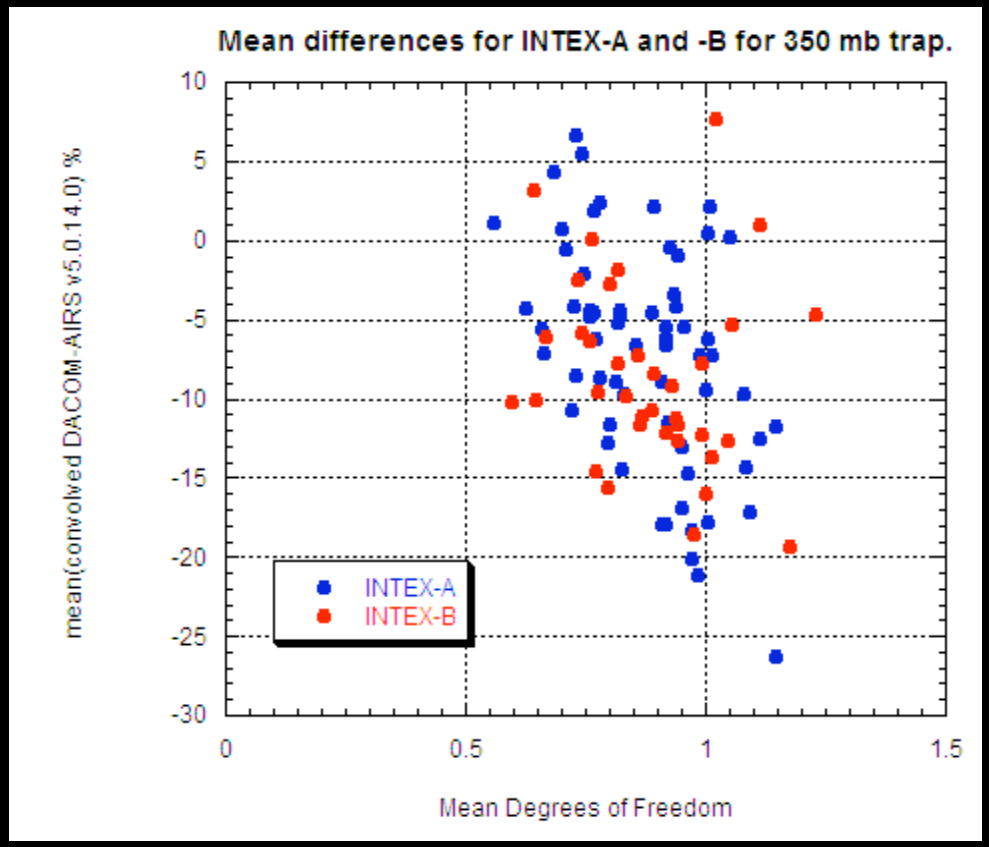


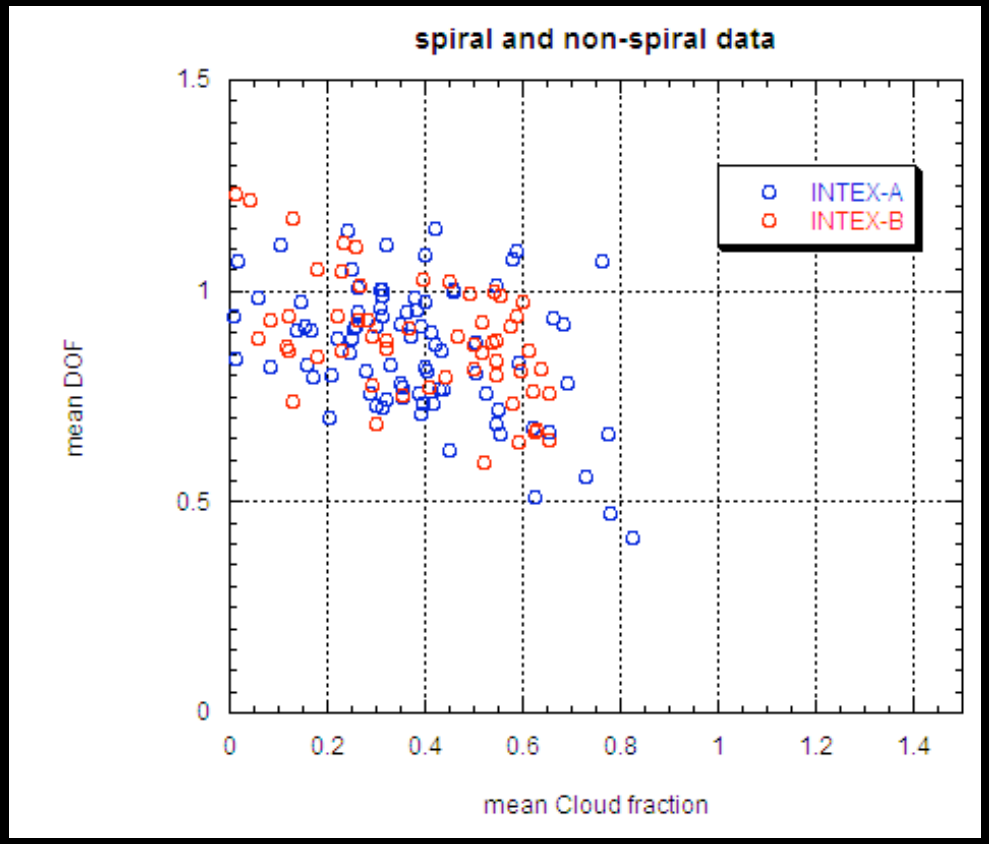
# INTEX: AIRS vs. DC-8 in situ
# No correlation with cloud fraction



# INTEX: AIRS vs. DC-8 in situ
# Weak anti-correlation with DOF



# INTEX: AIRS vs. DC-8 in situ DOF correlation with cloud fraction





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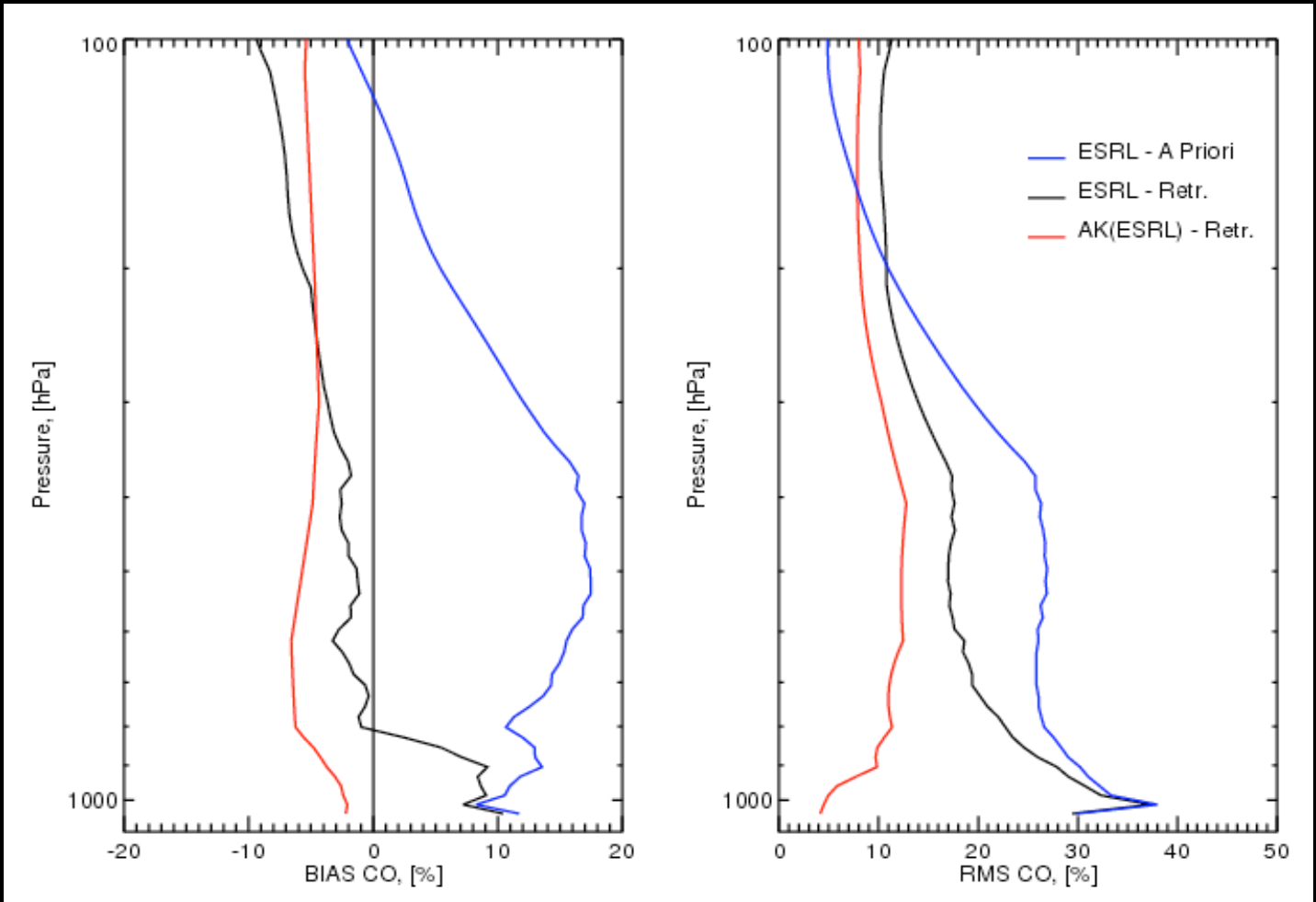
# NEXT STEPS

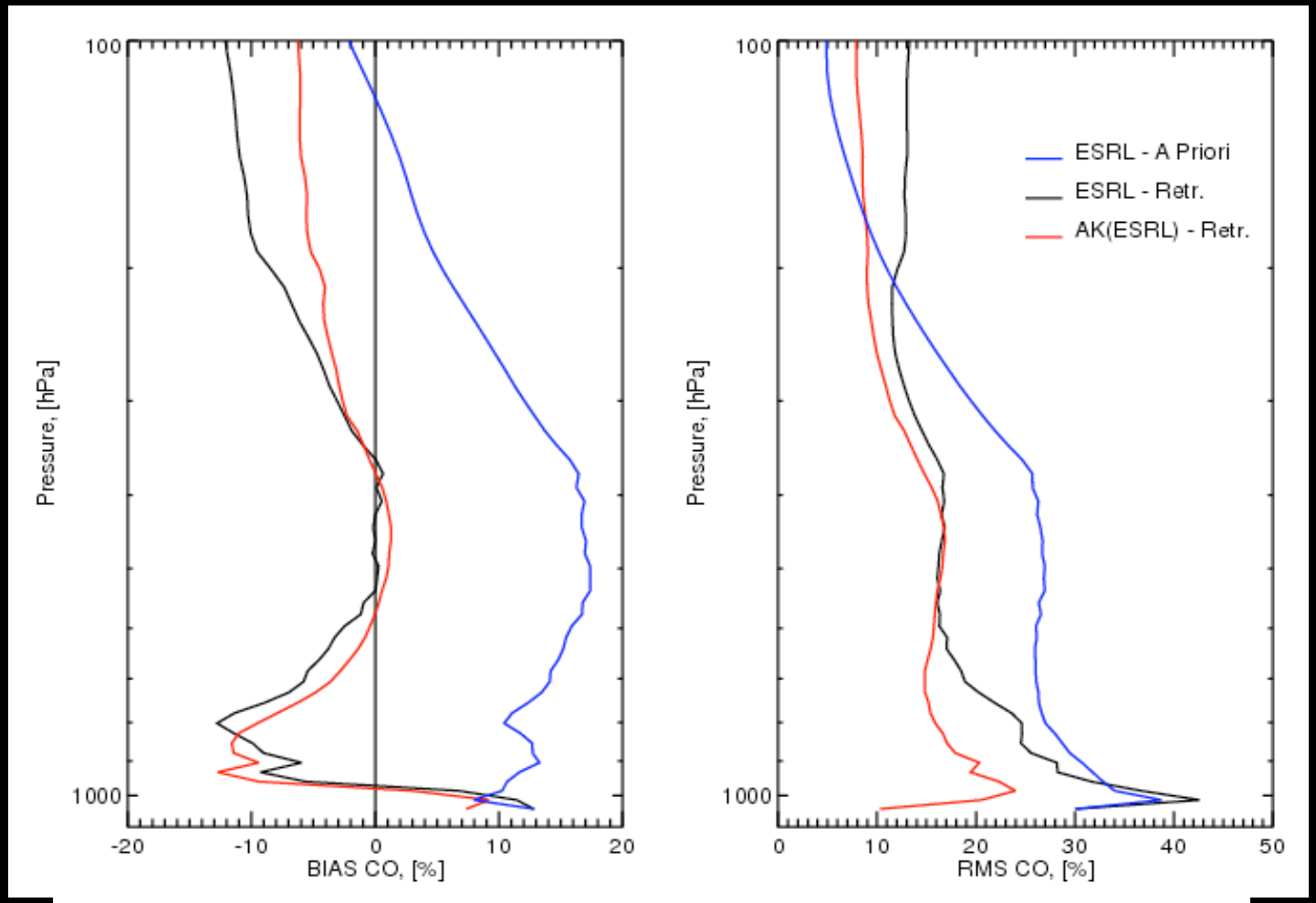
- V5 algorithm and validation manuscript in prep.
- Include INTEX-B C-130 and TexAQS P-3 profiles
- Expand to other research aircraft
  - Additional ESRL profiles
  - Collaborations (S. America, Africa, Mid-east)
  - HIPPO experiment
  - MOZAIC
- Expand to all NDACC column stations
- Evaluate half-bot = false
- Test potential v6 AIRS CO retrieval

# v5.0.14.0




Eric Maddy (380 profiles, 24 sites 1/1/05-1/1/06)

# Optimal Estimation

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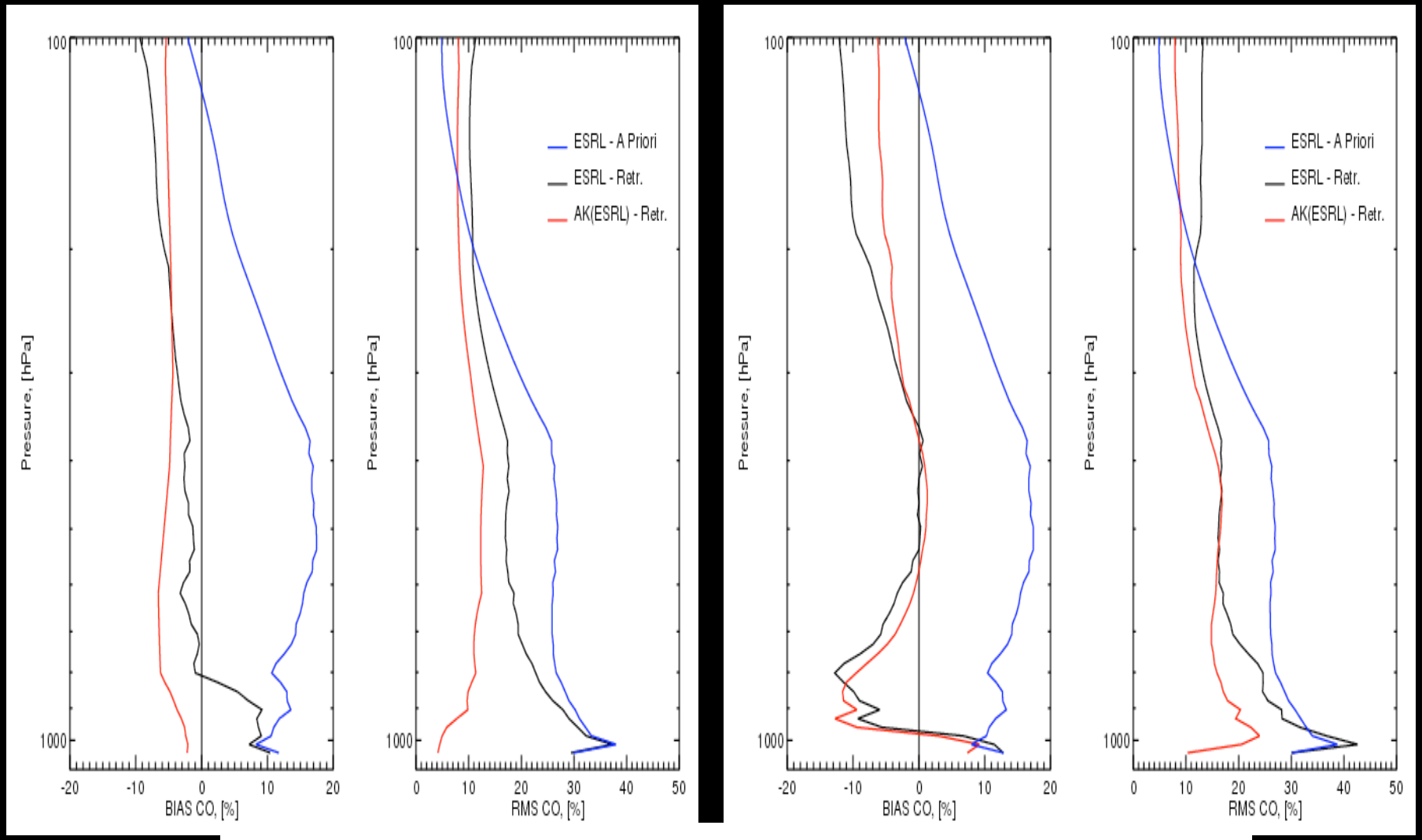
# v5.0.14.0 vs. O-E

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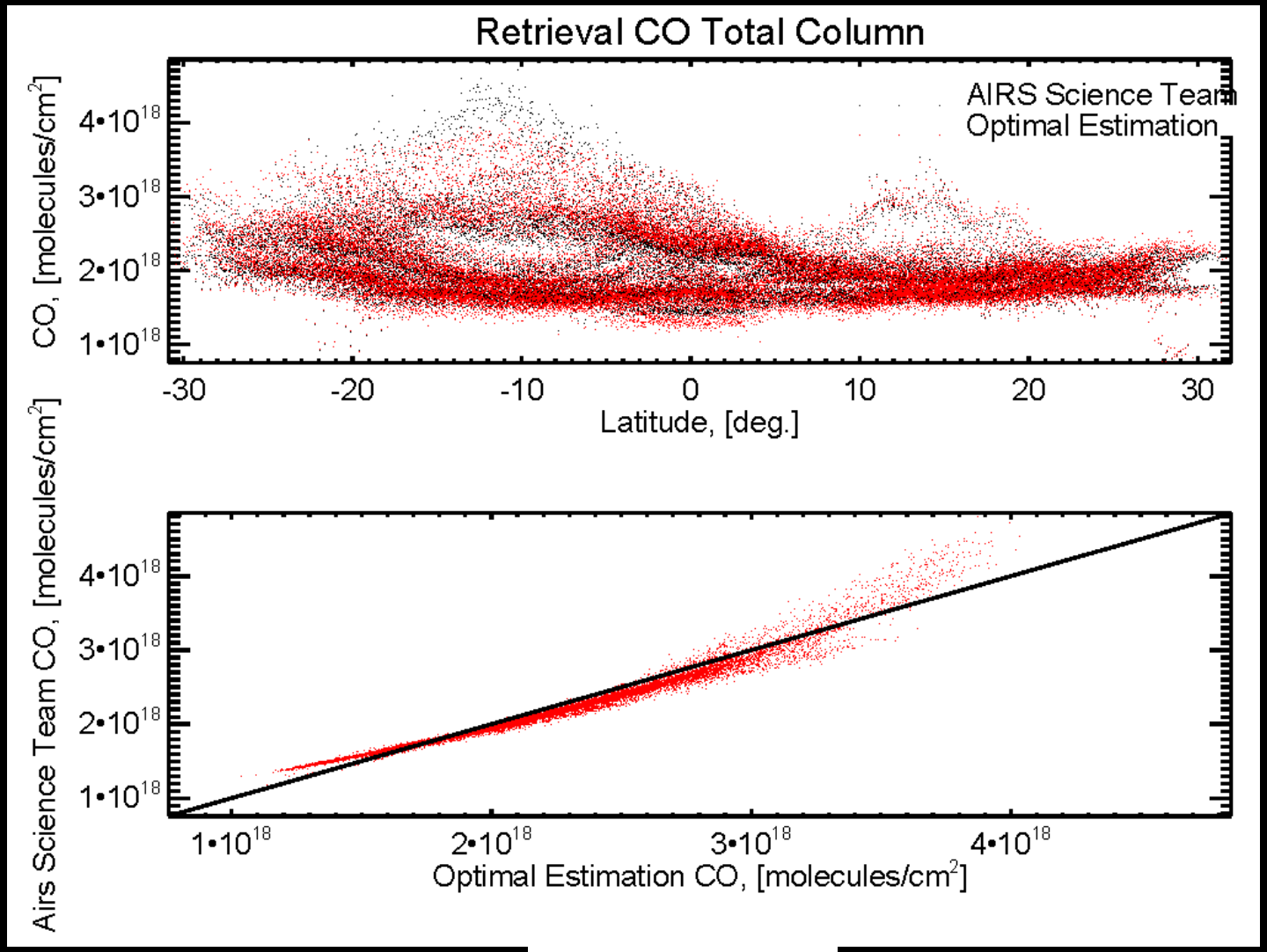
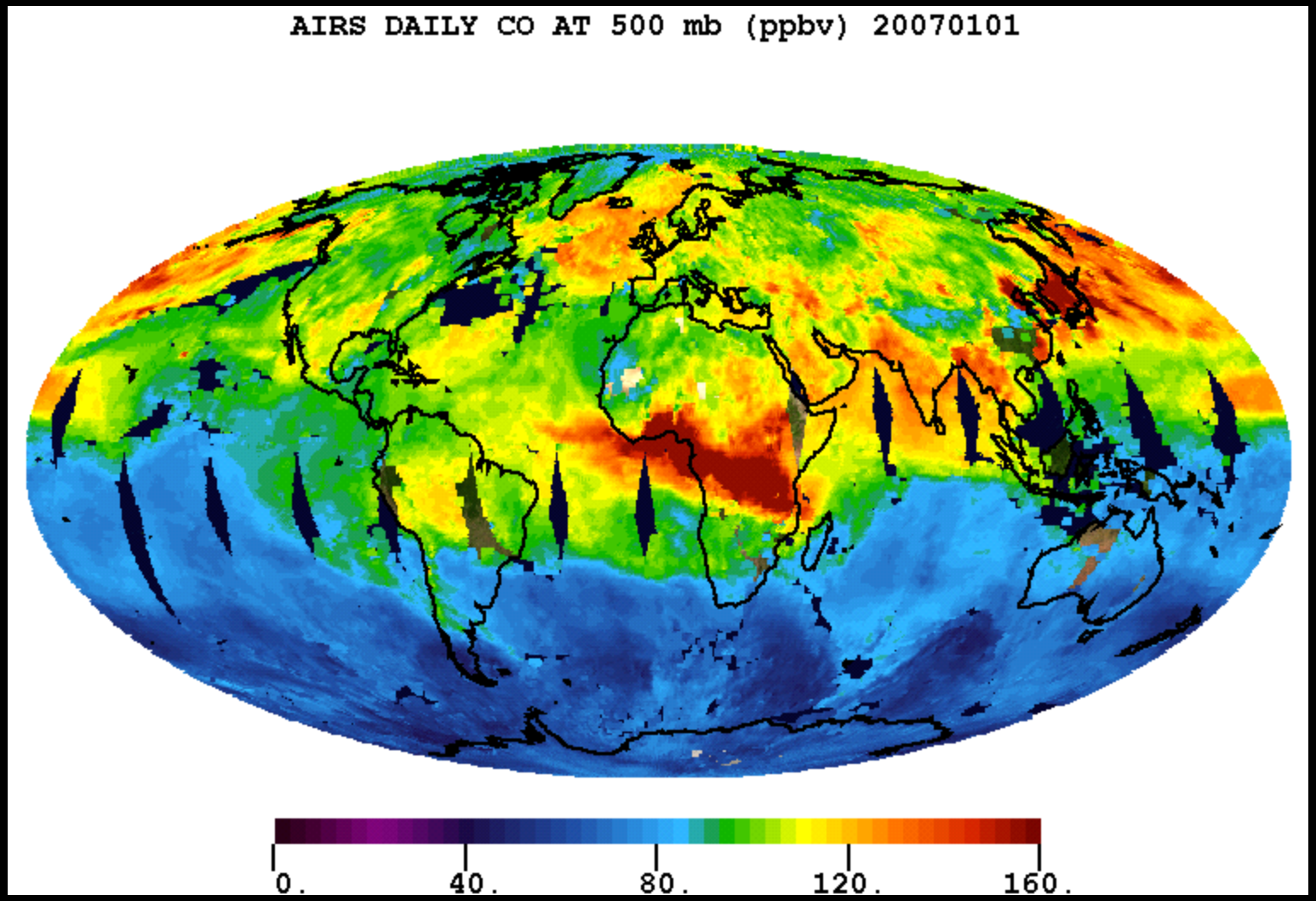



Eric Maddy

# AIRS CO Science

- Mexico City pollution plume (MILAGRO)
- Transport impacts on Houston pollution from TexAQS2006 (A-Train)
- Interannual variations in CO emissions
  - Boreal forest fires (Siberia, Alaska, Canada)
  - South American fires
  - Indonesian fires (ENSO link)
- Pyrocumulonimbus events (A-Train)
- 3-D structure of STE using A-Train CO, O3, H2O
- Carbon cycle and ecosystems
  - Correlations of CO emissions with population density, land-use, and other trace gases (A-Train)
  - Assimilation studies of AIRS CO and CO2

# AIRS: Daily Global view




**V5.0.14.0 CO standard product (movie from Ed Olsen, JPL)**