



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



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



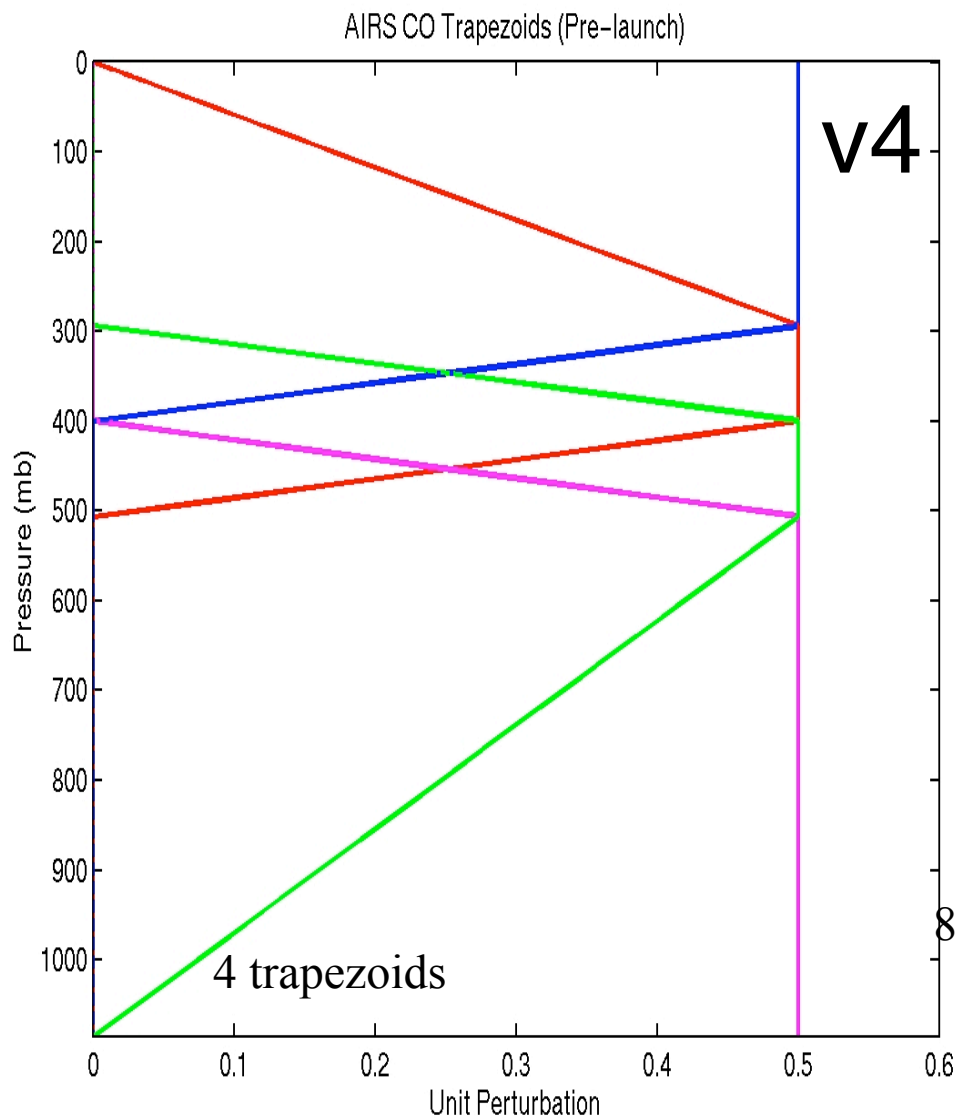
SUMMARY



- **v5 improved over v4!**
 - v4: only 500 mb validatable: 8% high \pm 5%
 - v5: 350, 500, 700, 850 mb: 4-11% high \pm 7%
- **AIRS 500 mb vs. in situ**
 - **INTEX: AIRS 9% high bias \pm 7.5%**
 - **ESRL (2005): AIRS 6% high bias \pm 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**

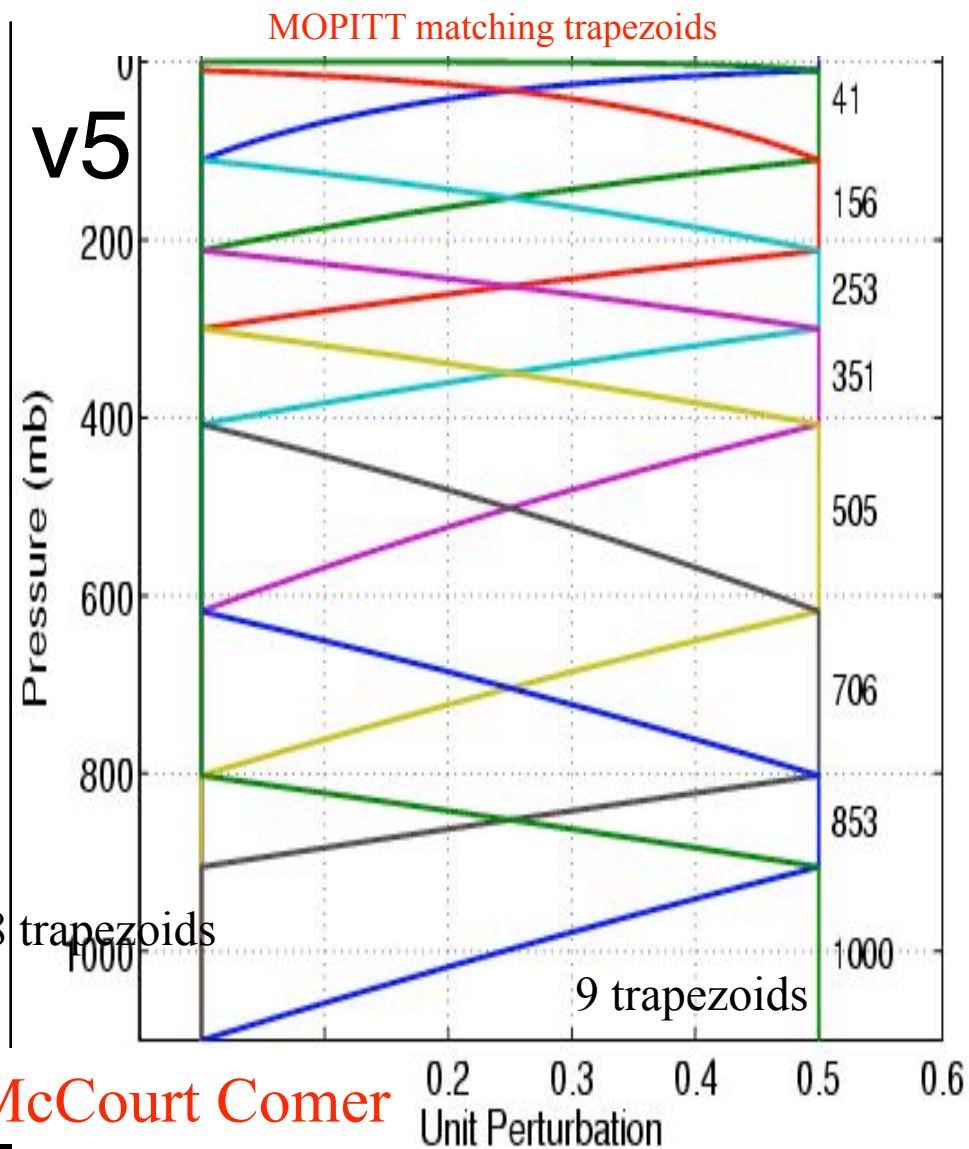
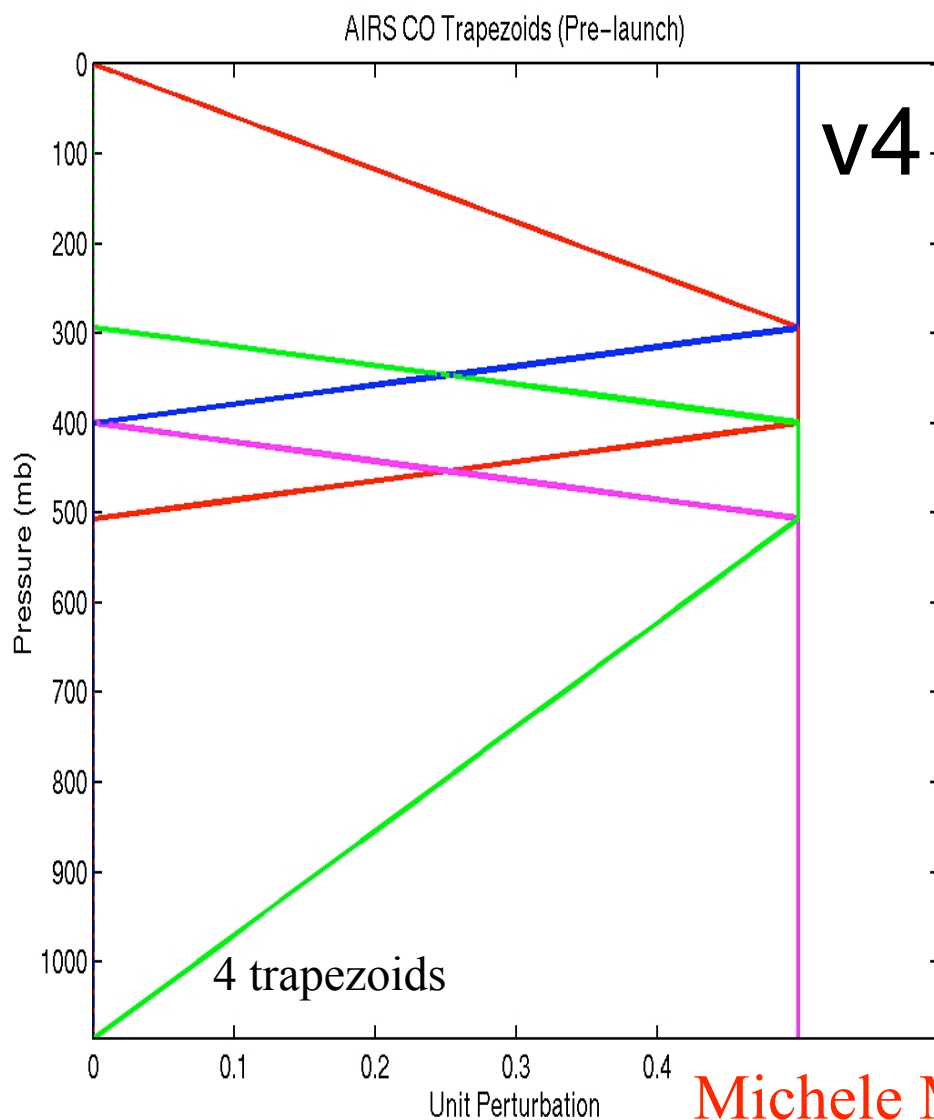


AIRS CO Trapezoids





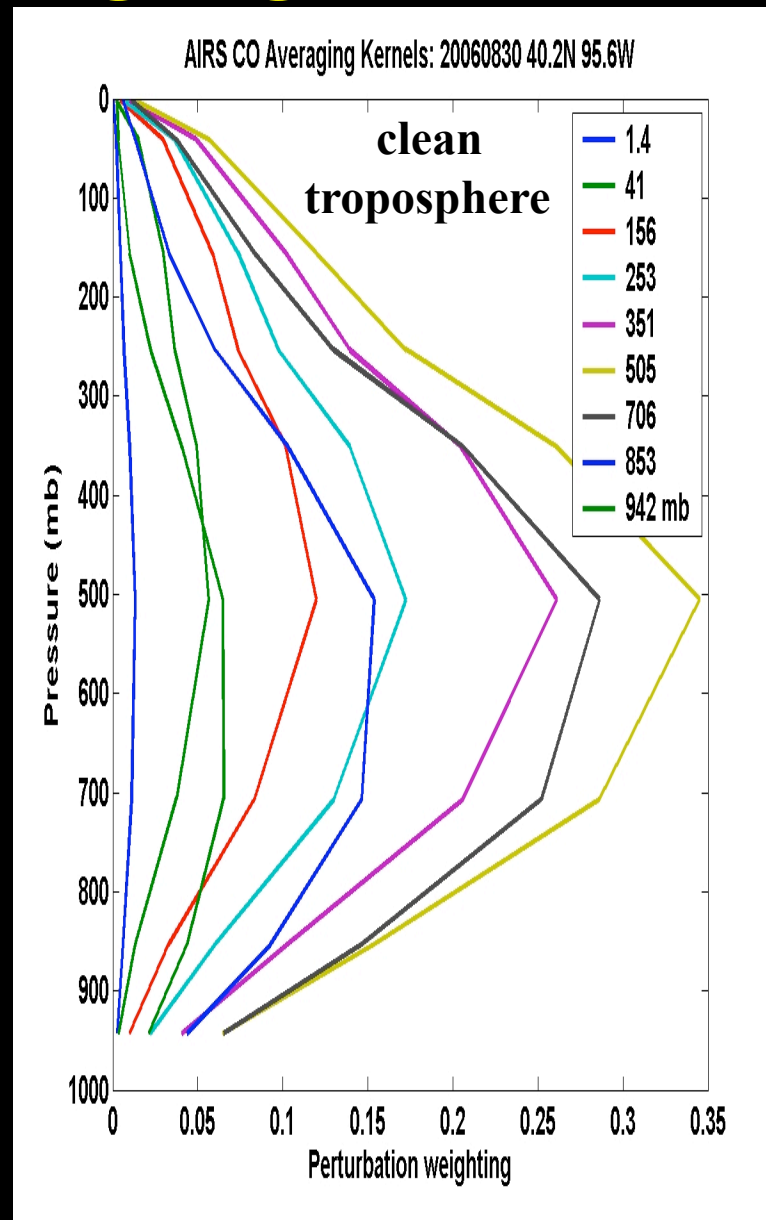
AIRS CO Trapezoids



Michele McCourt Comer



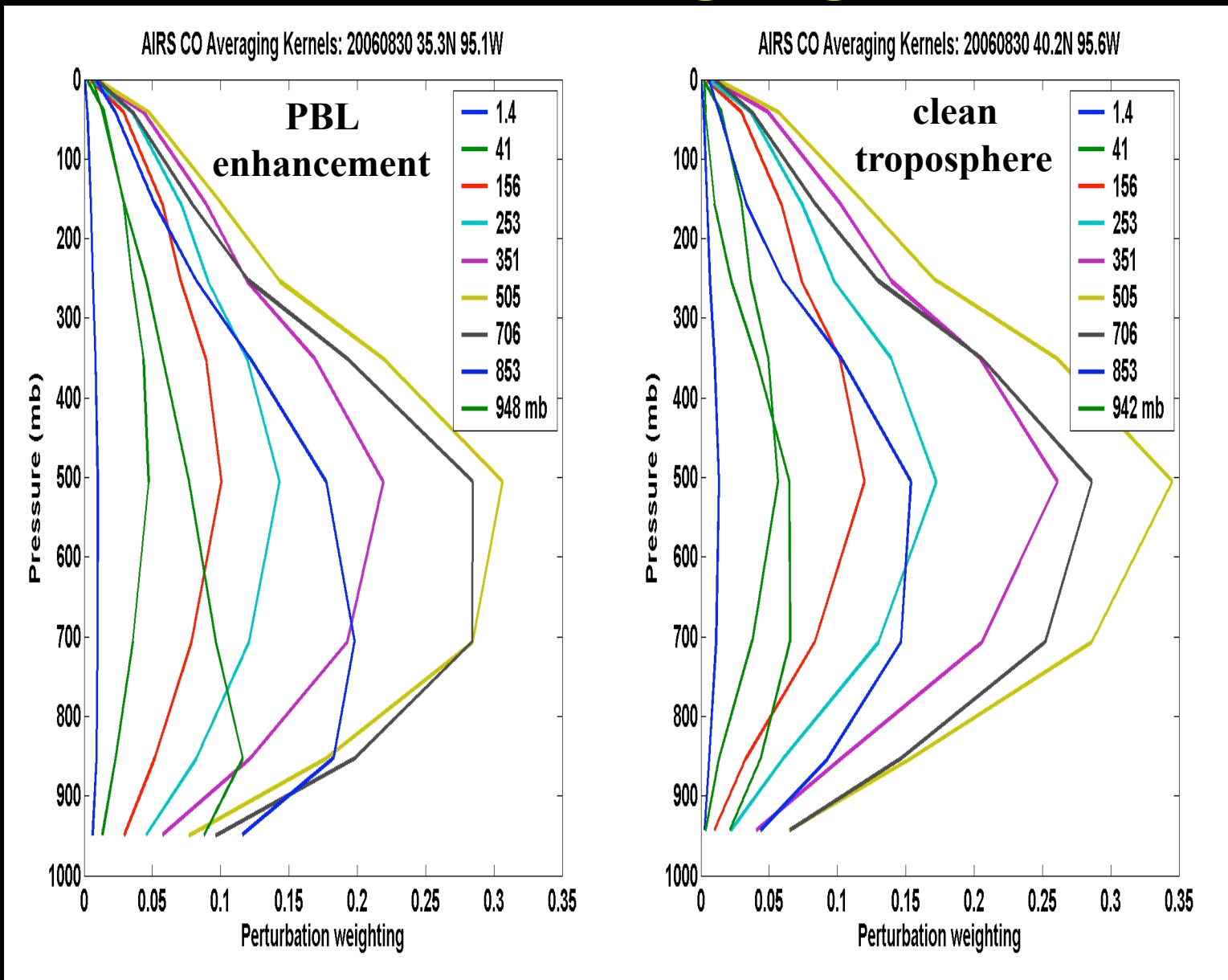
AIRS CO Averaging Kernels



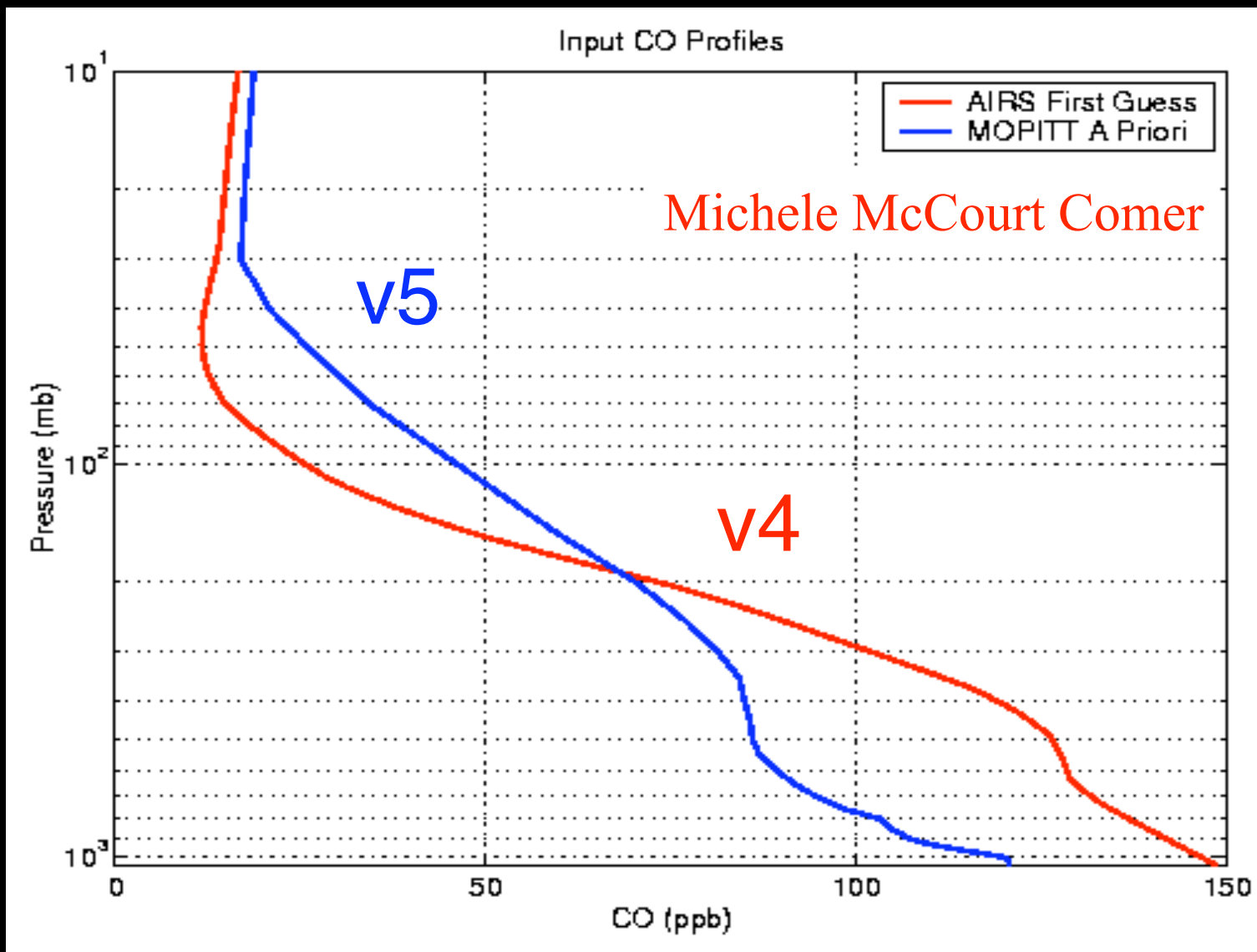


JCET

AIRS CO Averaging Kernels

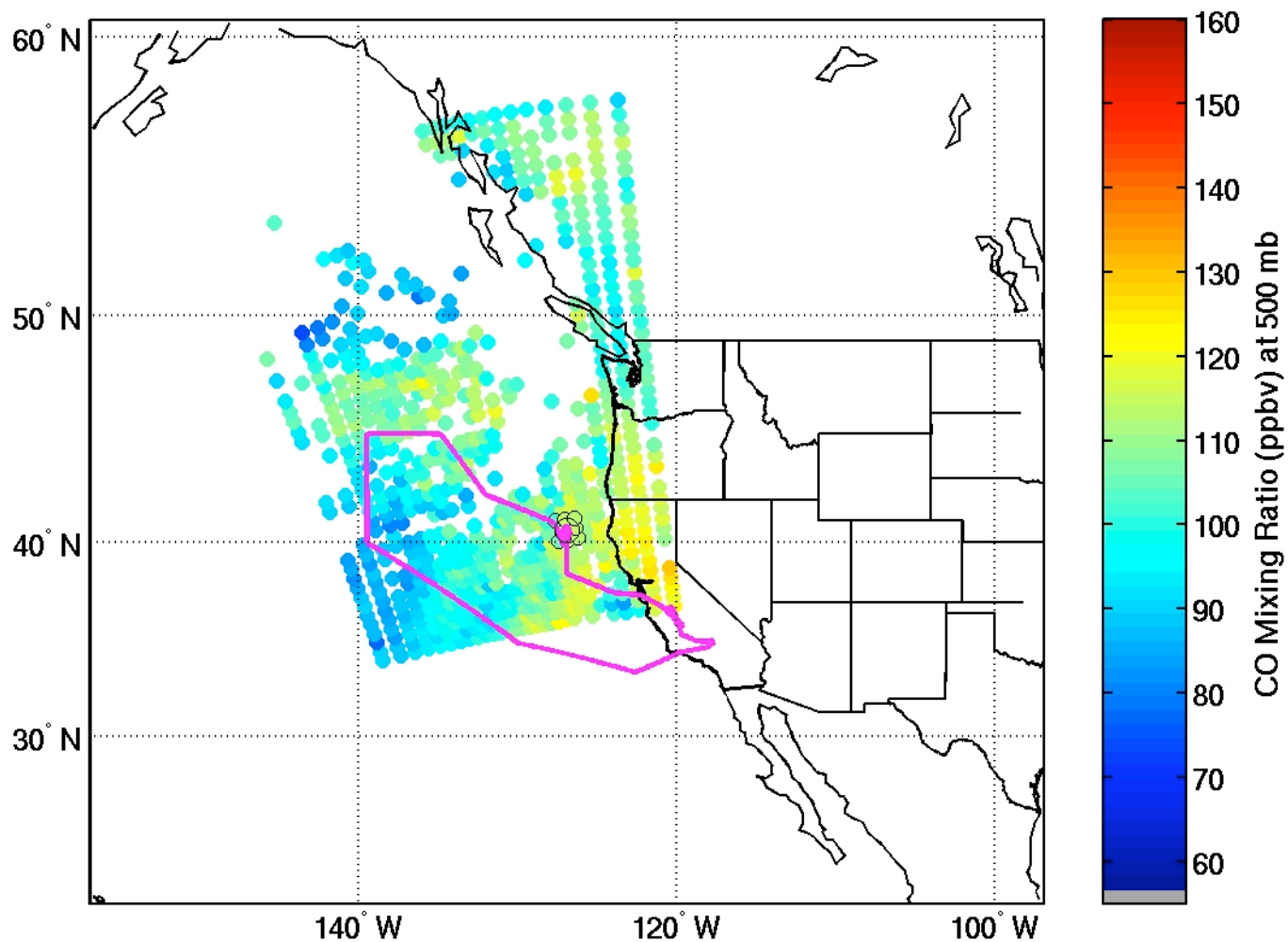


AIRS CO First Guess Profile

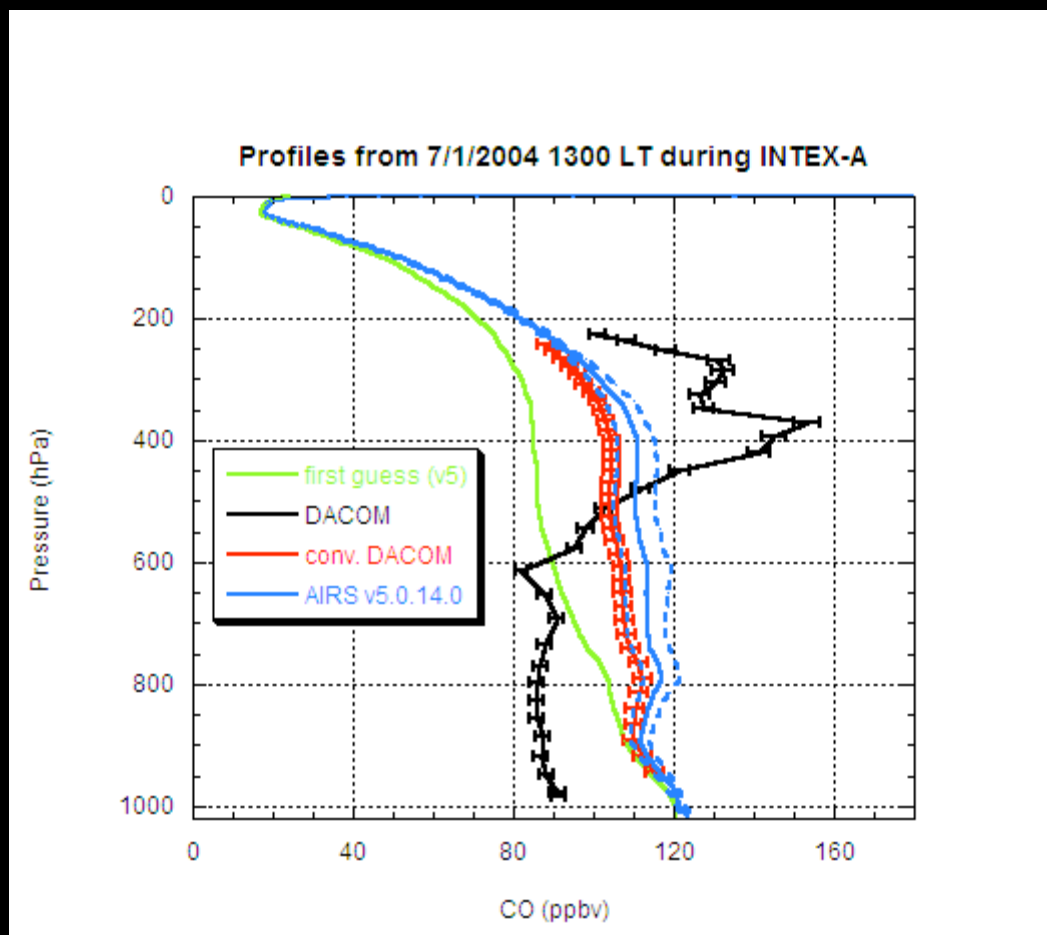


INTEX-A

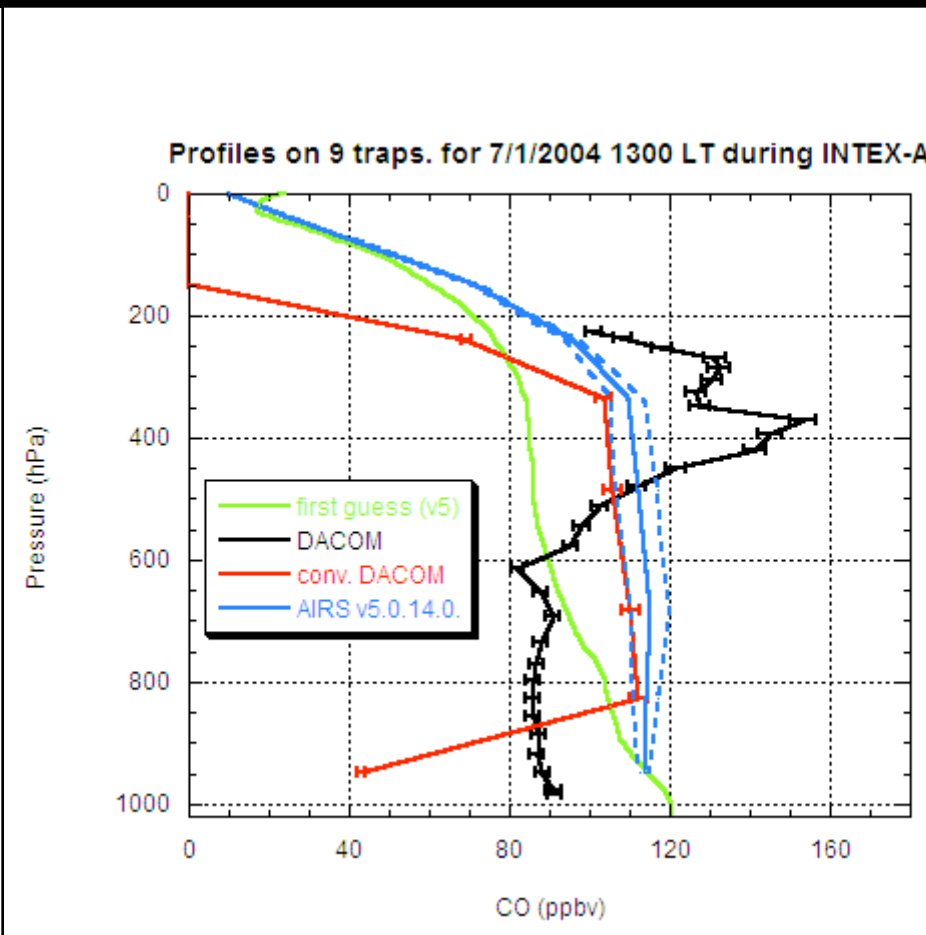
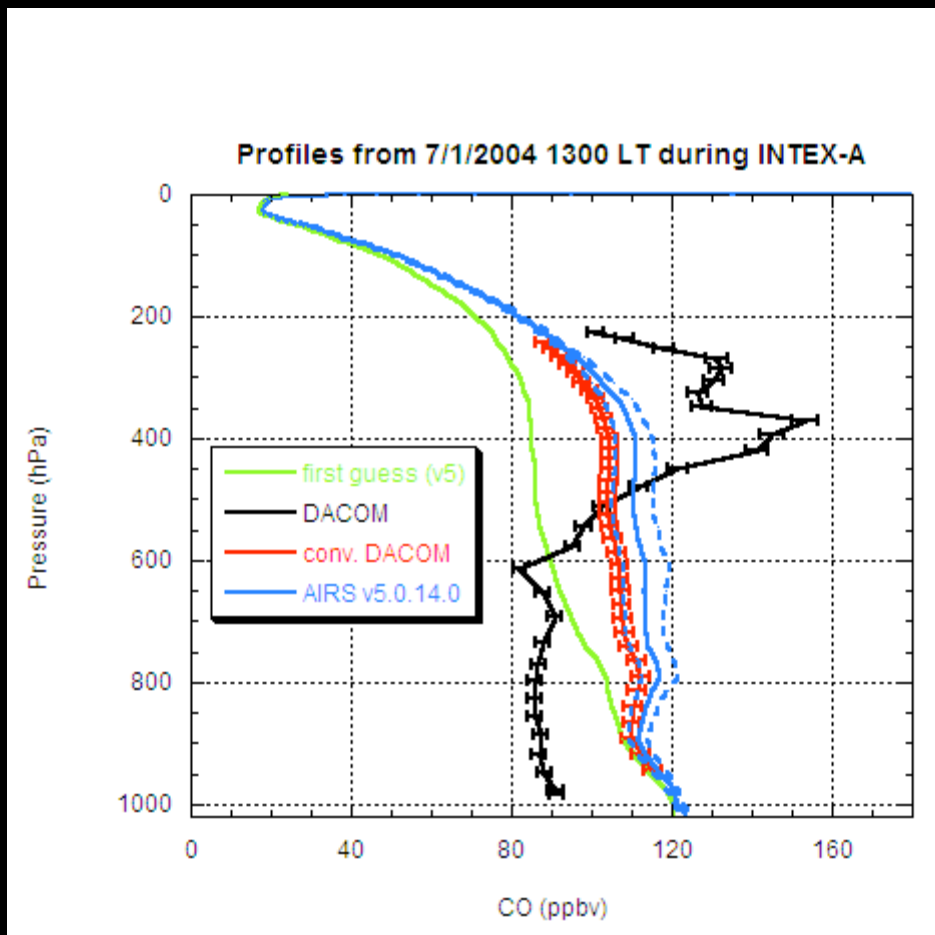
Local PM AIRS CO at 500 mb on 20040701



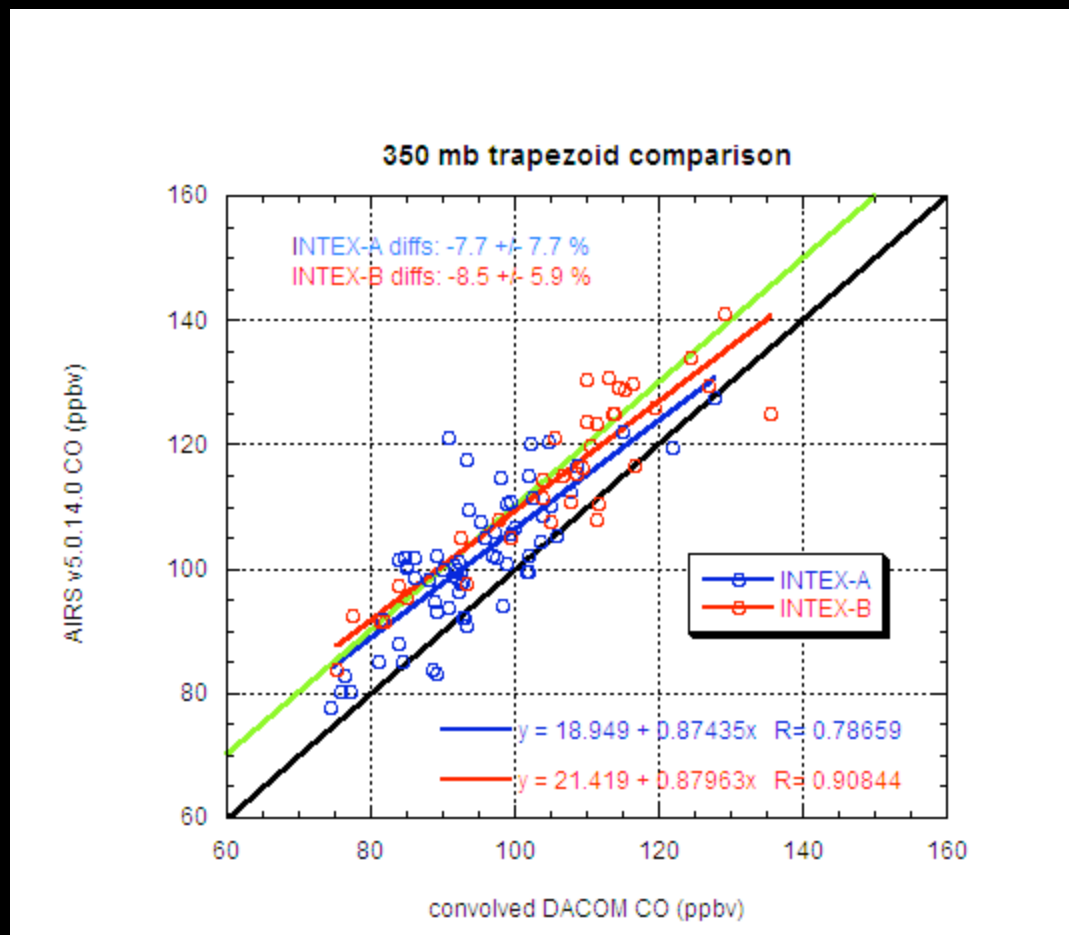
INTEX-A: AIRS vs. DC-8 in situ



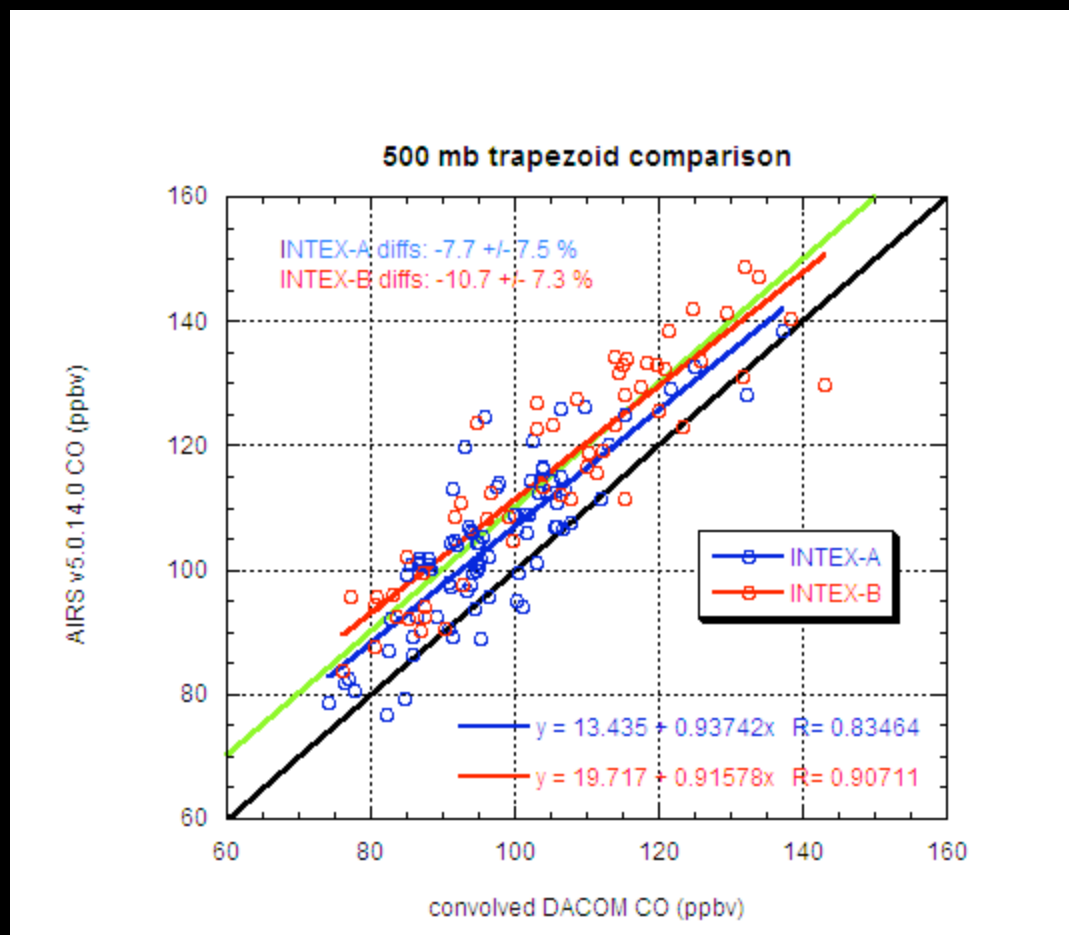
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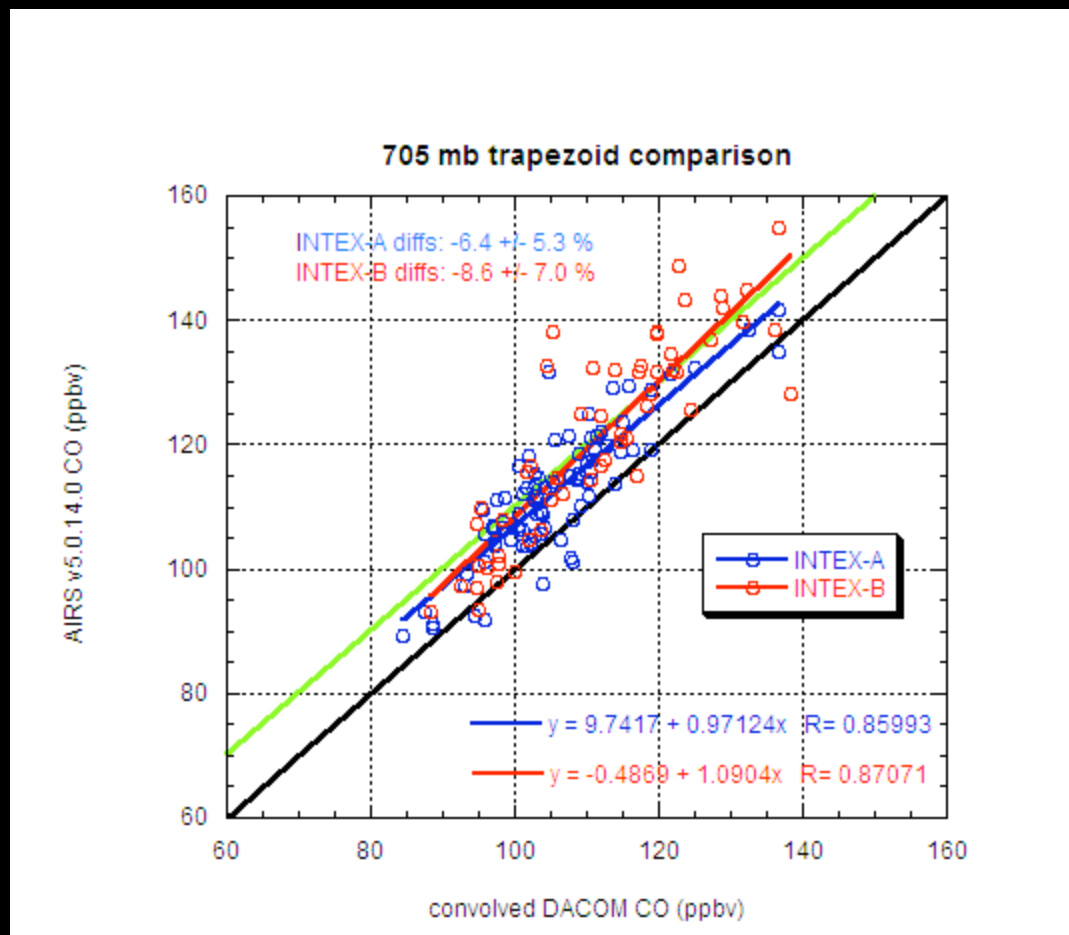
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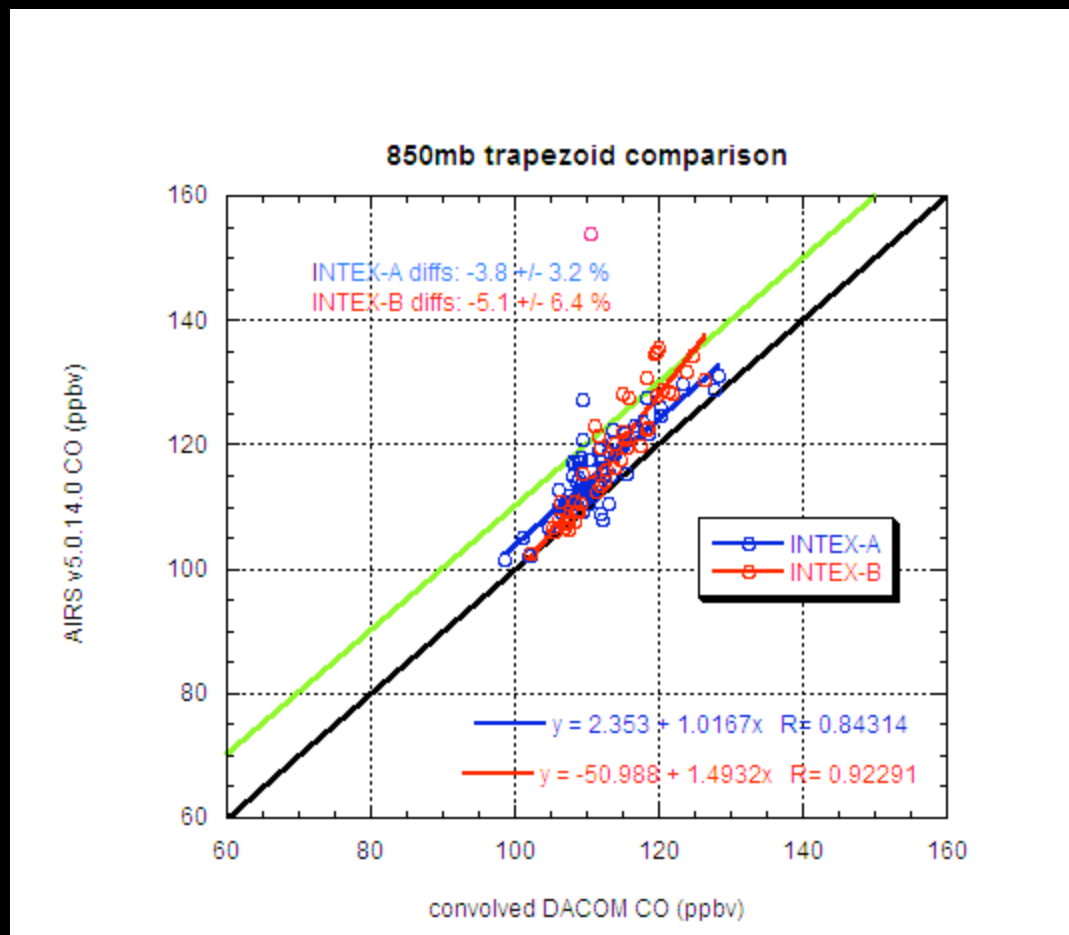
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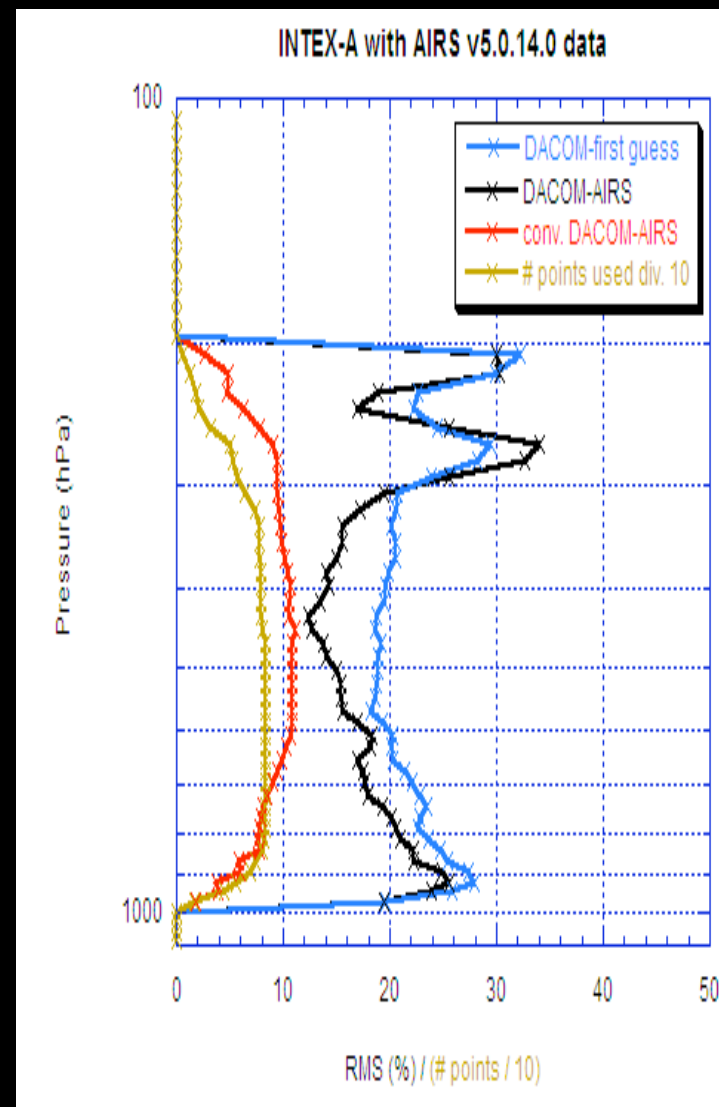
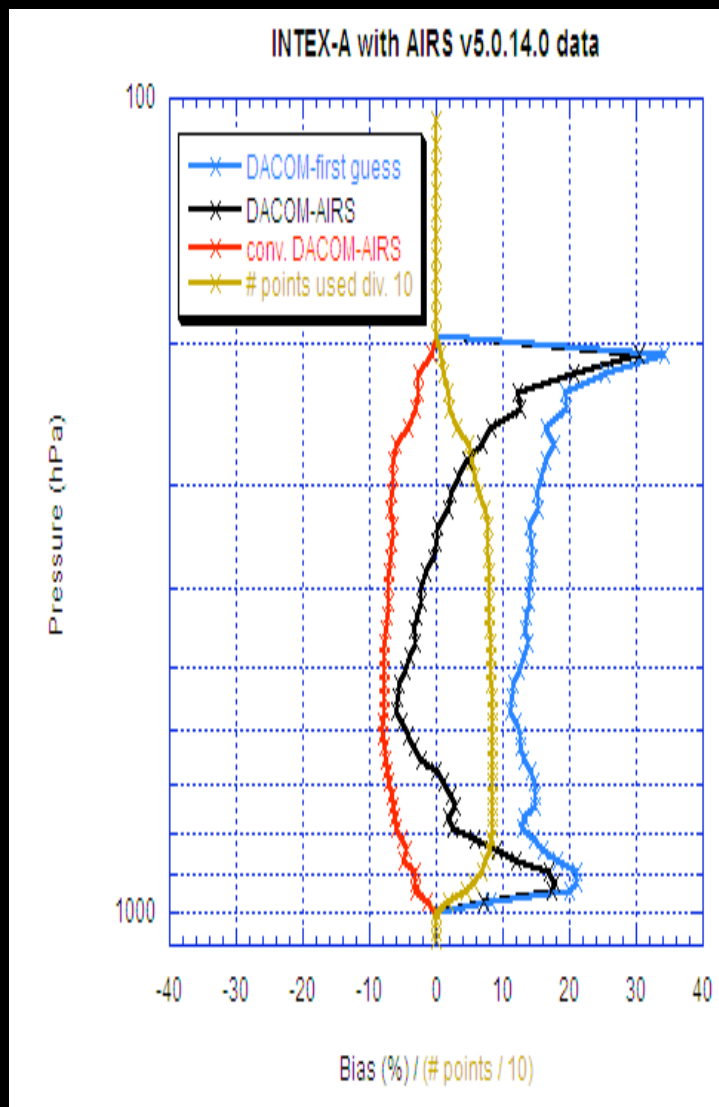
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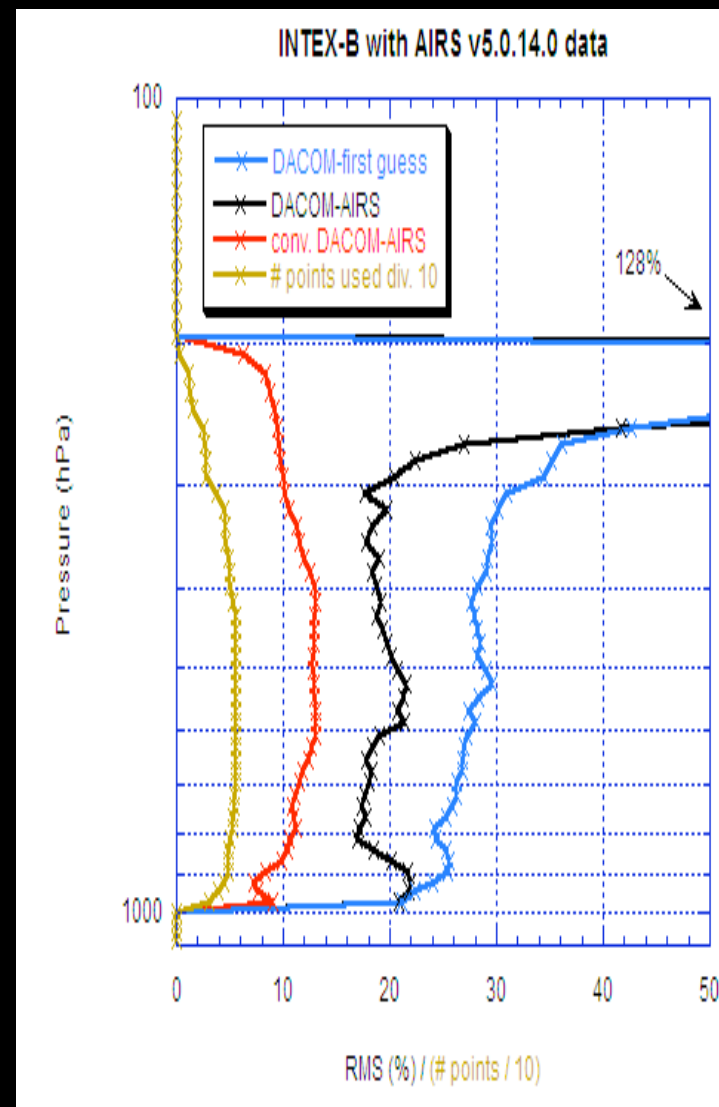
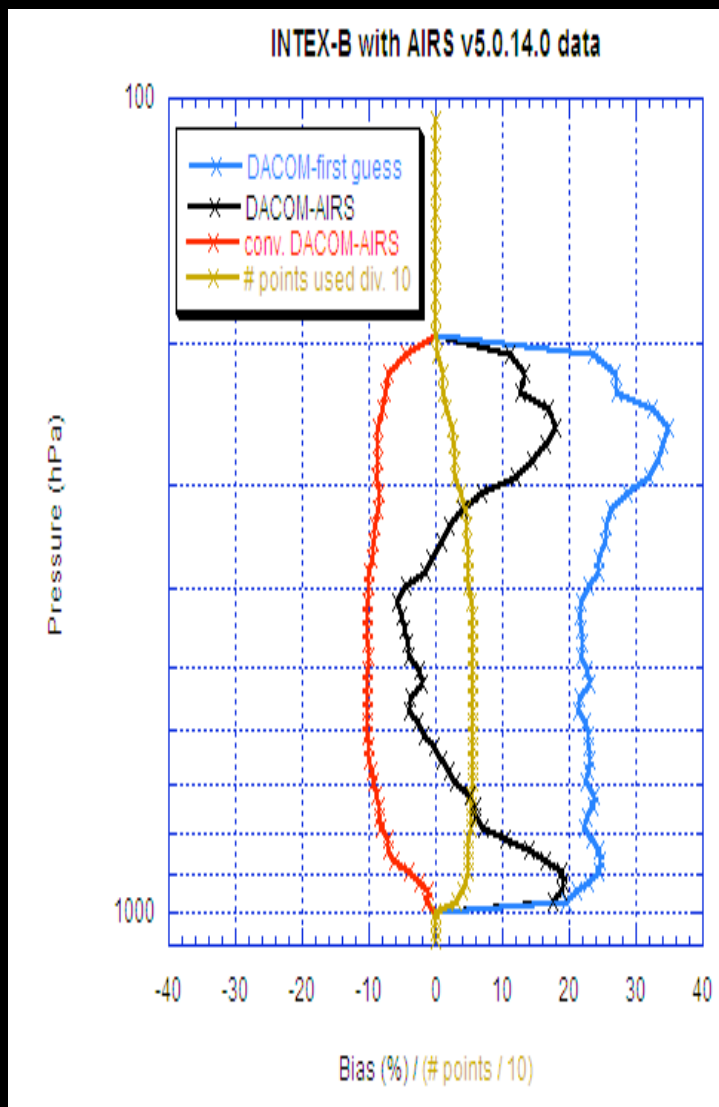
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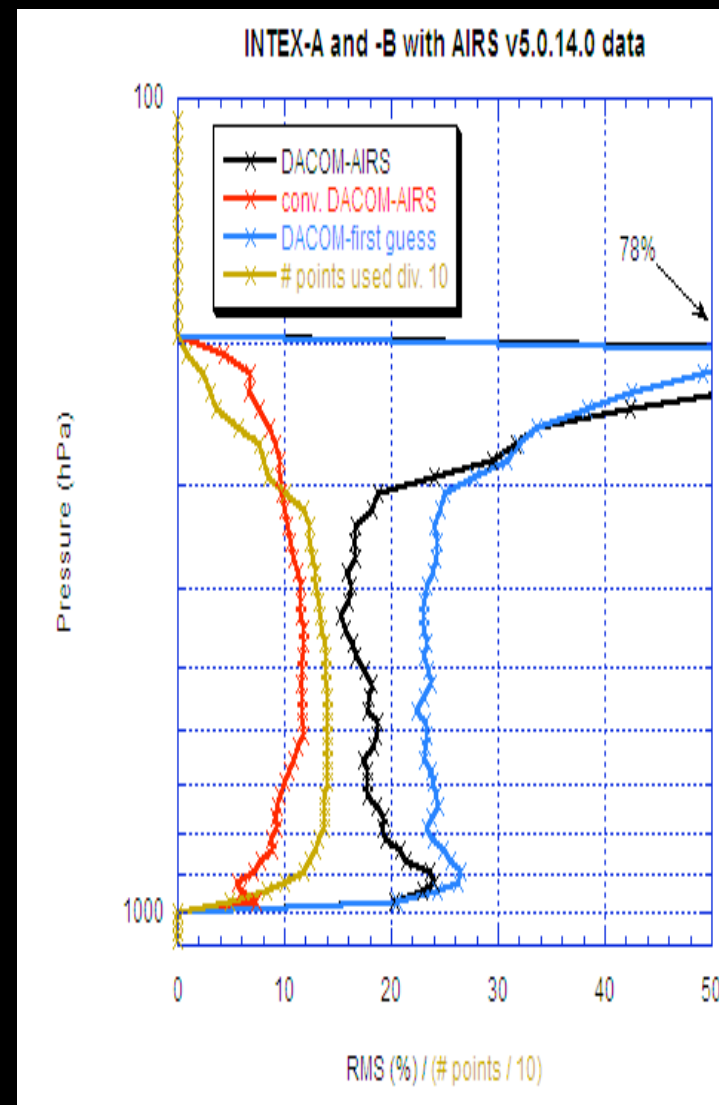
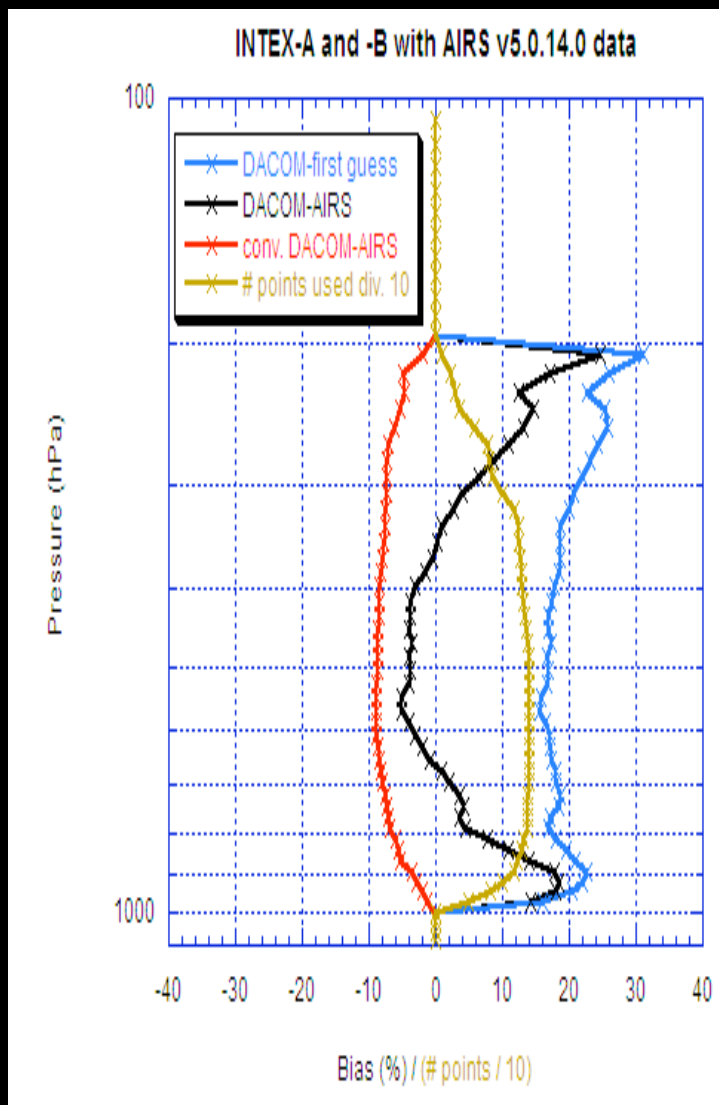
INTEX-A: AIRS vs. DC-8 in situ



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



INTEX: AIRS vs. DC-8 in situ





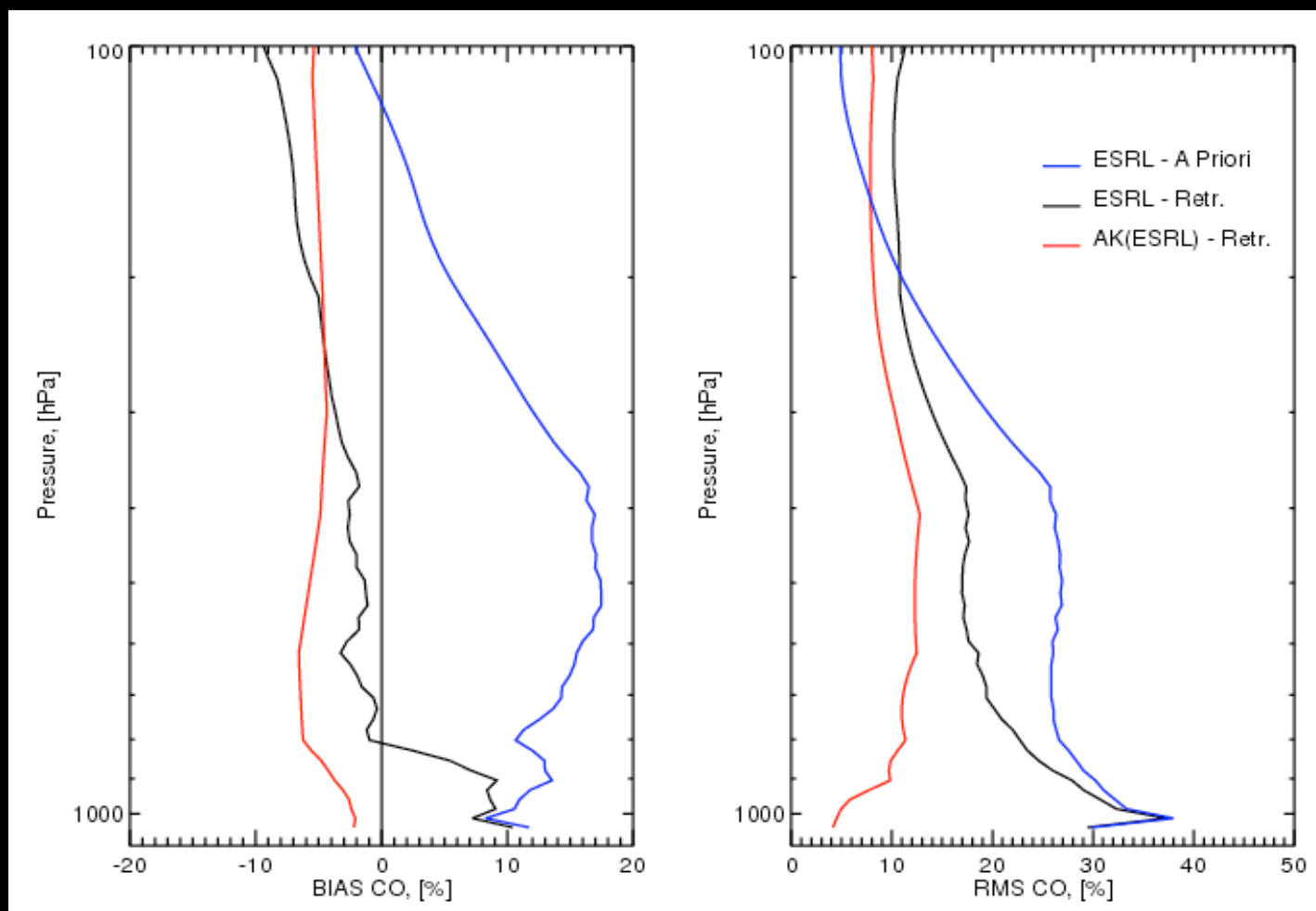
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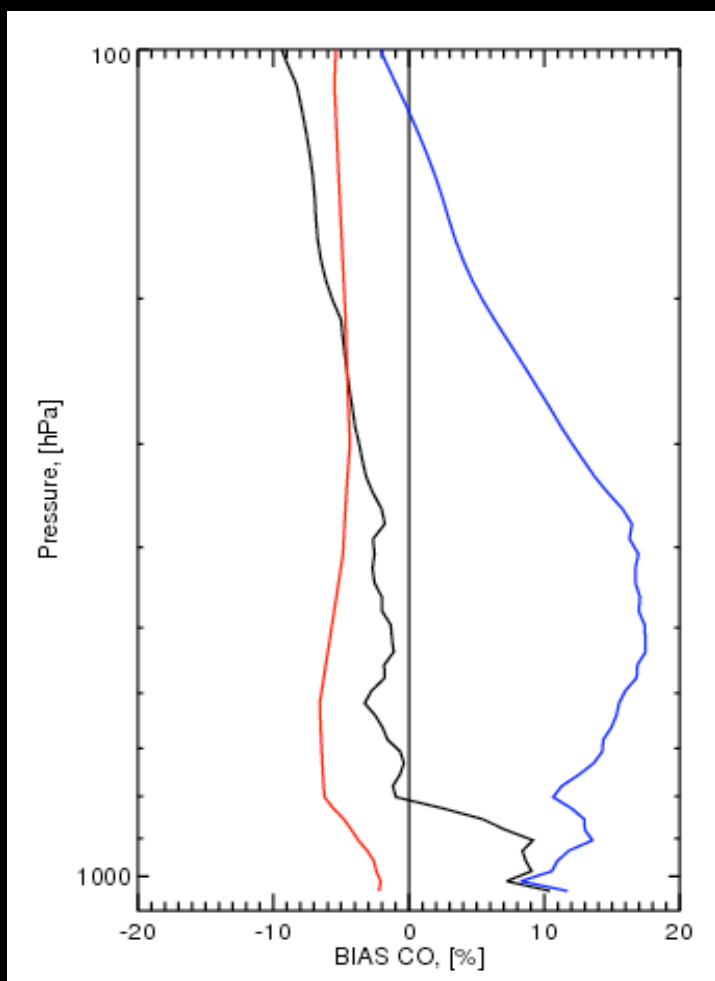
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AIRS vs. NOAA ESRL in situ

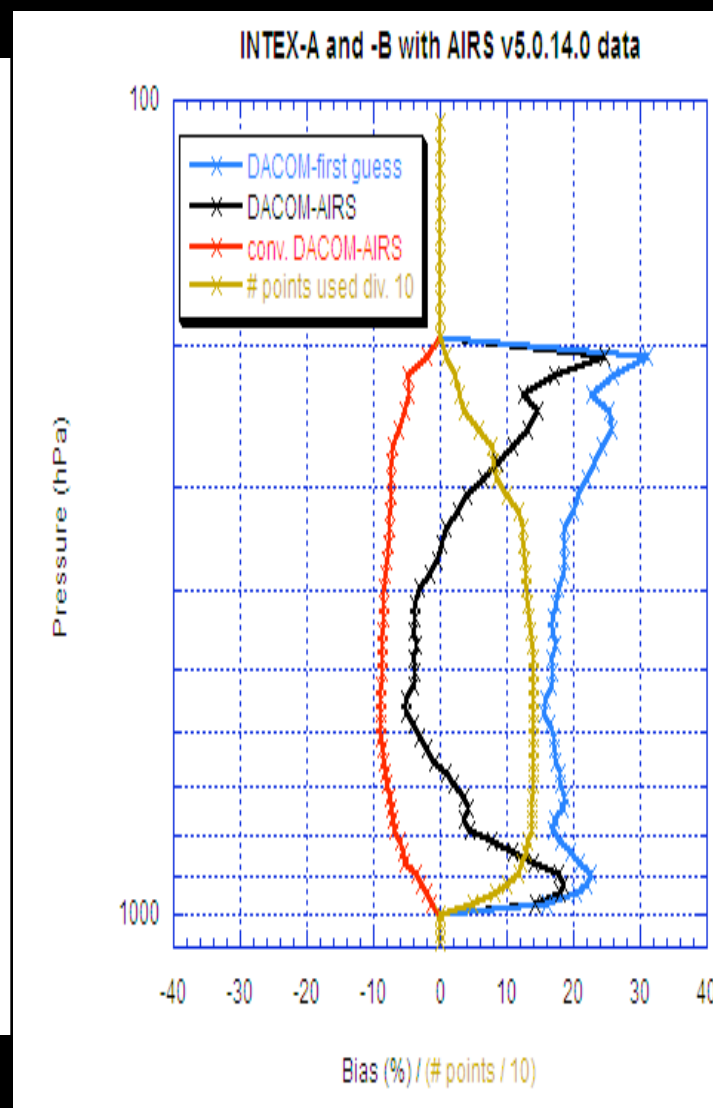


Eric Maddy (380 profiles, 24 sites 1/1/05-1/1/06)

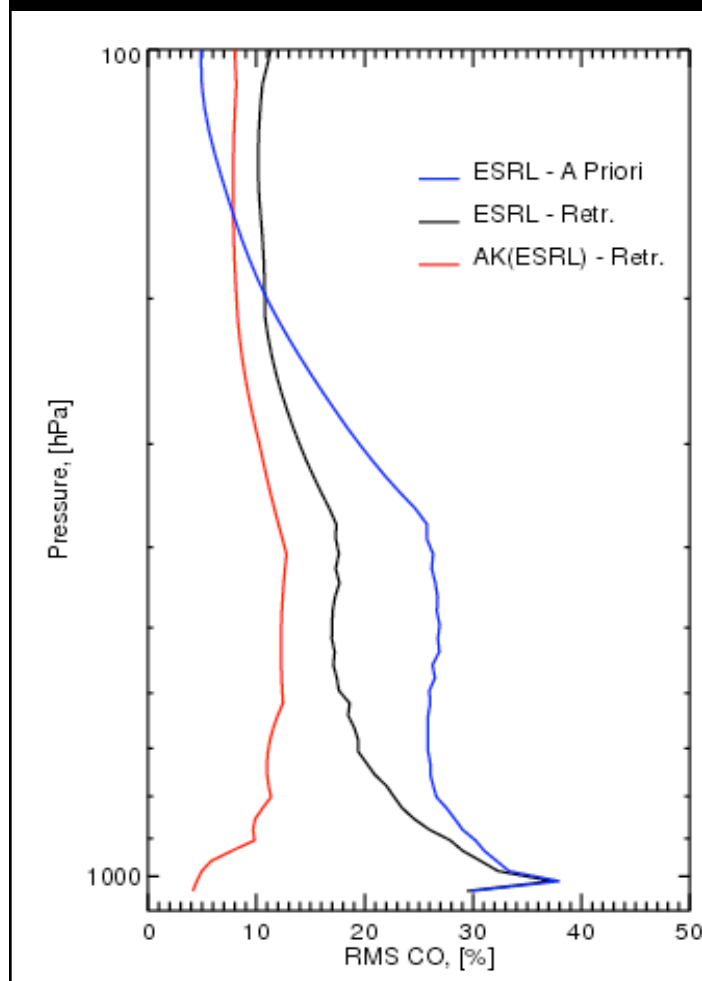
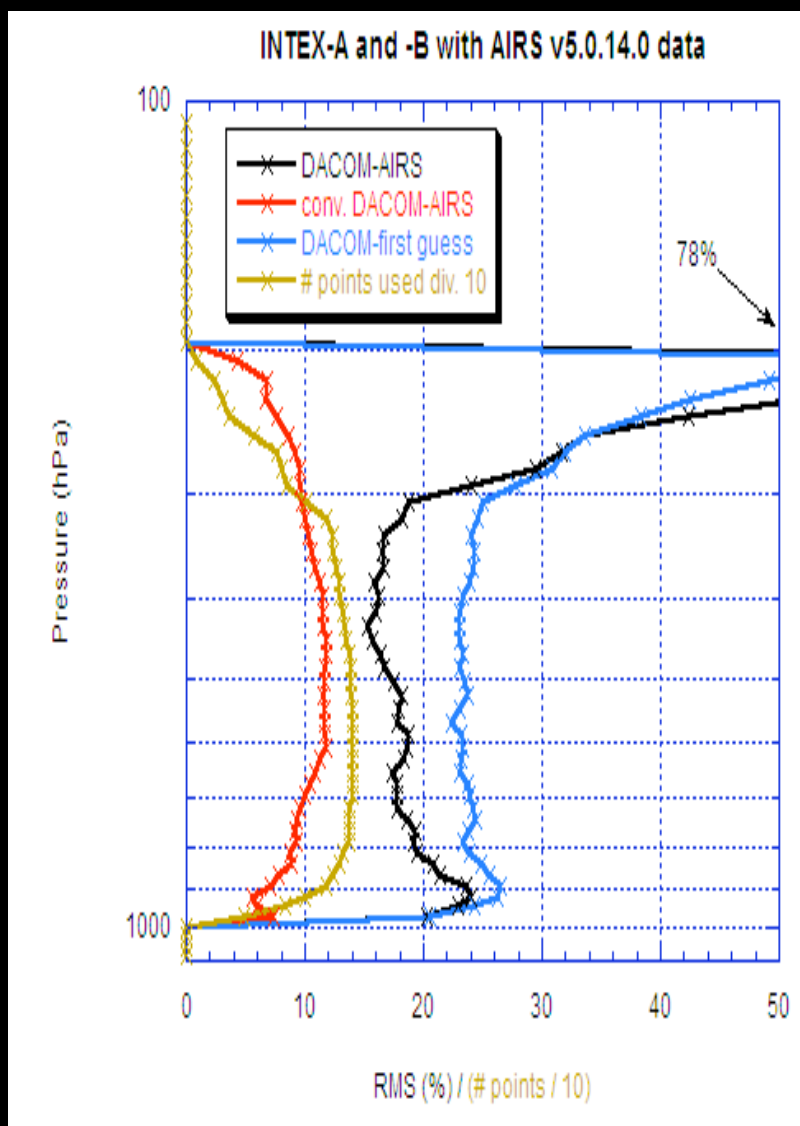
AIRS vs. NOAA & INTEX



Eric Maddy



AIRS vs. NOAA & INTEX



Eric Maddy



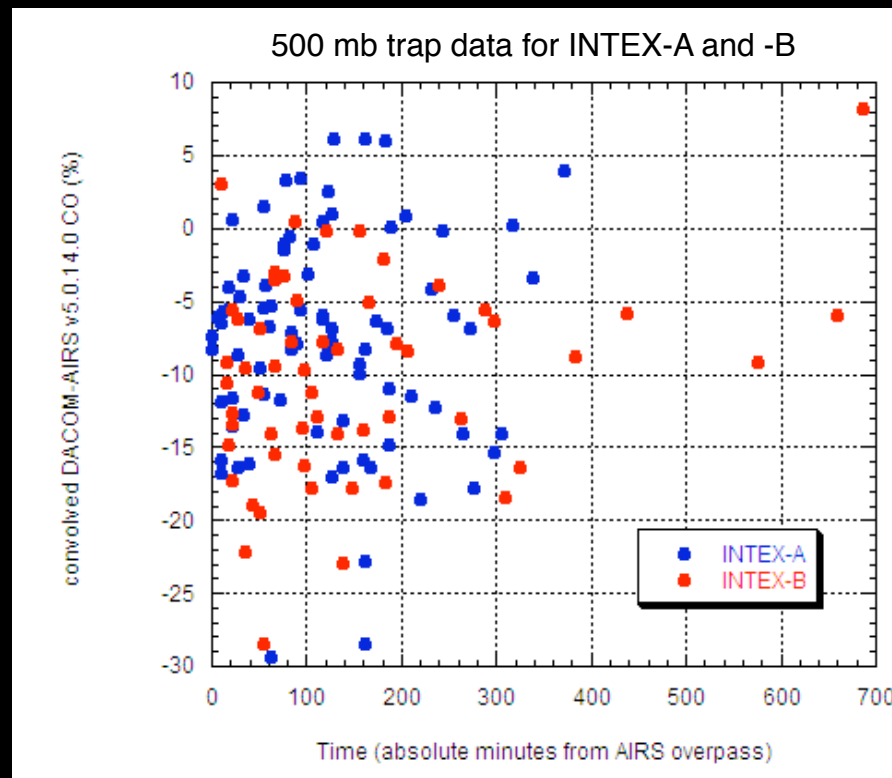
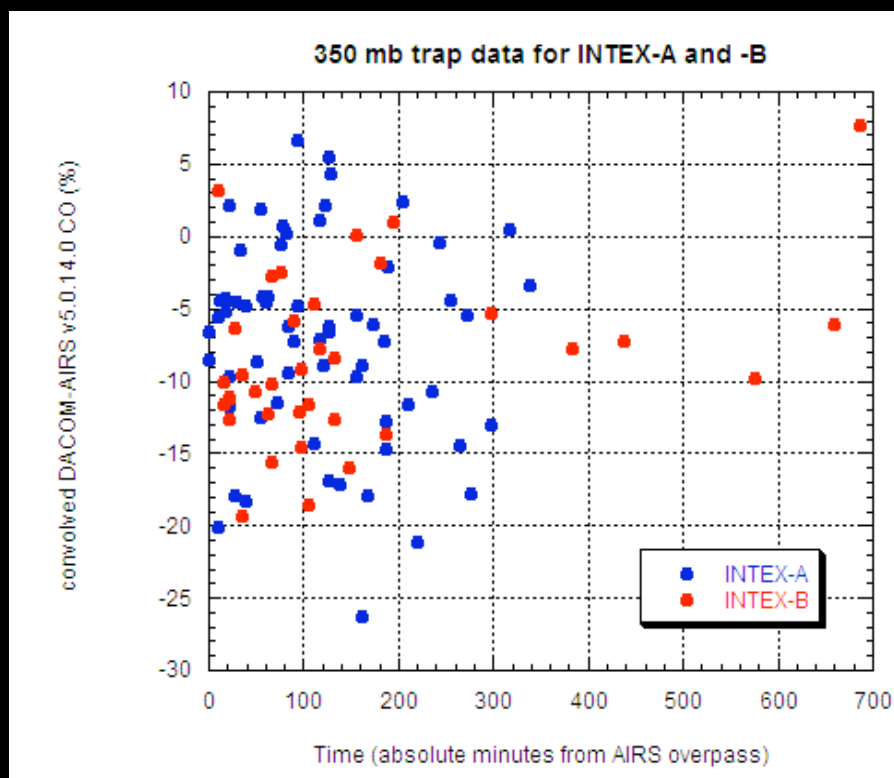
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INTEX: AIRS vs. DC-8 in situ

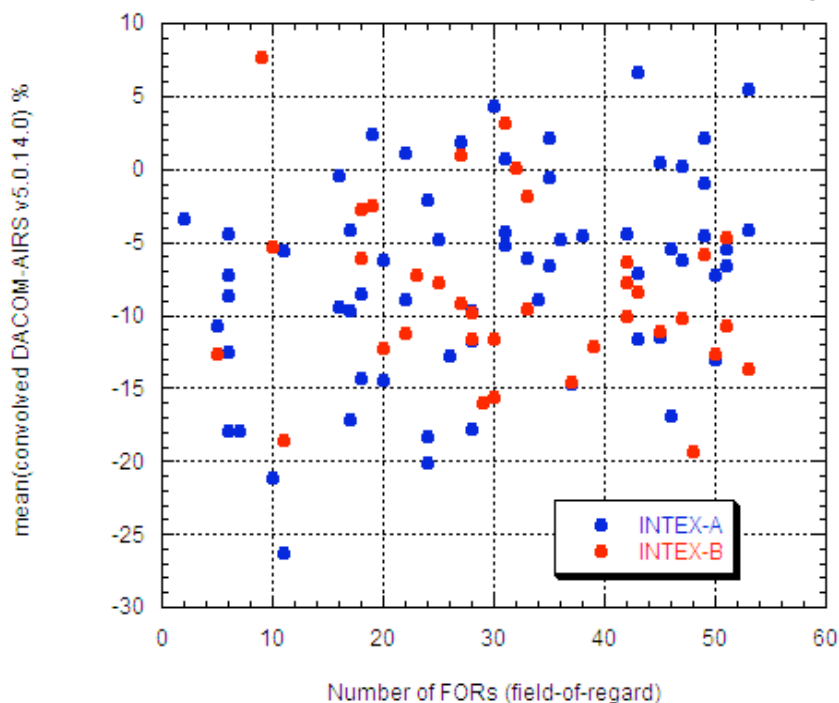
No correlation with time difference



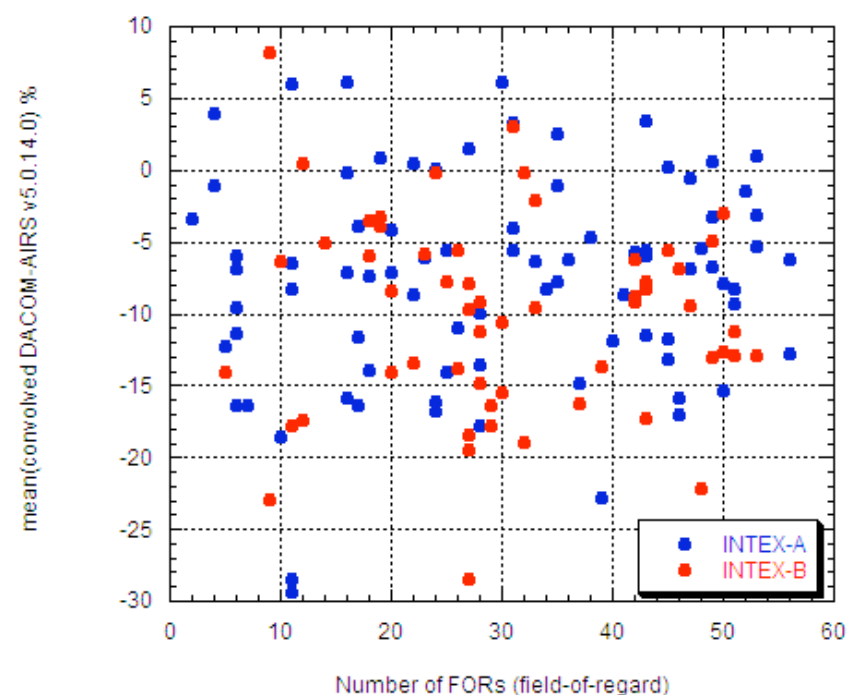
INTEX: AIRS vs. DC-8 in situ

No correlation with # FOR

Mean differences for INTEX-A and -B for 350 mb trap.

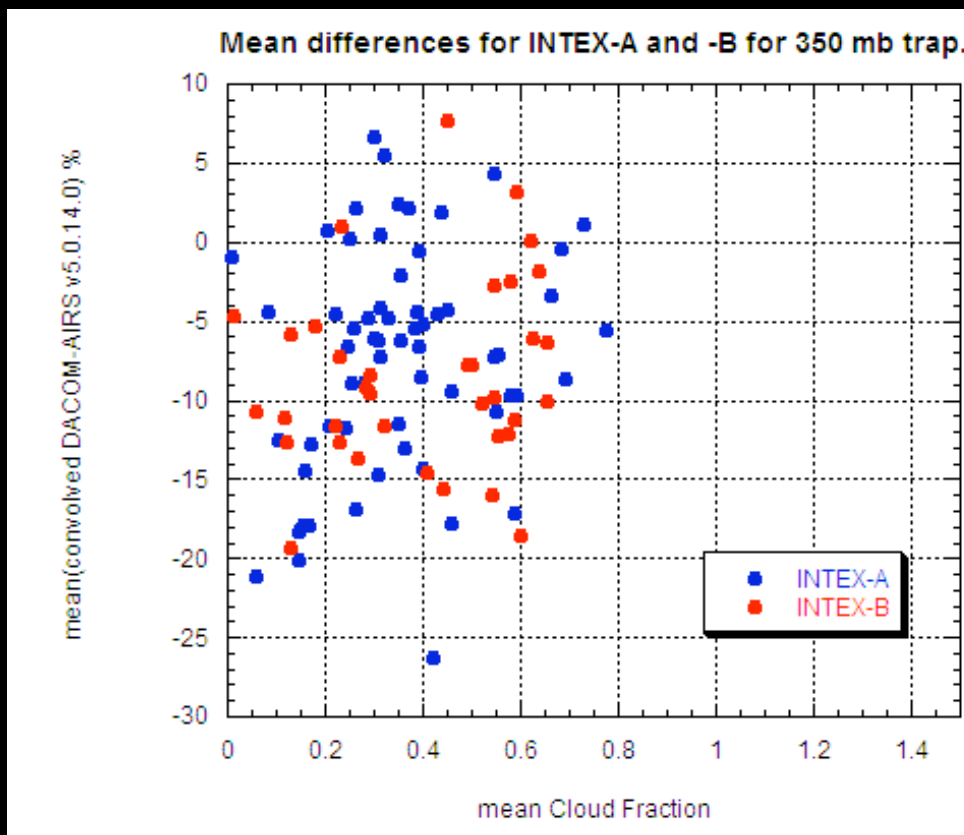


Mean differences for INTEX-A and -B for 500 mb trap.



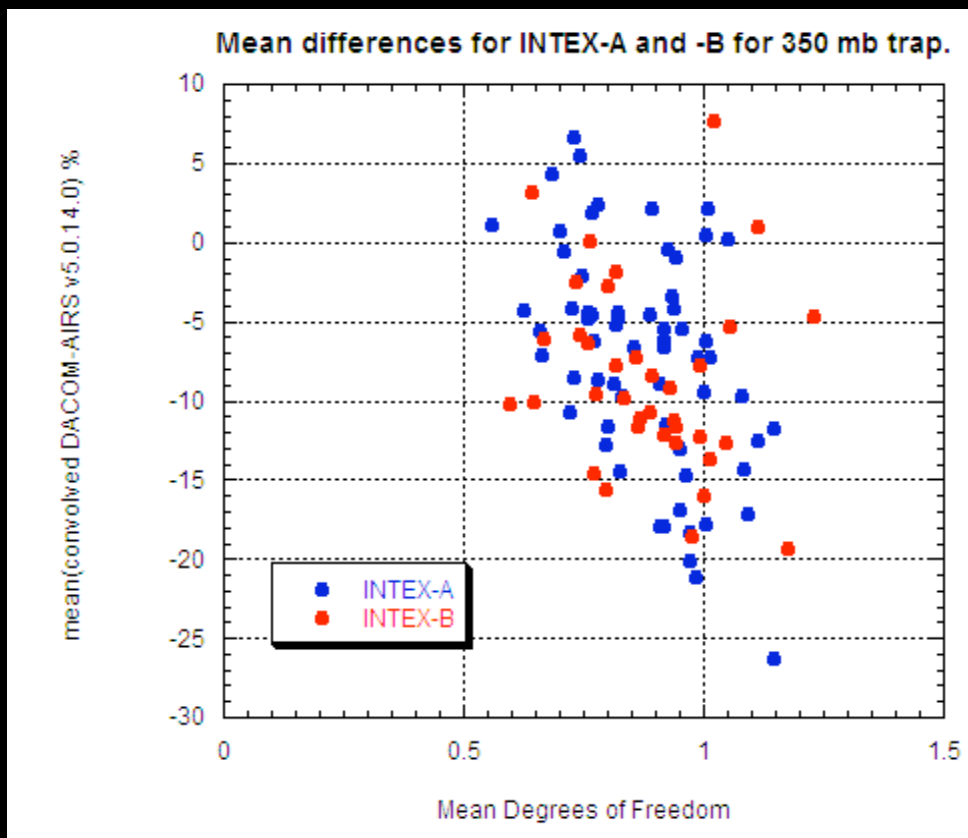
INTEX: AIRS vs. DC-8 in situ

No correlation with cloud fraction



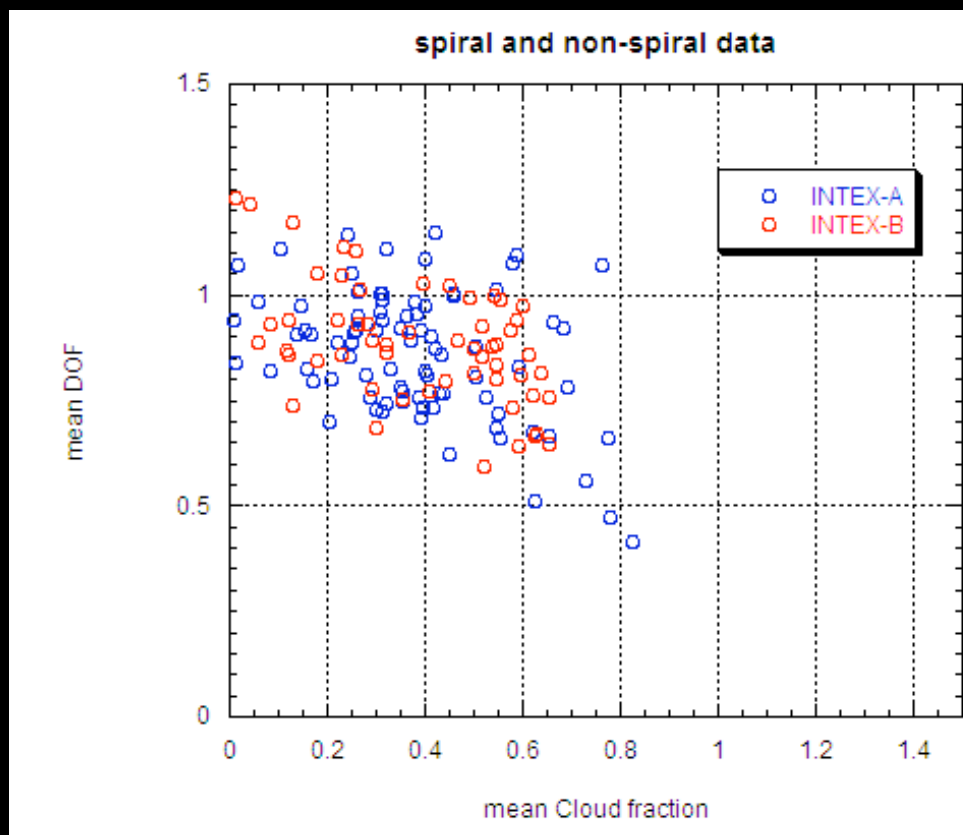
INTEX: AIRS vs. DC-8 in situ

Weak anti-correlation with DOF





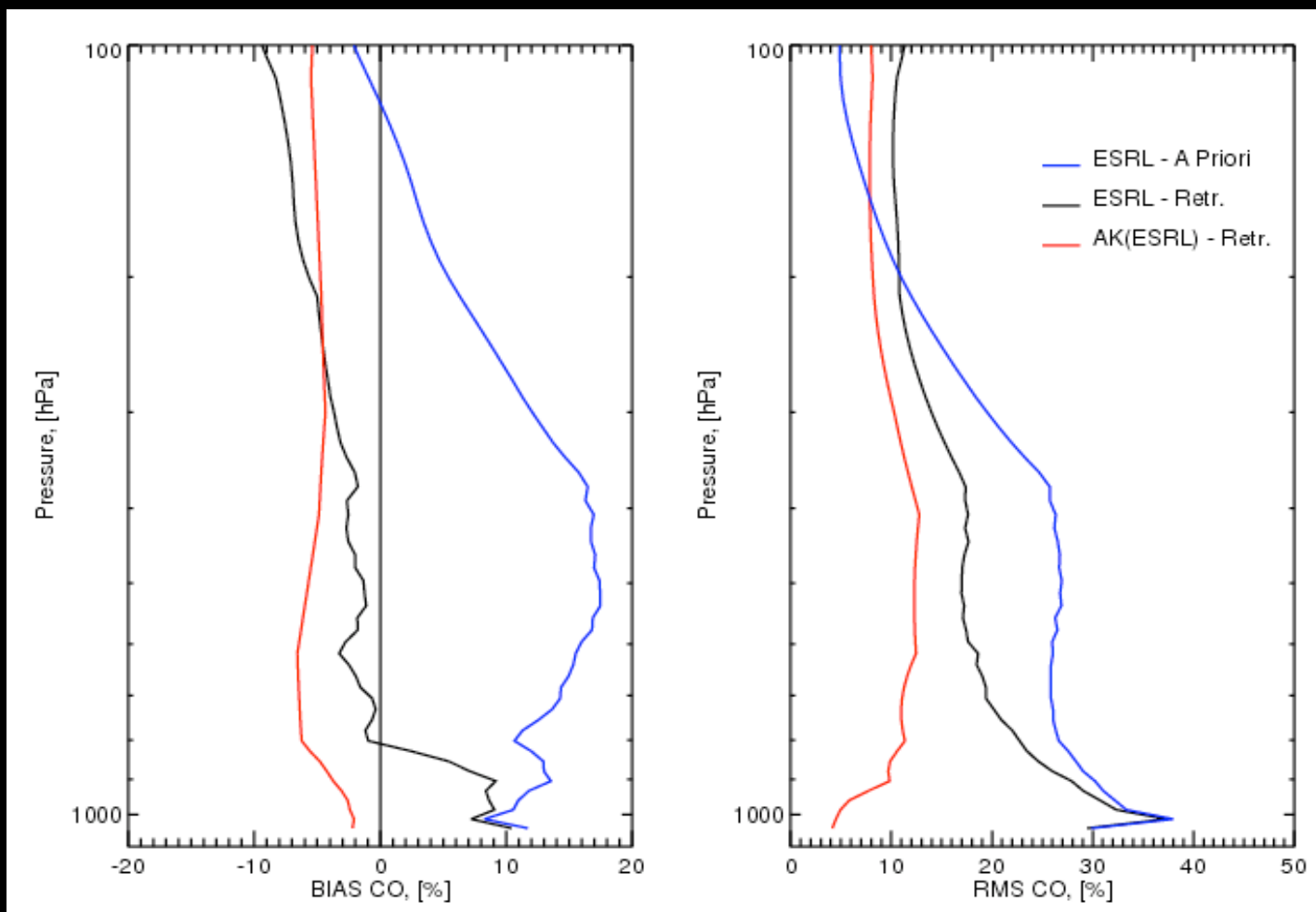
INTEX: AIRS vs. DC-8 in situ DOF correlation with cloud fraction





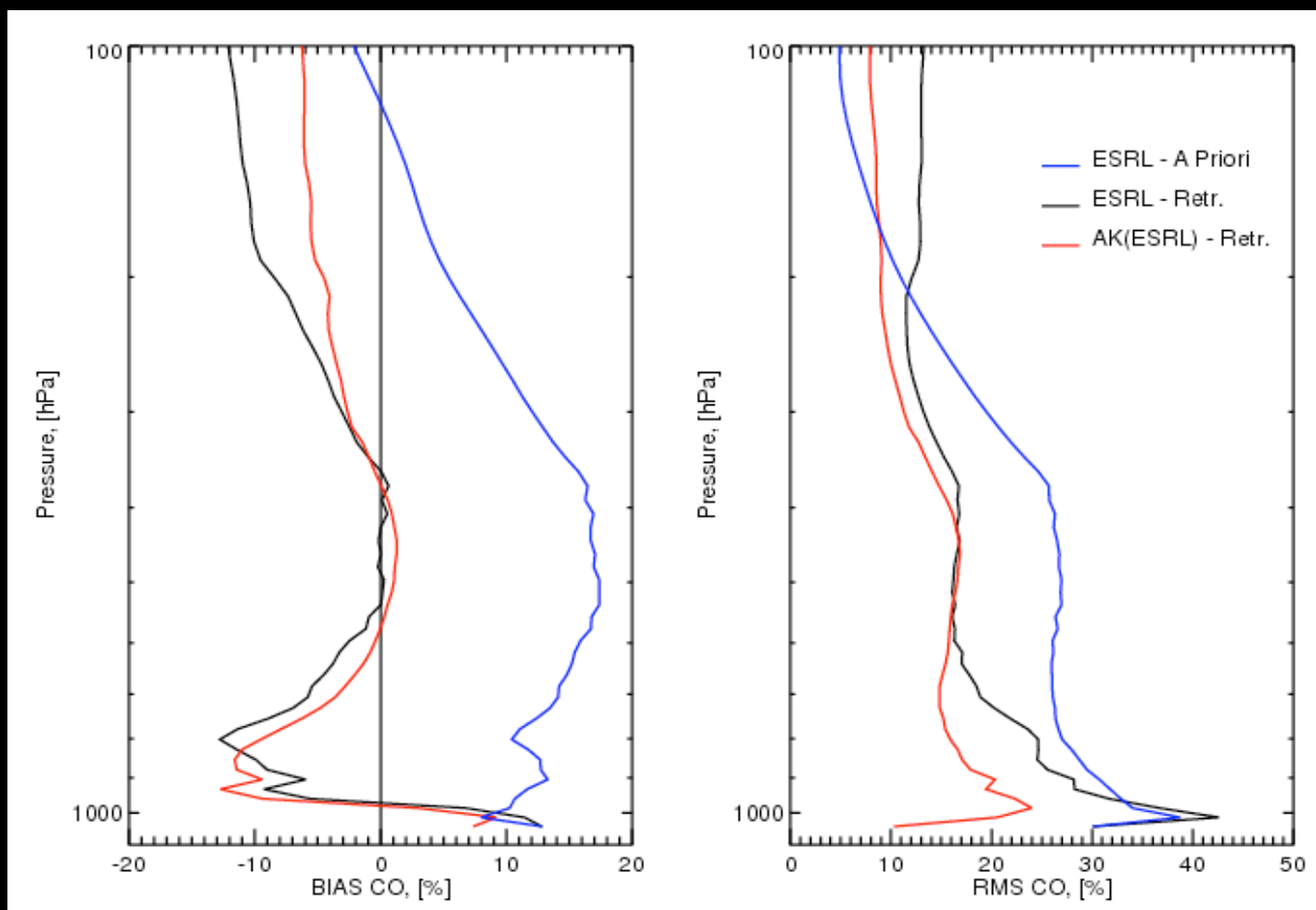
NEXT STEPS

- 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**



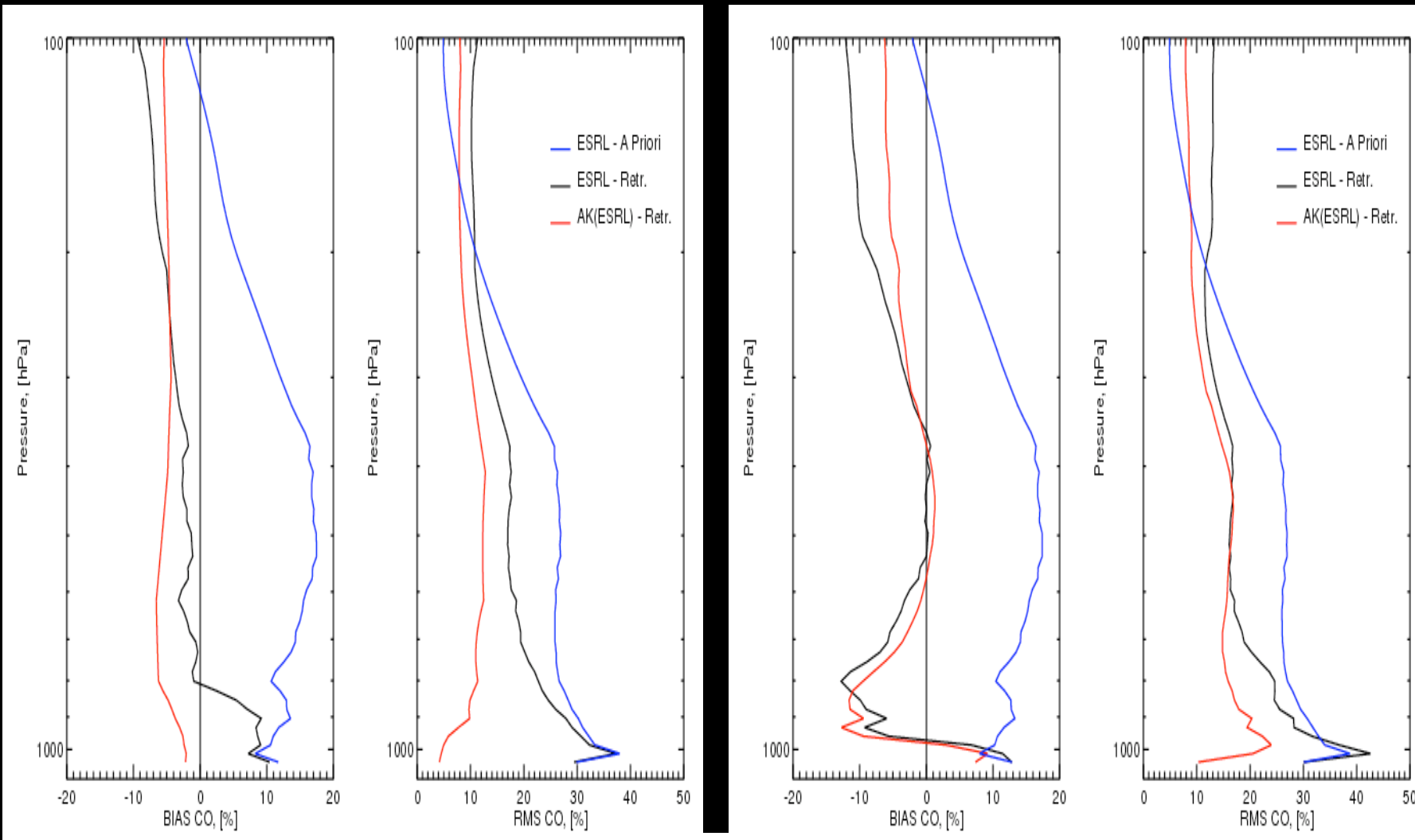
Eric Maddy (380 profiles, 24 sites 1/1/05-1/1/06)

Optimal Estimation



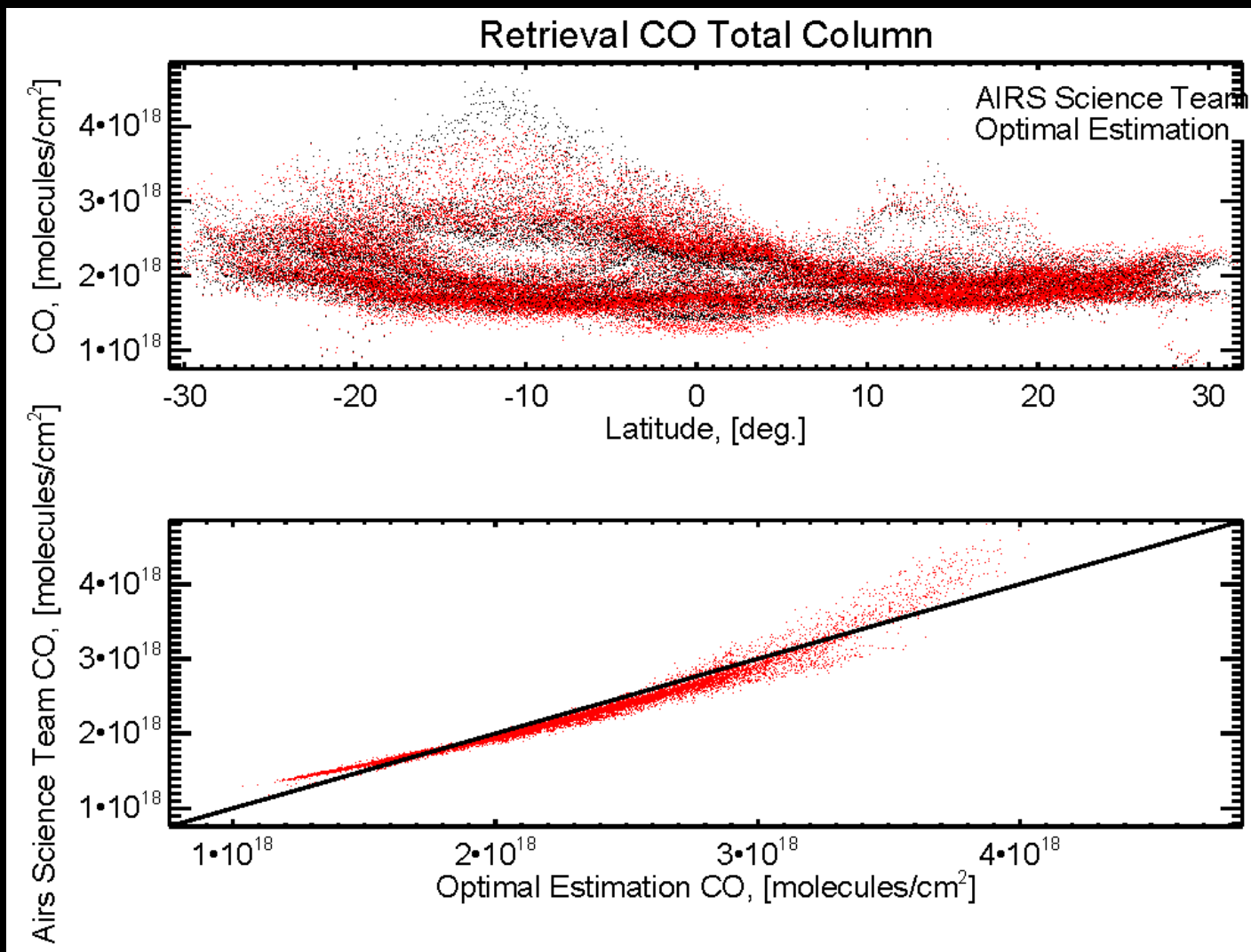
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v5.0.14.0 vs. O-E



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v5.0.14.0 vs. O-E



Eric Maddy



AIRS CO Science



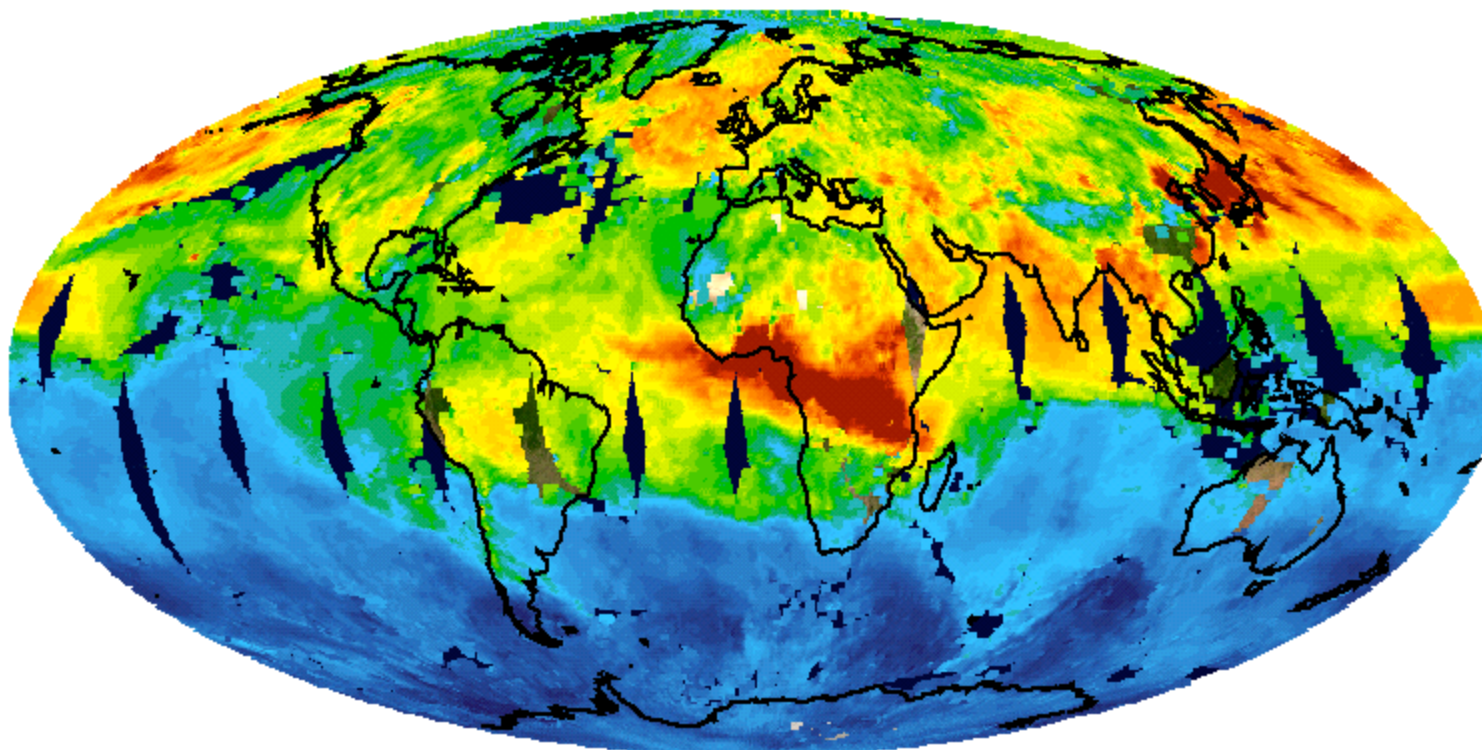
- Mexico City pollution plume (MILAGRO)
- Transport impacts on Houston pollution from TexAQS2006 (A-Train)
- Interannual variations in CO emissions
 - Boreal forest fires (Siberia, Alaska, Canada)
 - South American fires
 - Indonesian fires (ENSO link)
- Pyrocumulonimbus events (A-Train)
- 3-D structure 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



AIRS DAILY CO AT 500 mb (ppbv) 20070101



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

AIRS Science Team Meeting

mcmillan@umbc.edu 10/14/08