HIRDLS Ozone Validation Update

Bruno Nardi, Doug Kinnison, Cora Randall, Lynn Harvey, Thierry Leblanc, John Gille, John Barnett, Charles Cavanaugh, Mike Coffey, Jim Craft, Cheryl Craig, Vince Dean, Tom Eden, Gene Francis, Chris Halvorson, Jim Hannigan, Linda Henderson, Chris Hepplewhite, Brian Kerridge, Rashid Khosravi, Charlie Krinsky , Alyn Lambert, Hyunah Lee, Steve Massie, Joe McInerney, Jolyon Reburn, Brendan Torpy, Barb tunison, Alison Waterfall, Claire Waymark, Greg Young

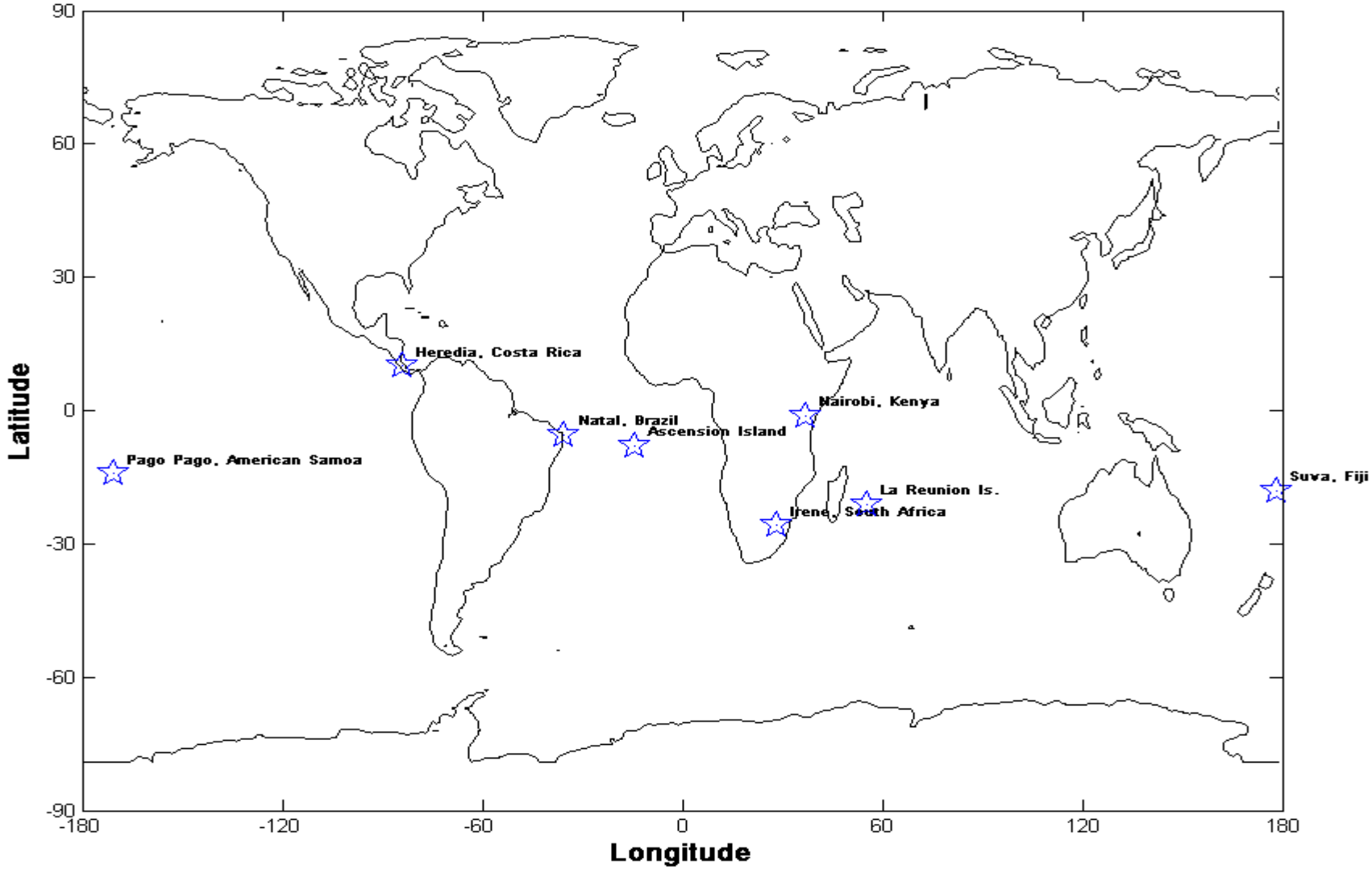
AURA Science Meeting, Boulder, 2006-Sept-11-15

OUTLINE

OZONE Comparisons

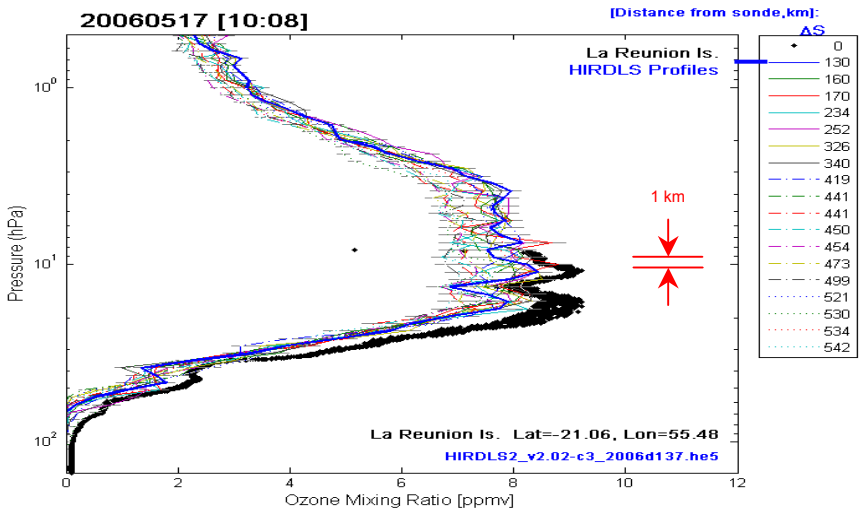
- Ozonesondes
- Lidar
- Large Balloon, Ft. Sumner Fall 2005
- ACE/FTS comparisons
- MLS comparisons
- NOAA16&17/SBUV & MLS zonal comparisons
- Lower stratosphere ozone

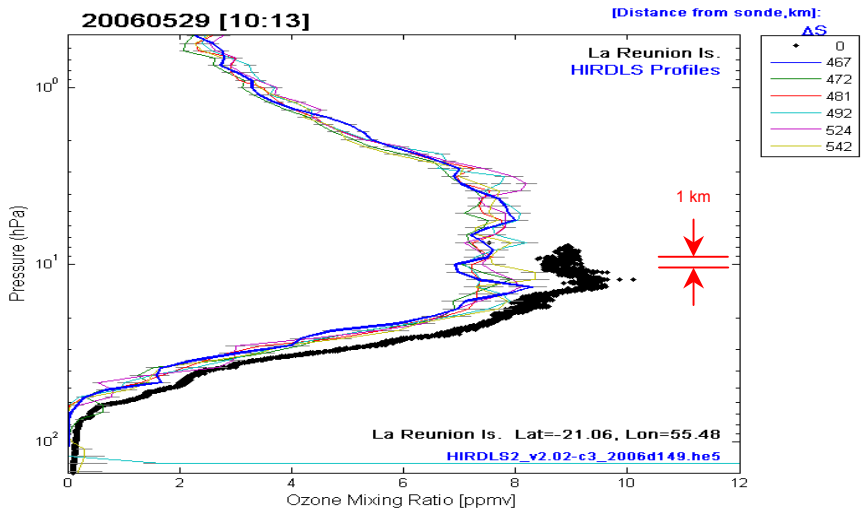
Selected Ozonesonde Station Locations

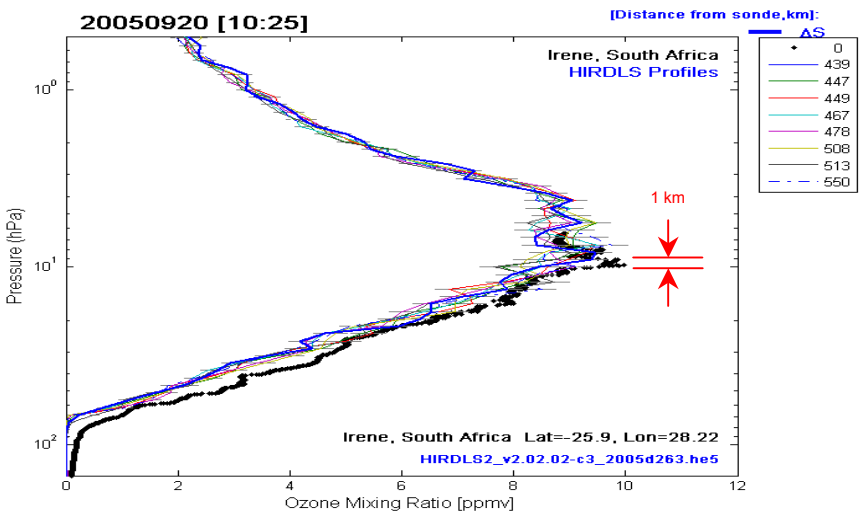


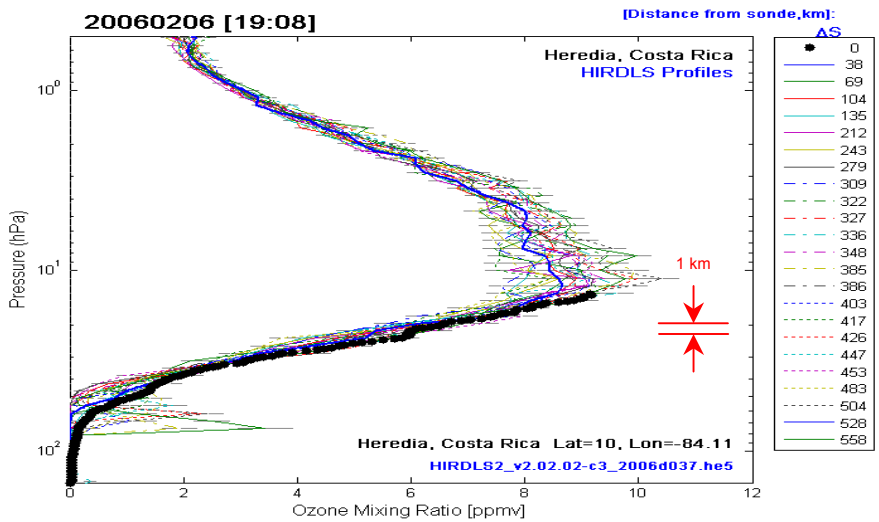
09/2006, v2.02.02

Ozonesondes



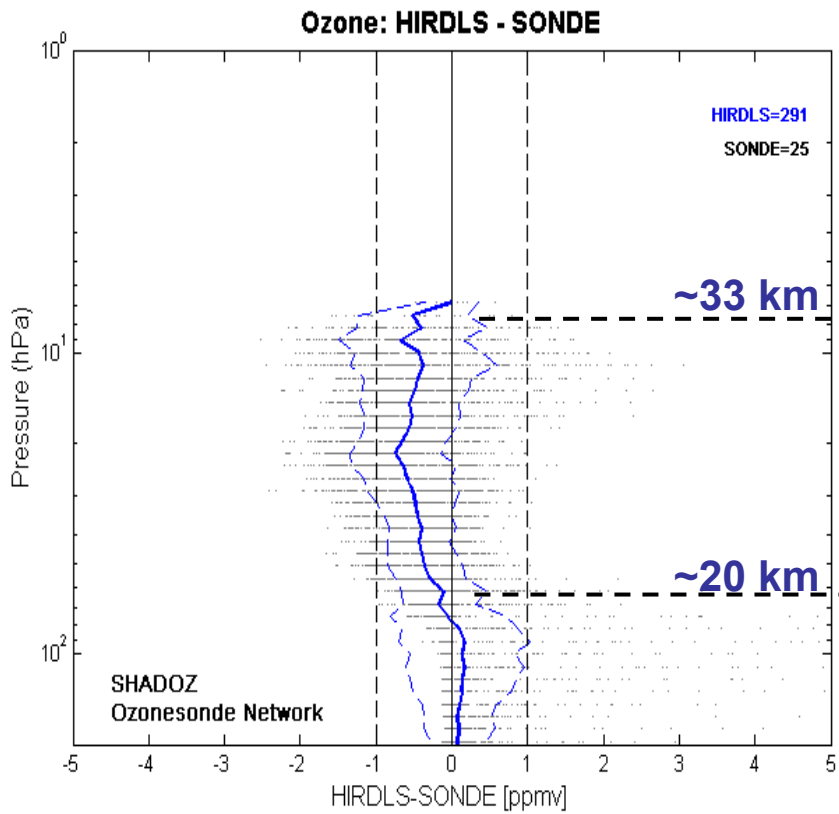


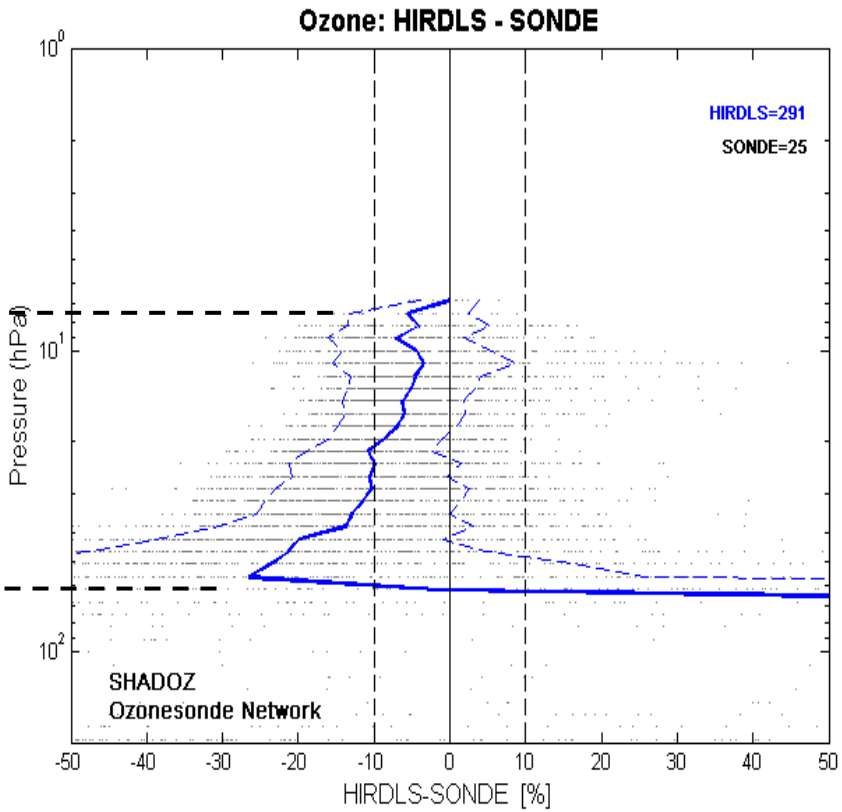




09/2006, v2.02.02

Ozonesonde Comparisons with HIRDLS
Statistical Summary: Average Differences



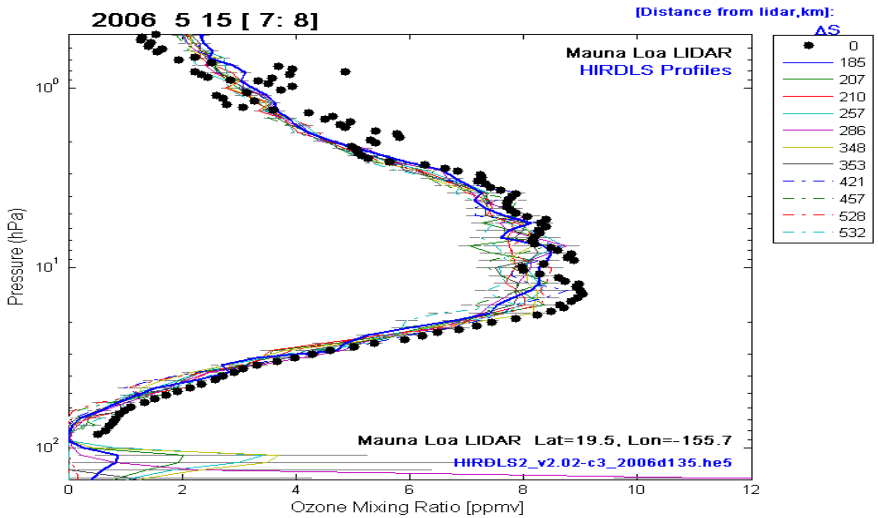


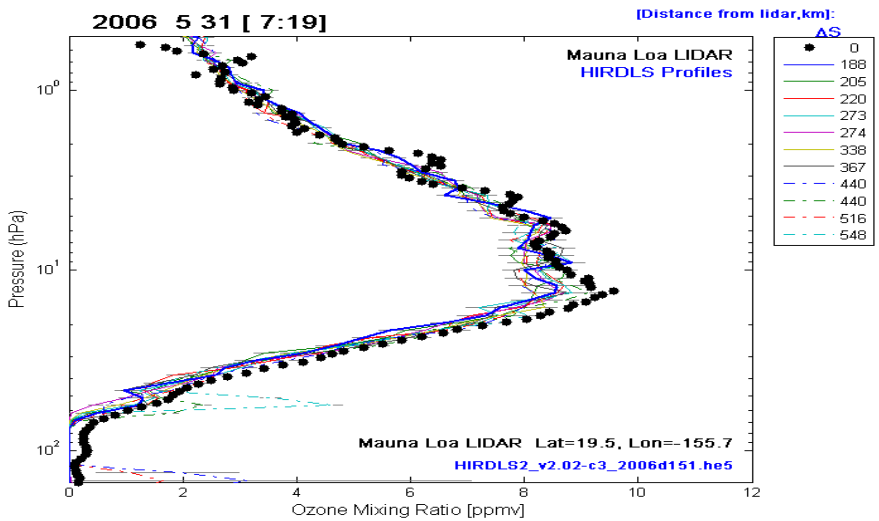
Mean Difference
1σ of Differences
Individual Differences

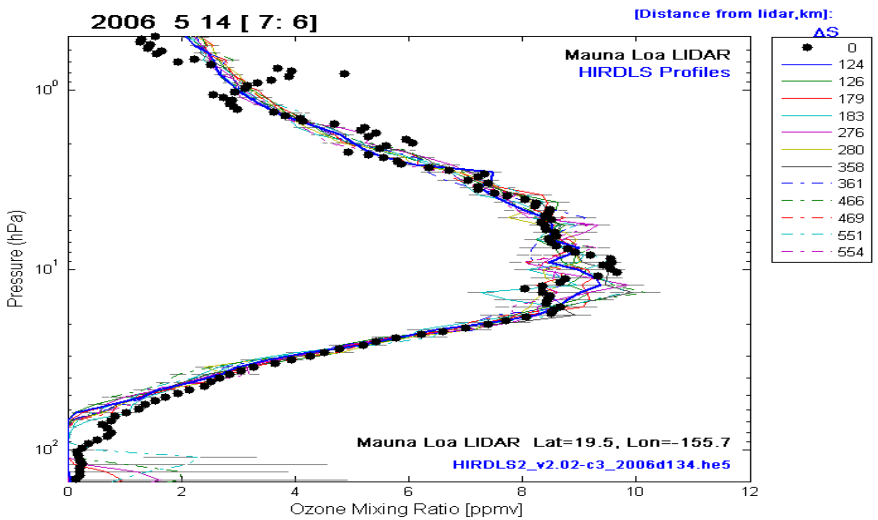
OZONE DIAL lidar

09/2006, v2.02
Data: May 2006

Mauna Loa Observatory, Hawaii
19.54°N, 155.58°W, 3459m
Stuart McDermid, T. Leblanc, JPL

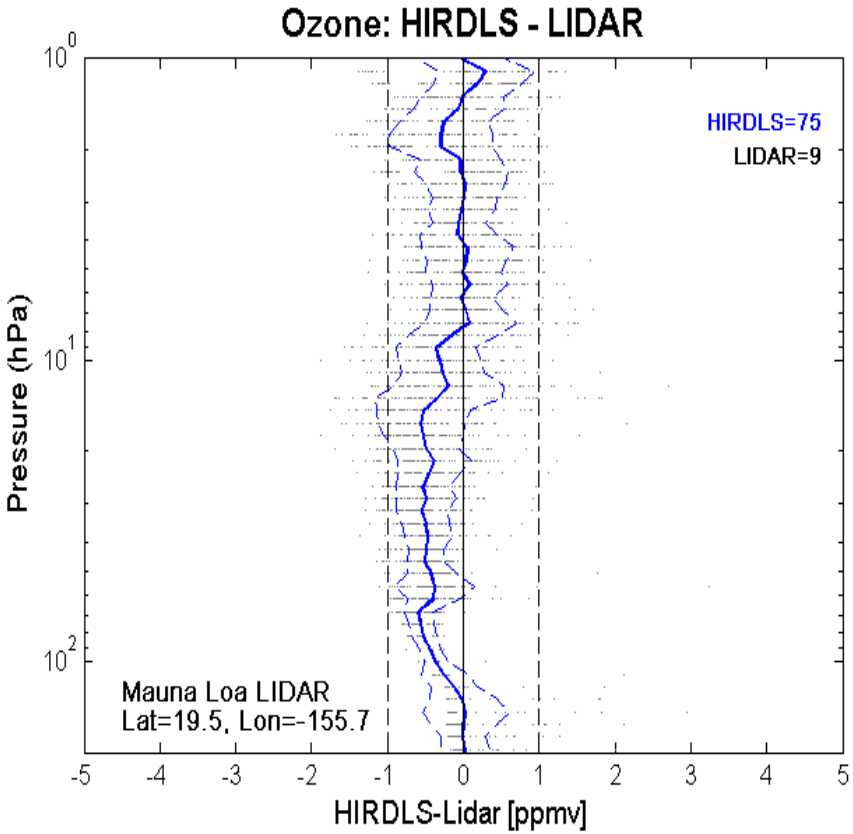


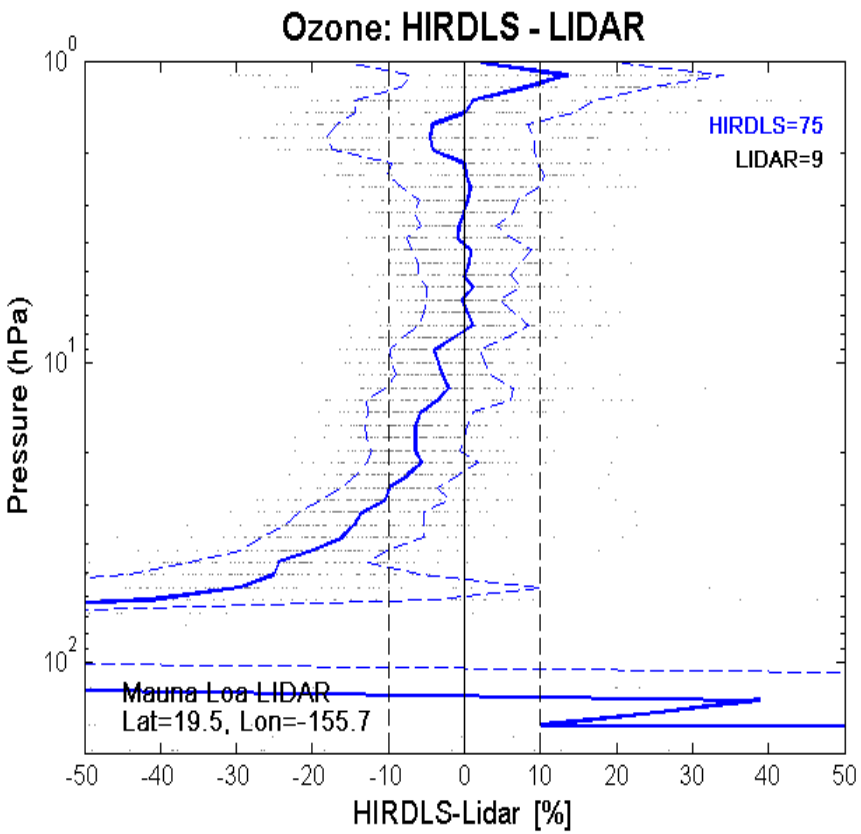




Ozone LIDAR Comparisons with HIRDLS
Statistical Summary: Average Differences

09/2006, v2.02
Data: May 2006

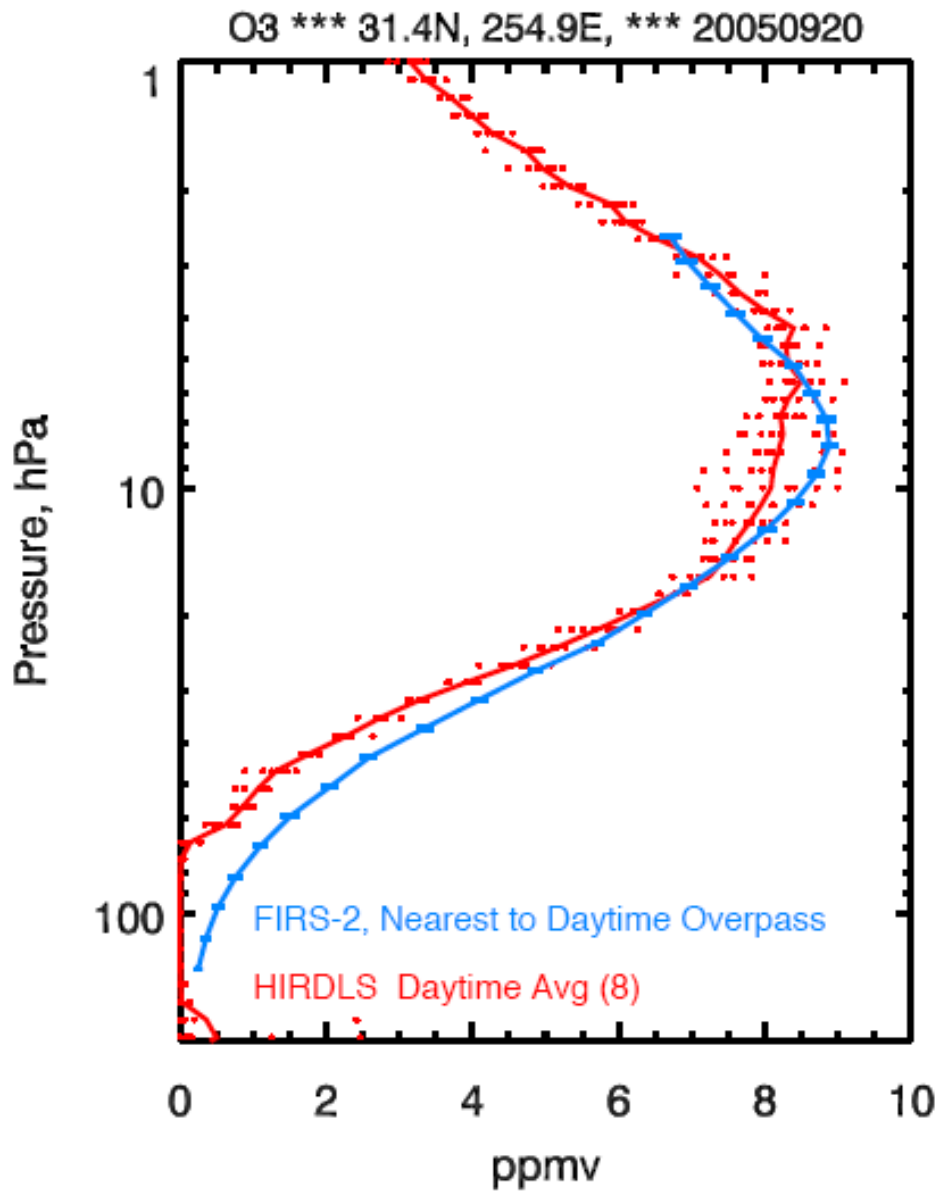




Mean Difference
1σ of Differences
Individual Differences

Large Balloon Campaign, Ft. Sumner, Fall 2005

HIRDLS vs FIRS-2



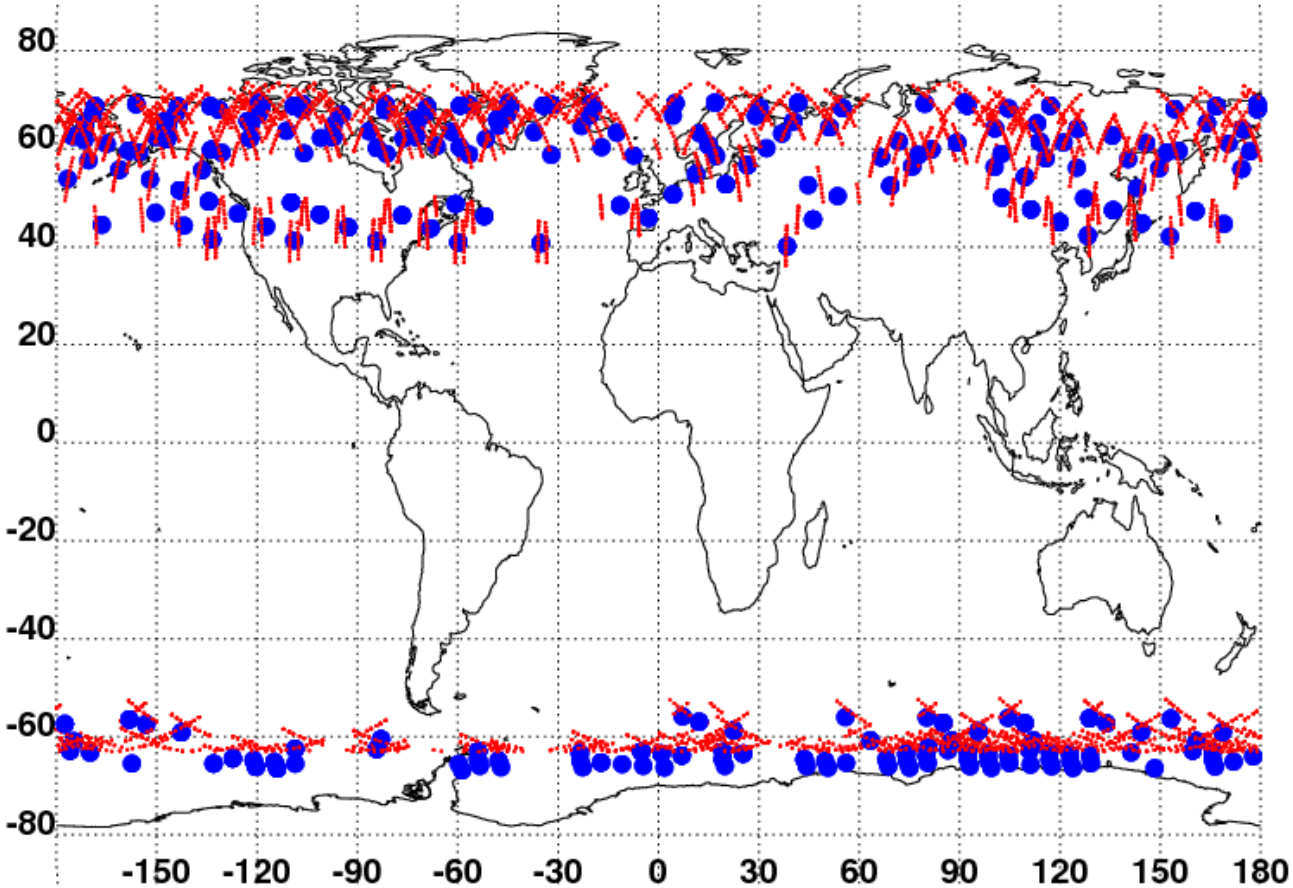
- September 20, 2005
  - 31.4 N latitude
  - 255 E longitude.
- Coincidence is within 5° longitude and 2° latitude.
- 8 HIRDLS profiles
- Daytime overpasses for HIRDLS
- Preliminary FIRS-2 data (Ken Jucks).

D. Kinnison

Coincidence Criteria: Same Day, ± 500 km.

All HIRDLS profiles coincident with a single ACE profile were averaged together before comparing.

HIRDLS/ACE(FTS) Coincidences in May 2006



Total of 325 coincidences

195 in NH
130 in SH

Avg Separation = 170 km, ranging from 7-470 km

NH ACE:
- **4-22 May Local SR**
- **25-31 May Local SS**

NH HIRDLS:
- **<u>4-22 May</u> ~5 hrs before to 20 hrs after ACE**
- **<u>25-31 May</u> 5-15 hrs before ACE**

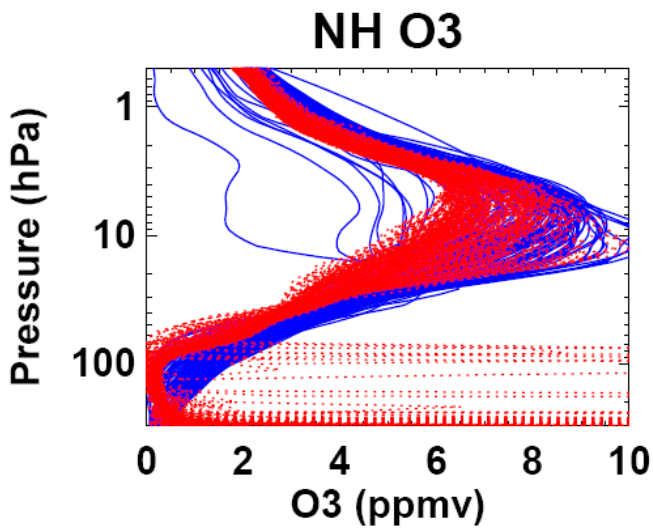
SH ACE:
- **Local SS for all coincidences**

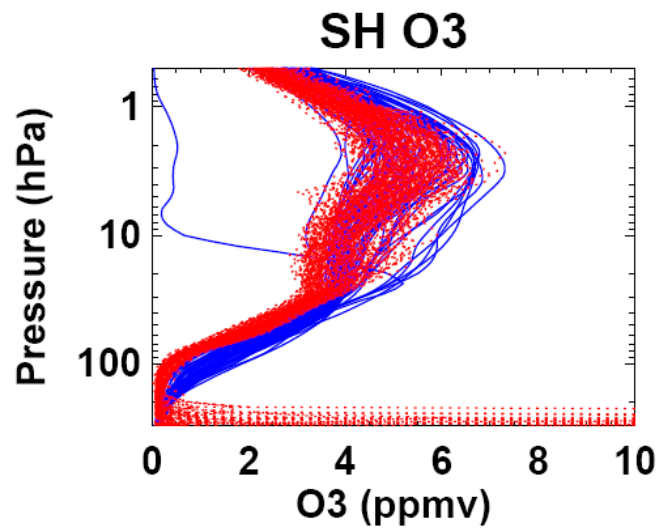
SH HIRDLS:
- **~5 hours later than ACE**

Cora Randall, ACE Team: P. Bernath, C. Boone, S. Mcloed

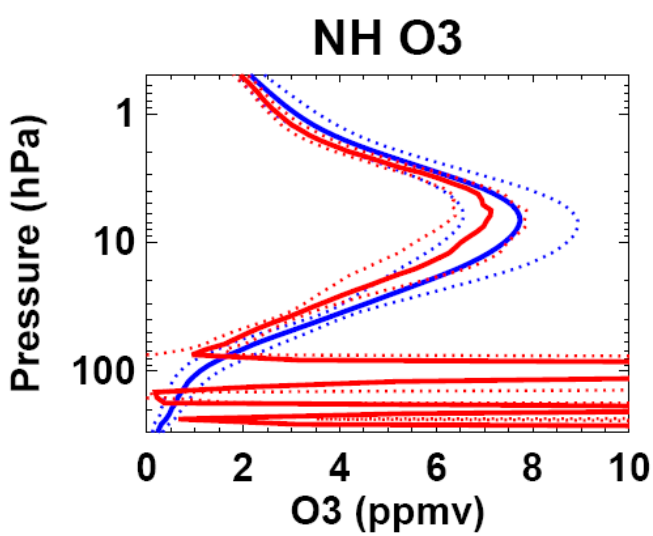
HIRDLS & ACE/FTS Ozone Profiles

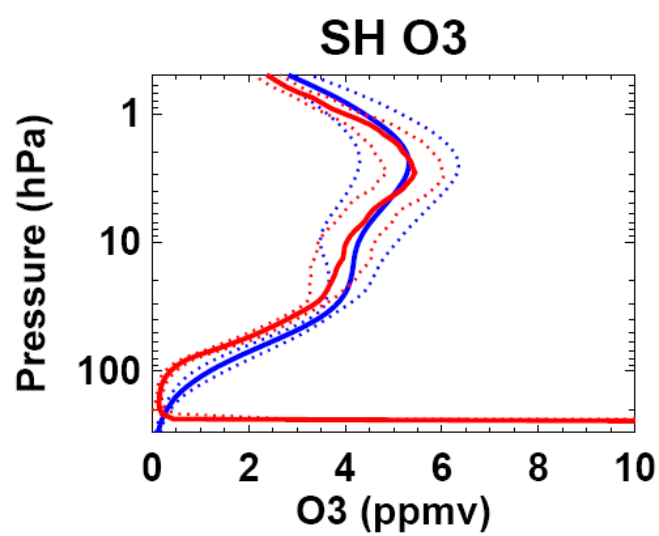
09/2006, v2.02
Data: May 2006





All Coincidences



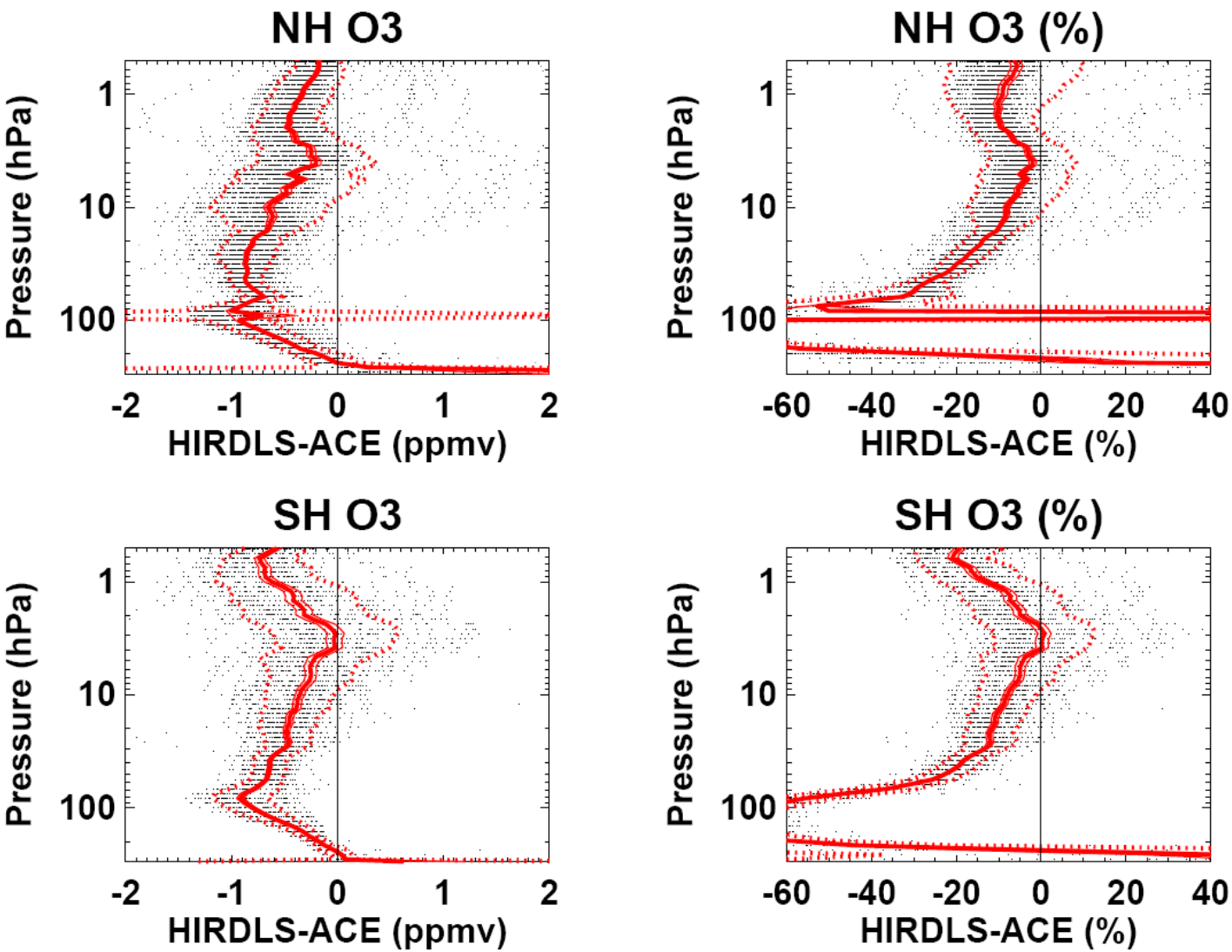


Average (solid) & 1-σ standard deviation (dotted)

Cora Randall, ACE Team: P. Bernath, C. Boone, S. Mcloed

HIRDLS-ACE/FTS Ozone Differences

09/2006, v2.02
Data: May 2006



Thick red:
Average

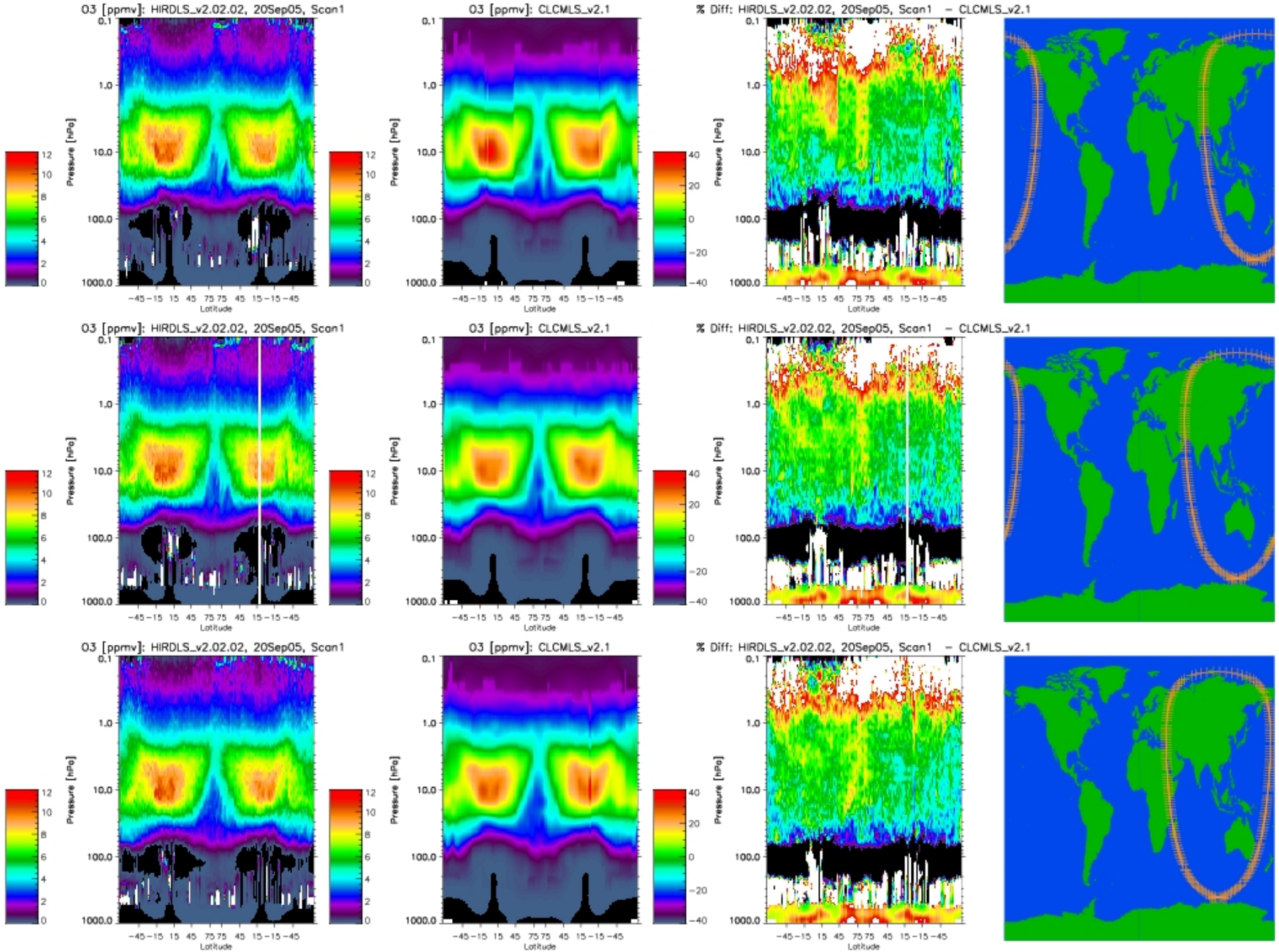
Dotted red:
1-σ distribution

Thin red:
1-σ uncertainty (often hidden)

Black points:
Individual differences

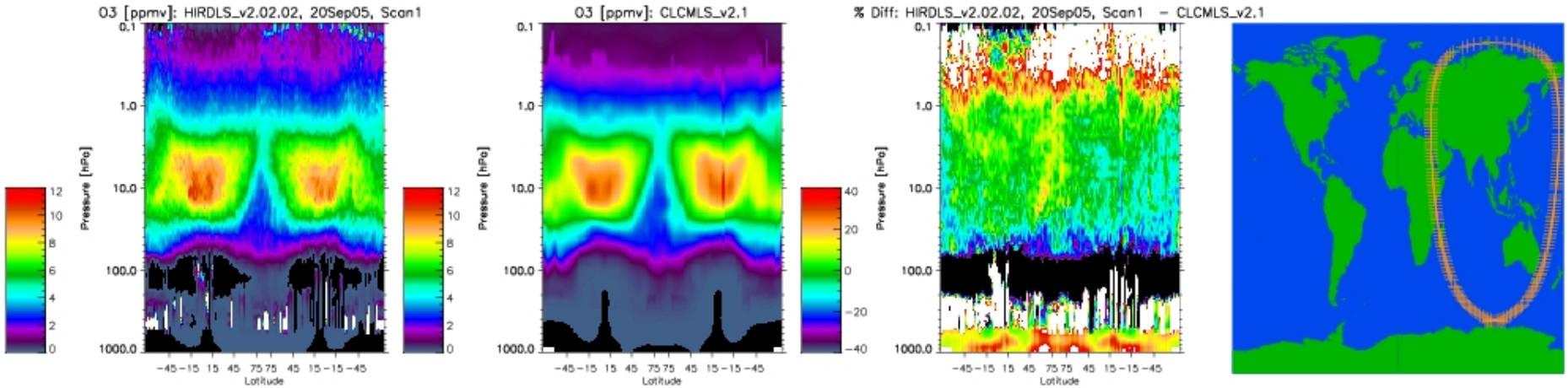
Cora Randall, ACE Team: P. Bernath, C. Boone, S. Mcloed

O3: HIRDLS(v2.02.02) compared with MLS(v2.1)

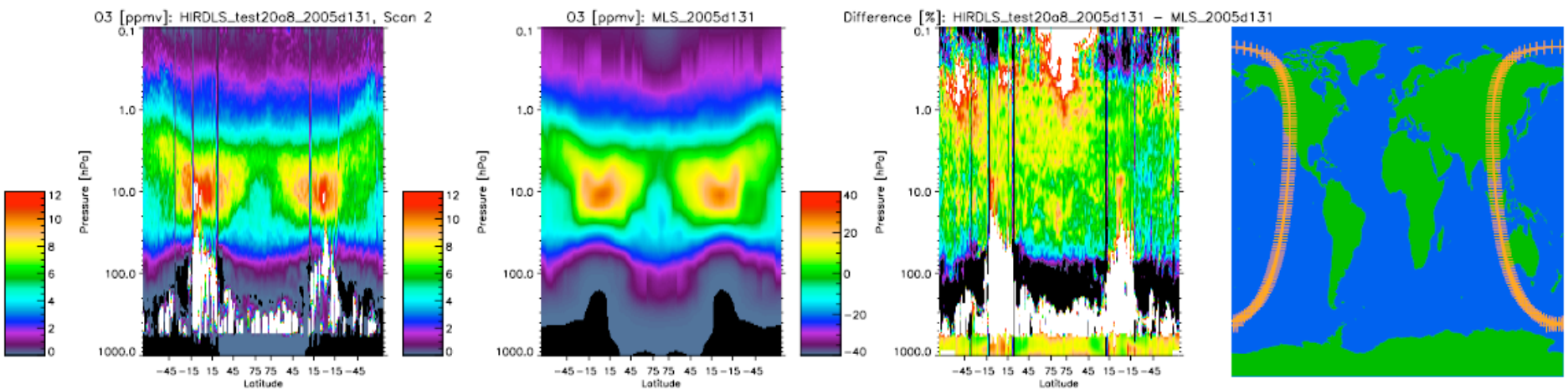


O3: HIRDLS compared with MLS

09/2006, HIRDLS,v2.02.02; MLS,v2.1
Data: Sept 2006



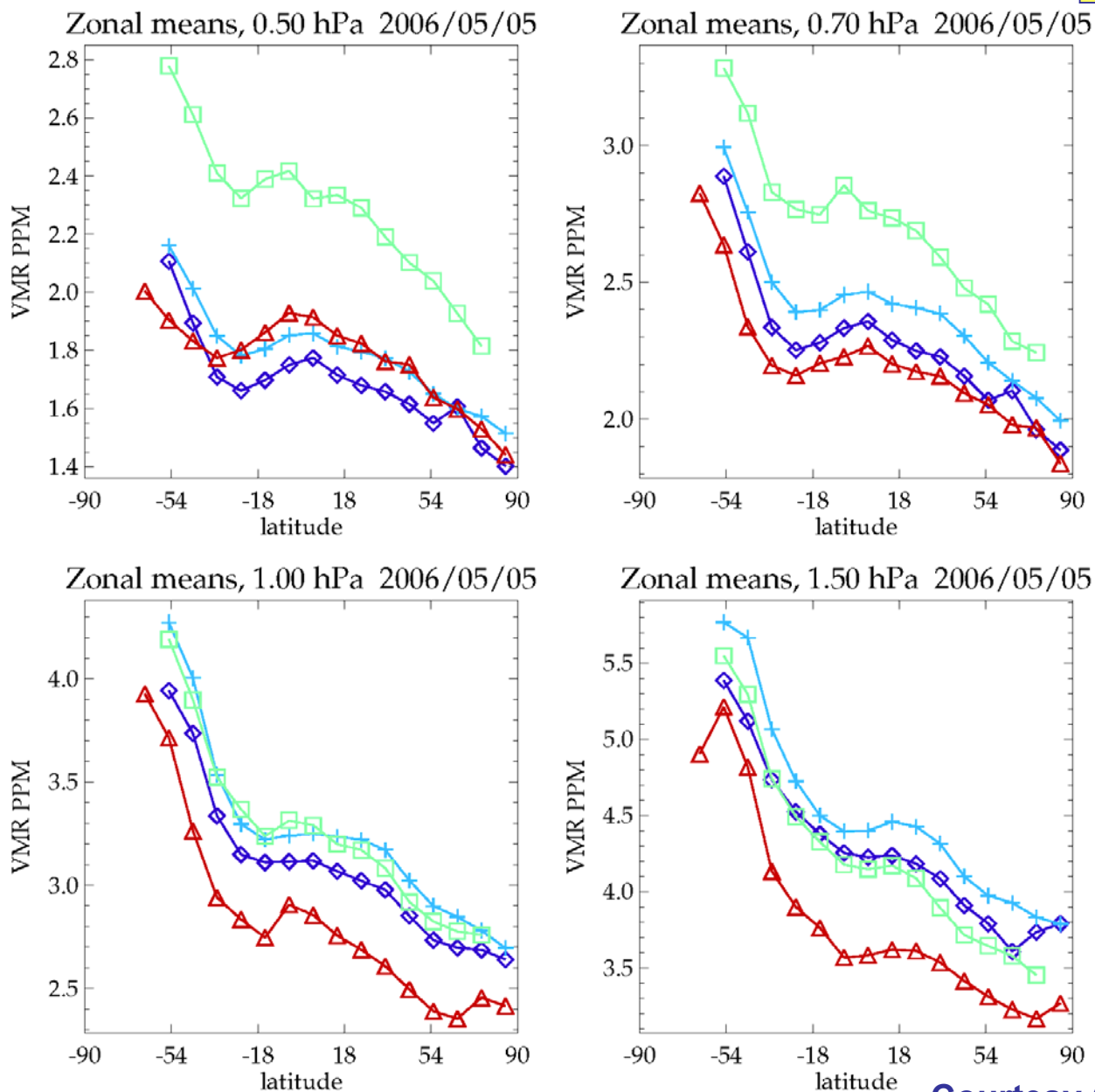
11/2005, HIRDLS,12/05pre-release; MLS,v1.5
Data: May 2005



NOAA16 MLS

NOAA17 HIRDLS

09/2006, v2.02
Data: 05 May 2006

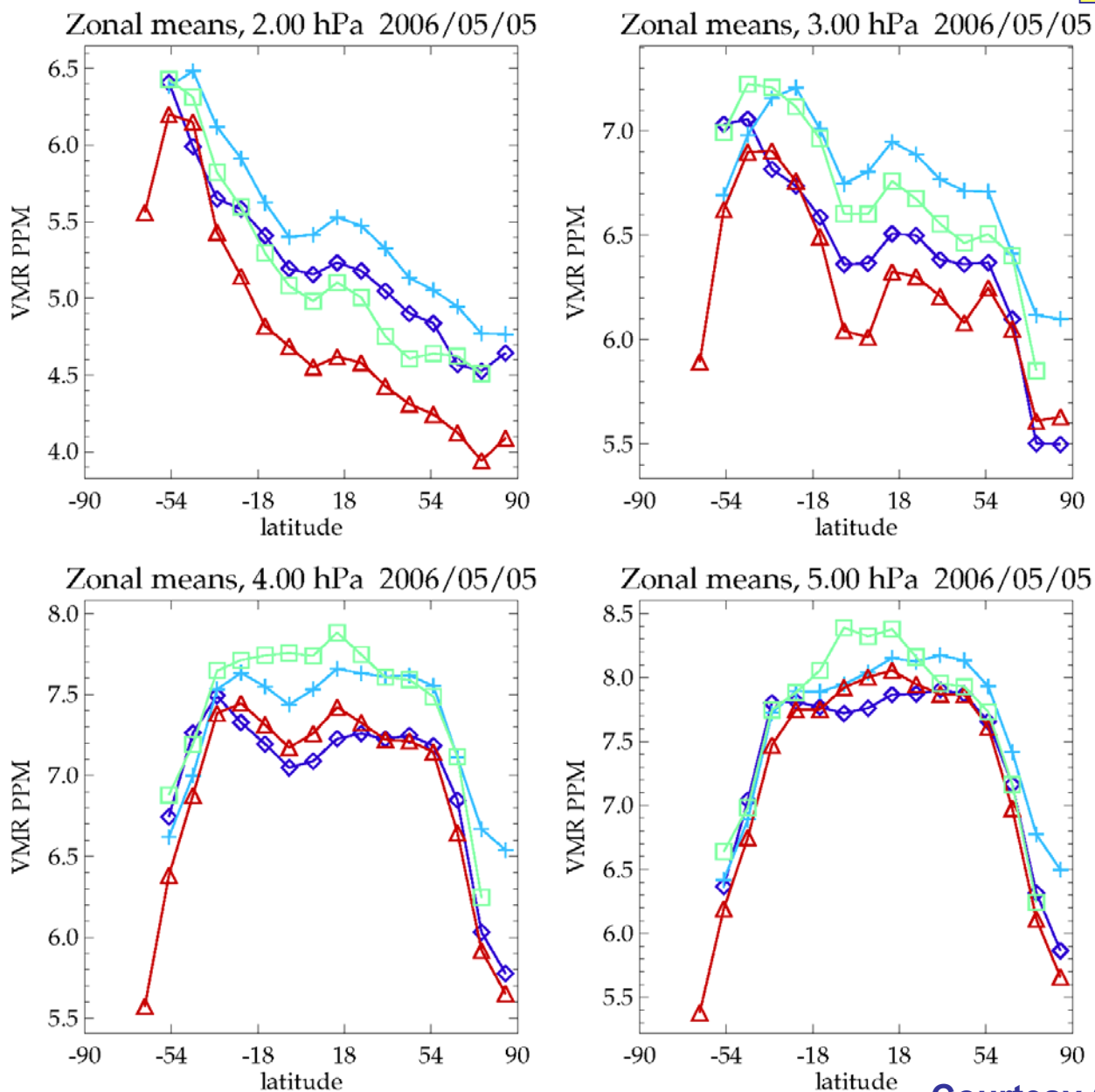


Courtesy Craig Long, NOAA

NOAA16 MLS

NOAA17 HIRDLS

09/2006, v2.02
Data: 05 May 2006

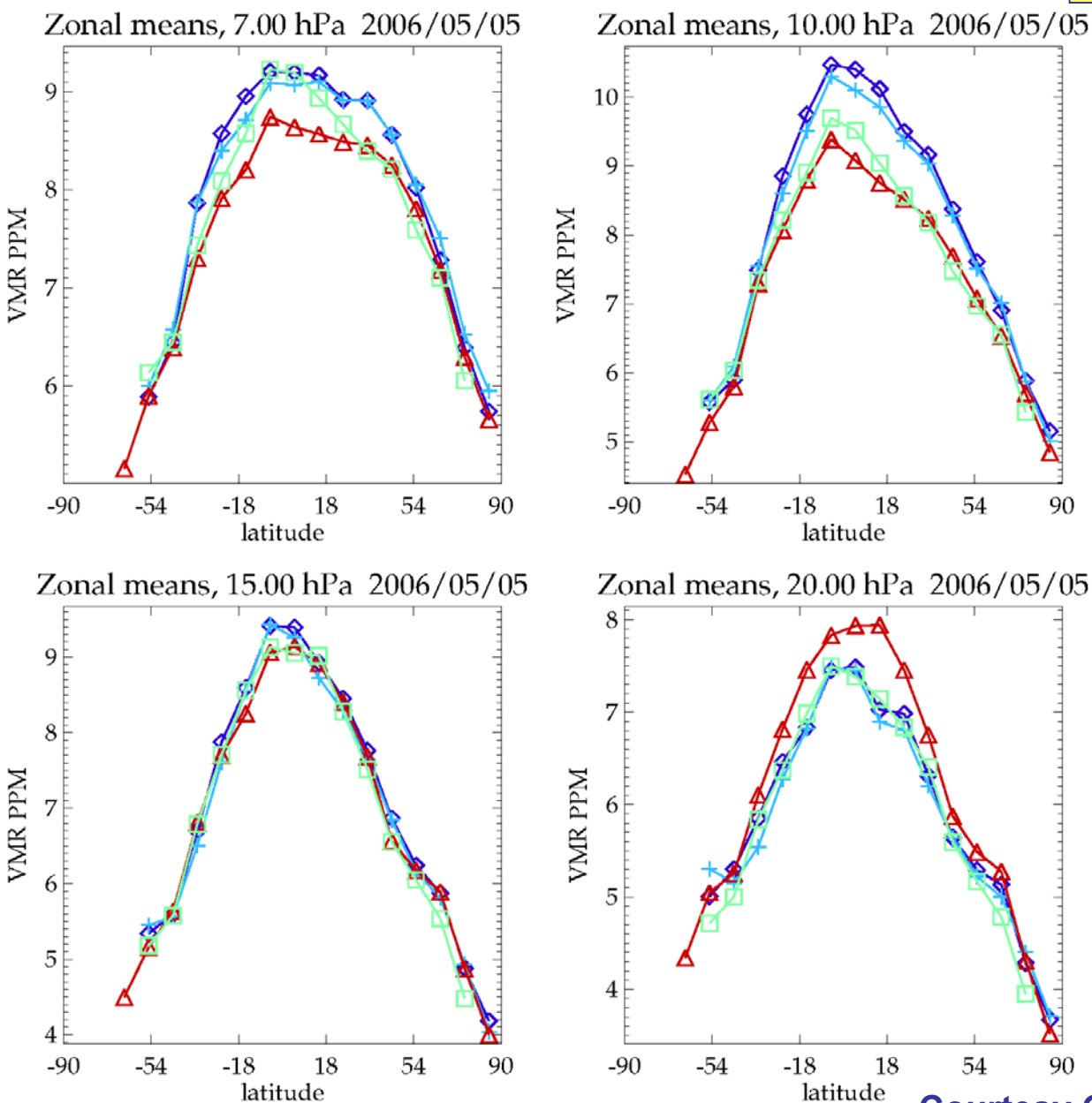


Courtesy Craig Long, NOAA

NOAA16 MLS

NOAA17 HIRDLS

09/2006, v2.02
Data: 05 May 2006

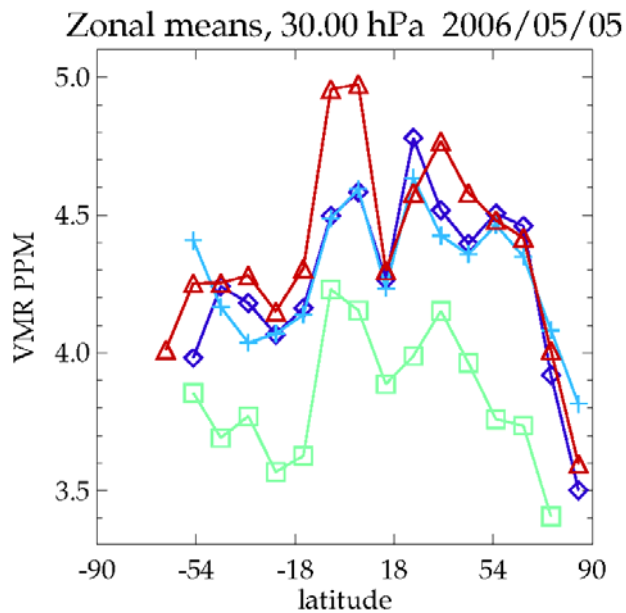


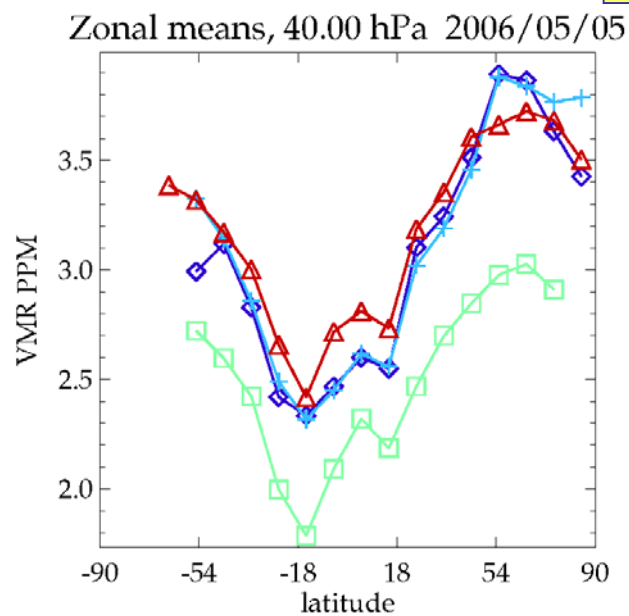
Courtesy Craig Long, NOAA

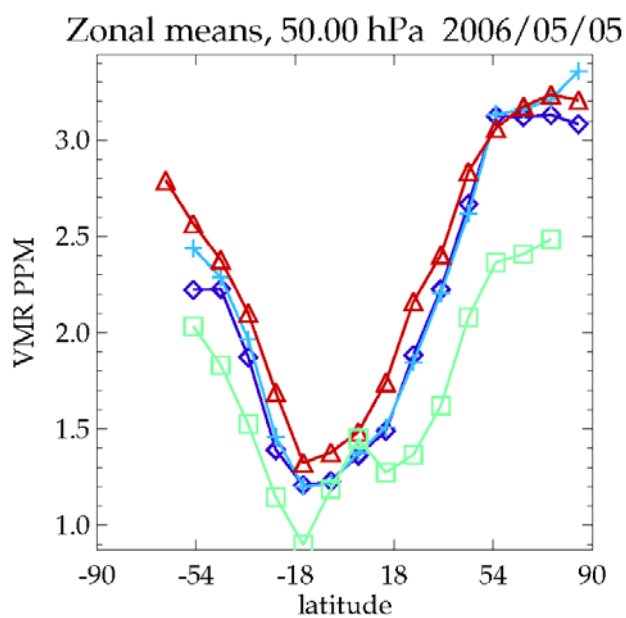
NOAA16 MLS

NOAA17 HIRDLS

09/2006, v2.02
Data: 05 May 2006

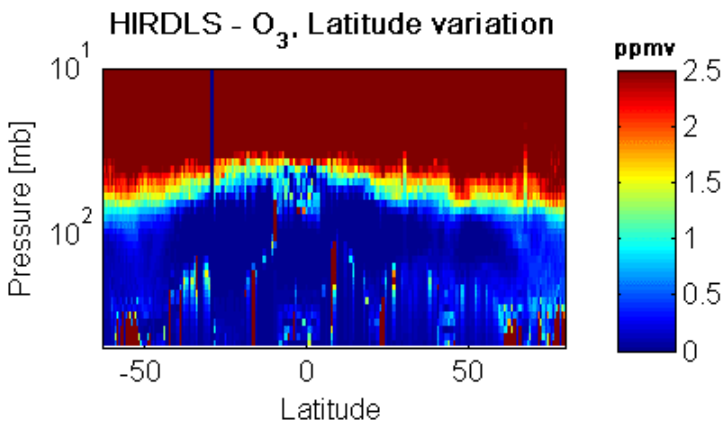


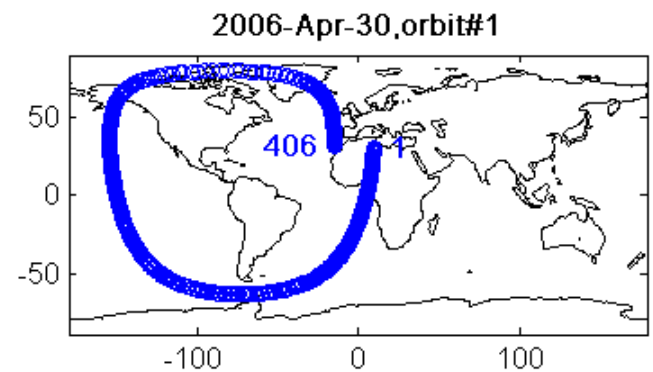


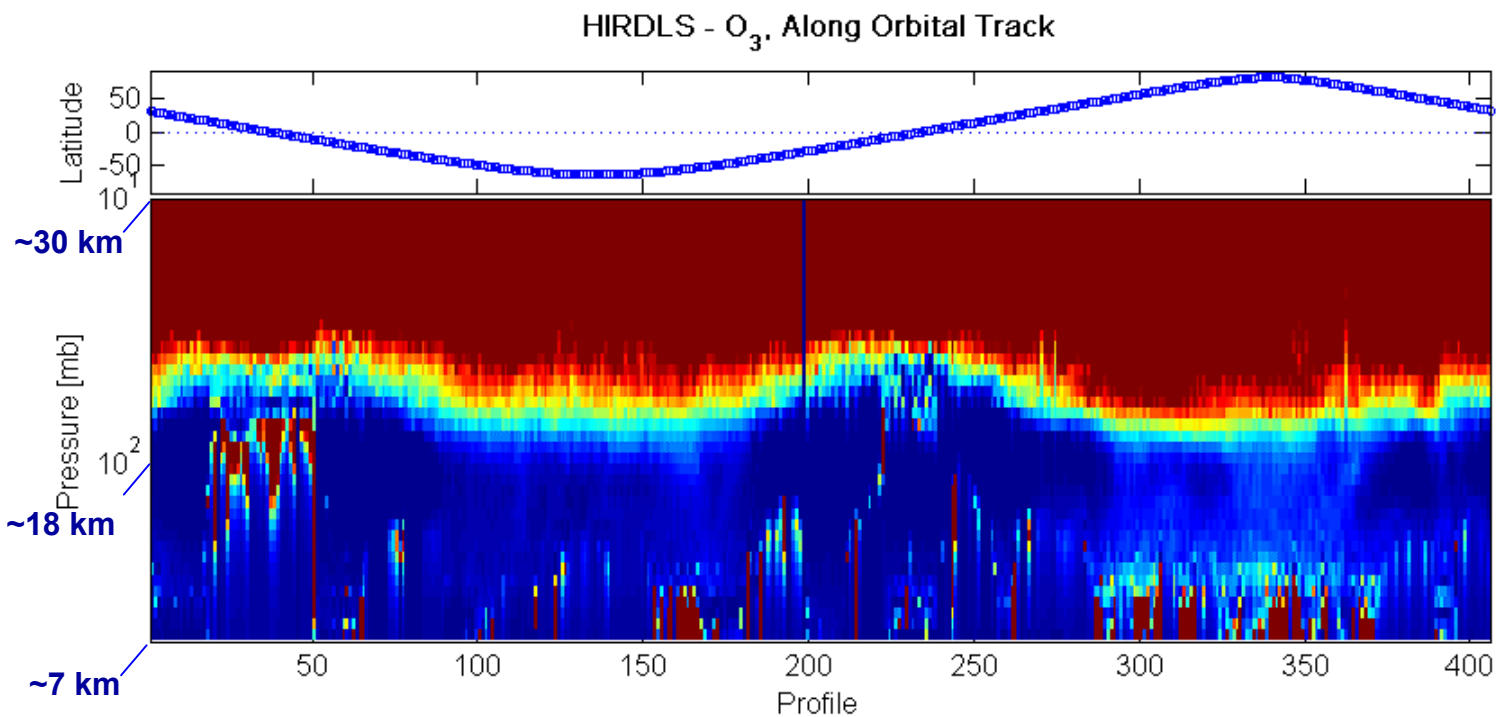


Courtesy Craig Long, NOAA

09/2006, v2.02
Data: 30 Apr 2006







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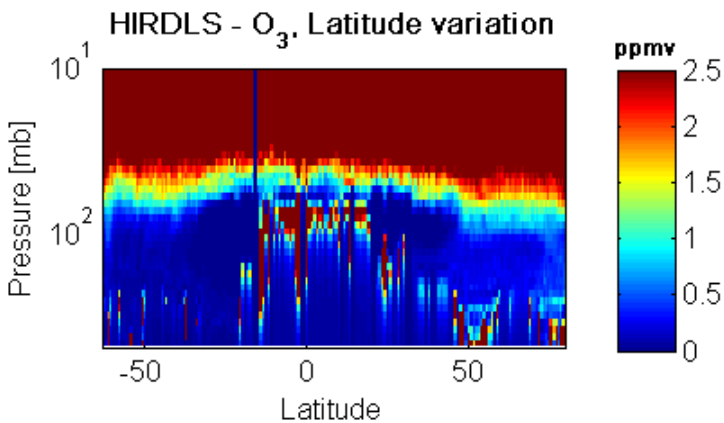
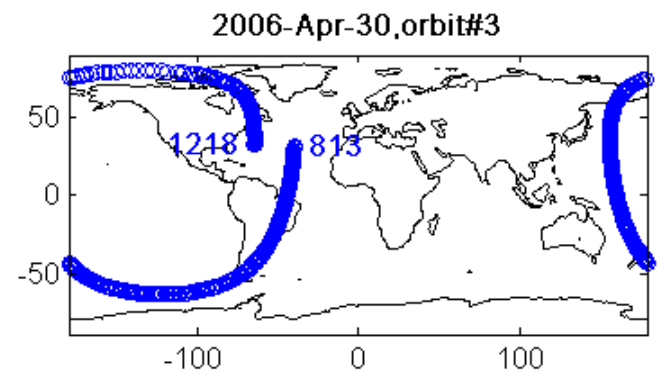
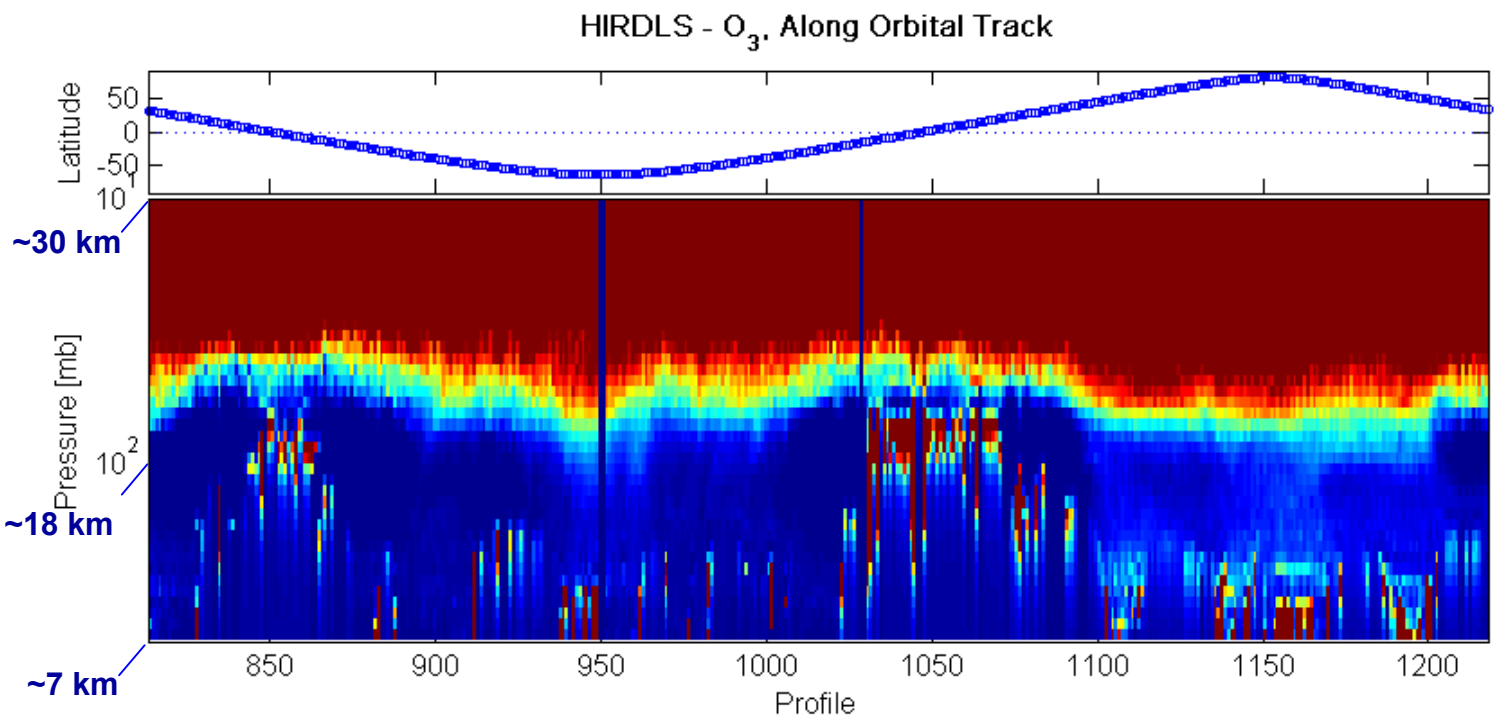
09/2006, v2.02
Data: 30 Apr 2006





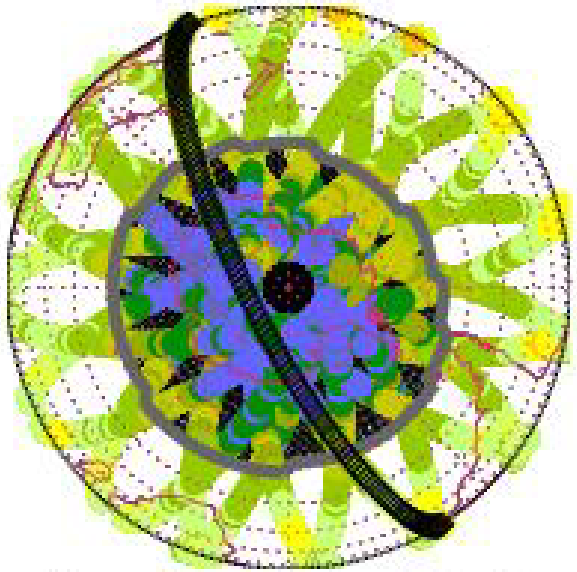


HIRDLS2_v6.2.1-3.2.2-4.0.12-1.7.0-hcl-c3_2006d120.he5

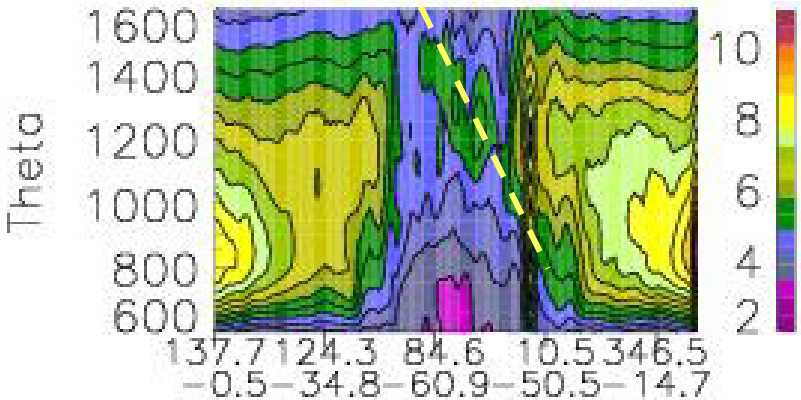
09/2006, v2.02
Data: 30 Apr 2006

20060521 Ozone at 1200 K

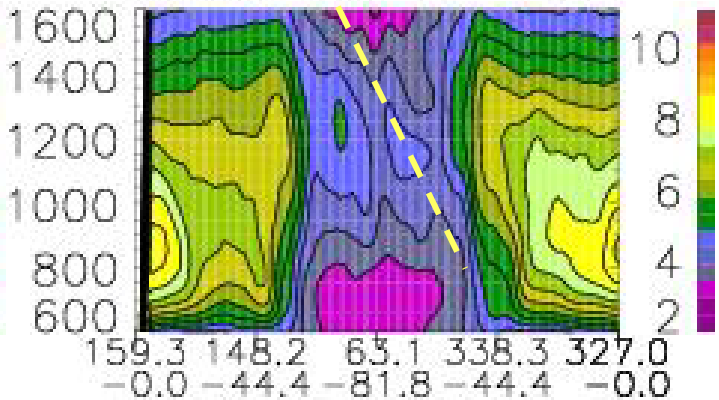
HIRDLS v2.02 EOS–MLS v1.52



Swath at t=15.7



Swath at t=15.5



V. Lynn Harvey & Cora Randall (CU/LASP)

Summary

Ozone accuracy at 10-2 mb is several percent

- **Ozone accuracy at 30-10 mb is 10 % or better (biased low)**
- **Current lower limit of valid ozone data is 50 mb (accuracy 20-40%, biased low)**
- **HIRDLS has high vertical resolution capability.**

<u>AVENUES TOWARD IMPROVED OZONE-PRODUCT / COMPARISONS</u>

1. Improved temperature retrieval (biased high) will produce increase in O_3.
2. Improvement in pointing algorithm
3. Continued improvements Kapton correction
4. Continued improvements open area correction
5. Continued improvements treatment of cloud features