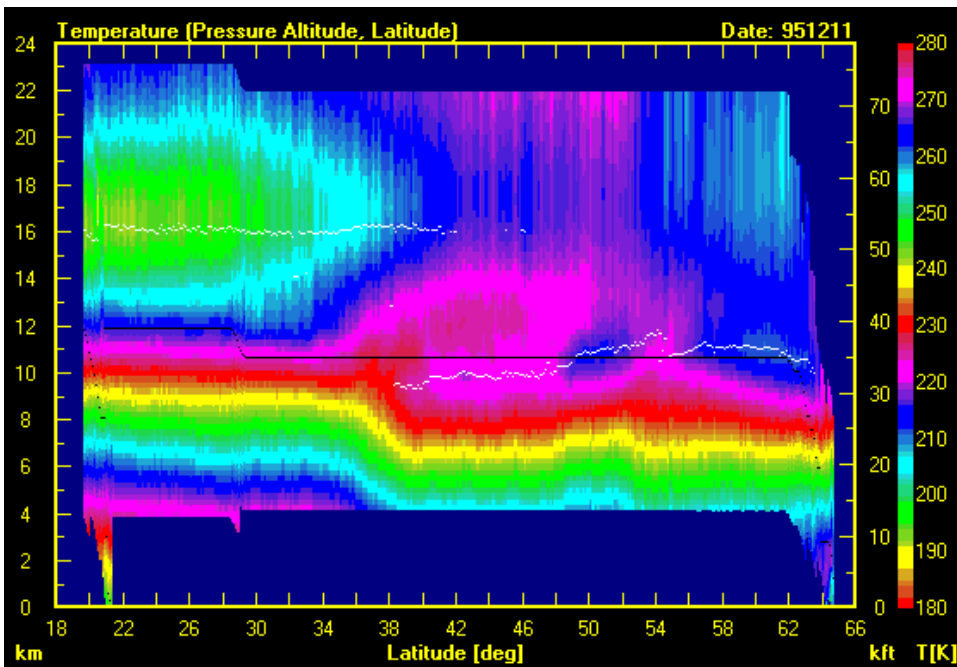


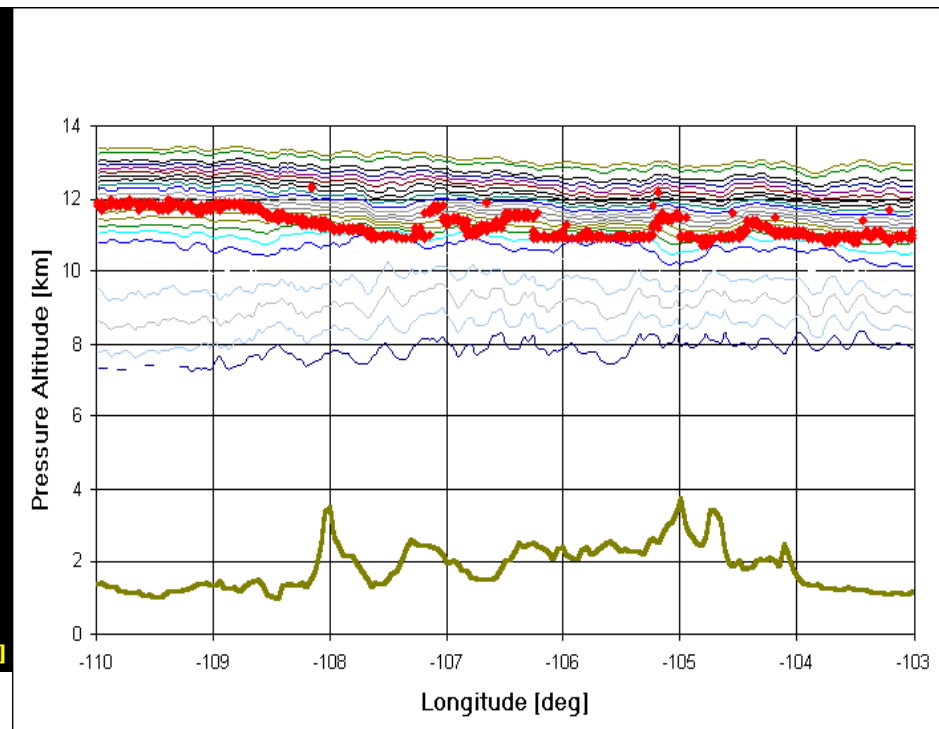
Microwave Temperature Profiler Observations for MPEX

Chris Davis and Dave Ahijevych
NCAR



DC-8 flight, Alaska to Hawaii

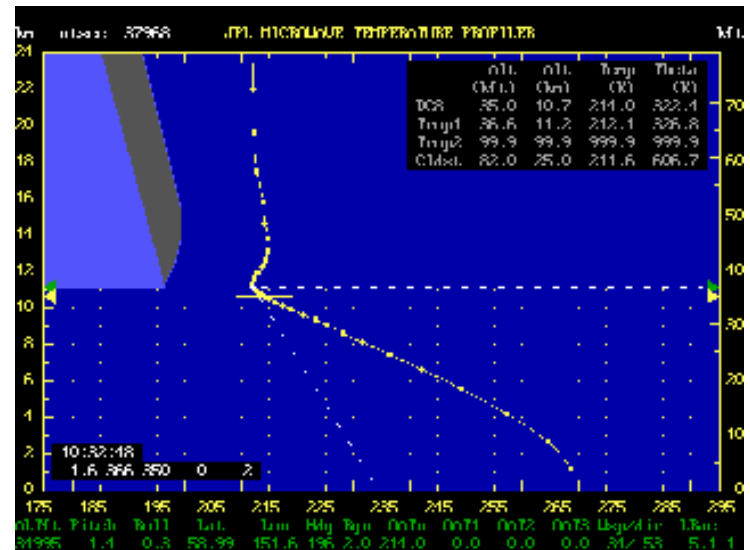
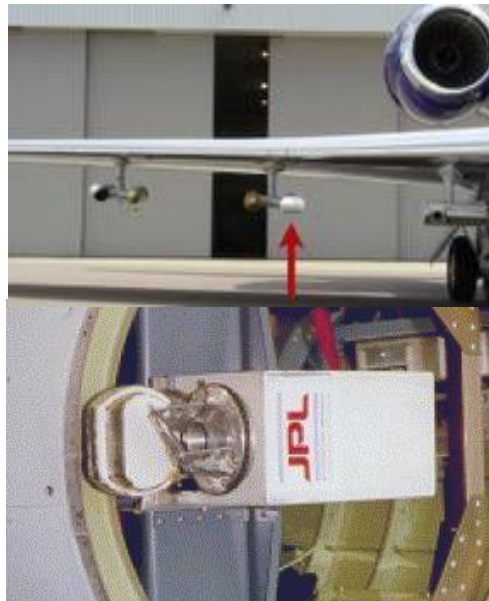
<http://mtp.mjmahoney.net/www/science/science.html>



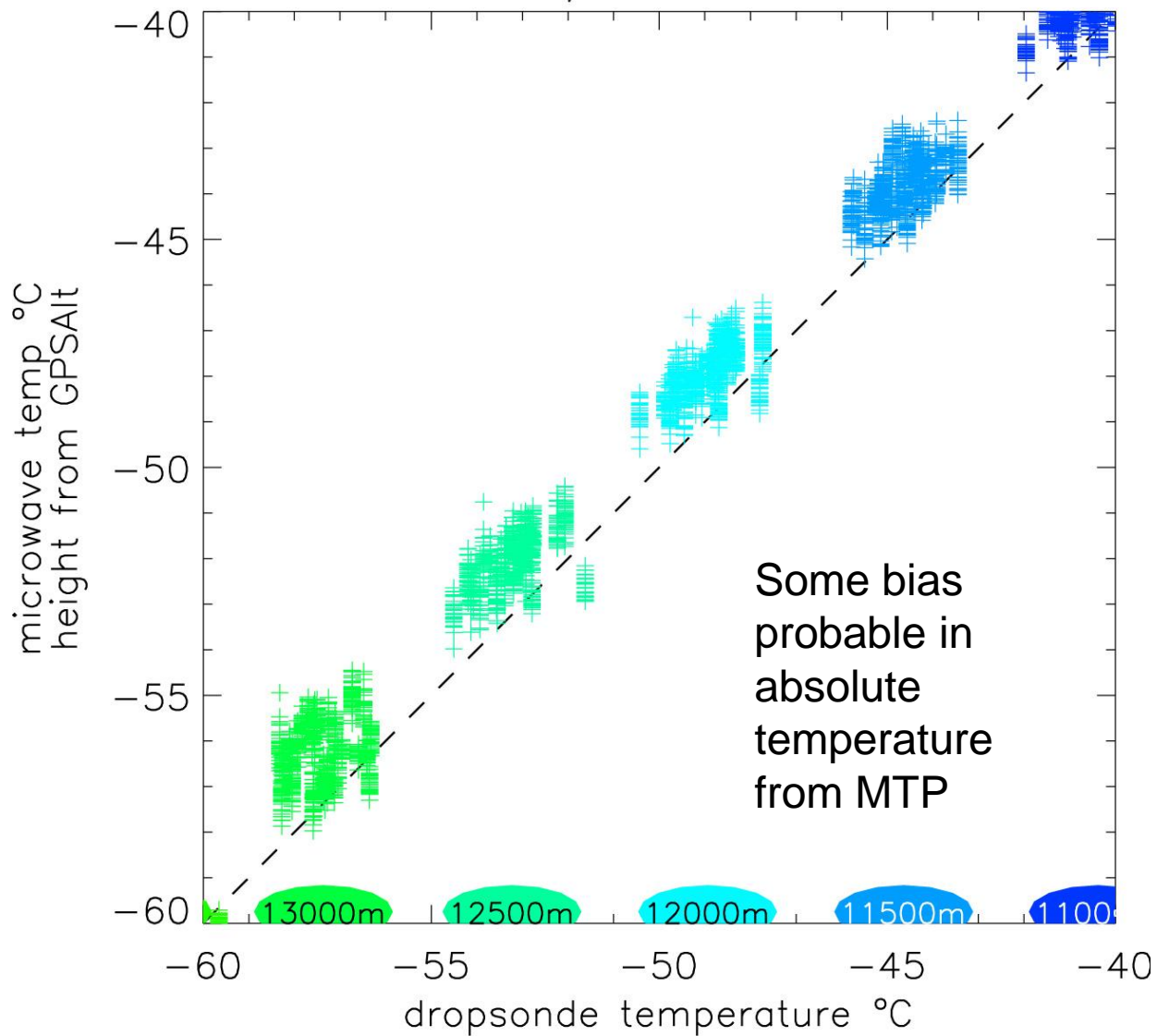
DC-8 flight, Kansas to California,
May 10, 1996

What does the MTP do?

- Passive microwave instrument; scans up and down at preset angles as plane flies, sensing 50-70 GHz emission from oxygen molecules
- Retrieves temperature; O_3 is well mixed and emissions vary strongly with density (i.e. p , T), hence, retrieval of T is possible.
- 20-30 measurements in vertical over range of ± 6 km from aircraft. Resolution near aircraft is ~ 100 m, but > 1 km near 6km away.
- Three scans per minute. At 800 kph, that is 4.5 km spacing.
- Good for relative temperature changes, not so good for absolute temperature

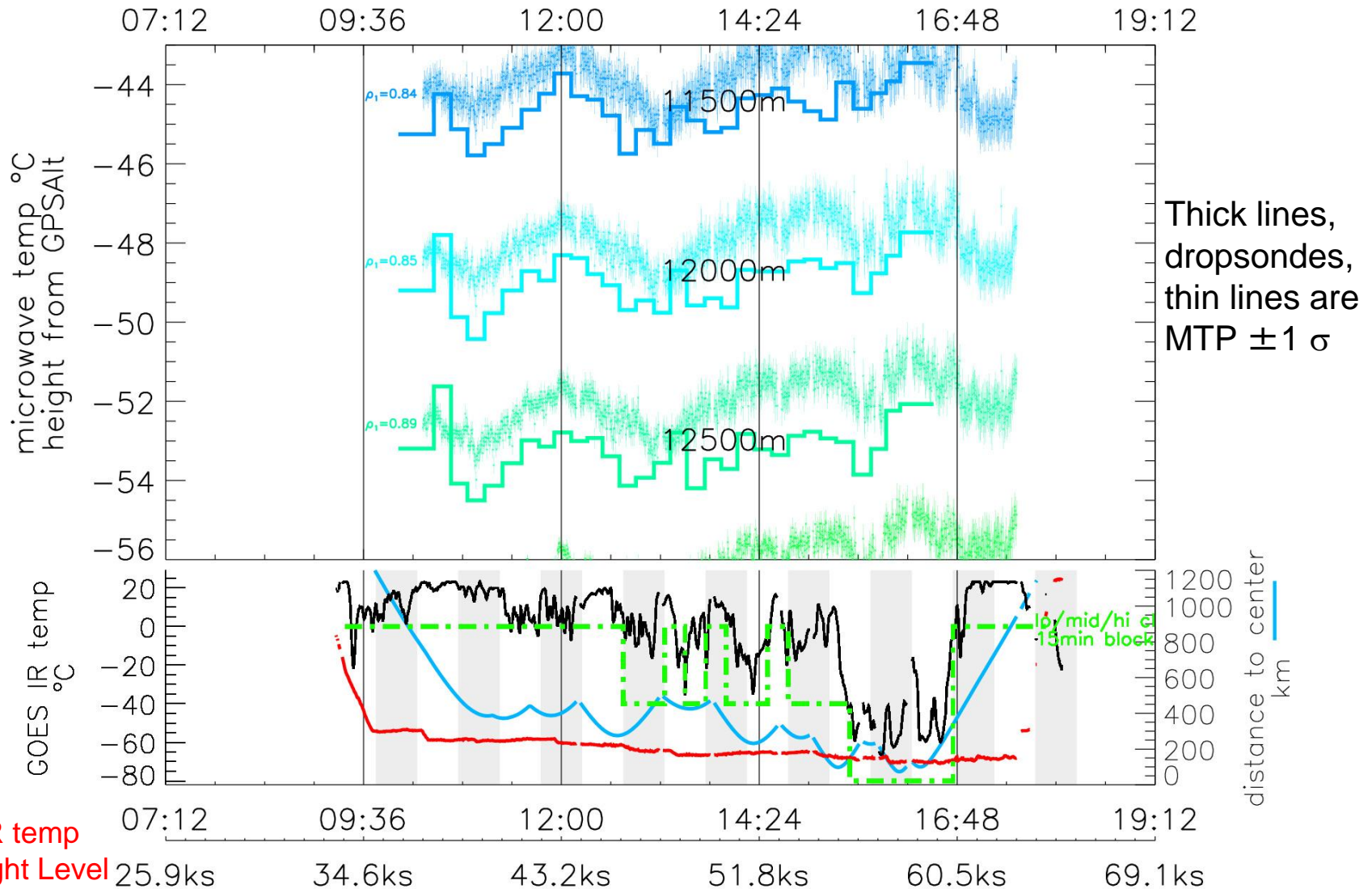


PGI36L 08/30 09:07-18:04



Time Series

PGI36L 08/30 09:07–18:04



Black: IR temp

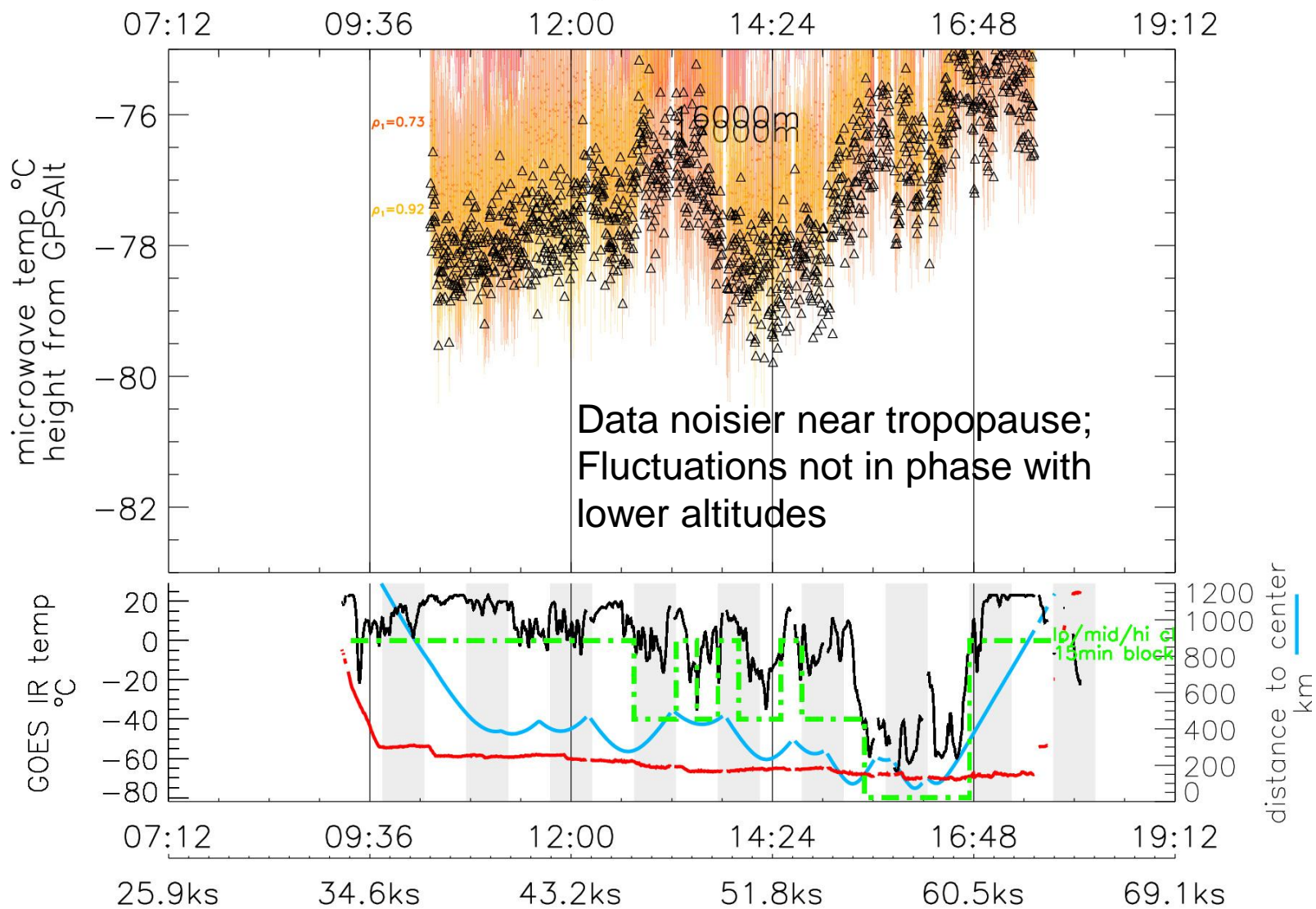
Red: Flight Level

Green: Cloud regime, cold, mid or warm/clear

Blue: Distance from center of circulation

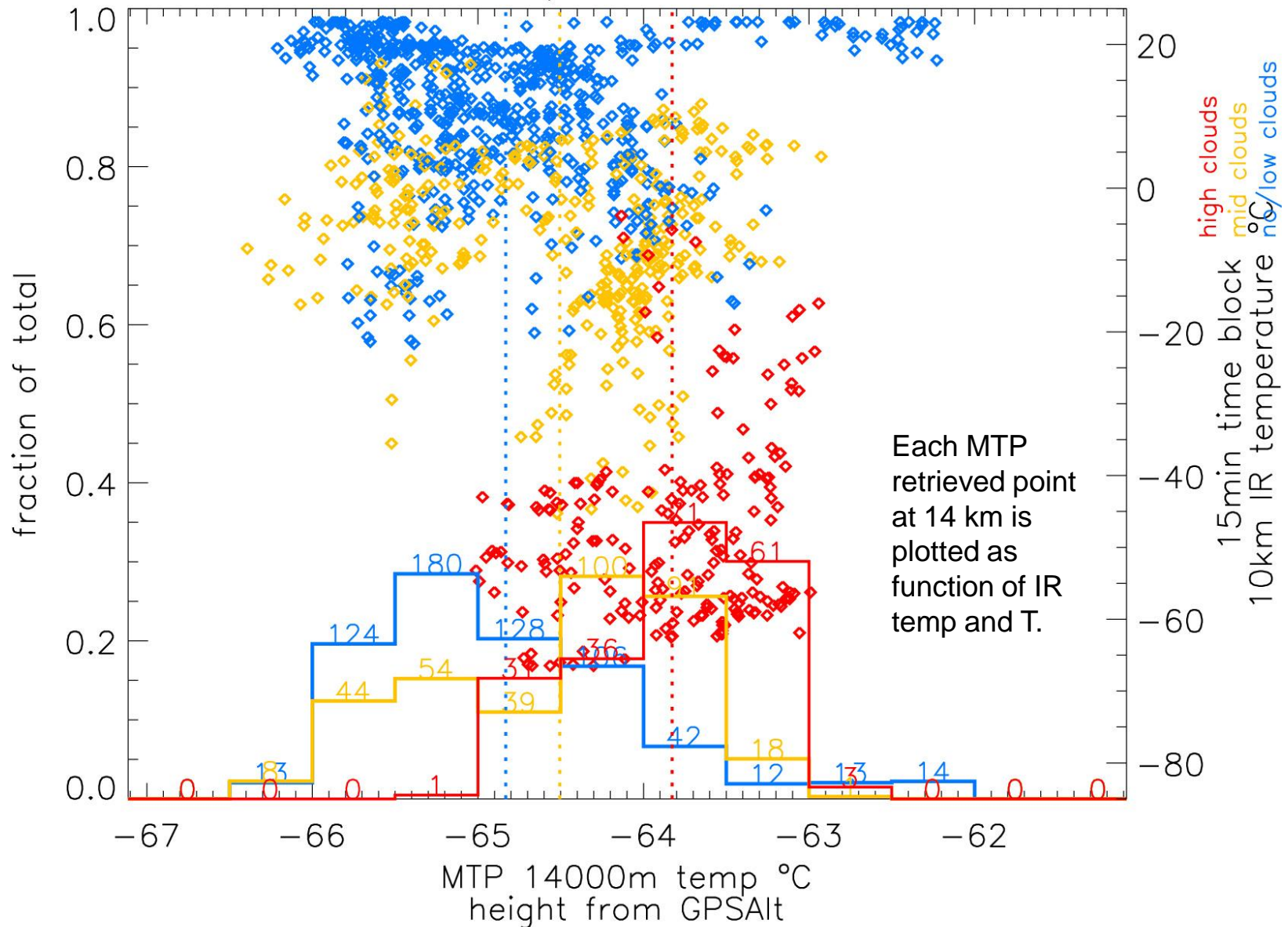
Time Series

PGI36L 08/30 09:07–18:04

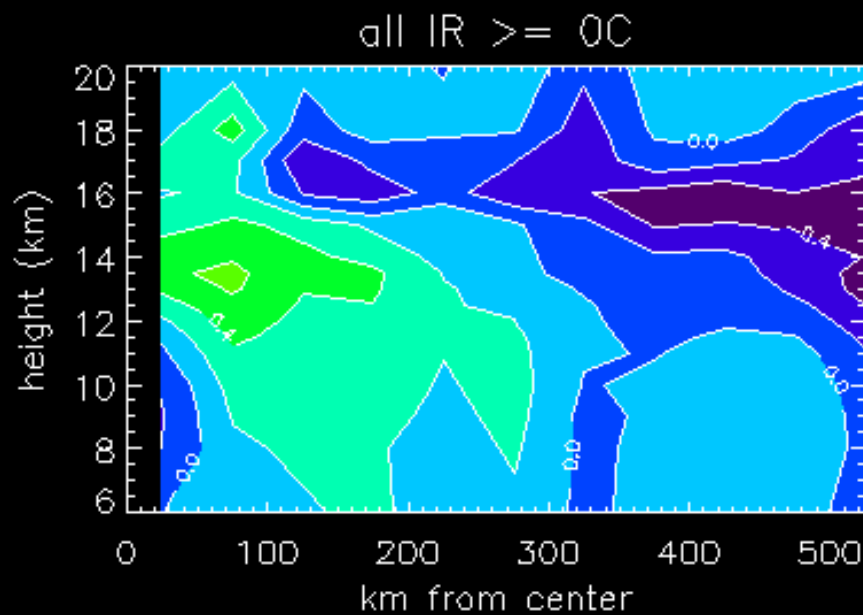
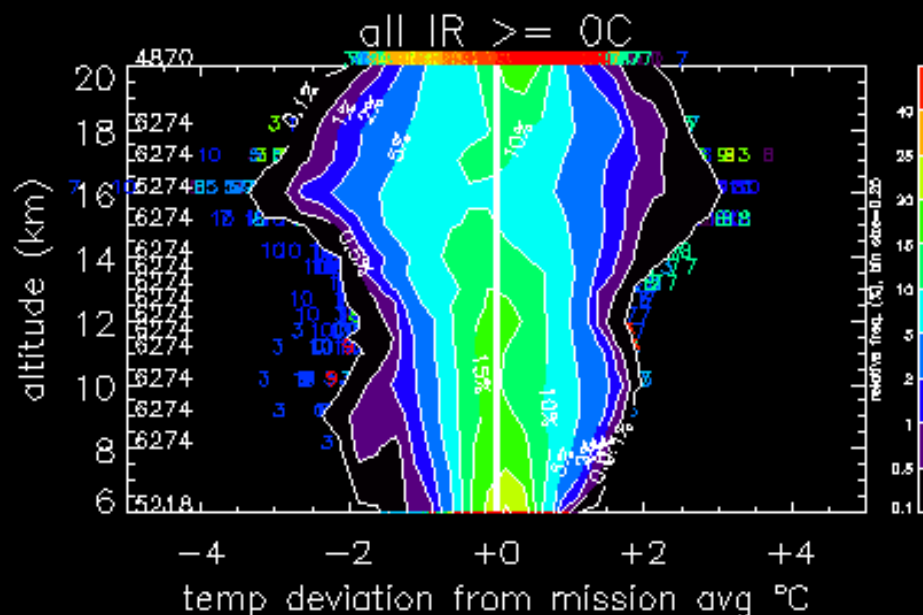
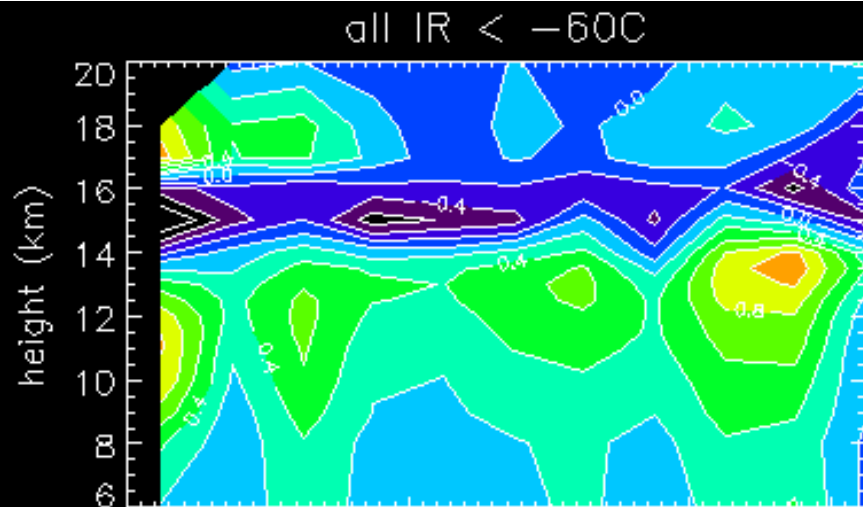
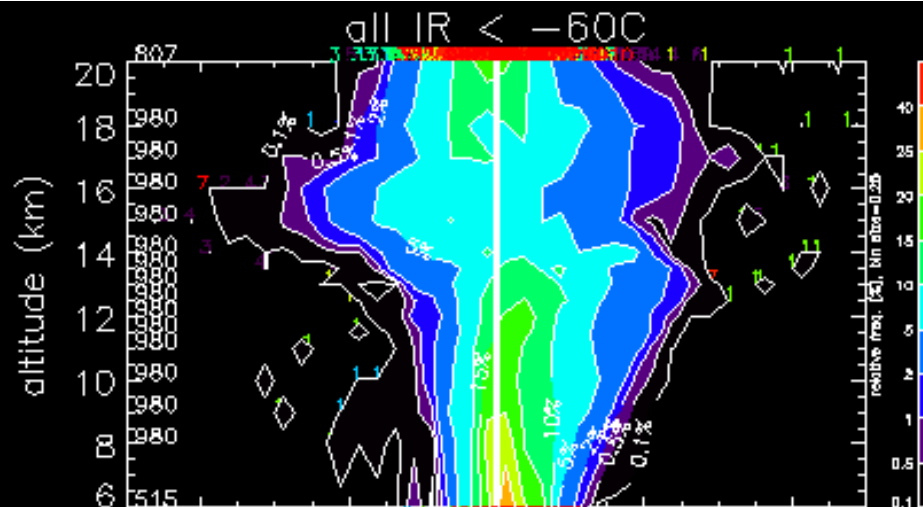


Histograms: Warmer near cold clouds?

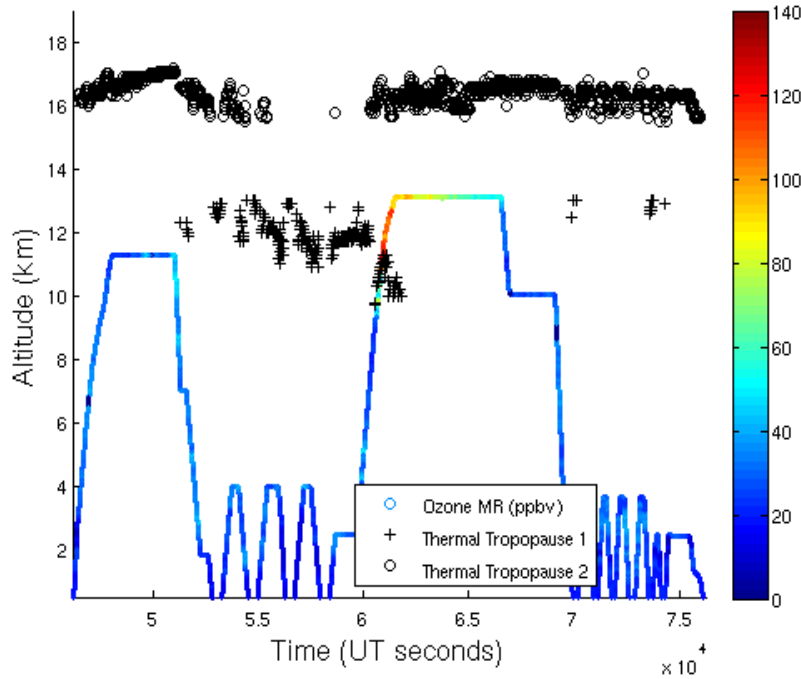
PGI36L 08/30 09:07–18:04



CFADs and Radial Cross Sections

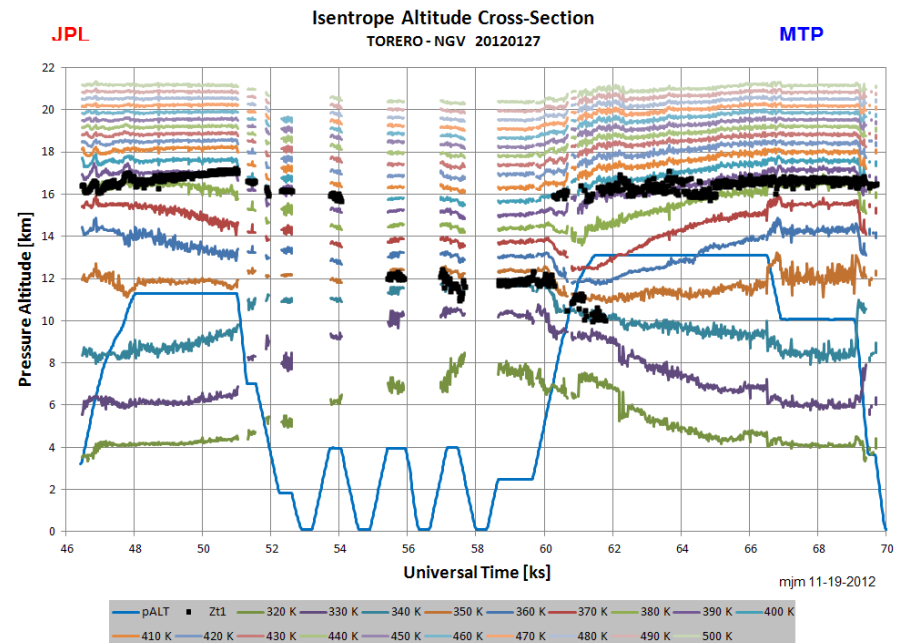


TORERO RF04 20120127 -- Ozone Volume Mixing Ratio



Isentropes in the region with double tropopauses are closely spaced indicating stratospheric conditions, but diverge as the flight returns to tropical latitudes and remains in the troposphere at around 65 ksec.

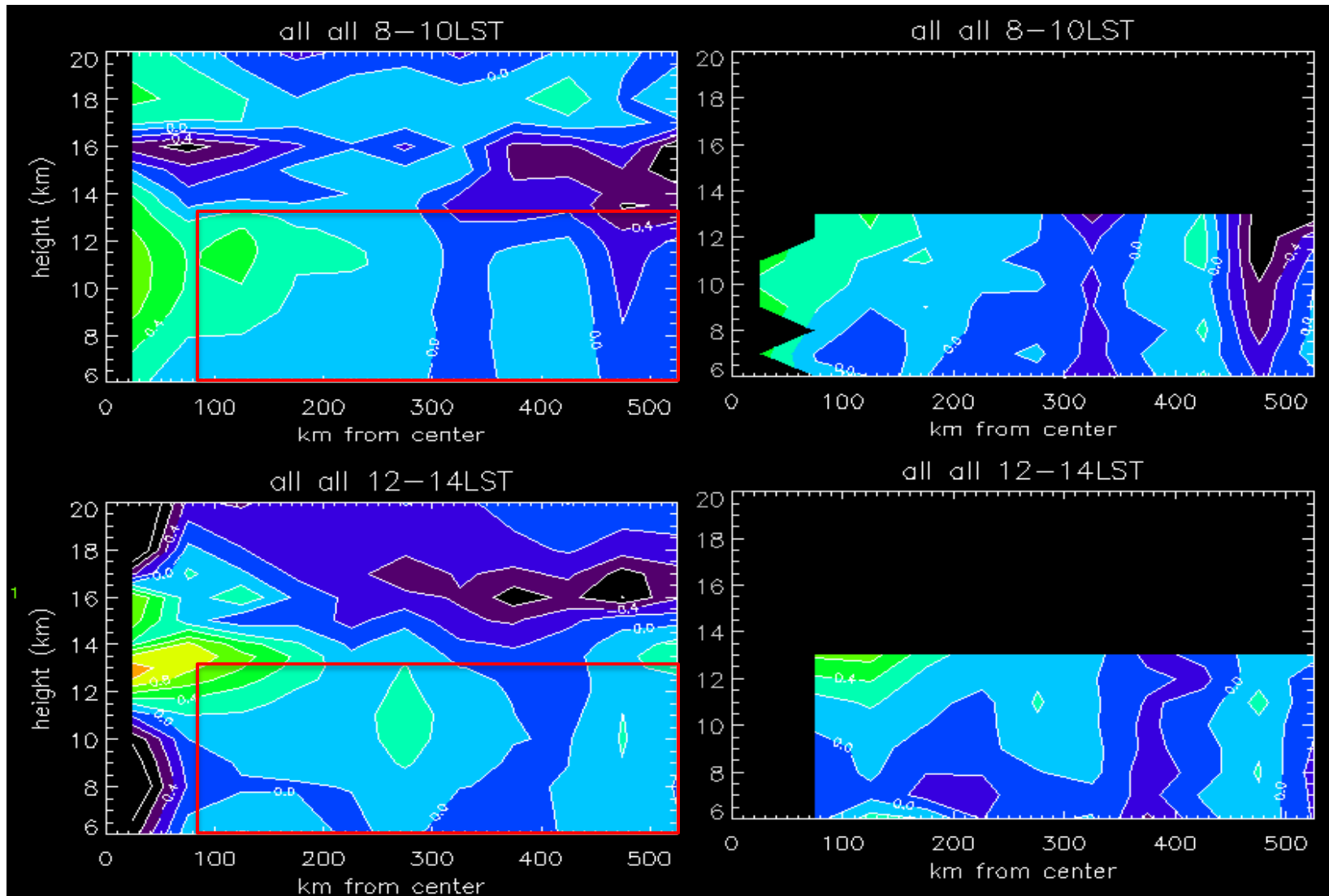
A flight along the coast of Chile passed through an area with double tropopauses, a midlatitude trop at about 12 km and tropical trop at 16-17 km as observed by MTP. Just after 60 ksec, the tropopause ht decreased to 10-11 km, suggesting stratospheric intrusion. In situ ozone measurements from a NOAA sensor confirm the presence of stratospheric air with high ozone mixing ratio.



Objectives in MPEX

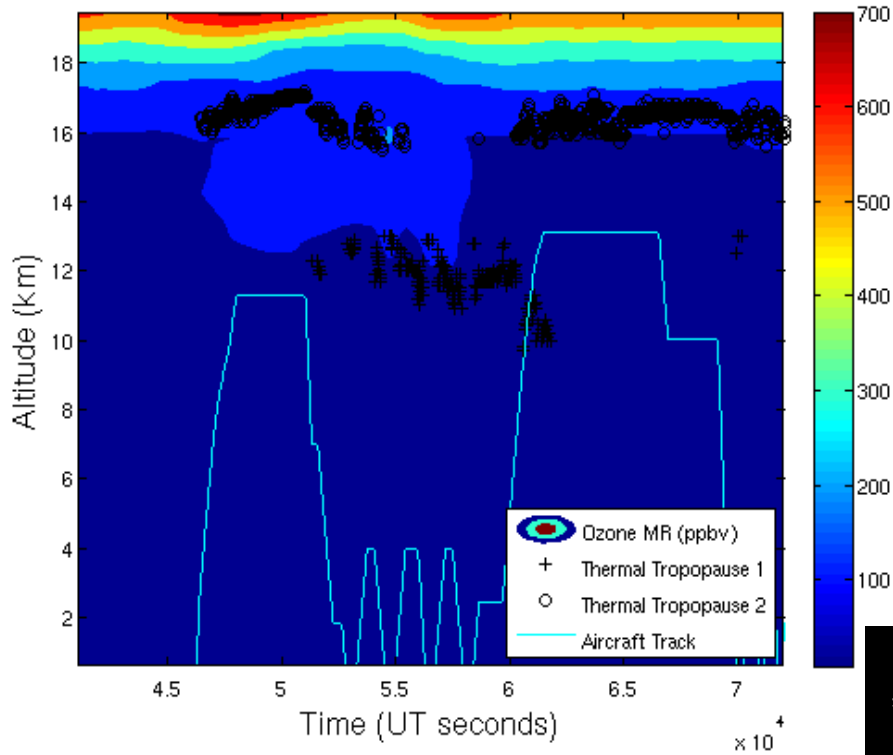
- Nearly continuous temperature profiles should reveal:
 - Fronts
 - Mountain waves
 - Lower-tropospheric features (flight-level 7-8 km)
 - Tropopause (flight-level 12-14 km))
- Combine with dropsondes
 - Fill-in gaps (tricky because of timing/position mismatch)
 - Characterize representativeness of dropsondes
- Extend to lower stratosphere (g-waves)
- Note: retrievals should be very good because of nearby rawinsondes (DEN, ABQ, RIW, GJT, AMA, LBF, etc)

Height-radius depictions: dropsonde comparison



Interval is 0.2 K

TORERO RF04 20120127



MTP tropopause height
superimposed on RAQMS model
ozone mixing ratio field

Averages along back trajectory show
elevated ozone consistent with in
situ observations of stratospheric
intrusion

