The NCAR Microwave Temperature Profiler

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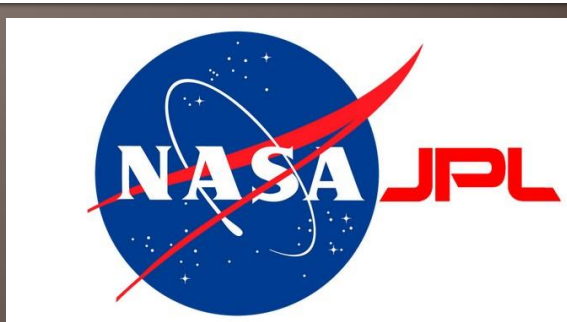
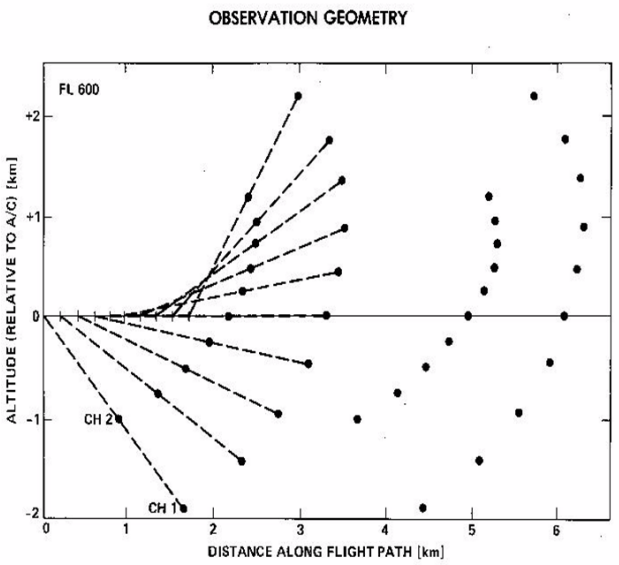


Outline

- MTP sensor specifications
- Data products
- Retrieval process
- Verification against independent data sets
- Prior research applications with MTP data products
- DEEPWAVE examples (preliminary data)

MTP Specifications

- Samples at three oxygen absorption lines (56.363, 57.612, 58.363 GHz)
- Samples at 10 viewing angles between nadir and zenith
- Two-point calibration uses heated blackbody target and ambient air temperature
- Profile available every 17 seconds (~4 km horizontal spacing)
- ~150 m vertical resolution near aircraft
- Estimated uncertainty ~0.5 to 1.5 K within +/- 6km of flight level

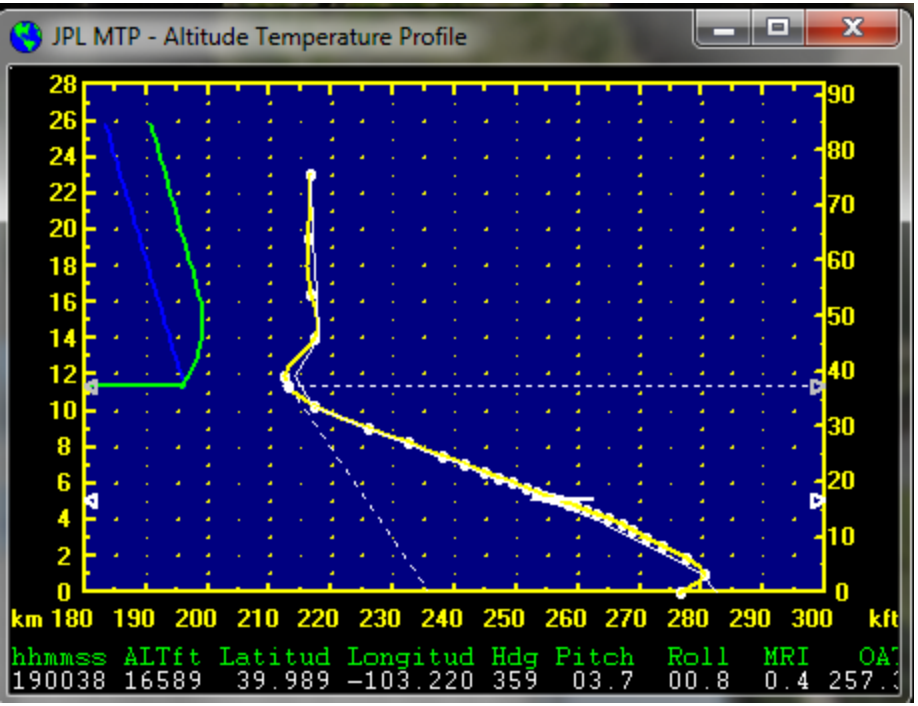


MTP Data Products

Real-time

Vertical temperature profiles

Tropopause height and temp

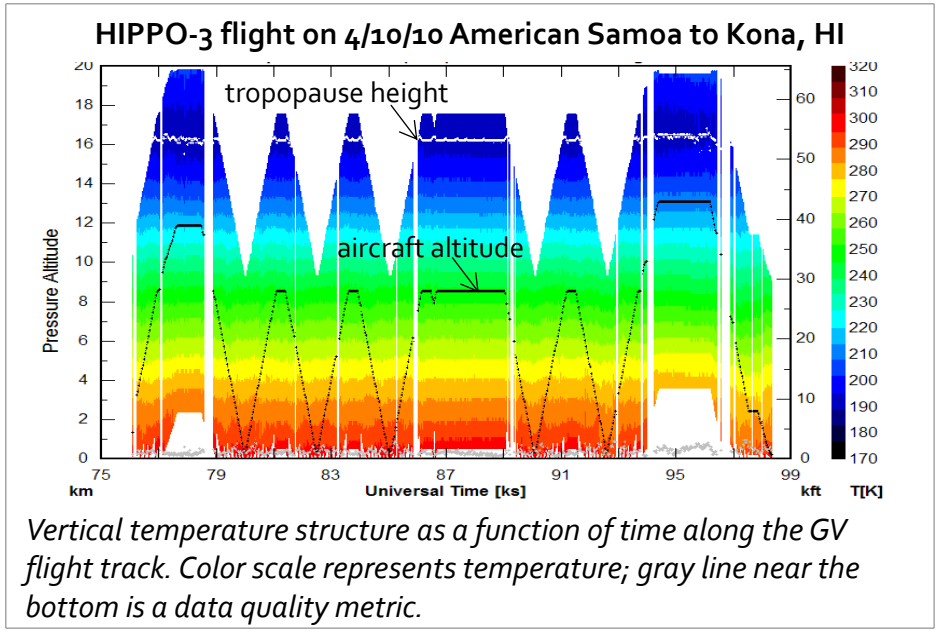


Post-Processed

Temperature curtain plots

Isentrope plots

Text files



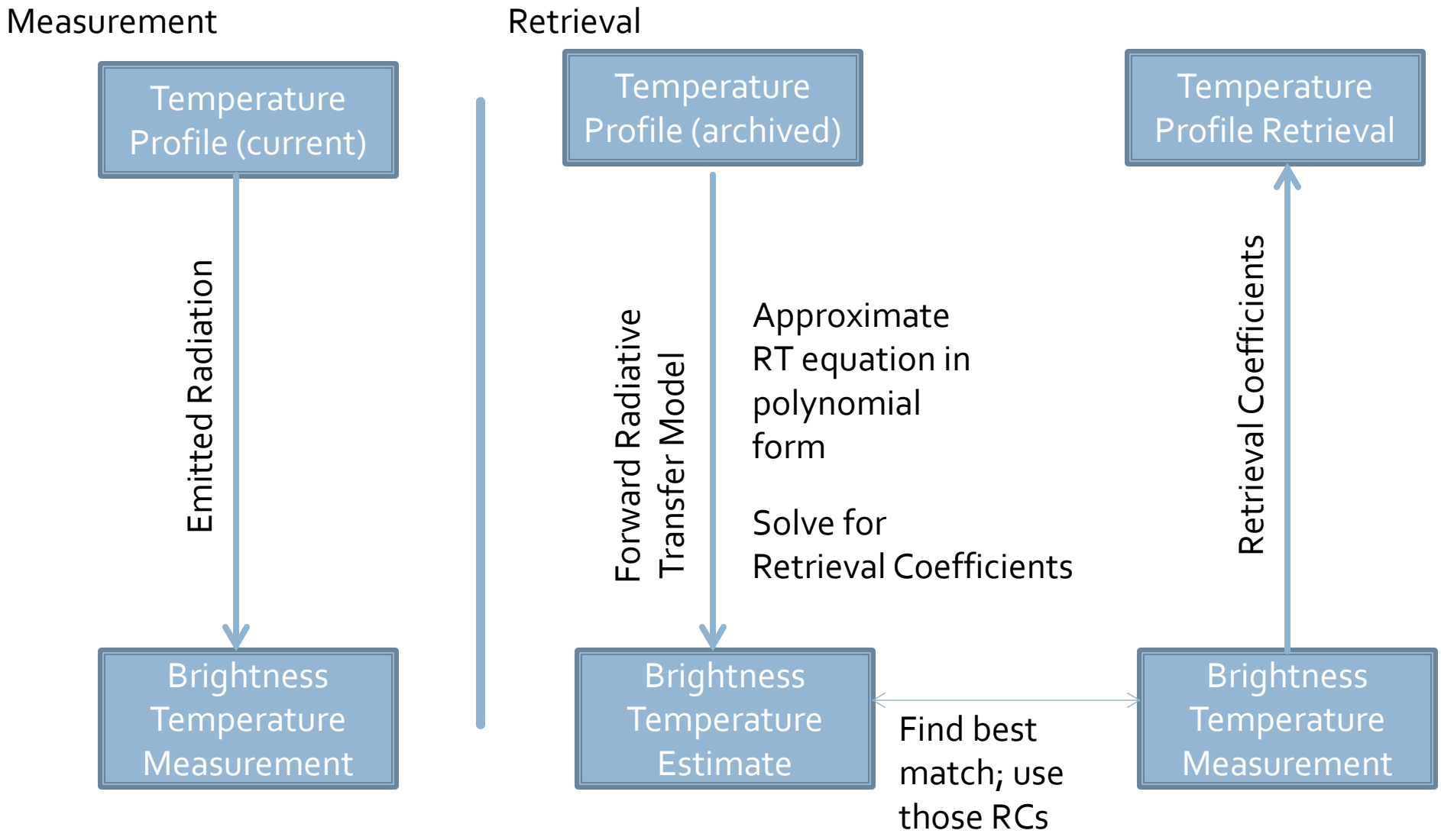
Vertical temperature structure as a function of time along the GV flight track. Color scale represents temperature; gray line near the bottom is a data quality metric.

MP File Structure

- Text file containing temperature profiles for a single flight
- 64-line self-describing header
- Single header line for each profile, followed by temperature and estimated uncertainty at each altitude
- Matlab code available for reading files and parsing data strings

Temperature Retrieval Overview

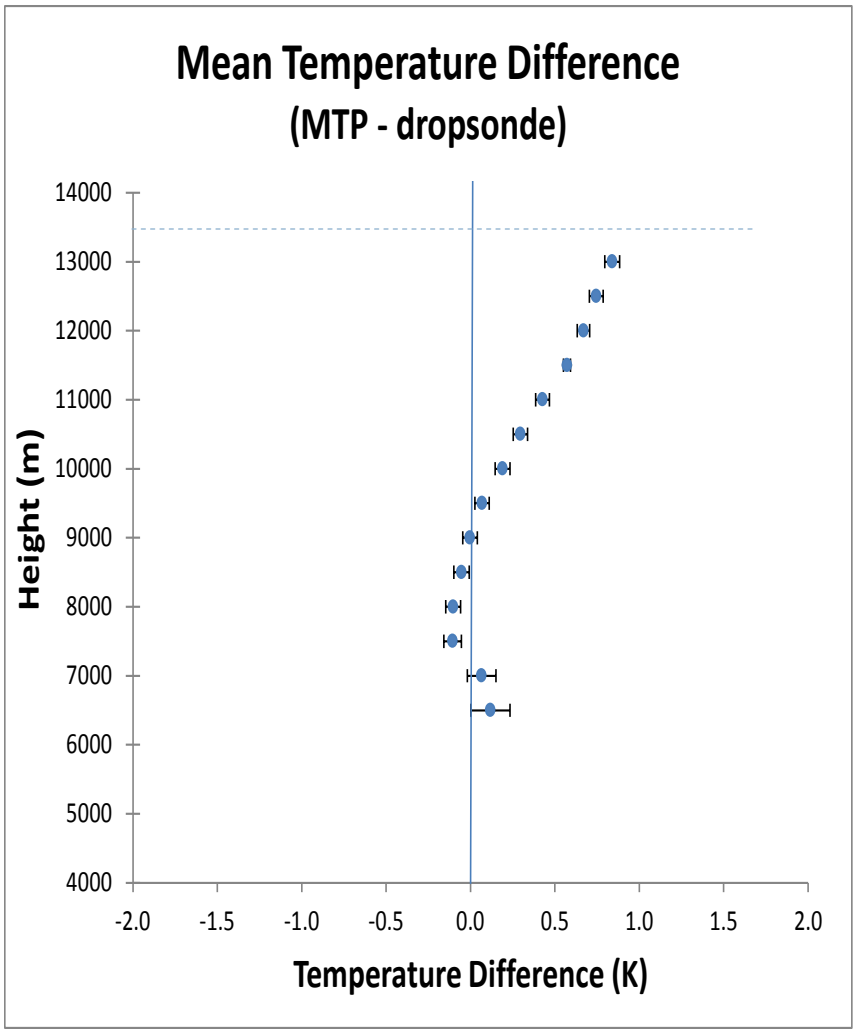
Statistical retrieval method using radiosonde data as a priori information



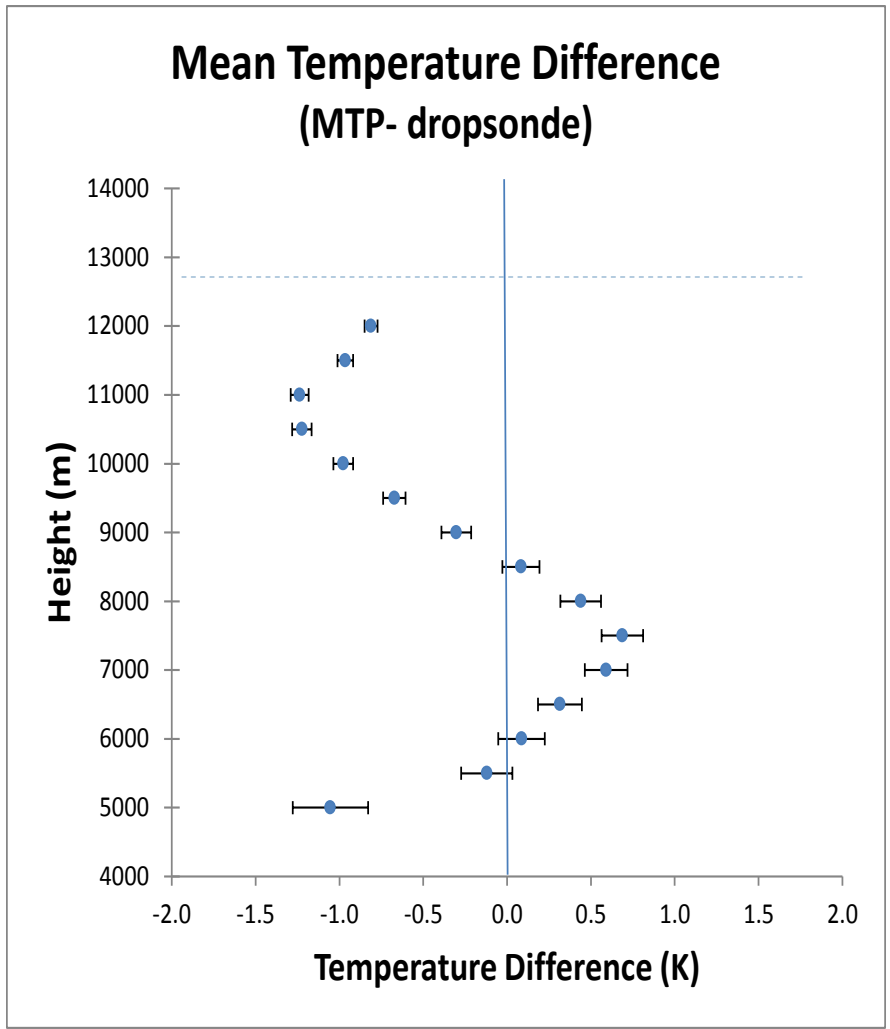
Verification:

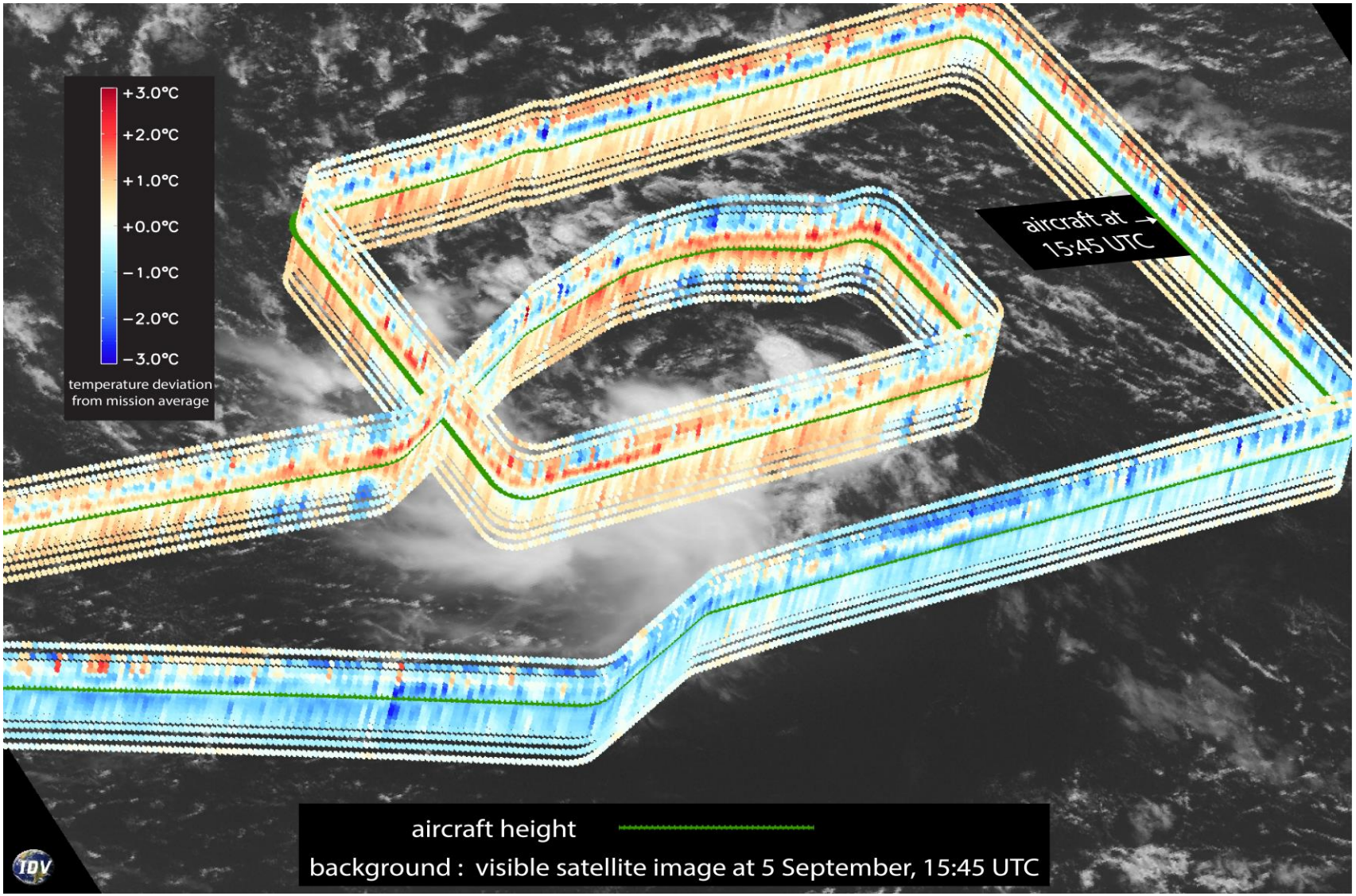
Retrieved temperature profiles vs. dropsonde measurements (N ~ 400 for each project)

Tropical Oceanic Conditions

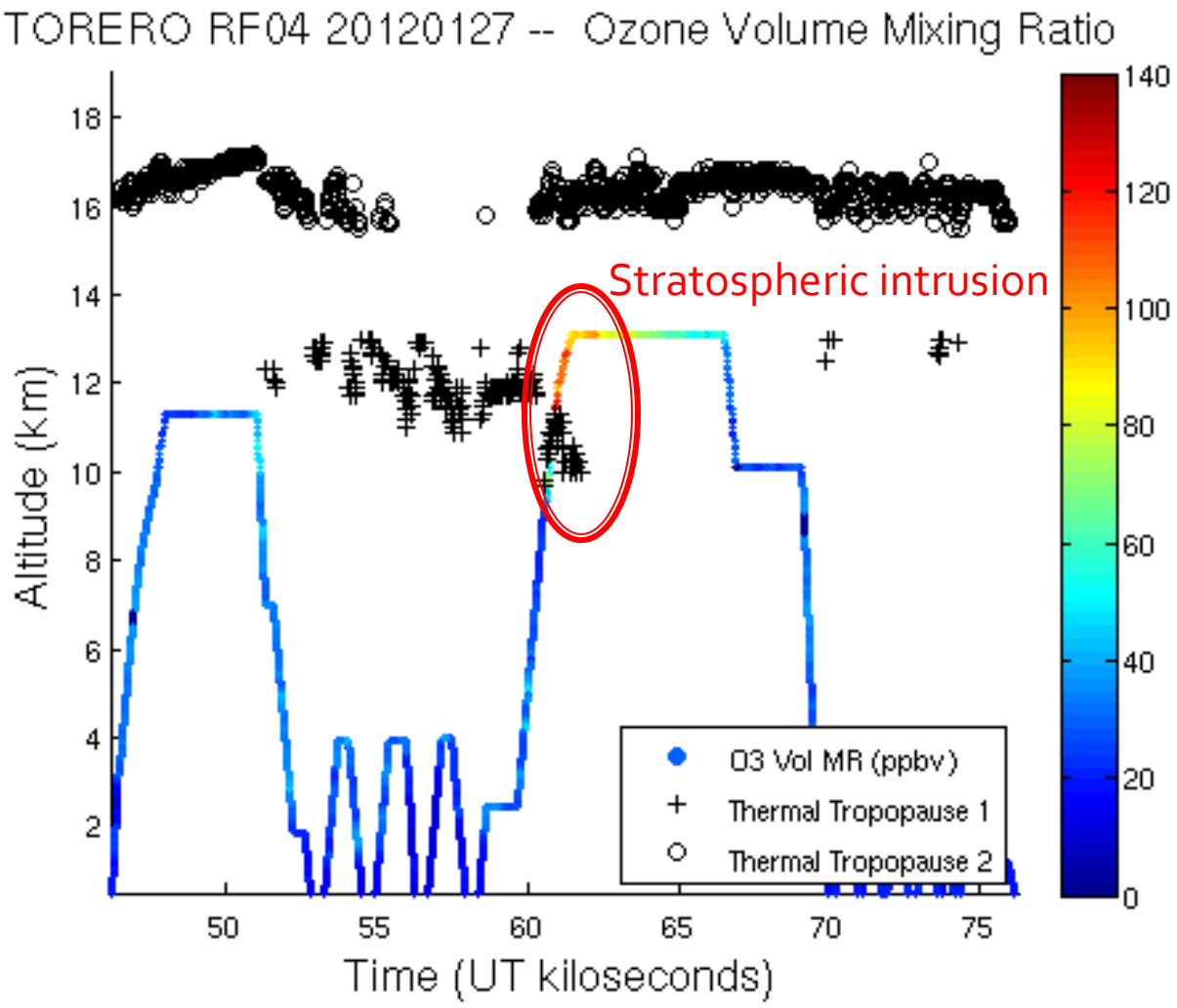


Continental Convective Conditions

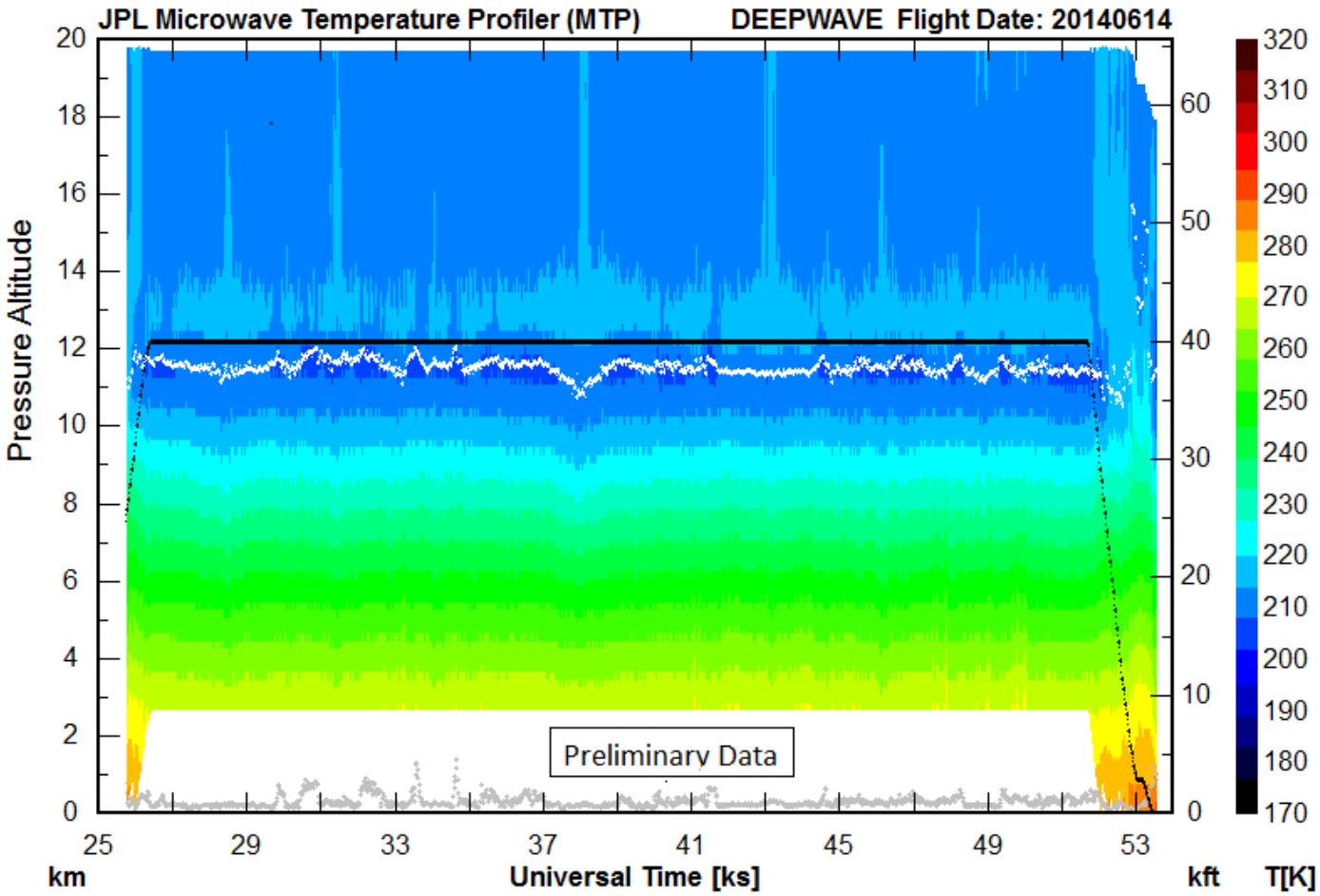




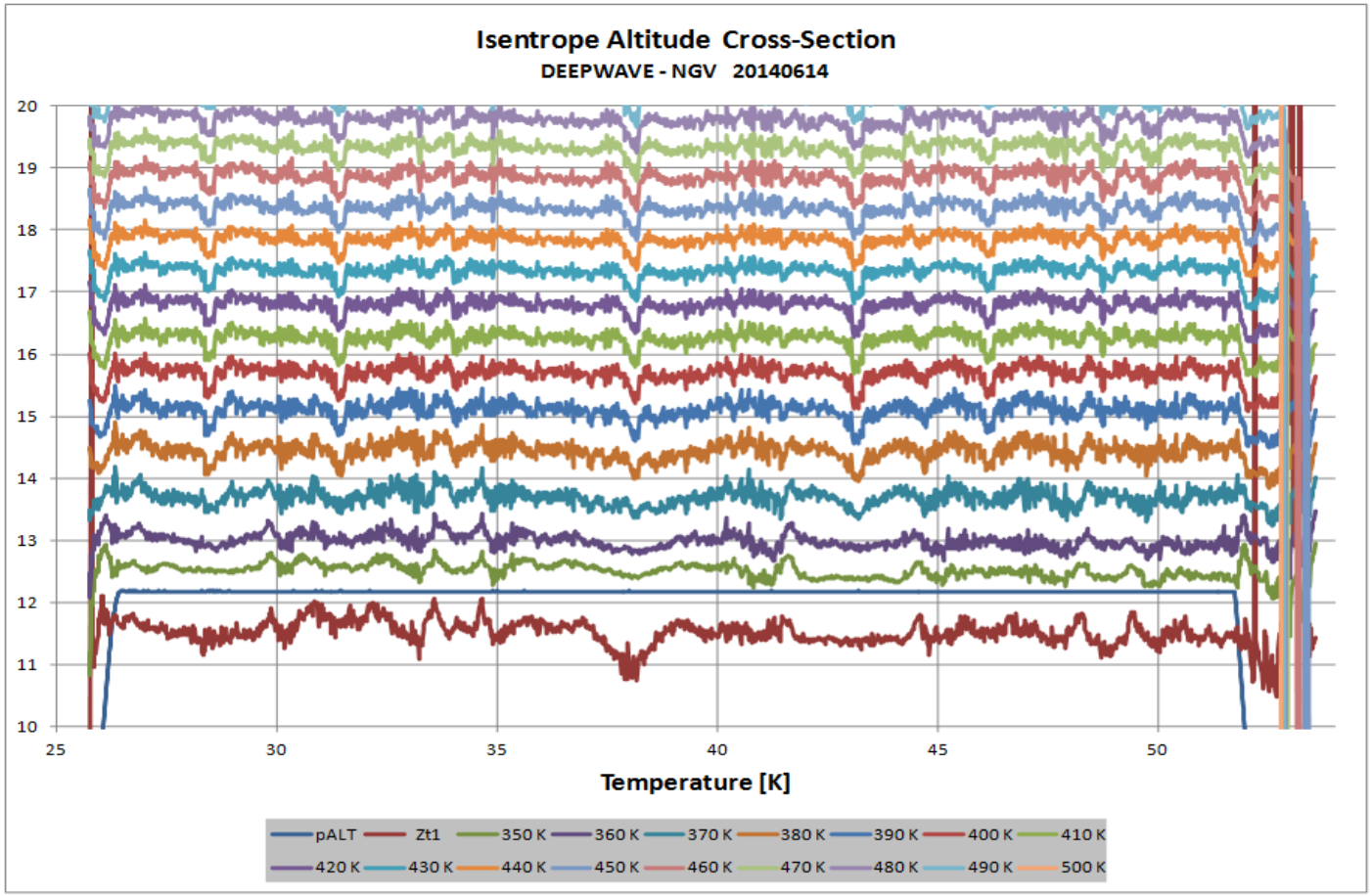
Davis et al., 2014, *J. Atmos. Sci.*


TORERO RF04 20120127 -- Ozone Volume Mixing Ratio
Stratospheric intrusion
Altitude (km)
Time (UT kiloseconds)
O3 Vol MR (ppbv)
Thermal Tropopause 1
Thermal Tropopause 2
18
16
14
12
10
8
6
4
2
50
55
60
65
70
75
140
120
100
80
60
40
20
0

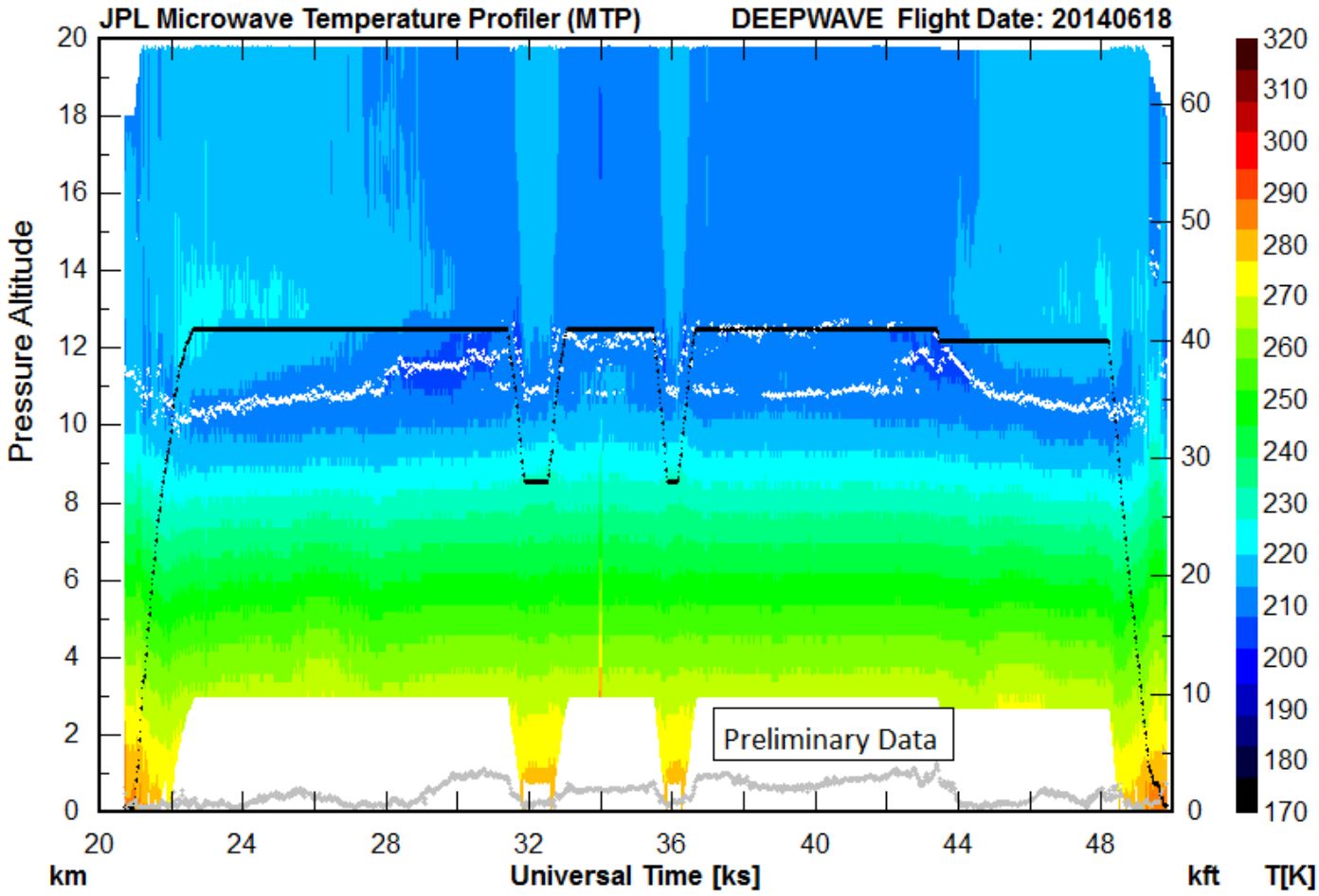
DEEPWAVE Preliminary Example RF04



RF04 Isentropes



DEEPWAVE Preliminary Example RF06



MTP Status as of RF07

- Sensor working well so far; raw data look good
- Retrieval quality is mixed
- Post-project processing will address retrieval quality issues
- Upsonde profiles will be used to derive additional retrieval coefficients to better represent temperature structure during DEEPWAVE
- Dropsonde profiles will be used for verification