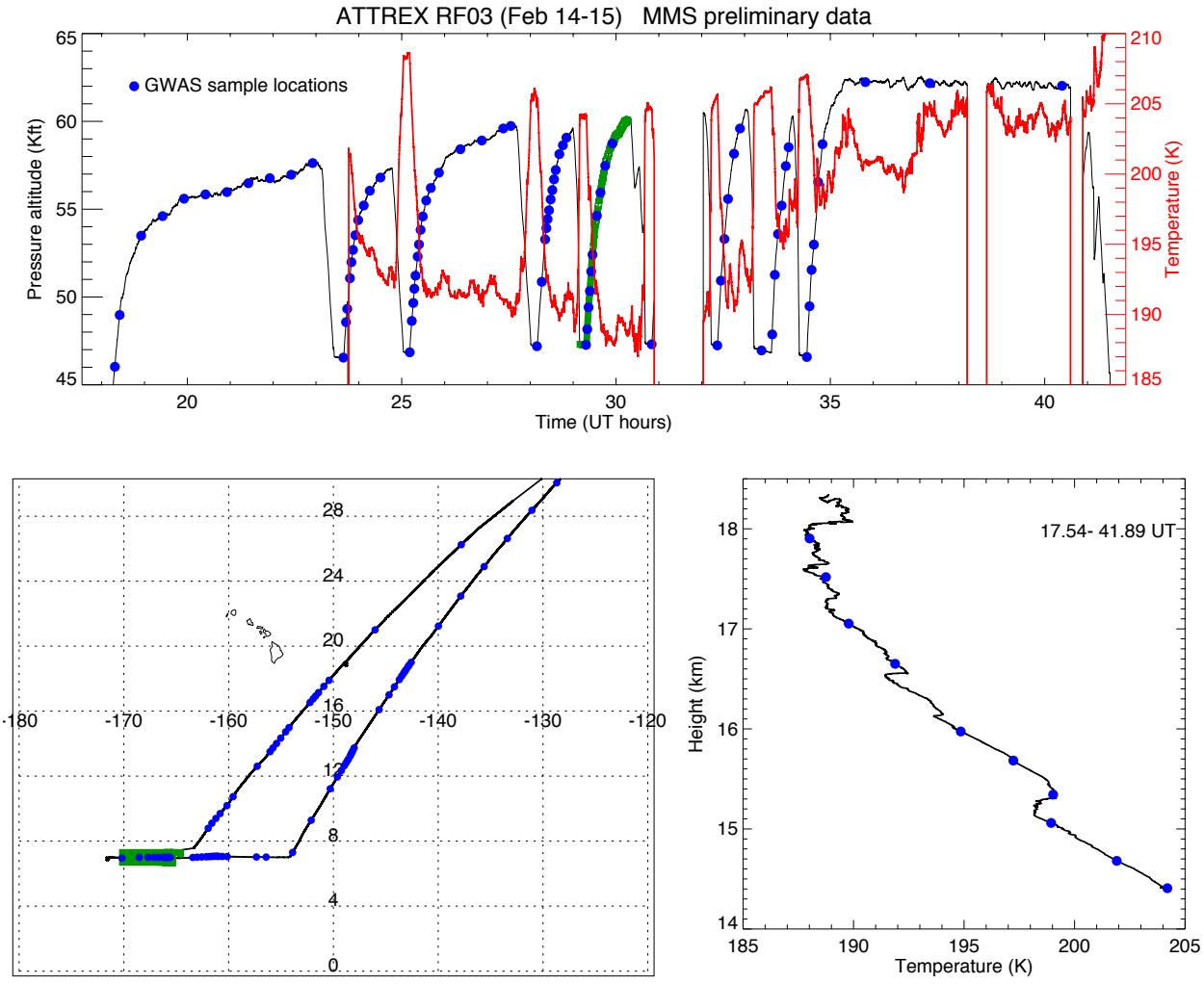
ATTREX Science Flight Report

2013-02-14 Science Flight #3

Takeoff: 1748 UT (0948 local), landing: 1816 (1016 following day), duration: 24.5 hours
Mission Scientists: Paul Newman, Eric Jensen, Hanwant Singh
Payload Managers: Jhony Zavaleta, Michael Craig, David Fratello

Summary:

This flight provided numerous vertical profiles through the TTL in the central Pacific downwind of cold air and convection west of the flight track. The aircraft headed south of Hawaii and then due west at 7 N to about 171 W. The figure below shows altitude and temperature versus time (top), flight track (bottom left), and a temperature profile from an ascent on the west end of the flight track (bottom right). The green segments in the time series and flight track plots indicate the location of the profile shown. Locations of GWAS samples are indicated by blue circles.

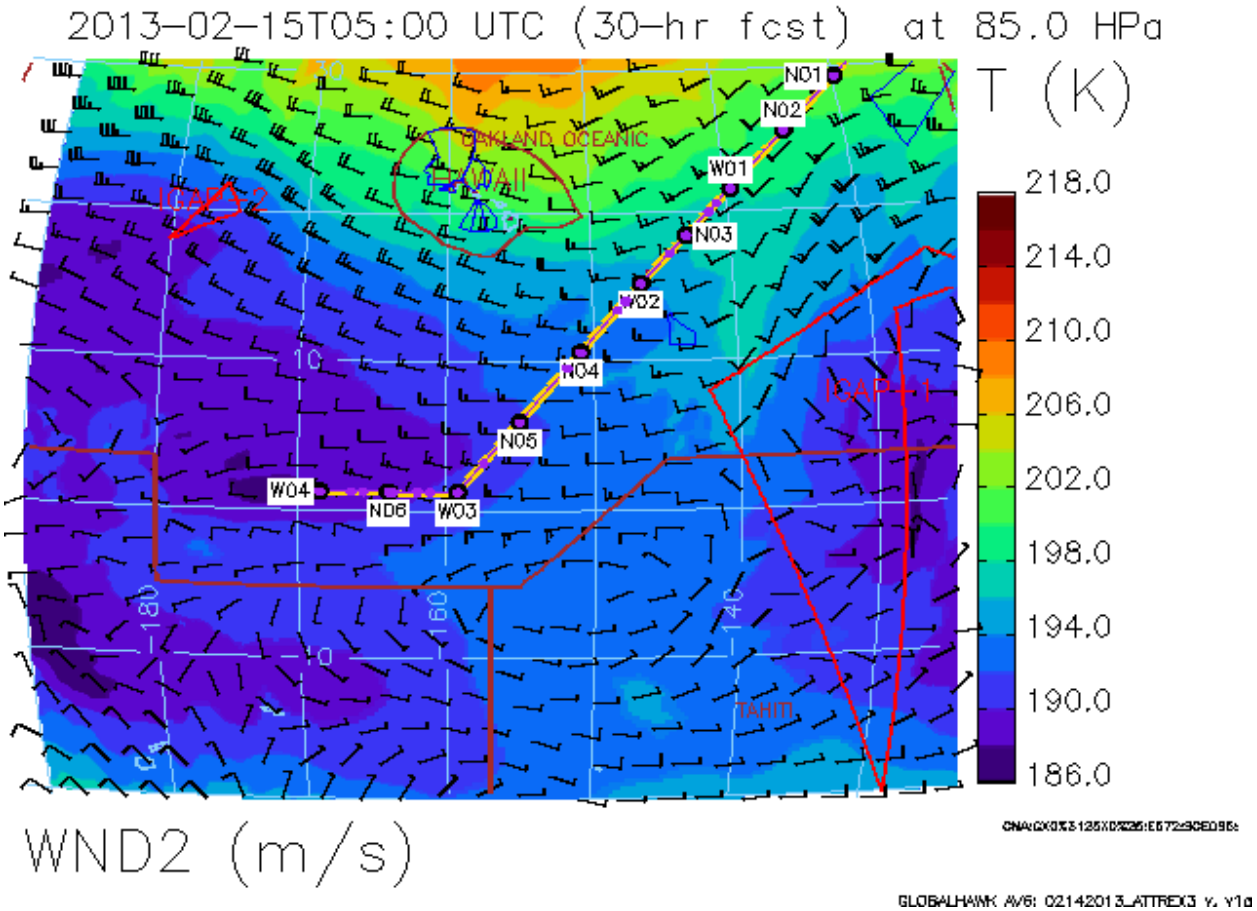


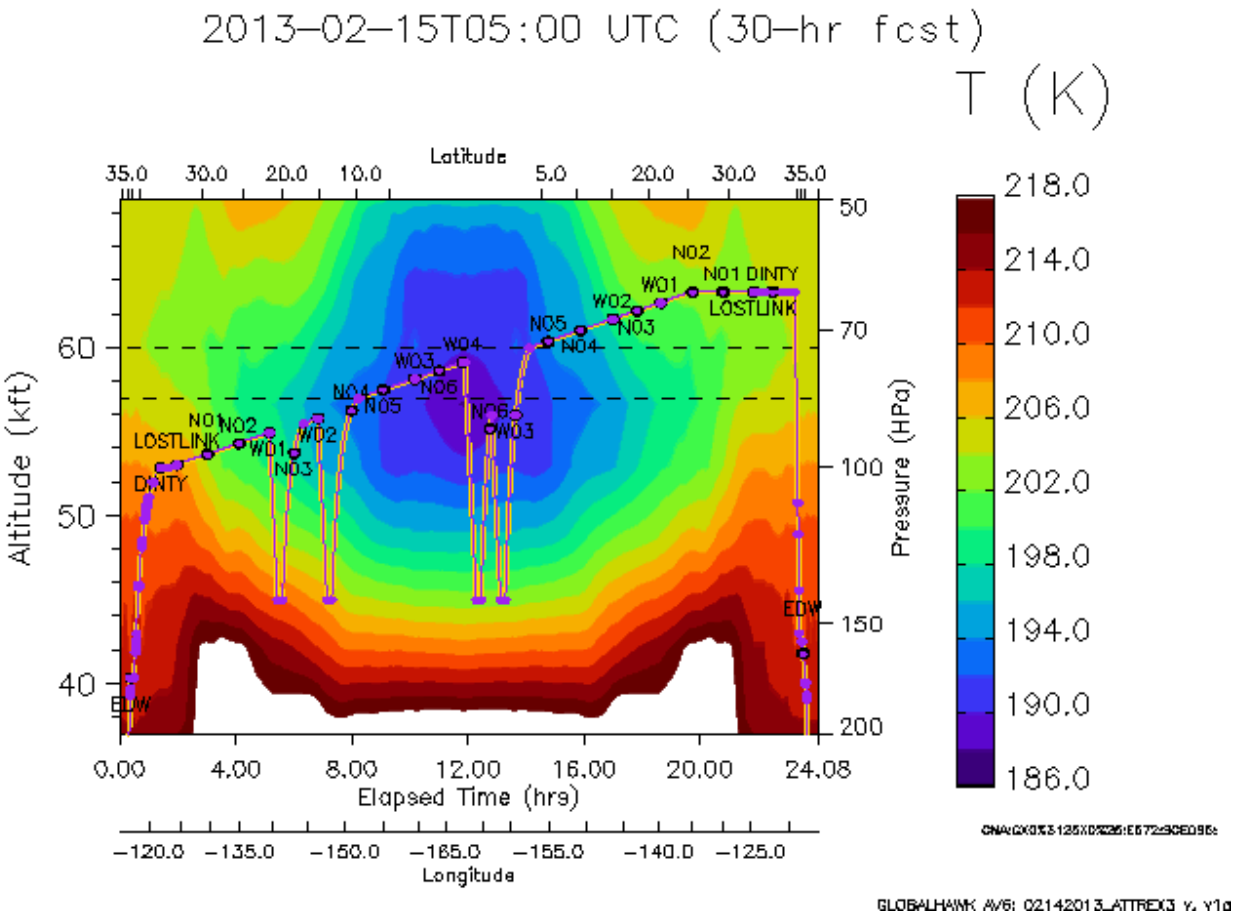
Dense anvil cirrus was sampled below 15.5 km near the west end of the flight track, and thin, patchy cirrus was sampled at about 17 km. Extremely dry air (measured H_2O as low as 1.4 ppmv) caused by the cold tropopause conditions in January was still present. All instruments functioned well.

Flight Plan:

This is the 3rd science flight of AV-6 for ATTREX .

The plan is to proceed SW and fly into some cold temperatures near the equator to the south of Hawaii. See attached plot. The air in the UTLS is flowing from the west where there has been extensive convection. We plan to profile twice as we head SW and then fly from W03-W06 with CPL on to identify cirrus in the TTL.





Flight log:

1545 GHOC staffed. P. Newman as mission scientist.

1600 Engine start

1650 While starting taxi, INS problem cropped up.

1705 Payload turned off.

1724 Fault cleared. Bringing payload back up.

1735 Vehicle moving.

1748 Wheels up.

1806 Passing FL380, theta = ~ 335K

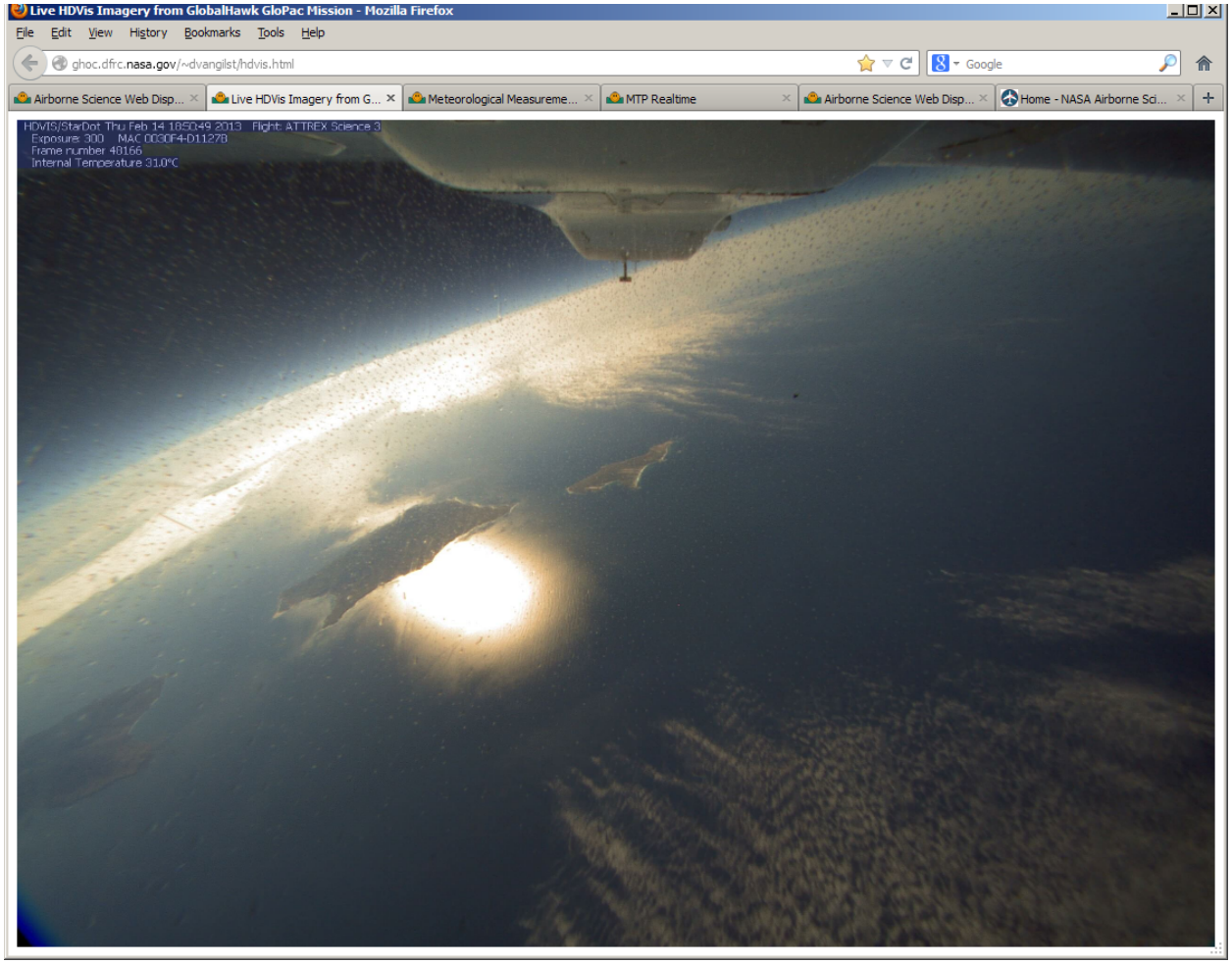
1817 Passing FL450, heading west.

1828 In stratosphere, ozone over 800 ppt

1849 Feet wet over the Pacific. FL525

1850 Nice view of marine clouds as we turn SW after feet wet.

1900 Ozone over 1ppm, while CH4 & N2O very low - stratosphere



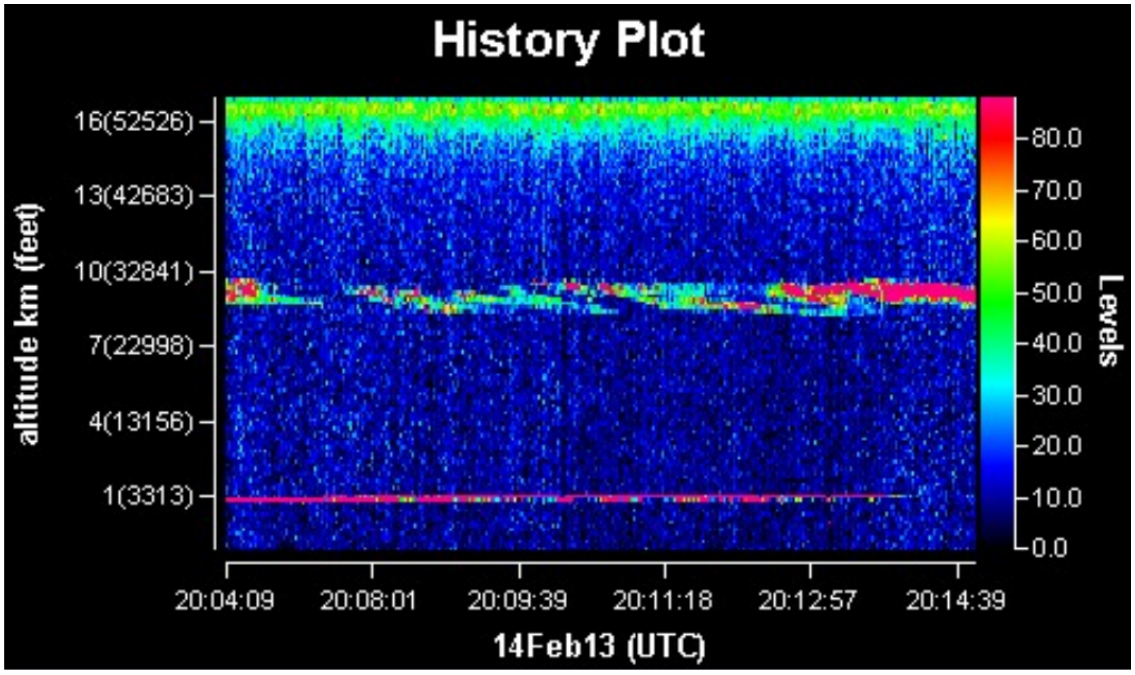
1933 Passed lost link waypoint, awaiting CPL enable.

1955 Nice layer of cirrus below plane at about 11 km (37kft).

Instrument Poll

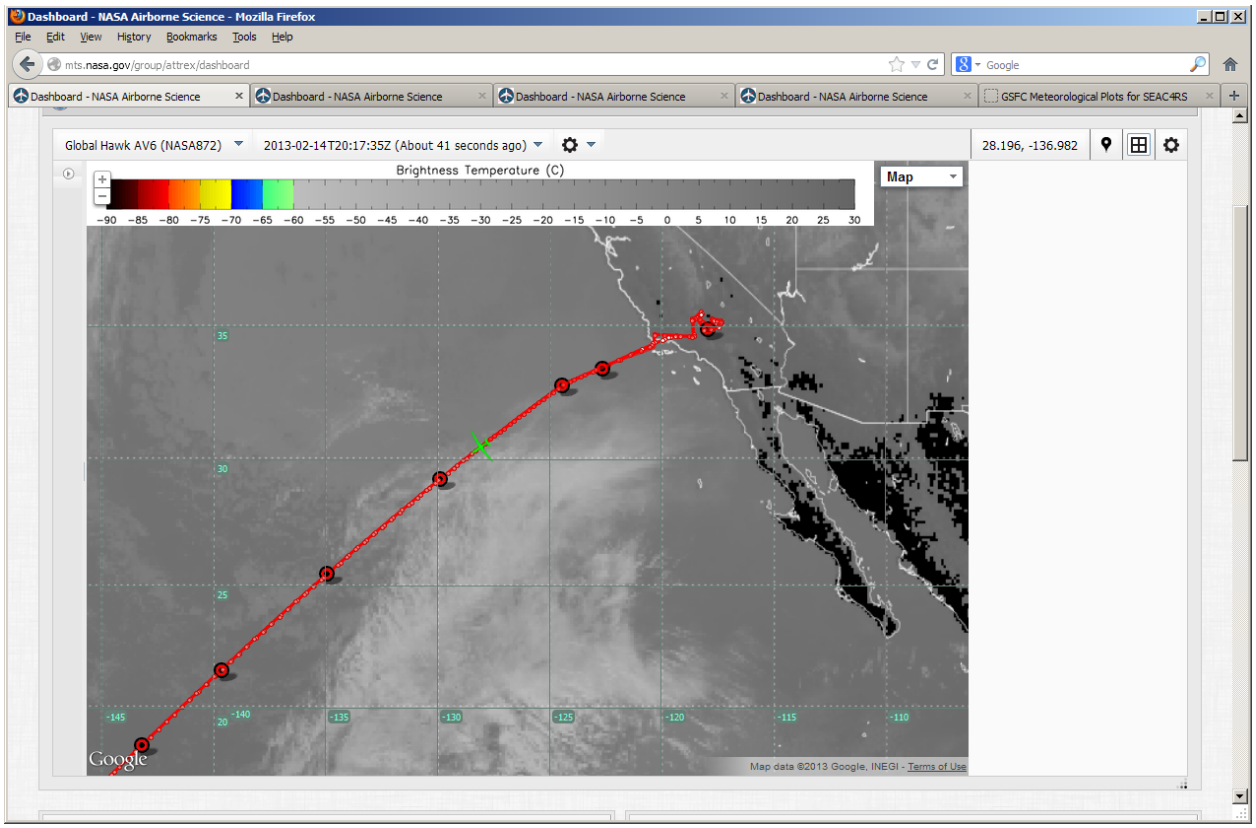
1. UCATS, WV, O3 – Look great. Everything working
2. DLH – Working very well.
3. Mini-DOAS – Working very well.
4. FCDP – Up and running, no problems.
5. NOAA O3, WV – Ozone working very well. Water working pretty well, temperatures not stable, so some oscillations in the data.
6. SSFR – Running fine. Lots of photons.
7. GWAS – 5 canisters so far.
8. CPL – Good profiles. Seeing some cirrus.
9. MMS –Working fine.
10. MTP – Everything doing well.
11. HU/PCRS – within limits and operating fine.

2002 Payload in good shape



2006 MTP has a tropopause at about 12 km and CPL shows cirrus somewhat under 10km. Aircraft at about FL550 with low water (NOAA ~ 2.5 ppm), ozone about 300 ppb, and CH4 about 1750 ppb. In the "tropical" stratosphere at FL550 (theta=410K).

2018 Passing over cirrus layer at aobut 8km (25kft) with marine stratus below.



2107 Almost finished passing over layer of cirrus. Emerging into region of marine stratus at

about 4,000 feet. Still in “subtropical” stratospheric air. Theta level at about 407K for and altitude of 56 kft.

2217 At about 2115, while at ~FL560, ozone jumped doubled to 0.6ppm from 0.3ppm.

2306 Descending from 57 to 45 kft.

2307 Ozone dropped sharply just before descent at about 21 N.

2325 Ozone down to 27 ppbv at 45 kft.

2339 Climbing back to cruise altitude.

0043 Descending from 56.5 to 45 kft.

0110 Ascending back to cruise altitude.

0147 Instrument teams report good payload health.

0249 NOAA H2O down to 1.4 ppmv at 58 kft

0257 Turning west at 7 N.

0332 CPL detected cirrus at ~15.5 km

0340 Heading down to 45 kft

0359 Entered cloud at about 47 kft

0410 Climbing back up to cruise

Later: We continued going up and down.

Thick cirrus near bottom of altitude range.

0651 start climb from 45 to 58

0735 descent to 45Kft MMS having some problems; TT3 fault ascending to warm up. MTP not getting MMS data

0750 GH is not authorized to descend if MMS not working. Paul just arrived so there is hope; we are turning north east. We are at 59.5 hoping to stay below 60Kft

0802 MMS is back; descent begins from 59Kft; MTP to switch to MMS

0822 Climb begins from 45Kft; 8.5N

0852 At 58.5Kft; 10.4N; TAT-90 F

0906 Descent from 59.99Kft to 45 Kft; 11.4N; future climbs to only 58Kft.

0917 Ku is up. We are staying at 45Kft for 20 minutes to get a bit further north for the last potential vorticity dip between 15-20 N

0937 Start climb from 45Kft to 58 K ft; 13.2N

1002 At 58Kft; 15.0N, O3-250ppb; H20- 2.5 ppm; as low as 1.5 ppm earlier

1006 Descent begins to 45Kft; TT3 limit at 54Kft.

1007 All instruments working normally (GWAS in good shape; no DOAS IR)

1027 Start climb from 45 to 58+ Kft (last climb) at base O3-75 ppb; H2O-7 ppm; 16.3N

1050 At 58 kft (O3-210 ppb; H20-2.1 ppm), 17.6N, start cruising upon ascent

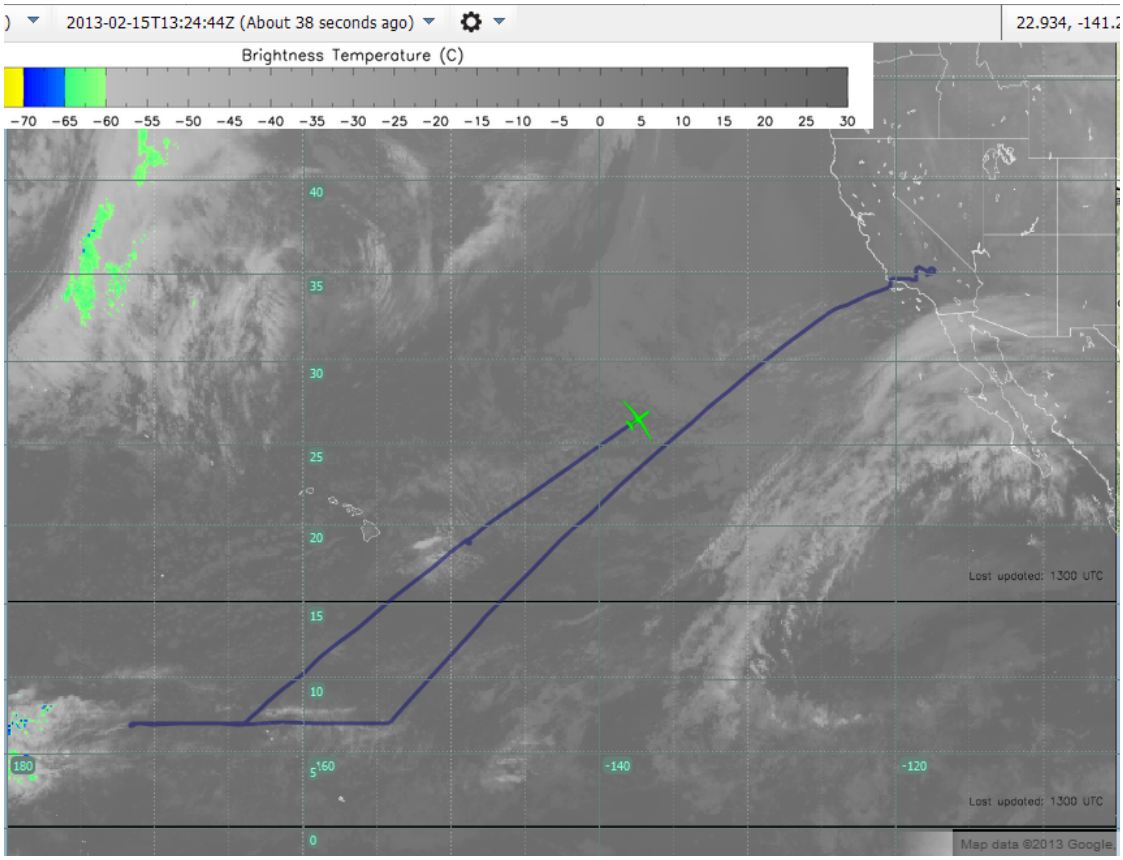
1107 MMS box maneuver begins at 61Kft and 19.0N; completed in about 10 minutes; heading home at cruise altitude

1218 62 Kft O3 and H2o have hovered around 750 ppb and 3 ppm; 22.7N

1300 Newman takes over from Hanwant Singh.

1315 Theta = 444 K, 62 kft, Ozone fluctuating between 700-900 ppb over the last 20 minutes. Water is about 3-4 ppm. Winds are light westerly (<10 m/s). CPL is showing virtually clear air below the plane with some marine stratus about about 4-5 kft.

1322 The plan was heavily revised during the 7N leg. See below the IR image with the track overlay. Note the return track from the middle of the track along a different heading, and the "close" grazing of Hawaii airspace. Also see the heavy "high" cirrus to the west of the hockey stick blade. We were principally aimed at the cirrus outflow of this stuff.



1424 Instrument Poll

1. UCATS, WV, O3 – Looks pretty good. Ch4 & ozone look good. UCATS water does not have temperature controller.
2. DLH – Operating very well.

3. Mini-DOAS – No photons.
4. FCDP – No particles. Working well, saw some high particle counts at 0509.
5. NOAA O3, WV – Ozone appears to be working well. No one in GHOC.
6. SSFR – Running fine. Lots of photons.
7. GWAS – 89 cans in the bank, 1 more to go.
8. CPL – Looks good. Some cirrus at 28kft.
9. MMS – Were doing well, but not getting packets in the last 5 minutes.
10. MTP – Looking good. Bouncing back and forth between iridium and Ku.
11. HU/PCRS – Instrument doing good. Having problem with a cal gas valve. Something about set-up with 28V aircraft power (probably actually high 26V)

1436 Cycling power on MMS

1437 GWAS, UCATS, and HU/PCRS would like airplane access this afternoon.

1452 Theta=447, altitude=62 kft, lat=31N, ozone ~ 1.7 ppm, h2o~4 ppm, ch4~1.45 ppm. Definitiely stratospheric air. Horizon is clear on the HDVis now, with CPL showing marine stratus below the plan at about 4kft. ETA~10AM PST.

1513 Theta=441, ozone fell off to about 1.2 ppm. Will wait a bit to open the last GWAS can when we get back to a very high ozone value.

1522 About 10 minutes out from LostLink waypoint. CPL will be turned off at this waypoint.

1533 CPL turned off. At the end, we were seeing thick cirrus above 30 kft.

1624 Beginning to power down payload. GWAS took its last can.

1704 Testing stair step maneuver in the range.

1735 Doing MMS pitch and yaw maneuvers at 44kft.

1741 Pitch and roll completed.

1811 All systems powered down and vehicle on approach to EDW

1816 Landed. Great mission.