Flight Report 12/17/02

Flight Type: Test Flight

Flight Objectives:

- 0-20º test of AATS-14 and GAMS/LAABS sun run
- 2nd full test of lidars and in-situ instruments under sunlit and dark conditions, overpass of TMF.
- Variations of constituents along NNW track from Dryden.
- 2 ozonesonde launches from TMF: 5:15pm & 6:45pm (local).
- No science expectation.

Flight Plan:

22:15 - Takeoff
22:30 - Sun run #1 (20-12) from 35º 29'N 119º 06'W to 40º 20'N 125º 21'W
00:13 – Sun run #2 (8-0) from 37º 25'N 121º 00'W to 41º 37'N 123º 49'W
02:14 – Table Mtn. Overpass 34º 23'N 117º 41'W
02:47 - Land

Forecast Meteorology:

The subtropical jet is located immediately to the south of Dryden. Wind speeds to the south of us (~100 km) are upto 70 m/s at about 30 kft. Our flight will occur on the northern side of this jet. Wind will generally be W to WNW (272-282º) at speeds of 50-60 kts at the northern end of the track, and 120 kts at the southern end of the track.

The tropopause north of the jet is somewhere near 25-30 kft.

Our flight will primarily take place in the lowermost stratosphere. Temperatures will be roughly –45º to –50ºC at 35 kft. Atmosphere is roughly isothermal (constant temperature) over the 20-40 kft range.

Relative humidity at the 35 kft level is rather dry. Possibly some light cirrus, but thick cirrus is highly unlikely. 700 hPa maps show relatively dry air along our path. Recent satellite images show popcorn cumulus spread up and down the California region.

Flight Meteorology:

To be added.

Flight Report:

Takeoff occurred precisely on schedule. Low broken clouds up to about 10kft. FASTOZ (Avery) reported stratospheric concentrations of ozone near about 320 hPa on ascent. Higher clouds (near 15-20 kft) noted at about 36º28'N during first sun run. Some light

turbulence also noted near this location. FL 350 generally at about 340 K. Excellent view of the Golden Gate, Oakland, and Pt. Reyes on the first sun run track.

A double tropopause was observed by MTP nearly continuously over the flight. A clear temperature minimum (224 K) was apparent at 30 kft, with a second minimum observed close to 50 kft (210 K).

Near approximately 41N (00:40 UT) near the end of the second sun run, some very interesting ozone structure was noted by FastOZ and DIAL. MTP reports a transition from the double tropopause to a more normal winter mid-latitude profile. Wind speeds had fallen off near this northern end to about 60 kts.

At the end of the 2nd sun run, we turned back SSE and ascended to 41 kft. On this turn, ozone dramatically increased to values near 600 ppbv. This suggests that we were ascending into air with a more stratospheric character. After leveling off at 41 kft, the ozone values fell back to more nominal values of 300 ppb.

As we flew SSE, wind speeds increased as we approached the jet core. FastOZ noted the fall off of ozone values as we moved closer to the jet core. Pilots noted lightning activity at levels well below us as we approached Table Mountain. Attempts to contact TMF failed because of the SATCOM link. Overpass of TMF occurred at 02:10:14 UT. The DC-8 was undercast (TMF was overcast) during the overpass.

Landing at 02:43 UT. Pilots: Dick Ewers & Ed Lewis. Mission managers: Chris Miller and Bob Curry. Mission scientist on board: Paul A. Newman.

Status Report: Instrument – PI

DIAPER (in situ aerosols) – Anderson
Good flight. A few contrail hits on the flight.

FastOz – Owens
Great Flight. Saw 750 ppbv of ozone.

DIAL (Lidar ozone and aerosol above and below the AC) – Browell
Work well. Interesting science data.

DACOM/DLH (in situ trace gases and open path water vapor) – Diskin
Problem with N2O, will be fixed by Thursday, but good H2O, CO, and CH4.

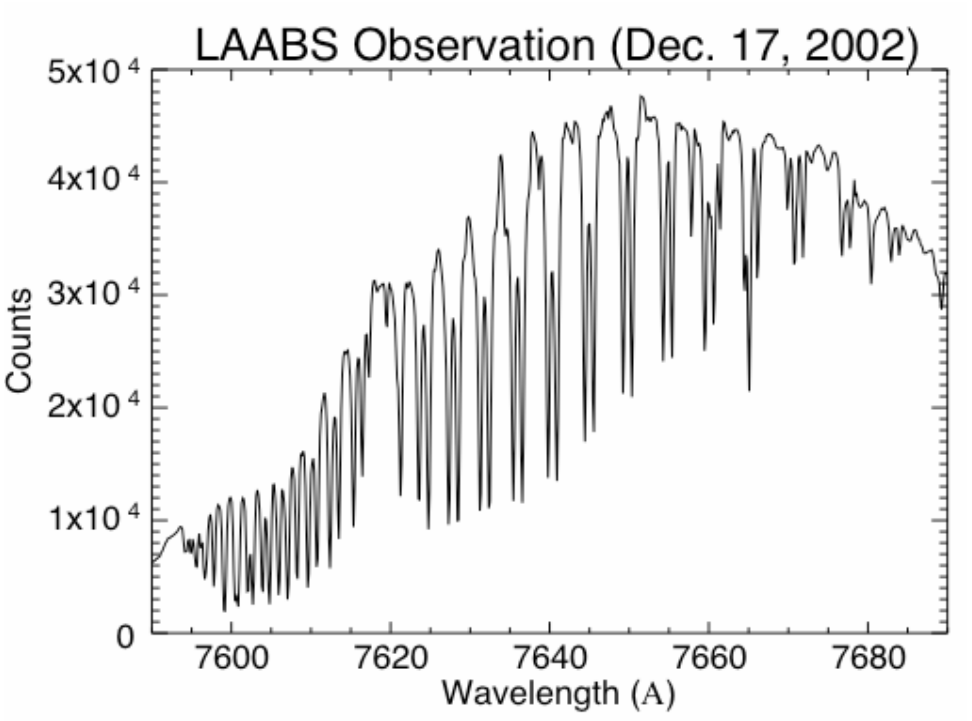
PANTHER (in situ PAN and other trace gases) – Elkins
Poor flight. Flash disk boot problem.

MTP (microwave temperature profiler) – Mahoney
Good flight. Lots of interesting tropopause structure.

AROTAL (Lidar ozone, aerosols and temperature above the AC) - McGee/Hostetler
Worked pretty well.

GAMS/LAABS (solar occultation ozone, aerosols and oxygen A band) – Pitts
Very good flight. From 20 to –2 degre zenith. See attached A-band spectra.

Example of a LAABS Instrument O_2 A-Band Raw Spectra taken during this flight (Dec. 17, 2002 DC-8 Test Flight). DC-8 Altitude: 35000 ft, Local Solar Elevation Angle: ~20°. Sample Wavelength: 0.14 A. Spectral Resolution: 0.42A



DIAS (Direct beam solar irradiance) – Shetter
Damaged during calibration on Saturday (12/14/2002). Should be ready for the 12/19 test flight.

FCAS/NMAS (in situ aerosols) – Reeves
Good.

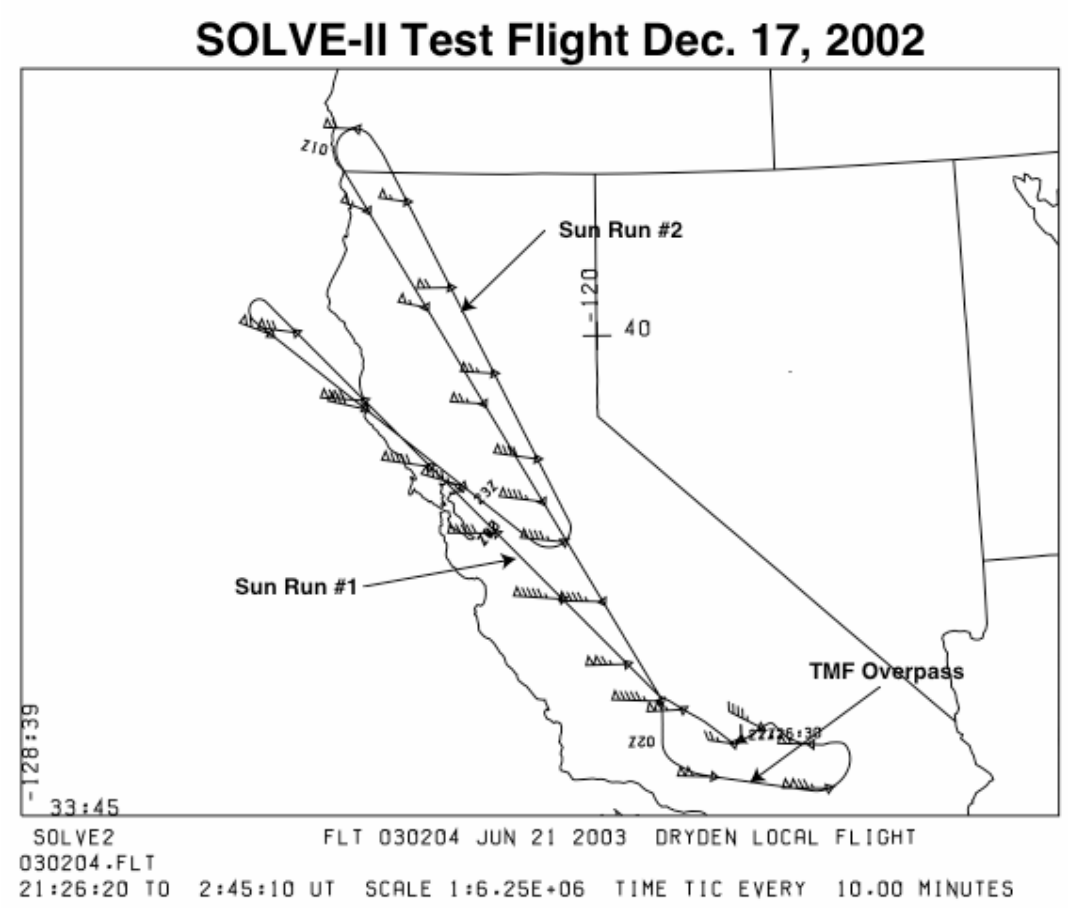
AATS-14 (sun photometer) – Russell
Great flight.

Differential GPS – Muellerschoen
OK. Flight. Lost track on the last 30 minutes, but was able to reboot.

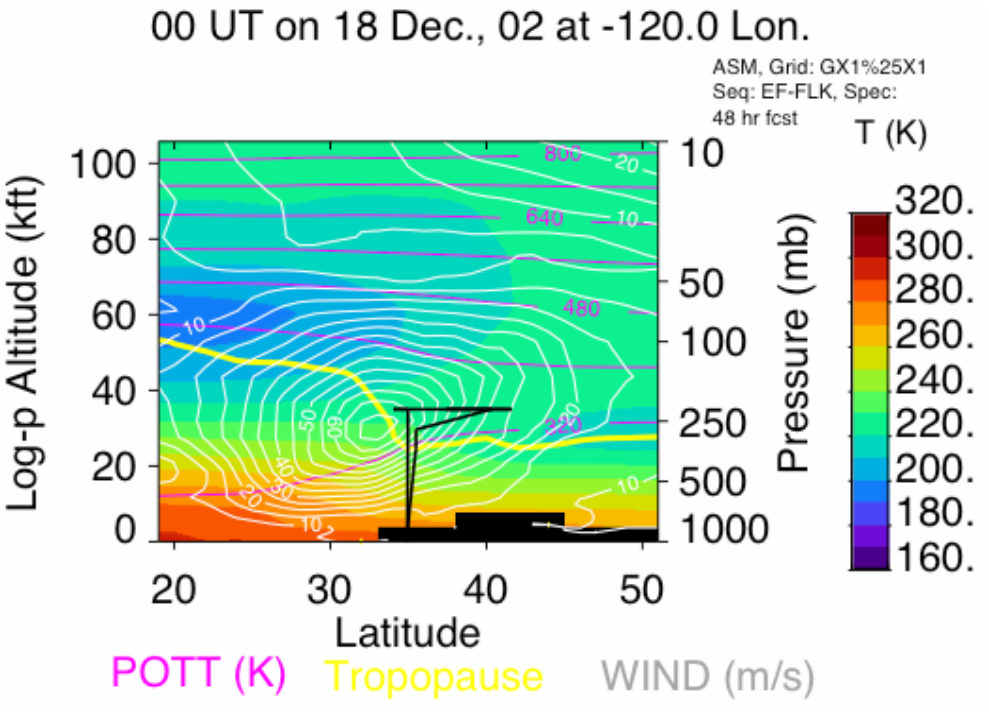
ICATS
Good flight. Slight problem with ozone inlet.

Plots (flight plan, solar zenith angles, rel. humidity):

Flight Plan:



Forecast horizontal transect along 120°W 48 hr forecast.



The broken and scattered clouds seen just NE of SF on the first sun run.