

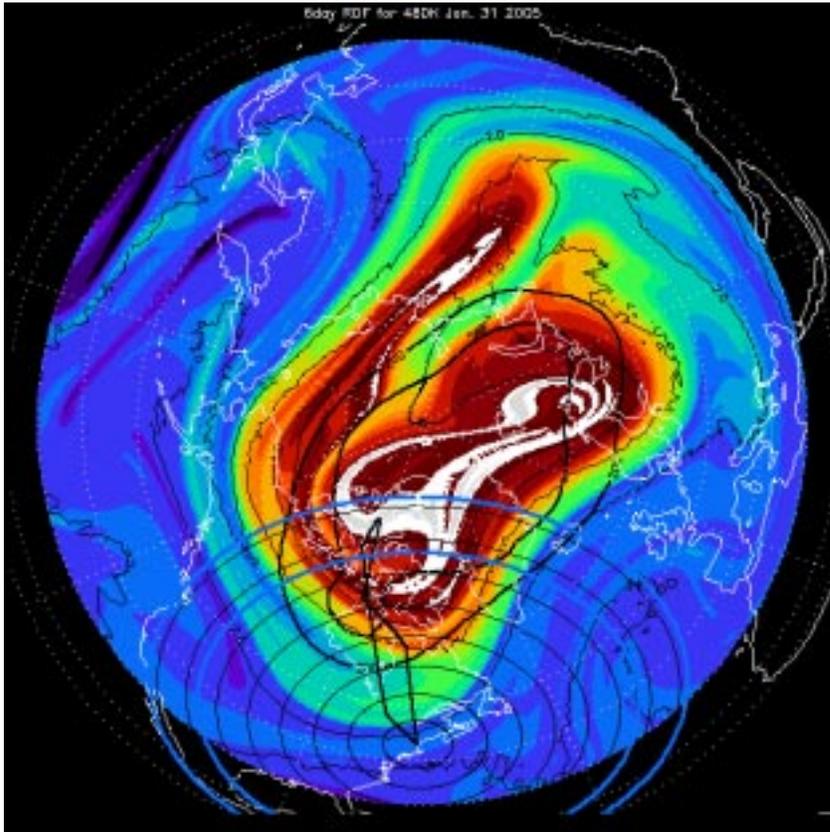
PAVE Science Flight Report 31 January 2005

Flight Plan

Fly northwest to pick up the Aura MLS track south of Hudson Bay (49°N, 81°W). Proceed northwest along the track to 71°N, 101°W. Travel east to Resolute (74°N, 94°W), coincident with a sonde launch. Turn back south to perform a sun run from 65°N, 88°W to 59°N, 74°W. Turn back toward Pease.

The MLS overpass will occur after the end of the track by about 20 minutes; the timing is fixed by the sun run. We will enter the vortex somewhere around 56°N. Air has been highly processed and we expect high values of ClO and depleted HCl. We do not expect to encounter PSCs.

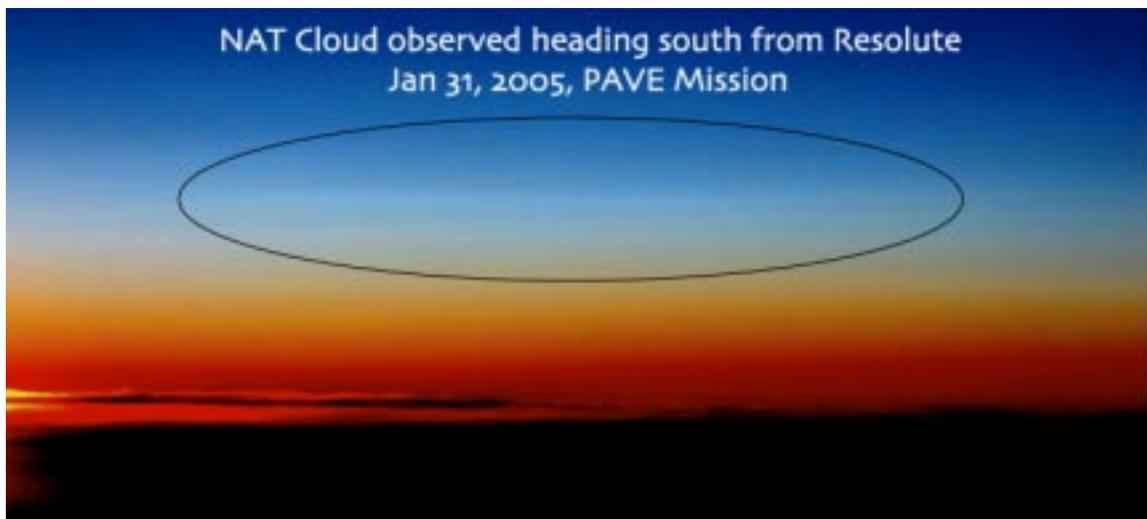
The RDF for the flight is shown below (PV at 460 K).



Report:

We took off 10 minutes early (13:18 UT) because the Navigator was concerned that winds might be higher and we would miss the sun run. On the last flight, air traffic control (ATC) gave us a lot of grief when we changed the sun run times. The tropopause was near 9 km. There were clear skies and a brown haze at takeoff. Levelled out at 33 kft (pressure) – about 1 km above the tropopause, ozone at ~100ppb – in clear skies. All

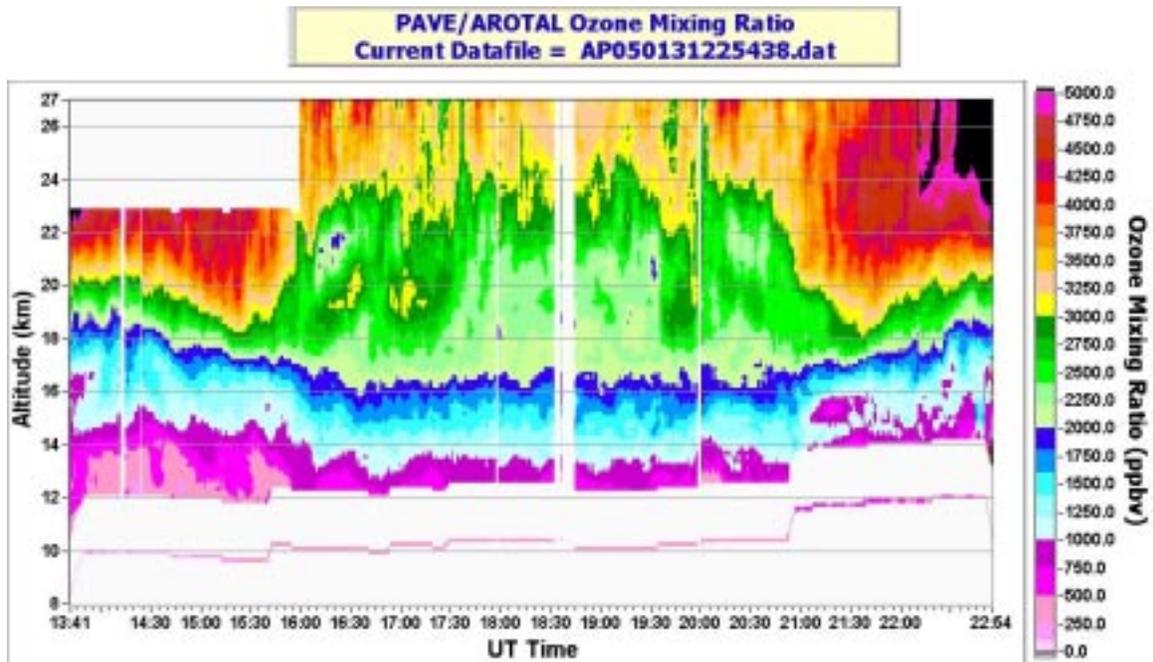
instruments were operating. Joined the Aura track about 10 minutes early; the forecast winds were weaker than expected, so we decided to fly further beyond Resolute than originally planned, then turn for the sun run. There were some clouds over the southern end of Hudson Bay, with evidence of an aged tropospheric fold (low water at aircraft level with high ozone below). Ozone levels rose as we approached the vortex. DIAL detected PSCs between 19.5 and 19 km at 59° (15:57 UT). This agrees pretty well with the IMPACT model prediction. AROTAL showed a big ozone transition at this latitude, with ozone decreasing significantly at 22 km. It was clear over Hudson Bay. Low ozone patches seen by DIAL seem to be correlated with the PSCs (NAT). PSCs amounts got stronger as we flew further north and passed waypoint 8, but ended at 16:40 UT as we got to the north end of Hudson Bay (waypoint 9). Ozone continued to decrease, and ASUR reported high CIO values at waypoint 9. DIAL reported another extensive PSC NAT cloud about 16:50. This cloud was quite a bit thicker than the previous cloud, extending from 16 to 22 km. The cloud ended at 17:20. These PSC regions likely are associated with the filament intruding into the vortex. The filament structure was seen in ozone as well (higher values of freshly intruded stratospheric air). Between 16:55 and 17:15, the *in situ* ozone rose above 350 ppb, with a highly correlated decrease on CO. AROTAL temperatures at Resolute were 192K at 18 km. DIAL saw enhanced stratospheric aerosols in this region as well. ASUR saw CIO drop as we got to higher latitudes. Turning south PSCs were visible on the horizon against the rising sun - see picture below. Interestingly, the winds reversed at flight level, so we were actually on the other side of the vortex (across the Equivalent-Latitude Pole). We encountered the PSC layer just before the sun run, but it disappeared before we started the run. Ozone at flight level stayed at 475 ppb, CO about 23 ppb. After the sun run, we exited the vortex at about 21:10 before waypoint 19. The total flight time was 10.1 hours.



Instrument Status

AROTAL	McGee	Good flight – nice data as we entered into vortex. Got some UV backscatter on the PSCs. Got temperatures on the return leg.
DIAL	Browell	Excellent flight – saw entry into vortex and exit. Saw Type 1a (solid) PSCs throughout the vortex. Sometimes saw filaments. There was a lot of structure below the aircraft in clouds and ozone.
FTS	Coffey	Worked well
CAFS	Shetter	Running fine
MTP	Mahoney	Worked well – got better retrievals due to new coefficients
ASUR	Notholt	Good flight – high CIO. Looked at HNO ₃ , N ₂ O on the way back
nadir CO ₂	Heaps	Worked fine – took data on the first half of flight (sunlit)
FastOz	Avery	Good flight – saw 1 ppm, lots of structure
DACOM	Diskin	Good flight – worked well
DLH	Diskin	Good flight – saw down to 5ppm
SAGA	Dibb	Worked fine
BNOD	Cohen	Saw NO ₂ on the way out, but pretty flat after that
ICATS	Hang	Worked fine
COBALT	Podolske	Worked well

Figures Below – AROTAL Ozone, DIAL Ozone and Aerosol



PAVE
Fit 8

Inner Vortex Survey
AEROSOL SCATTERING RATIO (IR)

1-31-05

