

DC-8 Flight 8, 12 April 2008

This was the first local sortie for the DC-8, roundtrip to Fairbanks. Objectives included sampling Siberian biomass burning plume expected near the southwestern end of flight track, aged Asian emissions at several levels along the northbound leg, MBL sampling in a BrO hotspot over the Bering Strait (reported by OMI and GOME2), a missed approach at Barrow to compare with W. Simpson's MAX DOAS observations, a BL run over one of the lakes studied by K. Walker (about 60 miles south of Barrow), and a wingtip to wing tip intercomparison with NOAA P3 along CALIPSO ground track coordinated with overflight by the B-200.

Biomass burning tracers were encountered in multiple thin layers as we approached the southwestern turn point. It was hard to remain in the layers due to their patchy nature (apparently small plumes in both vertical and horizontal extent). There were also multiple layers in this region that seemed dominated by fossil fuel emissions. As expected, deep clouds increased in the southwestern region. Tropopause descended as forecast, but we were largely successful at remaining in pollution layers below it. We arrived at the turning point at 30 kft expecting thickest part of the Siberian fire plume, but passed above it near 27 kft.

First attempt at MBL sampling was aborted at 1 kft due to stratus deck that was too thick for the DC-8 to get any lower. Thick clouds above us limited DIAL information, so we profiled up to 20 kft, encountering weak layers of pollution at several layers. Second MBL run began near 68 N. Stratus was thin enough that we made it to 300 ft AGL, weak signals of Br compounds were observed, perhaps also slight O<sub>3</sub> depletion. Clouds at all levels progressively thinned, so DIAL was able to direct us into another aerosol layer at 19 kft which was successfully characterized in situ. We returned to the MBL near our northernmost point (73 N) and again saw weak indications of ODE/Br chemistry. Heading toward Barrow we ascended into a layer at 5 kft for 10 minutes prior to another BL run that included the missed approach at Barrow. Here again the indicators of O<sub>3</sub>/Br chemistry were not striking. After Barrow the short transit to the lake included enroute ascent to 8 kft followed immediately by enroute descent. Lakes in the region all appeared to still be solidly frozen and no large enhancements of CH<sub>4</sub> were reported. However, small amounts of filterable Br- were observed during the first 5 minutes of our boundary layer run over the tundra and caribou. TOGA reported that selected HC ratios suggested active Cl chemistry on several of the BL runs during this flight. GT CIMS also reported low levels of both BrO and Br<sub>2</sub> on portions of several of the BL legs.

We joined the CALIPSO track at 22 kft and proceeded southward to rendezvous with the B200 and NOAA P3 at a prearranged point. P3 arrived early and found a visible haze layer at 16 kft. DIAL observed a separate layer with stronger scattering near 18 kft. We arrived at the point at 22:18 as planned and soon established formation with the P3 to left of DC-8. Comparison legs were flown in both layers, and also at 1 kft. Unfortunately, the early arrival of the P3 cost them enough fuel that they were unable to reverse course during the intercomparison as planned. This left us so far north at the end of 1 kft leg that we had to make a high speed and high altitude transit back to Fairbanks. Nearly all of

this transit was in the stratosphere at 38 kft. O<sub>3</sub> mixing ratio reached 800 ppb, highest of the mission so far.