

## DC-8 Flight 20, 5 July

Primary objective this flight was to characterize smoke from the Saskatchewan fires after aging for several days. In addition, the smoke was expected to be near or under a warm front along the south shore of Hudson Bay, so lofting of the smoke into the free troposphere was also possible. At the end of Flight 19 the previous day our major target for Flight 20 was to try to resample outflow from the large storms that had crossed the Pelican Narrows fires. Close inspection satellite images indicated that this outflow had traveled fast and was nearly out of range, and had been dispersed by shear. Thus, it was decided that the DC-8 would have little luck finding this air mass.

GOES images and the GASP products guided the planning for Flight 20, suggesting enhanced aerosols along the southern edge of the front. Sampling plan was to proceed ESE in a sawtooth pattern, crossing into the clouds to the north, then back into clear air to the south, repeating as time allowed, with smoke expected both in and out of the clouds.

Smoke was encountered near to Cold Lake as we proceeded to the fire region, but most of the fires were greatly diminished by the thunderstorms of previous afternoon and night. Our first low-level leg toward and into the clouds showed large enhancements in CH<sub>4</sub> and biogenics, but little evidence of smoke. Likewise the pass back to the south. Next pass to the north pointed us directly into deep convection with lots of lightning, so we diverted eastward to pass around this system before heading back toward the clouds. About this time the pilots reported that our weather radar was not functioning, limiting our opportunity to work in the clouds.

One final pass south of the front also found no large enhancements in fire tracers, so we decided to cross through the front (in a region with no active convection) and look for the smoke on the other side, over Hudson Bay. As we crossed through the clouds a short jump in CO and fire tracers was noted. On the far side DIAL observed a scattering layer in mid trop that was hypothesized to be a long-range plume, possibly from CA fires. In situ sampling of this layer found scattered ice crystals and very little aerosol. GOES visible images (received on board) suggested that there might be smoke over the bay to our north, so we proceeded in that direction. Turned out that the "smoke" in the satellite picture was due to transition from broken to nearly complete sea ice cover, and the air in the region was very clean.

At this point we turned back toward Cold Lake. Crossing the front in this direction, no obvious signs of smoke were noted. Reports from the ground confirmed that the fires near Pelican Narrows were not active, but that fires near Lake Athabaska were. Rather than diverting to these fires, we proceeded back to Cold Lake, with several low altitude legs to sample the biogenic emissions enroute.

Post flight discussions indicate that short-lived hydrocarbons, CO, HCN and acetonitrile were above background through a deep column near the front, but not highly elevated. Interestingly, AIRS CO retrievals during the time of the flight showed the sampling

region to be a hot spot. Perhaps the smoke was there, but well mixed by vertical motions in the frontal region.