

DC-8 Flight 11, 19 April 2008

Transit flight back to Palmdale to end Phase 1. Despite oft-repeated rumors that this flight was going to be a “straight shot” several science objectives crept into the plan. One target was to provide a DIAL O₃ curtain from about 8 km up to 12 km pressure altitude for comparison to MLS retrievals in the upper troposphere. This also presented an opportunity for formation flight with the NASA P3 (transiting to Ames) to compare insitu measurements of aerosols on the 2 platforms. Phil Russell requested that we fly along the CALIPSO ground track rather than that of MLS, if doing so would not seriously devalue the DIAL curtain (the ground tracks are separated by ~ 10 miles in the region of interest). N. Livesey and L. Froidevaux were reached by phone and email, respectively, and agreed to allow us to attempt to serve both MLS and CALIPSO along the same flight leg by flying directly under CALIPSO. Chemical forecasts predicted that a river of Asian pollution would be along this track in the mid to lower troposphere, with only scattered low clouds predicted for nearly all the flight south of the Alaska coast. Several of the models predicted plumes of pollution of various origin higher in the free troposphere, so we planned to search for evidence of these after leaving the satellite track.

The flight went extremely well. The P3 left before us and found that cirrus clouds extended to the planned rendezvous point (clouds were further south than expected), so we adjusted the plan in real time to join up a little later (down track) in clear skies. As we closed on P3, DIAL reported a thick layer of strong aerosol backscatter extending from 10 – 17 kft, with the strongest scattering estimated at 13 kft. Formation flight began at 24 kft with a wingtip to wingtip enroute descent (1000 fpm) to 10 kft. Both planes then ascended to 13 kft and remained together for 15 minutes. Maximum enhancements of CO (~360 pbb) and BB tracers were observed near this level. Planes broke formation with P3 descending to BL and DC-8 climbing to 17 kft, but the DC-8 continued to fly same speed as P3 so that DIAL could observe aerosol and O₃ curtains immediately ahead of the P3. Finding 17 kft just a little too clean for our tastes, the DC-8 descended back into the plume and sampled at 14 kft for the remainder of the time coordinated with the P3. When the P3 “stopped” to execute a spiral before turning toward Ames, the DC-8 climbed to 25 kft and continued along the CALIPSO track at an expeditious rate. DIAL was quite happy, lack of clouds allowed them to provide perfect zenith curtain for MLS, and a spectacular nadir curtain for CALIPSO. The latter showed the thick plume we had sampled with the P3 persisting essentially the entire length of the track. Meantime, most insitu folks took a 90-minute nap because this was one of the cleanest (most boring) legs of the mission so far. When we reached the turning point at designated end of CALIPSO track we were pleased to find ourselves 30 minutes ahead of schedule (despite a 15 minute delayed takeoff, and one hour flying at P3 groundspeeds). So we descended to the top of the plume we had been watching on DIAL so long, and then profiled down to 10 kft before ascending to 29 kft for speed. DIAL reported a scattering layer just below tropopause, so we ascended to 33 kft to try to sample it. Favorable tail winds pushed us rapidly toward CA, and little exciting was seen at the tropopause. Science team was polled among 3 options, pushing higher to really get into the strat, staying put to observe any response of the tropopause to CA orography, or descending into more “Asian” pollution. Plume sampling won handily, so we dropped down to 22 kft and proceeded

into Palmdale. Flight duration was just 5 hours and 46 minutes, or one hour less than in the plan. Imagine how quickly we would have made a real “5-hour straight shot”!!!