

Flight Report, ARCTAS # 12, CARB #1

For the first flight of the second phase of ARCTAS, the plan took advantage of a relatively large dry slot off the south coast of California. The lack of stratus was expected to allow extensive low level sampling over the harbors at LA and Long Beach and the Santa Barbara ship channel. Multiple passes over the LA basin at different times of day to characterize emissions were followed up by a southward leg to the south and west (including a loop around San Diego) designed to intercept the pollution plume from the LA basin after it had "cooked" for several hours.

All objectives were met, and all instruments except the NCAR HO₂ channel reported that good data were obtained for the majority of the flight. After take off we flew toward Palm Springs to allow warm up before entering the LA Basin. First pass through the basin was made along the northern edge to compare with long-term record at Mount Wilson. We spiraled up near Mt. Wilson and then entered the pattern to make a missed approach at LAX, crossing the runway at about 9:30 local time. Huge enhancements were observed by most experimenters, including the highest CO₂ ever measured by AVOCET in any airborne campaign. Proceeding at 500 feet above the ocean, we made our first circuit over the harbors, observing very high levels of S gases, with individual ship plumes showing SO₂ spikes near 50 ppb. Crossing over Long Beach we then transited through the LA basin at 1000 ft AGL and proceeded westward to Ventura, flying into weak onshore winds. Once back over the water, we turned southward to set up several transects of the Santa Barbara shipping lane. At this point we encountered our only ATC problems of the flight, finding that a Navy warning area along our planned route was active. Avoiding this area required us to circle back over the coast near Ventura and then deviate to the north side of the channel islands rather than the south side. ARB (Jim Pedersen) reported that this change in plan actually turned out for the best, since we made several additional passes over the coastal zone in an interesting region.

Just before take off it had been noticed that the smoke from the Hunter-Liggett fire was visible in GOES images in a distinct plume over the ocean just a little further west and north than the westernmost planned leg of our flight. Jim P. suggested that we extend that leg and attempt to sample this plume. We ascended to 15 kft during our northward leg to allow DIAL to try to pick the plume altitude and based on DIAL then descended to 4.5 kft to intercept the smoke. Pilots were able to see the plume and kept us in it for a while. Turning back to the east we crossed the shipping channel several times enroute to our rendezvous with the ship at the CH₄ seep at Coal Oil Point. Several circles at 500 ft near and over the ship were flown, modest enhancements in CH₄ were observed, but CO was also elevated in most of them, suggesting that we did not really encounter large emissions from the seep. Spiraling up over the seep, CH₄ levels dropped to background by 6 kft so the spiral was terminated at 10 kft and we continued onto Ventura and back into the LA basin for our second missed approach at LAX (13:30 local time). Enhancements of most pollution tracers at our lowest point over the airport were significantly lower than the morning pass, presumably reflecting growth of the boundary layer over the intervening 4 hours. After repeating the circuit over LA and Long Beach

harbors we headed south to San Diego. LA plume was not evident in the BL on south bound leg, so the return leg was flown at 3 kft in a layer with moderately enhanced aerosol scattering (picked by DIAL). We crossed the eastern side of the LA basin on the return to Palmdale and encountered highest O₃ of the flight (~ 140 ppb) near Riverside. This was consistent with updated model products which showed the LA plume to be advecting more to the east than the morning forecasts which had predicted flow to the south and east.