

INTEX-B: Flight 18 (AK local 4; May 12, 2006; Friday)

This was the 16th INTEX-B science flight and the second local flight from Anchorage, Alaska. The primary objective for this flight was to sample Asian pollution both ahead and behind of the ridge associated with a large WCB. Secondary objectives of opportunity were to do boundary sampling of the Bethel wetlands and a validation spiral for TES. The nominal flight track and model forecast for the DC-8 are shown in slides 2 and 3 respectively. Takeoff time for the DC-8 was 1115 (AK-LT) and the flight duration was 9.3 hours.

Most of the instruments aboard the DC-8 performed normally throughout the flight. Flight 18 sampled several important regions of a classical low pressure center with associated fronts (a frontal wave). In the lowest levels, as the DC-8 headed westward, it first was northwest of the surface warm front (in the cold air). Next, it traversed the warm sector between the warm and cold fronts, and finally at its westernmost point, it was west of the surface cold front (in the cold air). The middle and upper troposphere contained three features of interest—a trough over the far eastern Pacific, a sharp ridge that extended north to south just west of Anchorage, and the trough associated with the advancing frontal wave mentioned above. The DC-8 first was east of the ridge axis, in a region of northwesterly descending air. After crossing the ridge line, the winds shifted to southwesterly. This region corresponded to the cloudy, humid area of the warm conveyor belt in advance of the wave cyclone. The polar jet stream was crossed on either side of the ridge—first over western Alaska (northwesterly winds) and second near the western point of the flight track (southwesterly winds)—winds each time were approximately 100 kt. The above scenario means that air from Asia or the west central Pacific probably ascended in the cloudy warm conveyor belt ahead of the cold front, rose to much higher altitudes, and then descended east of the ridge. Clouds were widespread over the northern and western legs of the flight.

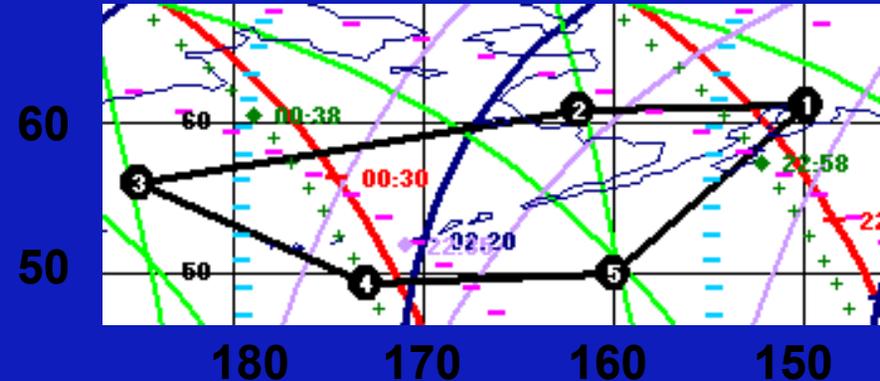
The primary objective was met but the secondary objectives of opportunity were not met. We flew NW from Anchorage at low altitude but found the Bethel coastal plain to be covered with low clouds and were not able to go into the boundary layer. At (61N, 162W) we headed west and intercepted a strong plume at 12K with up to 290 ppb CO, 1 ppb PANs, 72 ppb ozone, 400 ppt sulfate, 200 ppt HNO₃, 150 ppt HCHO... The low SSA and lack of methane enhancement implied a biomass burning plume, consistent with forecasts of Siberian fire influence. We got out of the plume at (61N, 166W) and did vertical profiling at 15-28K but sampled mainly background air (~130 ppb CO, ~60 ppb ozone). We climbed up to 30K at (59N, 176W), crossing the ridge at (60N, 170W), and found strong Asian pollution layers at 30K with ~250 ppb CO, 400 ppt SO₂, 2 ppb H₂O₂, etc. Ozone was not enhanced (in fact ozone was never enhanced together with CO during the flight) (see slide 4). We did vertical profiling at 25-30K to our westernmost point (57N, 176E). finding substantial and highly variable Asian pollution interweaved with stratospheric influence. At our westernmost point and 30K we found ourselves in the stratosphere (behind the front), but dropping just to 29K we got back in the troposphere with heavy Asian pollution (CO up to 200 ppb, SO₂ up to 500 ppt) extending down to 20K. Below that altitude we had background air until reaching 8K (at 53N, 179W) where we sampled Asian pollution of a different kind with elevated aerosols and soluble species, 400 ppt HHCHO, only moderately high CO (145 ppb) and highly scattering aerosols – was this outflow from Japan? We went back up to 30K at (51N, 175W) through some moderately enhanced dust layers, and at 30K we sampled again massive WCB outflow with 250 ppb CO, 200 ppt HCHO, but low soluble species (10 ppt SO₂, 70 ppt HNO₃, but 600 ppt H₂O₂...). We got out of the WCB at (50N, 174W), gave up on the TES spiral because there were clouds throughout the troposphere, and did vertical profiling at 1-26K back to Anchorage. The most interesting feature during the return was a persistent pollution layer at 8-12K with up to 230 ppb CO, 8-12 ug m⁻³ dust, 1 ppb sulfate, 300 ppt HNO₃, ...which seemed to represent a combined anthropogenic and biomass burning influence. We also saw some more sporadic pollution at 20-25K. Our MBL leg at (54N, 156W) sampled SO₂ up to 2 ppbv, apparently reflecting volcanic emissions from the Aleutians transported south. At 24K and (58N, 154W) we sampled a pollution plume right at the tropopause with CO up to 170 ppb anticorrelated with ozone; low SSA suggested a biomass burning origin (though there also was some SO₂ enhancement).

JICATS archived data files for INTEX-B are available at: <http://www.nasa.gov/centers/dryden/research/AirSci/DC-8/ICATS/FY06/INTEX-B/index.html>

Plan for inTES-B flight#18 – Anchorage local 4 on Friday 5/12 updated Wednesday 5/11 @20Z

Objectives:

- Bethel wetlands (ABLE-3A revisit)
- Asian pollution lifted in WCB and subsiding around ridge
- TES nadir validation



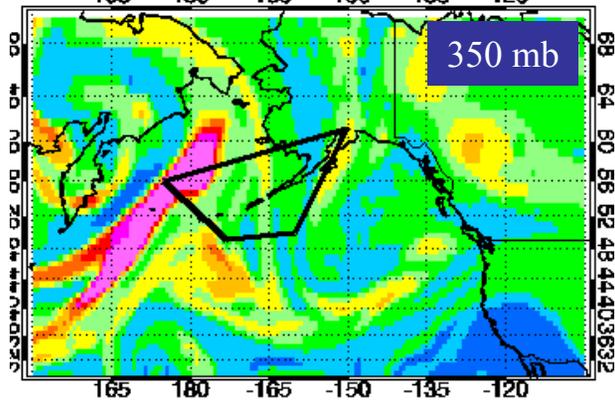
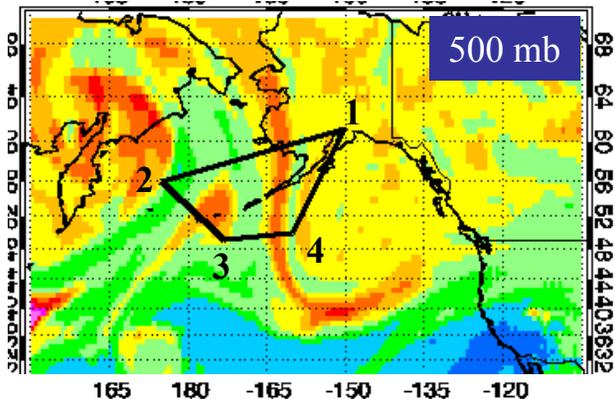
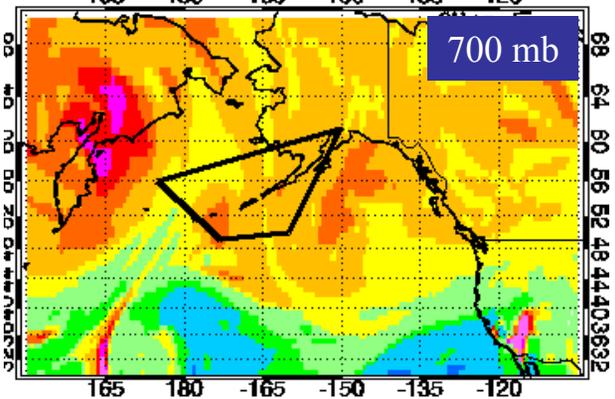
- Points 1-2: over mountains and in boundary layer
- Points 2-4: vertical profiling in Asian pollution around ridge
- Point 4: TES validation spiral (if we can)
- Points 4-1: vertical profiling in Asian pollution

Take-off time 1045 local, 9-10h flight

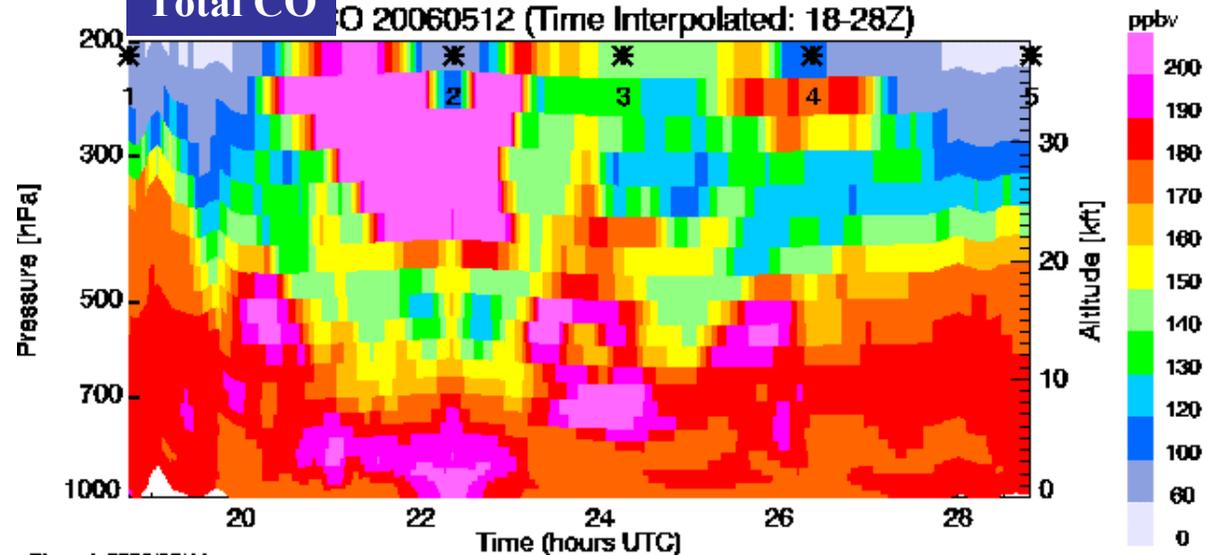
Point	1	2	3	4	5	6
Latitude	61.2	60.8	56	49.305	50	61.2
Longitude	-149.9	-161.85	-185	-173.02	-160	-149.9
Cum. Flt. Time	0:00	1:07	3:37	5:31	7:39	10:04
Leg Flt. Time		1:07	2:30	1:54	1:37	2:25
Local Time	10:45	11:52	14:22	16:16	18:24	20:49
UTC	18:45	19:52	22:22	0:16	2:24	4:49
Spiral				0:30		

0510 12Z Fx for Flgt on 0512

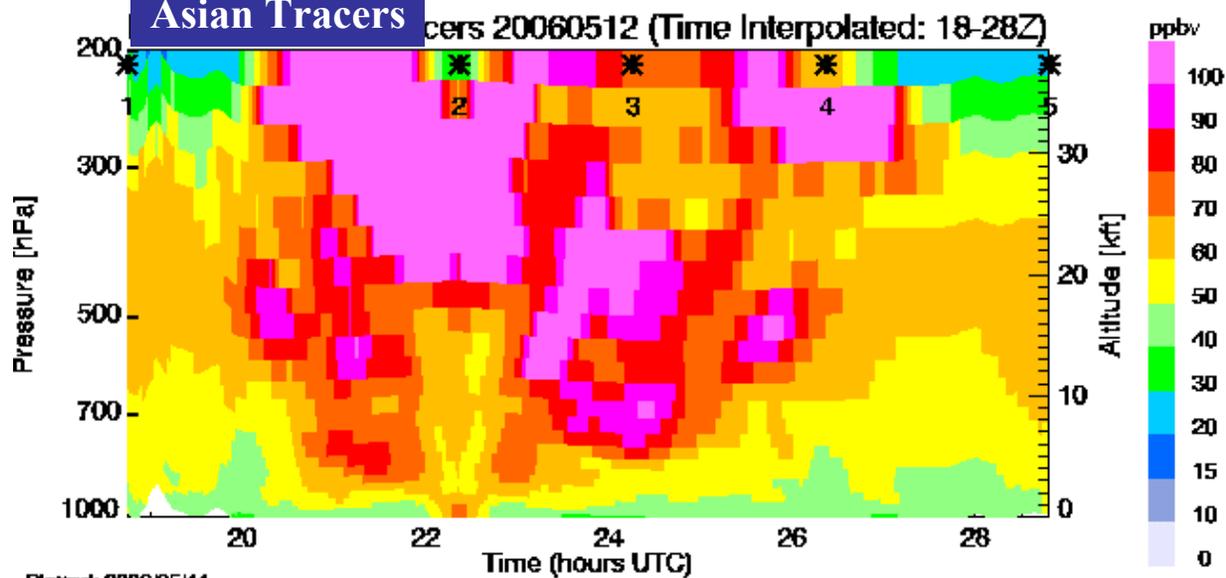
CO for 05/13 0Z



Total CO



Asian Tracers



INTEX-B
Flight 18

Alaska Local 3: WCB / TES
Aerosol Scattering Ratio (1064)

5-12-06

