

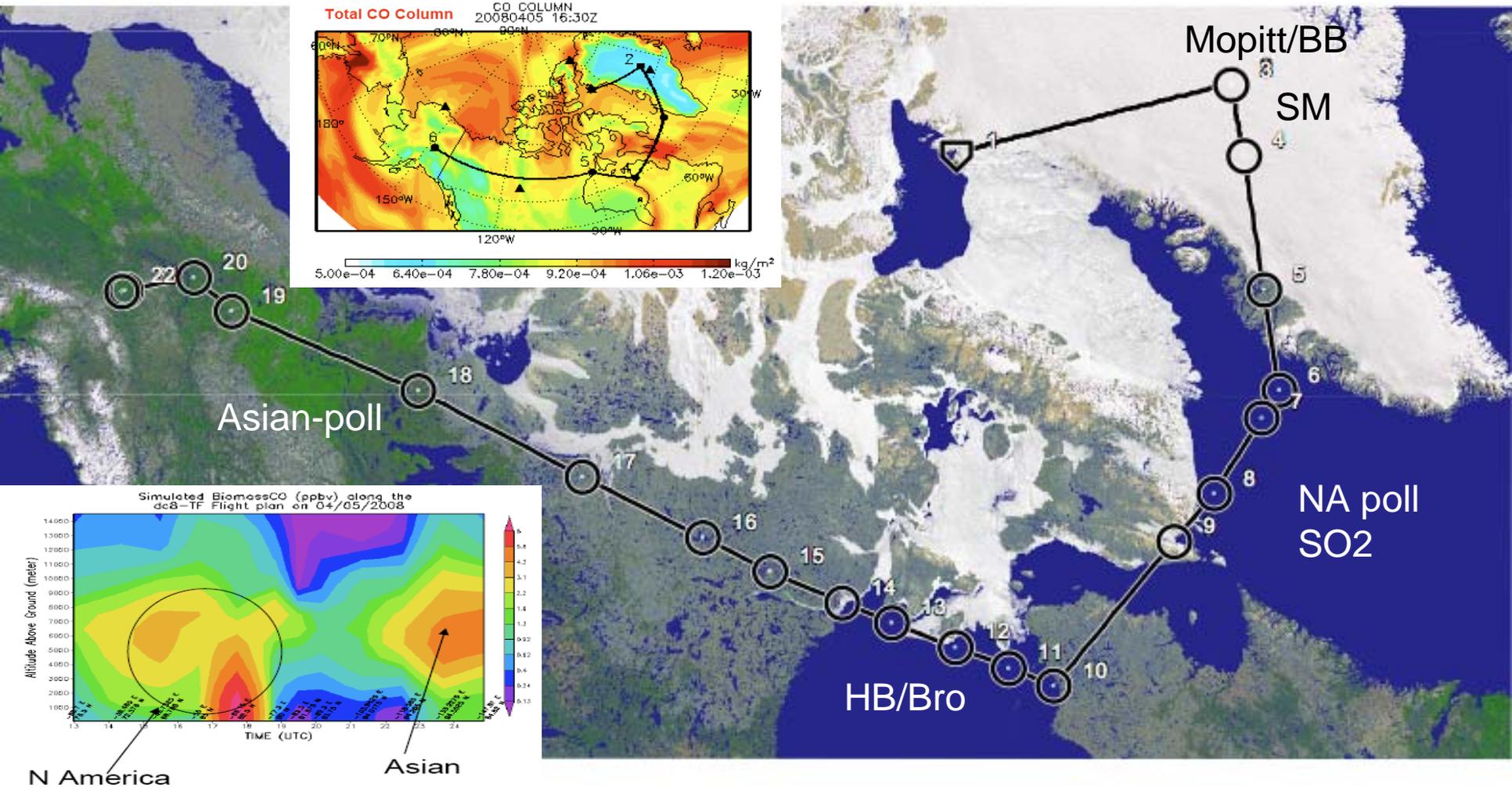
ARCTAS DC-8 Science Flight 5 (April 5, 2008; Saturday)

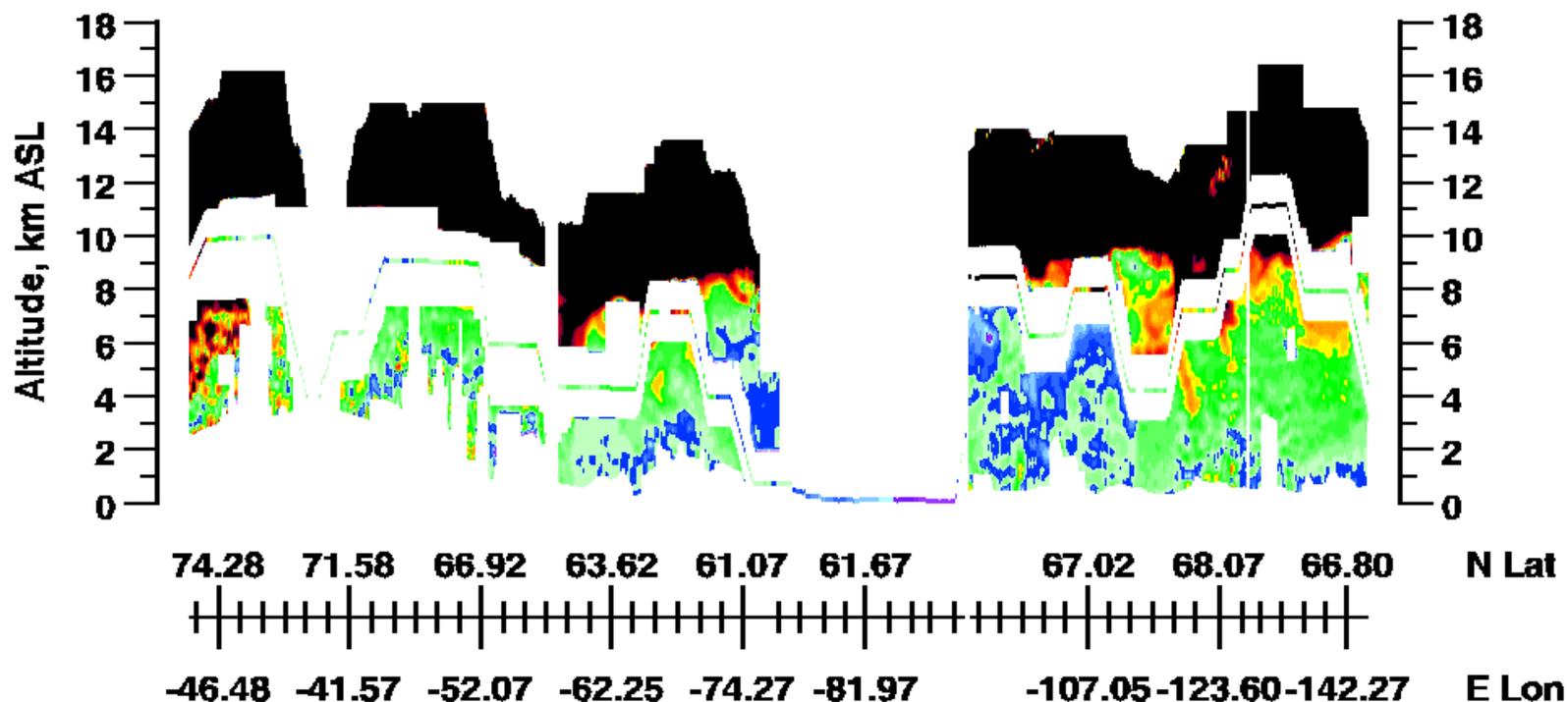
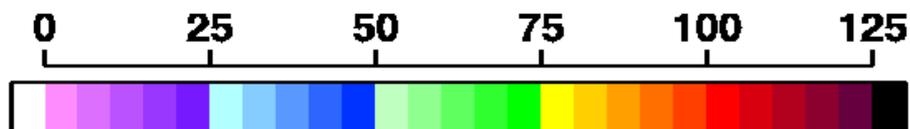
This ARCTAS DC-8 science flight originated from Thule, Greenland and ended at Fairbanks, AK. The main objectives were to under fly MOPITT over the Summit station, sample North American and Asian pollution influences along the flight track, and investigate boundary layer halogen chemistry over Hudson Bay and OMI tropospheric satellite retrievals of BrO. The nominal flight tracks and Way Points (WP) are shown in the slide below but these were modified in-flight to take advantage of specific opportunities and to avoid clouds. Take off time was 1000 h (LT-Thule) and the flight duration was 10.5 hours.

The major flow features were persistent low pressure over Alaska, ridging over the Canada-Pacific coastline, low pressure over the eastern part of the track, and high pressure east of Thule. The spiral down at Summit had cirrus tops at approximately 29,000 ft, and bases at approximately 25,000 ft. No low or middle clouds were in the area. During the low level transit over Hudson Bay, the eastern edge had winds from 090 at 34 kt. These values changed to 010 at 10 kt over the western edge. The air temperature generally cooled during the westward transit. Scattered fog occurred at various spots. The remainder of the flight to Fairbanks was unremarkable meteorologically but a variety of clouds and cloud layers were observed.

This was a good flight and we were able to meet all our objectives. With the exception of SP-2 (black carbon) and the CIMS OH channel most instruments aboard the DC-8 performed normally and collected data. After take off we climbed to 33 Kft towards the Summit and did a spiral under light cirrus but acceptable for MOPITT validation over ice surfaces. Some biomass burning influences were indicated by elevated nitrile tracers. The coordination with Summit station was excellent and they launched an ozone sonde just prior to DC-8 spiral. The Max DOAS instrument at Summit operated during this time. After the spiral we headed in the south westerly direction under somewhat cloudy conditions intercepting North American pollution at various altitudes. These polluted air masses contained rather high SO₂ and sulfate concentrations. We subsequently descended down to 500 ft over Hudson Bay in search of high BrO and low O₃ concentrations as predicted by OMI retrievals and models. These conditions were not encountered as ozone was moderately high (30 ppb) and the in situ instrument aboard the DC-8 failed to detect significant BrO concentrations. As we moved west over Hudson Bay under very low NO_x conditions (<10 ppt) ozone declined somewhat with values as low as 15 ppb. No difference was encountered between 500 ft and 300 ft levels. While predicted BrO was not detected there was soluble bromide present and a decline in mercury concentrations suggested that some bromine chemistry was underway. As the DC-8 climbed out of Hudson Bay the lidar saw increasing surface ozone concentrations. The DC-8 climbed into the stratosphere (38 K ft; O₃-600 ppb) heading west but we did not see significant BrO here either. Polluted air masses of potentially Asian origin were sampled enroute Fairbanks at a variety of altitudes. In most cases these were thin aerosol layers that contained little ozone enhancement.

April 5, 2008 Thule to Fairbanks (Take off 10 am-10.5 h flight btime)





Aerosol Scattering Ratio (591 nm)

