OIB
Antarctic Flight 8, Thwaites, Smith & Koehler Glaciers #3

Aircraft	DC-8
Flight Number	DC8-100116
Flt Req #	108002
Flight Hours	10.6
Date	10/28/09
Purpose of Flight	ICE Bridge-Thwaites, Smith & Koehler Glaciers #3
Aircraft Status	Airworthy
Sensor Status	All installed sensors operational.
Significant Issues	None
Accomplishments	Low altitude ATM flight west of the Pine Island area covering several coastal features including glaciers and mountains from W89° to W114°. MCoRDS, Ku Band radar, Snow radar & gravimeter in all collected data with KU Band radar operating in an altimetry mode. DACOM, WAS, DLH and AVOCET benefitted from a one time opportunity to sample morning & evening atmospheric chemistry measurements of Punta Arenas emissions over the Straits of Magellan south of the city. ATM guidance was described as excellent and the clear conditions in the subject areas were spectacular .
Planned events	Three missions are available for selection based on the takeoff forecast on the 29 Oct. flight.

Flight Summary

Thwaites-Smith-Kohler-3, FLT 8

Wednesday, October 28, 2009

Seelye Martin (Mission Principal Investigator):

Weather summary: This was an easy call; the AMPS model showed clear skies along the coast east and west of Pine Island Bay, and the Chilean flight services reported off-ice sheet winds, 25 knots on the eastern end of our line, decreasing to 5 kts on the west end.

Mission description: Immediately following takeoff, we will fly a short line at an altitude of 300 ft over the ocean past Punta Arenas to examine the trace gas emissions. Then, the primary mission is a low-level flight that runs from the Abbot Ice Shelf to the Thwaites-Smith-Kohler glacier, following the grounding line from east to west for about 700 km of line, and where this segment of the

grounding line ties into our earlier Getz grounding line survey. At the end of the line, we will do two ICESat lines over the Smith glacier.

Time line of flight:

0846 local: During the aircraft power change over from external to internal, the ATM popped a breaker on its UPS. This meant that we needed to sit on the runway for eight minutes to reset the ATM navigation. 0856: ATM good to go. 0911: takeoff. Flew out over the ocean, and south at 300 ft past the city. Continued about 15 nm south of city, then at 0922 completed pass and headed for transit altitude. Glen Diskin and Michelle say that the pass gave good results.

1207: Beginning descent and changing cabin pressure at a rate of 500 ft/min. We will make our landfall at the Venable Ice Shelf. At 7,600 ft, still over cloud deck. 1209: turbulence, entering cloud deck at 6,200 ft. 1211: broke through cloud deck, thick sea ice is visible, Snow radar collecting data. 1218: made landfall crossing over ice shelf, ATM observed a 50-m freeboard at shelf. There were lots of icebergs off the shelf as well as thick sea ice. View of ice shelf from aircraft was excellent.

We are on the deck, very choppy, flying the line. Almost too choppy to write. Can see surface. Clear at deck, but very choppy, 20 kt wind, air temp -20 C. So far, a textbook flight. 1240: choppy, clear surface. 1304: generally a very flat surface.

1322: wind speed is 14 kts, air temp is -21 C. 1339: mid channel, Pine Island glacier, transiting across its grounding line. The glacier is 40 km wide. 1345: air temp -20 C, just finished crossing PIG at grounding line, heading for Thwaites. Took photos of ice tongue. 1352: crossing into Thwaites drainage basin. 1406: finished with Thwaites, now climbing over into Smith/Kohler drainage basin past Mt Murphy. 1455: maneuvering over large expanse of grease ice with large icebergs. Air temp -18C, IR surface temp, -5C. 1457: heading up Kohler, which becomes Smith glacier.

1509: Mt Murphy is coming up again, then Mt Takehe, a famous conical volcano. Lots of pictures of Mt Murphy as we ascended Kohler/Smith. This has been a great flight. Nary a laser pulse lost to clouds. We are at 6,000 ft. 1549: descending down the last ICESat line. 1600: heading over polynya at base of glacier, nice transition from open water to frazil to thin ice. 1601: climbing at

3,000 ft/min, passed cloud deck at 4,000 ft. 1608: cabin is at pressure and level; sea ice visible below. 1922: atmospheric sample pass at Punta Arenas at 300 ft over the water. 1928: terminate pass. Ascend to 1,500 ft for laser calibration pass over airport. Problem with military jets operating out of the airport leads to a restricted airspace, reduced maneuvering space. 1930: ramp pass for ATM calibration. Landed at 1940 local; mission duration: 10 hr 29 min.

Individual instrument reports:

ATM: measured 160 million laser shots, got data for most of the flight line.

LVIS: not operating.

DMS: DMS obtained overlapping imagery throughout all flight tracks of the ATM LIDAR. Approximately 10,000 images were acquired over a very wide-ranging spectrum of ice roughness. For the most part, the areas without glacial flow were fairly smooth, but I feel that area variations greater than 20-cm extent were imaged. As with yesterday's flight, the crossing of flight lines in several places will provide opportunities for calibration of the camera's bore-sight stability.

MCoRDS: The glacier ice thickness was measured with the MCoRDS system along the coastal flight lines with more than 80% coverage. About 600 GB of data were collected today. The ice thickness measured during the grounding line flights rarely exceeded 1.5 km. Investigators concerned about achieving of data on their hard disk, but data appears to be available, but in a different format and recoverable.

Snow and Ku-Band Radars: Due to a higher pulse repetition frequency (3 kHz vs. 2 kHz), the Ku-band Radar collected 300 GB vs. 200 GB for the Snow Radar. Large fluctuations in the aircraft altitude resulted in the use of 10 different waveform settings for the Snow Radar. With a 2-GHz bandwidth, the Snow Radar can operate over a change of 1075 ft in altitude. The Ku-band Radar provides a broader intermediate frequency (IF) bandwidth; due to relaxed IF filter specs, enabling the instrument to operate over a slightly larger variation of altitude. The variation in altitude today was on the order of 2000 ft, for a flight that should be centered about 1500 ft altitude. Post-processing the near surface data and correcting for drastic changes in altitude will be tedious at best.

POS/AV: Flight went good for both POS-AV systems, and no problems occurred during the entire flight.

AVOCET/DLH/DACOM/WAS: All of the sampling instruments on board (AVOCET, DACOM, DLH, and WAS) performed as expected and took advantage of the unique opportunity to investigate the local pollution signature of Punta Arenas. During the morning flyby of the industrial site and the city, preliminary data indicate two distinct types of CO2 sources in the region: a relatively clean industry emitter and a dirtier city during rush hour. The evening return flyby (of the city only due to military jet activity in the area around the industrial site) showed a less distinct but still identifiable signature. The WAS instrument collected samples continuously during the flybys, and preparations are being made for a rapid turnaround of the data from the UCI lab. This is the last flight of AVOCET with ICE BRIDGE.

Gravimeter: worked properly.

Jim Yungel (ATM Team):

Mission #8 took off after a short (10 min) delay necessary to reset the ATM INS module following an open breaker at power transfer (second random open breaker of the deployment). Following transit to Antarctica, a survey line was flown along the coast, offset inland over the "grounding line" (the point where the glaciers start floating on the ocean). This set of flight lines consumed the majority of the data portion of the mission and was followed by two 30 minute

IceSat track lines up and down the combine Smith Kelly glacier complex. The weather was "severe clear" most of the day, and the ATM, GPS, NAV and Cambot systems ran well and collected data that looked excellent in the real time displays.

The other sensors reported a good day, and a ramp pass was flown for TAM at 1500' (looked good).

We flew past some spectacular mountains in the last portion of the mission.

Thwaites-Smith-Kohler 3

10.7 hrs total / 3.9 hrs survey

440 knots transit / 250 knots survey