

Preliminary Science Flight Report

Operation IceBridge Arctic 2011



Flight: F04

Mission: North Basin Transect /Thule-Fairbanks

Flight Report Summary

Aircraft	P-3B (N426NA)
Flight Number	TBD
Flight Request	11P006
Date	Tuesday, March 22, 2011 (Z)
Purpose of Flight	Mission North Basin Transect/Thule-Fairbanks
Take off time	12:53 Zulu from Thule Air Base (BGTL)
Landing time	21:16 Zulu at Fairbanks, AK (PAFA)
Flight Hours	TBD
Aircraft Status	Airworthy.
Sensor Status	All installed sensors operational.
Significant Issues	None
Accomplishments	<ul style="list-style-type: none"> • Low-altitude survey (1,500 ft AGL) of a sea ice transect along 3 ICESat ground tracks in often marginal to poor conditions. Mission needed to be shortened during flight because of weight, drag, and head winds. • Unscheduled ICESat camp overflight at 19,000 ft. • ATM, snow and Ku-band radars, accumulation radar, gravimeter, magnetometer, POS/AV, and DMS were operated on the survey lines. • MCoRDS was not in operation on this flight due to the sea ice mission. Instrument team used time on the aircraft during the flight to work on the system and collect test data.
Geographic Keywords	Arctic Ocean
ICESat/CryoSat Track	ICESat tracks 0329, 0328
Repeat Mission	Near repeat of April 5, 2009 mission and 2010 mission.

Science Data Report Summary

Instrument	Instrument Operational			Data Volume	Instrument Issues
	Survey Area	Entire Flight	High-alt. Transit		
ATM	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	31 GB	None
MCoRDS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	N/A	None
Snow Radar	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	200 GB	None
Ku-band Radar	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	200 GB	None
Accumulation Radar	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	150 GB	None
DMS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	11.4 GB	None
POS/AV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2 GB	None
Gravimeter	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	80 MB	None
Magnetometer	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	TBD	None, but issues with HF

Mission Report (Michael Studinger, Mission Scientist)

Today's mission was planned as a near-exact repeat of the 2009 Arctic basin transect from Fairbanks to Thule. The original plan also included a single pass over the ICEX camp north of Prudhoe Bay, but given the latest camp location and within the operational constraints it was clear that we had to drop the camp overflight on today's mission to make it to Fairbanks within 8.5 hours. Even without the camp overflight, it was clear before takeoff that the flight had to be shortened because of weight, drag from the antennas and wind. The forecast for the survey line was far from ideal but given the large survey area and a large number of operational constraints that have been imposed on us this year we had no choice other than launching the flight given the circumstances. Given the forecast we got and the satellite images we downloaded before takeoff (Fig. 2) we planned to climb up on the last ICESat ground track 0334 towards the coast of Alaska, since this was the area with the best chance to collect ATM laser altimeter data in high-altitude mode. All other areas were clouded in and we hoped to be able to stay beneath the cloud cover.

Thule Air Base opened with a short delay this morning after yesterday's condition Delta and subsequent snow removal. Nevertheless, we managed to takeoff at 10:00 L (13:00 Z) as planned. At 14:20 Z we began our descent into the survey area that we had to stop at 10,500 ft AGL because of zero visibility. At 14:35 Z we were at the beginning of the line near waypoint 032999 at 9150 ft. We started to descent further at 14:37 Z in zero visibility and reached 1600 ft at 14:42 Z. Because of the poor visibility combined with moderate to strong turbulence we could not descent below 1500 ft. Conditions improved slightly as we progressed along the line and ATM was getting intermittent surface reflections. At 15:58 Z we turned to ICESat track 0328. At 17:21 Z the sun came out.

We experienced a strong headwind of 40 kts with significant wind shear along ICESat track 0329 that turned into a 60 kts head wind when we turned to ICESat track 0328. It was clear that we had to change cut the line short and head back to Fairbanks soon. At 17:35 Z, shortly after Waypoint 032811 we had to break off the line and were heading towards Fairbanks. The transit route to Fairbanks was close to the ICEX camp location and we decided to fly a high-altitude pass over the ground survey line. We obtained updated coordinates from Kyle Krabill in Thule during the flight. A Twin Otter (N70AR) from the Naval Research Laboratory was supposed to be over the camp doing a survey at 1500 – 2000 ft AGL for one hour in a window between 1500Z and 2000 Z, along the same ground truth line.

Thanks to Kyle Krabill back in Thule we received the latest coordinates of the survey line just 11 minutes before we reached the camp. John Sonntag entered the new waypoints into the ATM

navigation system and about 4 minutes before we reached the camp, or 20 nautical miles, the pilots prepared to couple the autopilot to the ATM navigation system. Everything worked well and at 19:34:19 Z we reached SVP2, the northern end of the ground survey line going at 19,000 ft. At 19:35:03 Z we left the survey line at the southern end at SVP1. During the time on the line, the aircraft was within 70 ft or better of the desired track – an excellent accomplishment by everyone involved to make this happen.

Close to the magnetic pole, we had again difficulties coupling the auto pilot to the ATM navigation system and the pilots had to hand-fly the aircraft. Once we got away from the magnetic pole the coupling worked fine.

Today's flight was under difficult conditions often in zero visibility. Given the time constraints and the large number of desired science goals that resulted in numerous operational difficulties we did not see a point in delaying this flight to wait for better conditions. By changing plans in mid-air we tried to get as much done as we could.

Individual instrument reports from experimenters on board the aircraft:

ATM: After talking to the manufacturer last week, the ATM team applied a fix to the temperature controller for the wide-swath ATM laser (ATM4BT2) that failed last week. The temperature controller consists of two heating elements in series and after isolating the faulty heating element the system worked well at half of its capacity, which was sufficient on today's flight to continuously operate the laser at around 47°C without requiring additional heat from a hair drier.

MCoRDS: The MCoRDS system was not operated on this flight due to the sea ice mission, but the instrument team used the flight for testing, configuring and calibrating the system.

Snow and Ku-band radar: The snow and Ku-band radars collected 100% data along the low altitude segment of the survey line. Both systems collected 200 GB each with 170 GB at low elevation. During the high-altitude transit, the system was operating in experimental mode only, with 300 MHz bandwidth, reducing the range resolution to about 1 meter.

Accumulation radar: worked well and collected 150 GB of data.

Gravimeter: Worked well. No issues

Magnetometer: worked well, but was impacted by occasional HF radio transmissions and possibly vibrating HF antennas.

DMS: DMS worked well and collected 10,759 images. Best day so far.

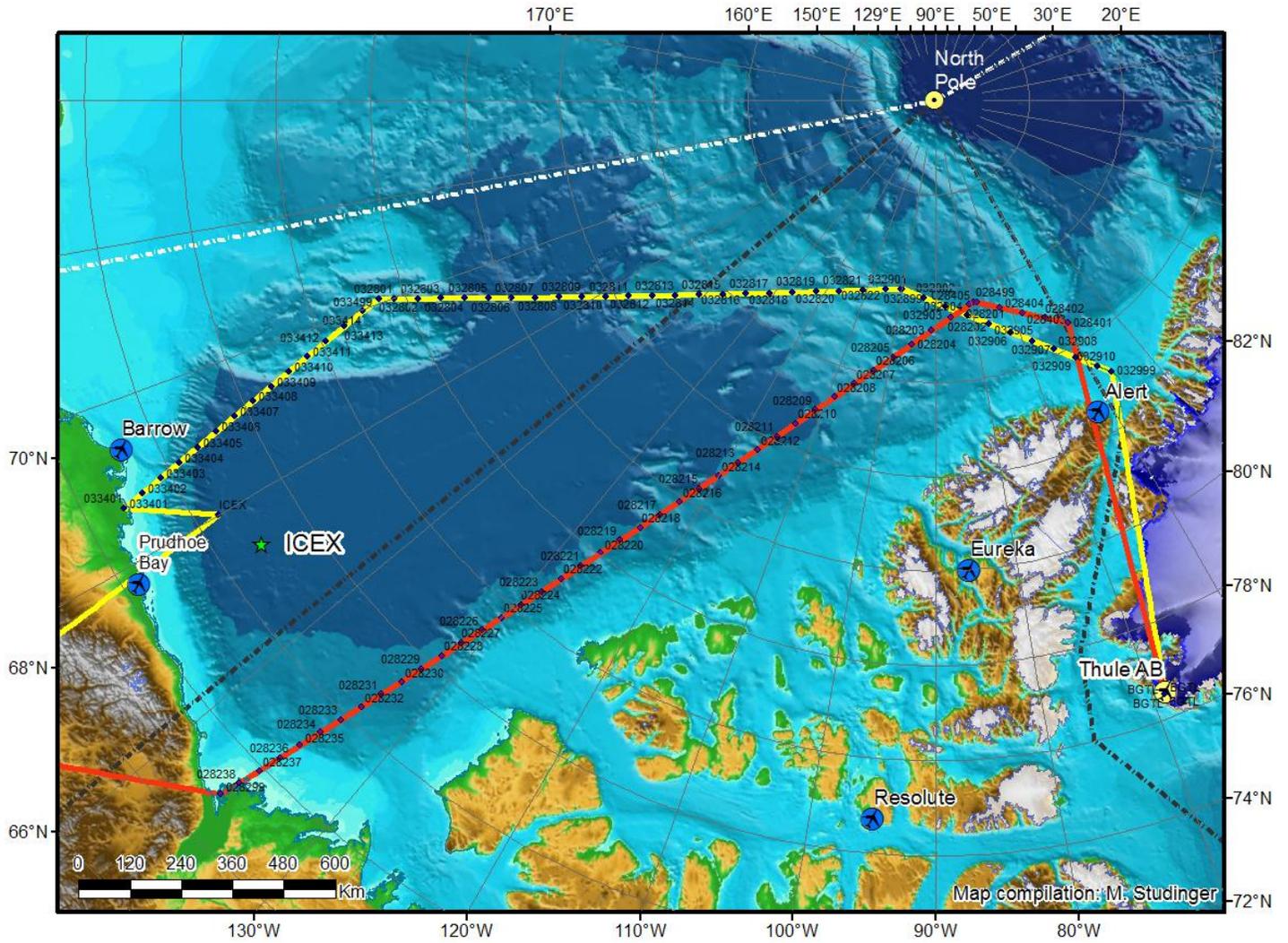


Figure 1: Sea ice mission plan for the Northern Basin Transect (yellow). The survey line had to be abandoned shortly after entering FAA airspace due to headwinds and other operational constraints. This opened the opportunity to fly over the ITEX camp at high altitude.

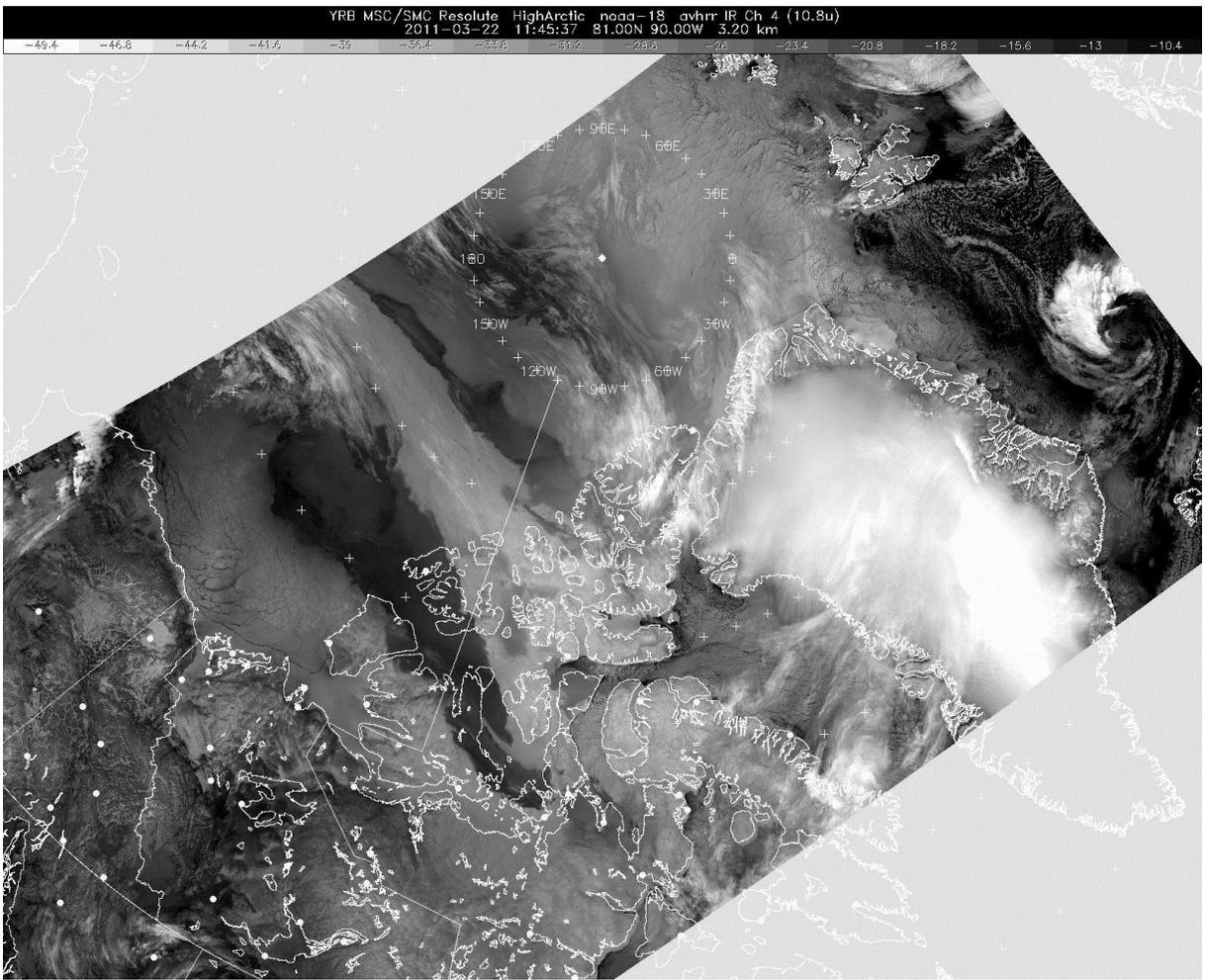


Figure 2: IR satellite image downloaded shortly before takeoff, showing significant cloud cover along the route to Fairbanks.