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# Preliminary Science Flight Report

## Operation IceBridge Arctic 2011



**Flight:** F03  
**Mission:** Sea Ice ZigZag West

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### Flight Report Summary

<b>Aircraft</b>	<b>P-3B (N426NA)</b>
<b>Flight Number</b>	TBD
<b>Flight Request</b>	11P006
<b>Date</b>	Friday, March 18, 2011 (Z)
<b>Purpose of Flight</b>	Mission Sea Ice ZigZag West
<b>Take off time</b>	11:13 Zulu from Thule Air Base (BGTL)
<b>Landing time</b>	18:00 Zulu at Thule Air Base (BGTL)
<b>Flight Hours</b>	TBD
<b>Aircraft Status</b>	Airworthy.
<b>Sensor Status</b>	All installed sensors operational.
<b>Significant Issues</b>	None
<b>Accomplishments</b>	<ul style="list-style-type: none"><li>• Low-altitude survey (1,500 ft AGL) of a sea ice transect along CryoSat-2 ground track (ascending orbit 4979). Completed entire mission as planned in marginal conditions.</li><li>• ATM, snow and Ku-band radars, accumulation radar, gravimeter, magnetometer, POS/AV, and DMS were operated on the survey lines.</li><li>• 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.</li></ul>
<b>Geographic Keywords</b>	Arctic Ocean, Lincoln Sea
<b>ICESat/CryoSat Track</b>	ICESat track 0136
<b>Repeat Mission</b>	No, but similar to 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"/>	36 GB	Heater failure on T2
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"/>	215 GB	None
Ku-band Radar	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	215 GB	None
Accumulation Radar	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	173 GB	None
DMS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	72 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 is similar to the Sea Ice 05 mission from 2010 and is intended to sample thick multi-year ice immediately north of Ellesmere Island, and the gradient to thinner ice towards the pole. It was shortened from the 2010 version, because the cruising speed of the P-3 during the transits is slower than that of the DC-8 we used for last year's survey. In addition to the slower cruising speed of the P-3 we also face additional constraints on Fridays in Thule that shorten the window of operations for us: the DC-8 rotator gets priority over everything, which means that we have to wait in the morning before pushing the aircraft out of the hangar and getting fuel. Luckily, the wait has not been as bad as we've been told and we were fueled and ready to go at 0745 LT, but had to wait for the rotator. We followed the DC-8 on the taxi ramp and were airborne at 1113 Z (0813 LT), just 3 minutes after the DC-8. In addition to a morning delay, the Thule airfield closes one hour earlier on Fridays, which means we have to be on the ground no later than 1445 LT, allowing a maximum length of only 6.5 hours for missions on Fridays. We modified the 7.5 hour mission plan for a 6.5 flight by planning to end the mission at waypoint RK03, heading back to Thule, since we have already surveyed the sea ice in the area between waypoints RK04 and NS06 during yesterday's CryoSat-2 underflight on an almost parallel line.

The weather forecast from last night and this morning indicated that the ZigZag West mission had the chance with the highest percentage of cloud free conditions. All other high-priority missions showed substantial cloud cover that would have resulted in significant loss of laser altimeter data. The conditions were much better than on yesterday's mission. We encountered the weather and visibility conditions we had expected from the forecast, with the exception of the severe turbulence at the northern part of the survey area. The entire flight was very calm, with occasional strong winds of 25 kts or more. Figure 2 shows one of the forecast models we looked at before takeoff, a new visualization of NOAA's GFS model. The model visualization shows cloud cover along the entire survey line at 500 meter flight elevation and would have called for a no-fly decision. Instead, we talked with the meteorologist at Thule Air Base to understand the weather situation and decided to launch despite the grim meteogram in Figure 2. It was the right decision and we collected good data along the entire line. The weather worked out well and we are relieved to have completed one more mission that requires us to issue a NOTAM for laser operations in Canadian airspace 24 hours before takeoff.

At 1243Z we descended to the start of the survey line at waypoint 013601 and began surveying in cloud-free conditions. The temperature controller for the wide-swath ATM laser (ATM4BT2) failed and the laser was not operating because the temperature was significantly lower than the 47°C that are required. A hair drier was used to get increase the temperature and at around 1332Z, near waypoint

013606, the laser was warm enough to start firing. Jim Yungel spent the rest of the flight on the floor of the aircraft, blowing hot air into the ThemoRack to ensure continued operation of T2.

At 1457 Z we turned early 10 nm before RK01n, because we were getting behind schedule with an ETA after the airfield closes. We also had to turn early before RK02 at 1548 Z to make up time. At 1548 Z we had to make a decision whether we abandon the survey line early in order to accommodate a ramp pass and have enough time for post calibration. We decided to finish to fly the survey line all the way to waypoint RK 03, because this is the area with the thickest ice. We gave science priority over a ramp pass and time for post-flight static GPS collection. We reached the end of the survey line at RK03 at 1636Z and began our climb heading back to Thule. We scrapped the ramp pass because the aircraft needs to be inside the hangar with the doors closed at 1600 LT on Fridays..

Today's flight was a successful mission that accomplished data collection along 100% of the shortened survey line.

### **Individual instrument reports from experimenters on board the aircraft:**

**ATM:** The temperature controller for the wide-swath ATM laser (ATM4BT2) failed and the laser was not operating because the temperature was significantly lower than the 47°C that are required. A hair drier was used to get increase the temperature and at around 1332Z, near waypoint 013606, the laser was warm enough to start firing. Jim Yungel spent the rest of the flight on the floor of the aircraft, blowing hot air into the ThemoRack to ensure continued operation of T2. The narrow-swath laser T3 worked well throughout the entire time.

**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 215 GB each.

**Accumulation radar:** worked well and collected 173 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.

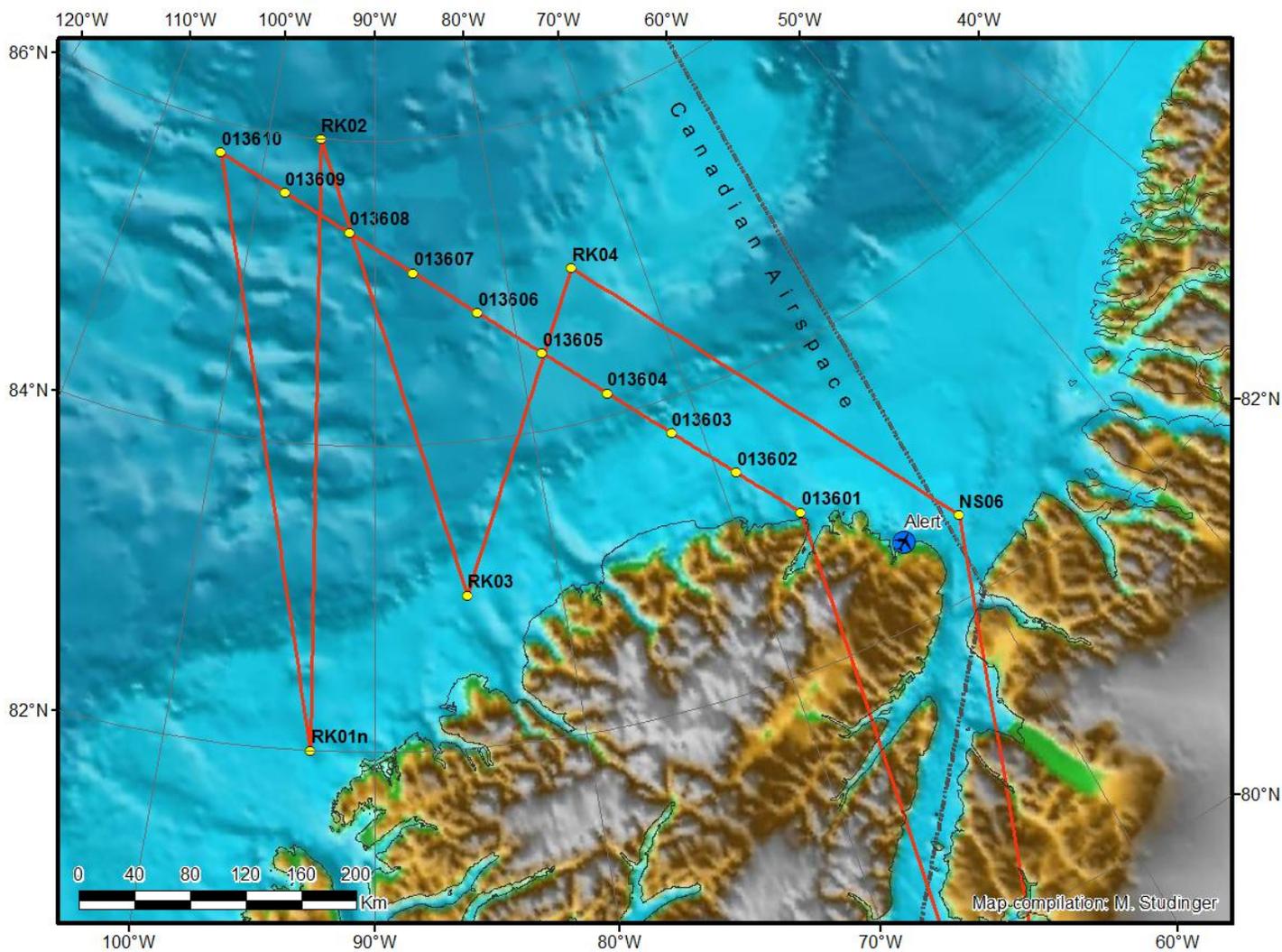


Figure 1: Sea ice mission ZigZag West along ICESat orbit 013601 and some north-south trending transects that sample the gradient in sea ice thickness north of the coast of Ellesmere Island

GRAMET FROM Start(82.99N/66.47W/3000m) at 18/03/2011 11 TO End at 18/03/2011 19 UTC (GFS 20110318 00 UTC)

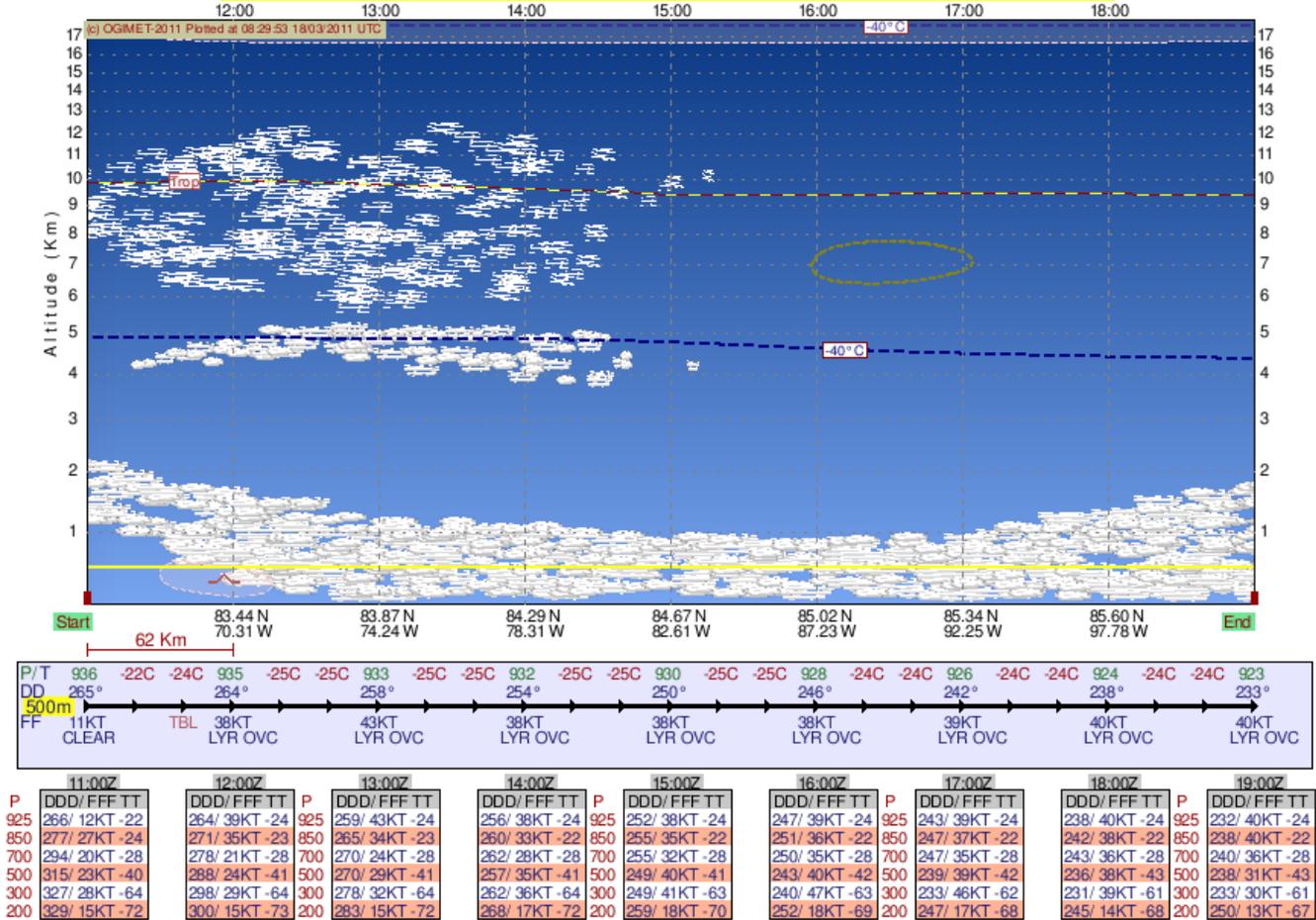


Figure 2: Visualization of the GFS model along the ICESat survey line from waypoint 013601 (left) to 013610 (right).