

# Preliminary Science Flight Report

## Operation IceBridge Arctic 2011



**Flight: D05 and D06**  
**Mission: Box 2 Flight 3**

### Flight Report Summary

<b>Aircraft</b>	<b>LaRC B200 (NASA529)</b>
<b>Flight Number</b>	D05 and D06
<b>Flight Request</b>	11-025 LaRC
<b>Date</b>	Monday, April 18, 2011 (Z)
<b>Purpose of Flight</b>	Monitor surface elevation in the southern most part of Greenland, complete Box 2 grid (West of Narsarsuaq). Transit grid lines in Box 3.
<b>Take off time</b>	1018 Zulu from Kangerlussuaq (BGSF); 1602 Zulu from Narsarsuaq (BGBW)
<b>Landing time</b>	1519 Zulu at Narsarsuaq (BGBW); 1822 Zulu at Kangerlussuaq (BGSF)
<b>Flight Hours</b>	7 .3
<b>Aircraft Status</b>	Airworthy.
<b>Sensor Status</b>	All installed sensors operational.
<b>Significant Issues</b>	Power loss to instrument caused some data lose on transit line 317.
<b>Accomplishments</b>	<ul style="list-style-type: none"> <li>• High-altitude survey (28,000 ft AGL) of the southern tip of Greenland west of Narsarsuaq.</li> <li>• Completed all grid lines in Box 2 (West of Narsarsuaq)</li> <li>• LVIS and camera were operated on the survey lines.</li> <li>• Ramp pass at 16000 ft and 12000 ft at BGSF.</li> <li>• 2 Pitch and Roll maneuvers over frozen fjord at BGSF and over roll over open water fjord at BGBW.</li> </ul>
<b>Geographic Keywords</b>	Narsarsuaq, Southern Greenland, Ice Sheet south western flank, Narsap Sermia, Kangiata Nunata Sermia, Sermilik, Kangaussarssup Sermia
<b>ICESat/CryoSat Track</b>	1297
<b>Repeat Mission</b>	No

## Science Data Report Summary

Instrument	Instrument Operational			Data Volume	Instrument Issues
	Survey Area	Entire Flight	High-alt. Transit		
LVIS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	76 GB	None
LVIS Camera	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	30 GB	None
POS/AV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	~2 GB	None

### Mission Report (David Rabine, Instrument Operator and Lora Koenig, Mission Scientist)

Today's mission was designed to complete the grid lines in Box 2, west of Narsarsuaq. As shown in the satellite image (Figure 1) a front was just starting to move into Southern Greenland but clouds were not forecast on our flight region until late afternoon. The flight was planned to complete the southern-most lines first and then move north away from the approaching clouds throughout the day. We planned an approximately 5 hour flight to Narsarsuaq and a 2.5 hour flight back in order keep the flights within the open hours of the Kangerlussuaq airport.

The B200 was ready for departure as soon as the airport opened and took off at 1018 Z. The plane transited to southern Greenland along ICESat 1297 for ~160 nmi which is a repeat of the track from the April 15, 2011 flight. ICESat track 1297 is the most direct grid line for transit to Box 2; to save time this line was flown for a second time. Upon reaching Box 2 the plane flew grid lines to fill in the middle grid lines to a 5 km grid spacing. There were intermittent high clouds in the area when the plane arrived but the laser was able to penetrate along the lines. At a few points the surface was lost but only in the turns. The plane flew a crossing line across the grid lines on its approach into the airport (Figure 2). The plane had a significant head wind and then tail wind on the grid lines but the air was stable.

The plane landed (1519 Z) and refueled at Narsarsuaq. After takeoff (1609 Z) in Narsarsuaq the plane flew the remaining grid line in Box 2 and transited north to Kangerlussuaq on grid line 317 in Box 3. As the plane started Grid line 317, a coastal grid line in box 3 power was disrupted to the instrument and navigation systems. The instruments were restarted but there will be some data loss on this line. The plane landed at Kangerlussuaq at 1822 Z.

Figure 3 below shows the coverage to date of the LVIS/ B200 grids line from this campaign. And shows the completed Box 2 grid.

Below are the detailed Flight notes from the Instrument Operator. Times from the Instrument Operator on the plane are in local Kangerlussuaq time (-2 hours from Z)

20110418 Flight Notes GPS Day 108 (Day of week 1) , GPS Week 1632

Climbed out to 16,000 feet after straight out departure. Some cloud, but thin and below us: no trouble getting signal through it.

Turned back toward Kangerlussuaq for the roll and pitch and then ramp pass at 16k feet.

09:02 File 00015 deep crevasses as we're flying along broken ice flow (saw a few "tall" waveforms)

09:17 File 00020 lots of crevasses in the second half of the file

09:56 Cleared to 28k feet, we were at 26k for transit

10:04 On first line, we're in a very light cloud layer. No impact on TX pulse, I have seen a little interference on secondary on occasion (fiber pulse)  
10:04 Serious tail wind, we have 162 m/s ground speed  
10:54 Good thing we went south first, clouds (at our level) look to be moving in from the south. I actually think we're in a very thin layer, but I'm not seeing interference on either the TX or Fiber signal.  
10:55 Missed turn on this one by a fair amount due to winds, but it was almost all mountains (one outflow we went over). Over ice now on track.  
11:27 Small section of cloud around the plane interference at the end of the 4th line, over mountains. Looked like either TX or Fiber is clear most of the time just the same. Happened a bit after through the turn, I opened the iris up to focus on Channel B for a bit.  
12:38 North most line, perfectly clear. High clouds rolling in from the south, last line on transit.  
13:00 Descending from last line is taking us across a bunch of our tracks from before and today. Will stay on and they're keeping us above 10,000 feet so I can continue to collect lidar data.  
13:08 10,000 feet, so shutting off laser, 54GB of LVIS data collected on first flight, 23.4GB of images  
13:19 touchdown

==== Flight B =====

\* Attempted roll and pitch over fjord, but winds so calm water was mirror / glass so only attempted roll maneuver. Did get the nadir portion, will attempt at Kagerlussuaq if possible.

\* Unable to climb beyond 24k, due to ATC.

\* Drifted off the line a fair amount due to winds + autopilot at start but recovering.

\* Cloud layer below us, but thin enough we are having no trouble getting through to the ground.

15:07 Research power lost, so everything died. Applanix is reset, may need to re-fly that line (gap for sure)

\* Got everything back up, but Applanix real time solution is clearly wrong, our current ground speed is 850 m/s

\* Will do a roll and pitch to try and calibrate this last flight segment.

16:24 Full stop, will run Applanix for 30 and Javad's for 60 minutes

75GB total RTLVIS data for the day (so 21GB on the second flight)

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

**LVIS:** Worked well, ~95% or better coverage, there was interference received from random radio transmissions. There was a power shut of to all instruments at the start of the Northward transit on Line 317 in Box 3. This caused the loss of the navigation systems GPS lock. The instruments were restarted. There was some data loss.

**LVIS Camera:** Worked well, no issues.

**POS/AV:** Worked well, the loss of power at the beginning of Line 317 will degrade the position data.

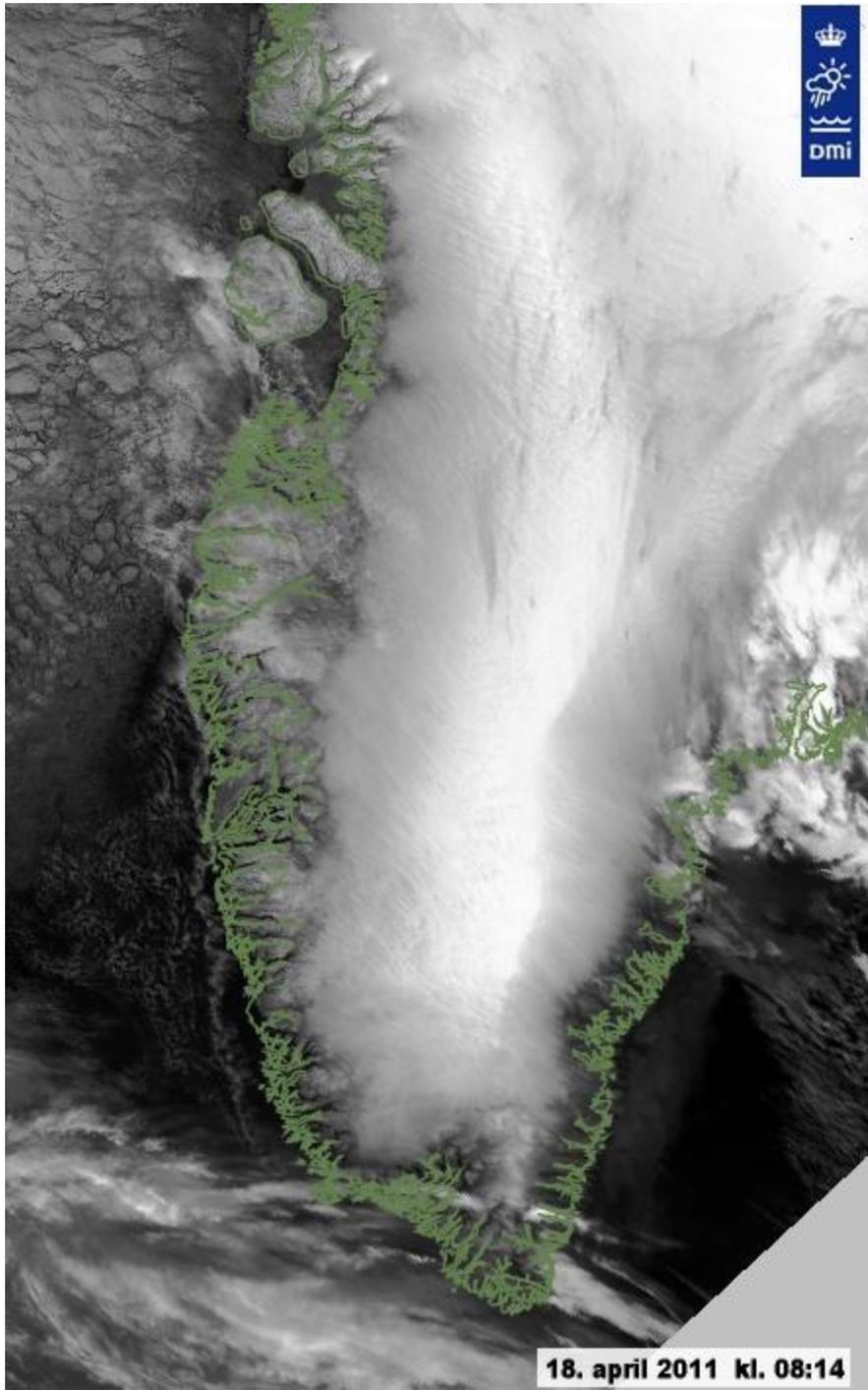


Figure 1: IR Satellite image taken at take off time.

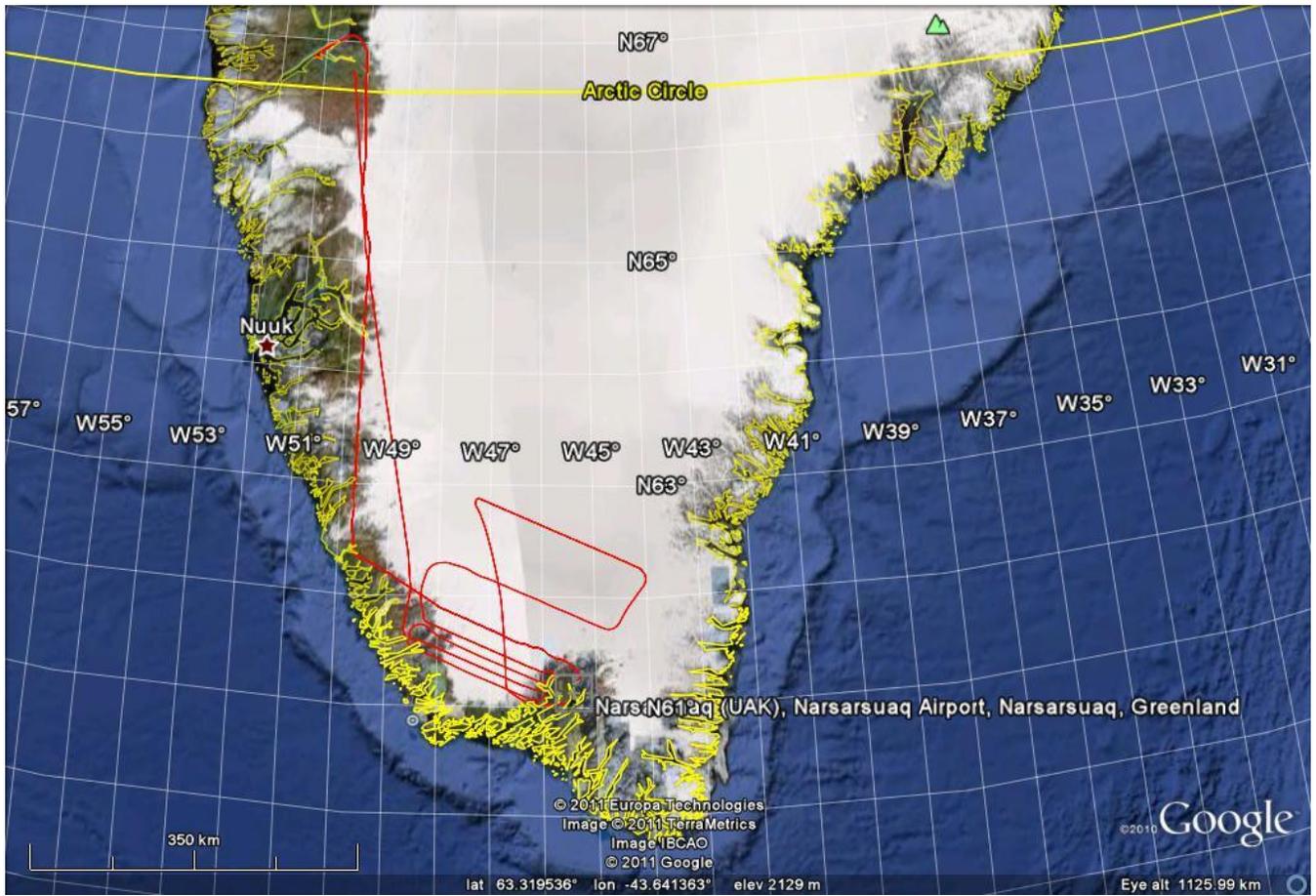


Figure 2: Proposed preliminary B200 flight trajectory form April 18, 2011.

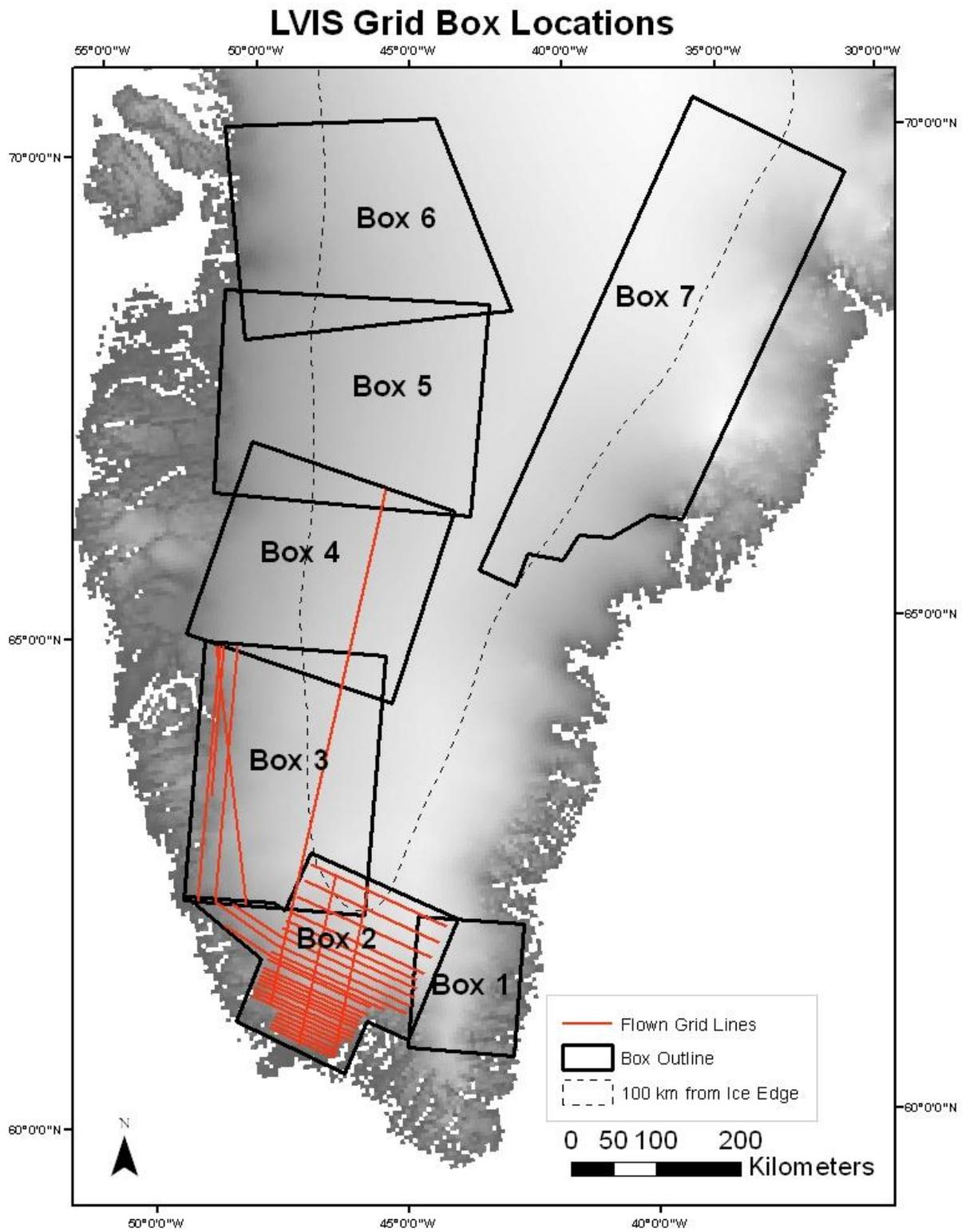


Figure 4: LVIS grid lines flown to date during the B200 Arctic 2011 Operation IceBridge Campaign.