

Summer 2017 IceBridge Falcon Flight Plans
21 June 2017 Draft

compiled by

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Introduction to Flight Plans

This document is a translation of the NASA Operation IceBridge (OIB) scientific objectives articulated in the Level 1 OIB Science Requirements, at the June IceBridge planning meeting held at the University of California - Irvine, through official science team telecons and through e-mail communication and iterations into a series of operationally realistic flight plans, intended to be flown by NASA's HU-25A Falcon ("NASA-524") aircraft. The campaign will be a small one, with 6-7 research flights based at Thule Air Base, Greenland. The flights are primarily aimed at assessing properties of the summer sea ice north of Greenland and Ellesmere Island. We may also conduct a brief land ice flight if the flight hour budget permits.

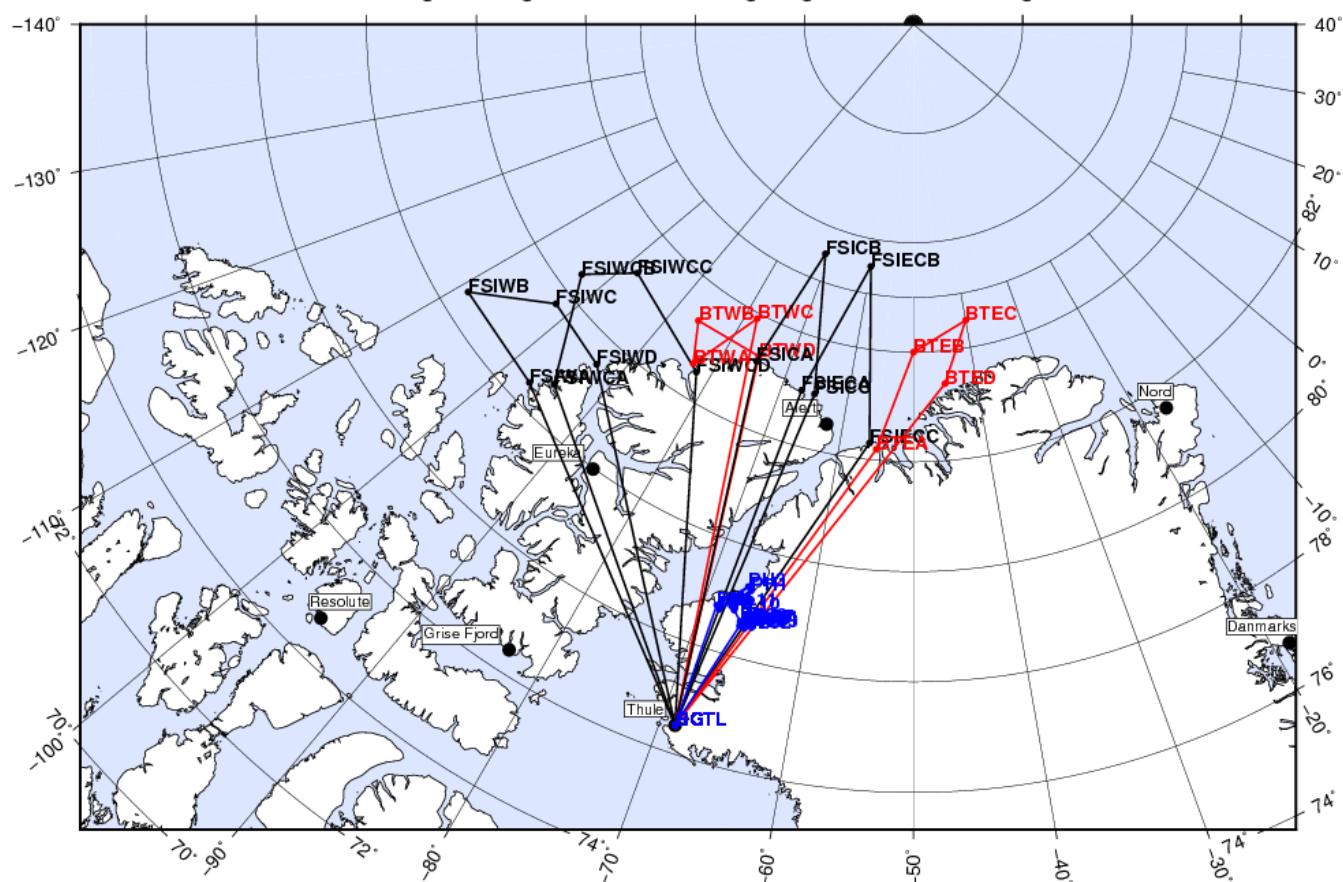
The sea ice missions will be planned and conducted in a manner different from most previous IceBridge campaigns. We expect weather conditions to be challenging, with extensive summer cloud cover present. Furthermore most of the flight plans will be dynamic, with portions of them selected to overfly ice in the near vicinity to that flown during the spring campaign. These lines will be derived by the science team members using a Lagrangian tracking technique and their updates will be provided to the field team daily. Most of the flight line designs will be modified to incorporate these segments where possible, on a dynamic basis and subject to weather. Thus, in this document we provide only three flight plans which we consider to be fixed. Two of these are designed to measure the process of ice convergence as it compresses against the coasts of Ellesmere Island and Greenland. Once flown, at least one of these flights will be re-flown after the passage of approximately one week, with the flightline coordinates again propagated forward to the approximate time of the repeat flight by the science team. Two such flight plans are provided to allow for weather contingencies. The third fixed flight is intended to overfly a number of supraglacial lakes near Hiawatha Glacier. The remaining flights are intended to broaden coverage of Arctic sea ice within the range of the Falcon aircraft and will be modified as described above. We merely provide placeholder rough drafts of these flight plans here.

Also, we note that IceBridge-affiliated researchers have requested Worldview satellite imagery along lines coincident with the two fixed "convergence" flights. Thus, anything other than minor changes of a few km to these flight lines carries the risk of making the Worldview imagery unsuitable for its intended purpose.

This field campaign also differs significantly from most prior OIB campaigns, in that we will be flying a relatively small twin-engine jet Falcon aircraft. Our use of the Falcon imposes several important operational necessities. First, its limited payload means that we will fly only two instruments – a single ATM lidar, and the DMS camera system. In terms of flight operations, we plan to transit from Thule to the sea ice north of Ellesmere and Greenland at high altitude, then drop down to 1500' AGL to conduct the science surveys, climbing back to high altitude for the return to Thule. The range of the Falcon allows us to cover approximately 1100 nm per mission using this high-low-high operations concept.

Red: convergence flights Black: coverage flights Blue: lakes flight

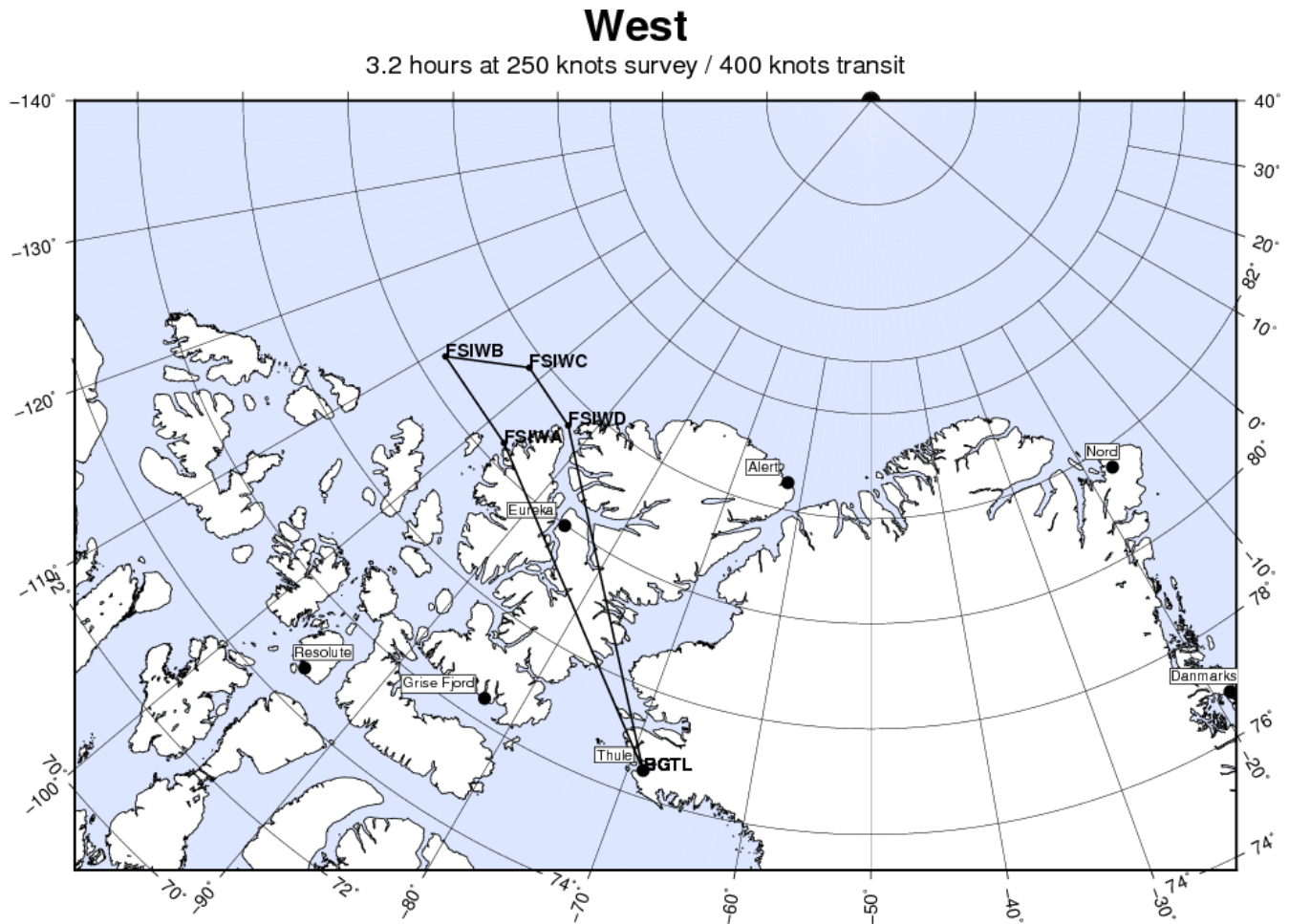
Red: convergence flights Black: coverage flights Blue: lakes flight



West

This mission is primarily intended to broaden our sampling of the sea ice in the area north and west of Ellesmere Island. If practical, we will modify this flightline to incorporate a portion of a spring mission, propagated forward in time to the day of this flight according to ice motion.

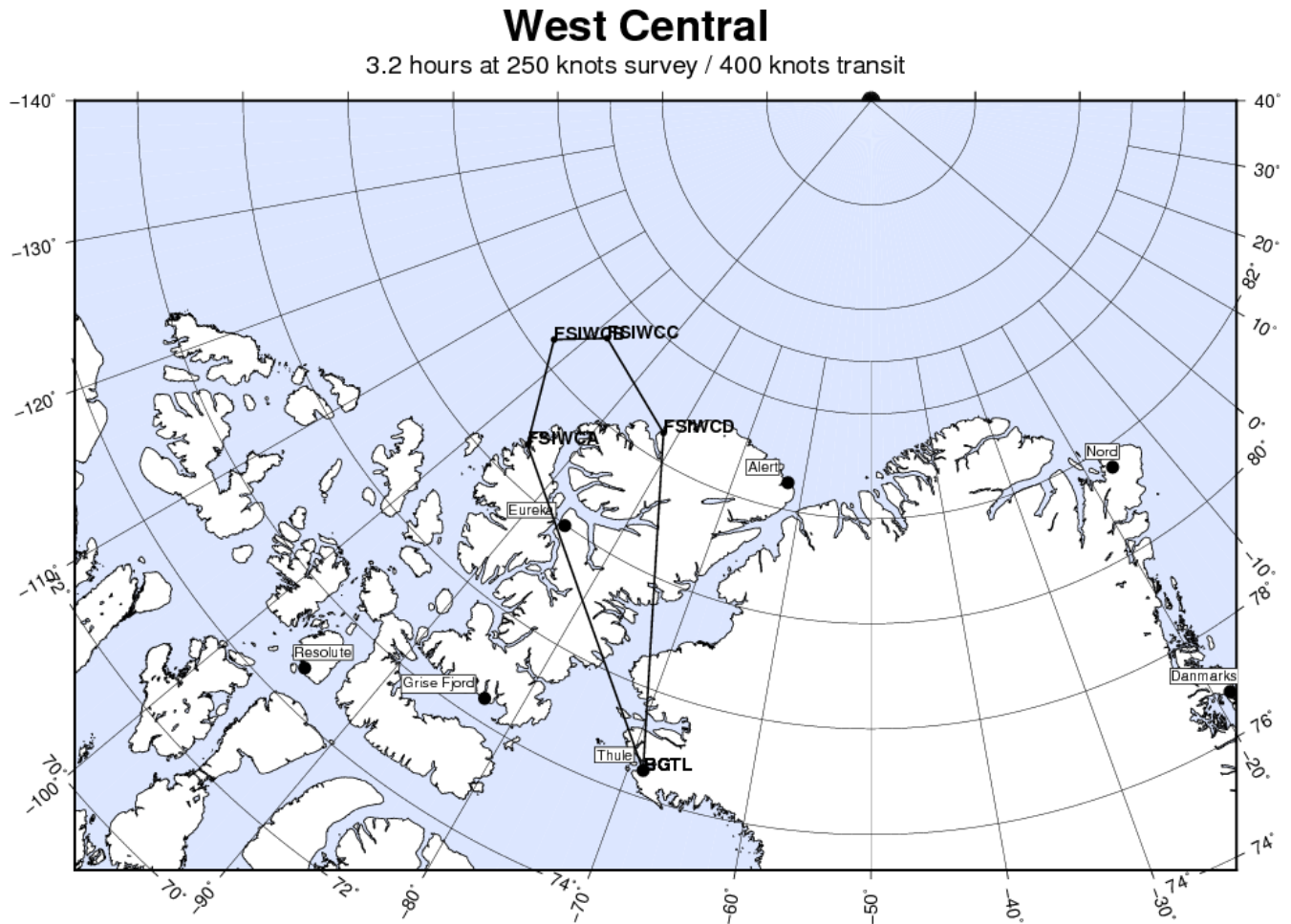
Remaining Design Issues: redesign using propagated coordinates if reflow



West-Central

This mission is primarily intended to broaden our sampling of the sea ice in the area north of Ellesmere Island. If practical, we will modify this flightline to incorporate a portion of a spring mission, propagated forward in time to the day of this flight according to ice motion.

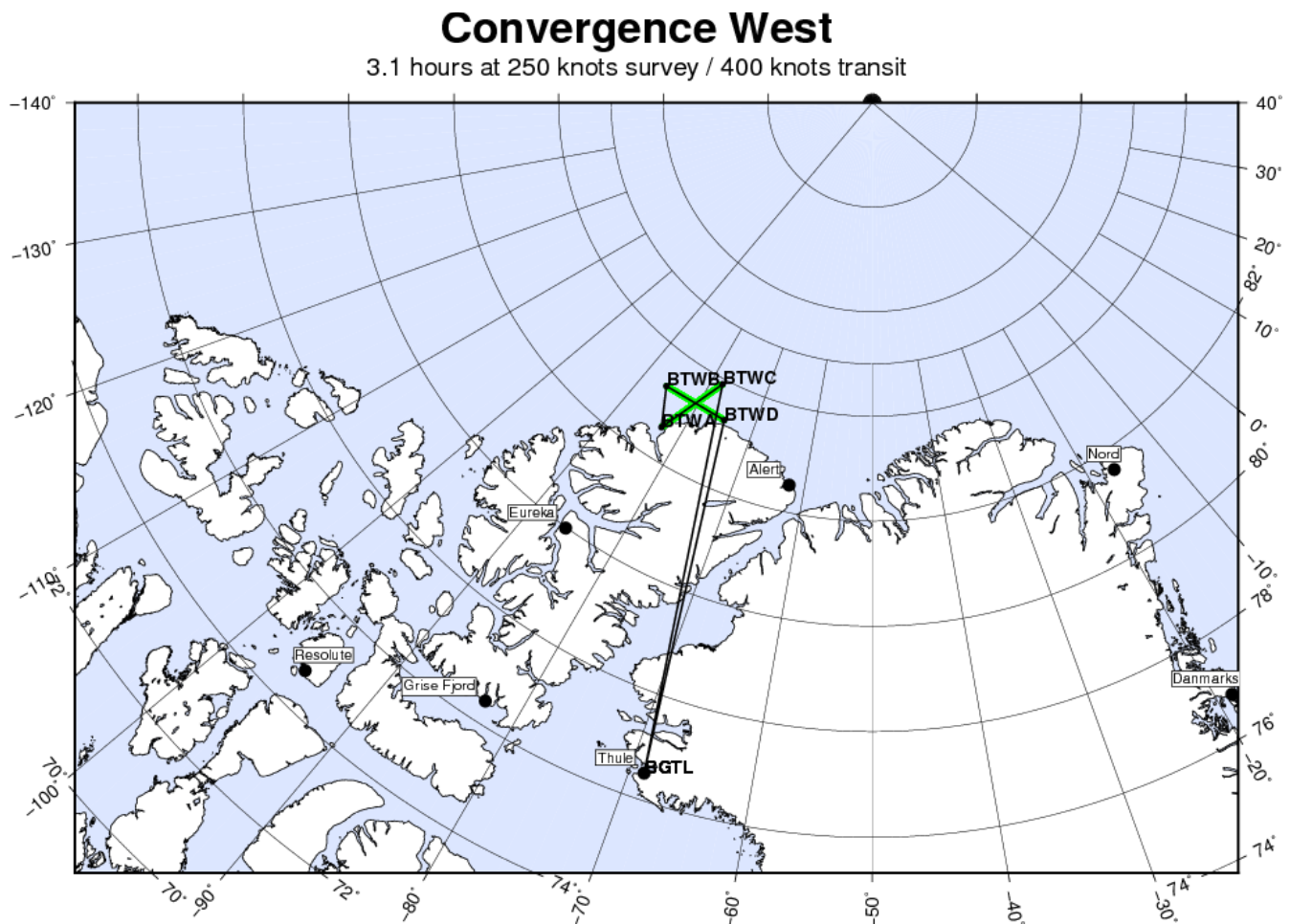
Remaining Design Issues: redesign using propagated coordinates if reflow



Convergence West

This mission is primarily intended to measure the process of convergence of the sea ice in this area as winds and currents push it toward the northern coast of Ellesmere Island, compressing it against the land. The intention is to fly this mission (or its companion to the east) as early as possible during the campaign, then reflly it after the passage of approximately one week using coordinates propagated according to ice motion during the interim, to measure the resulting deformation. In addition, we have requested Worldview satellite imagery along these particular coordinates.

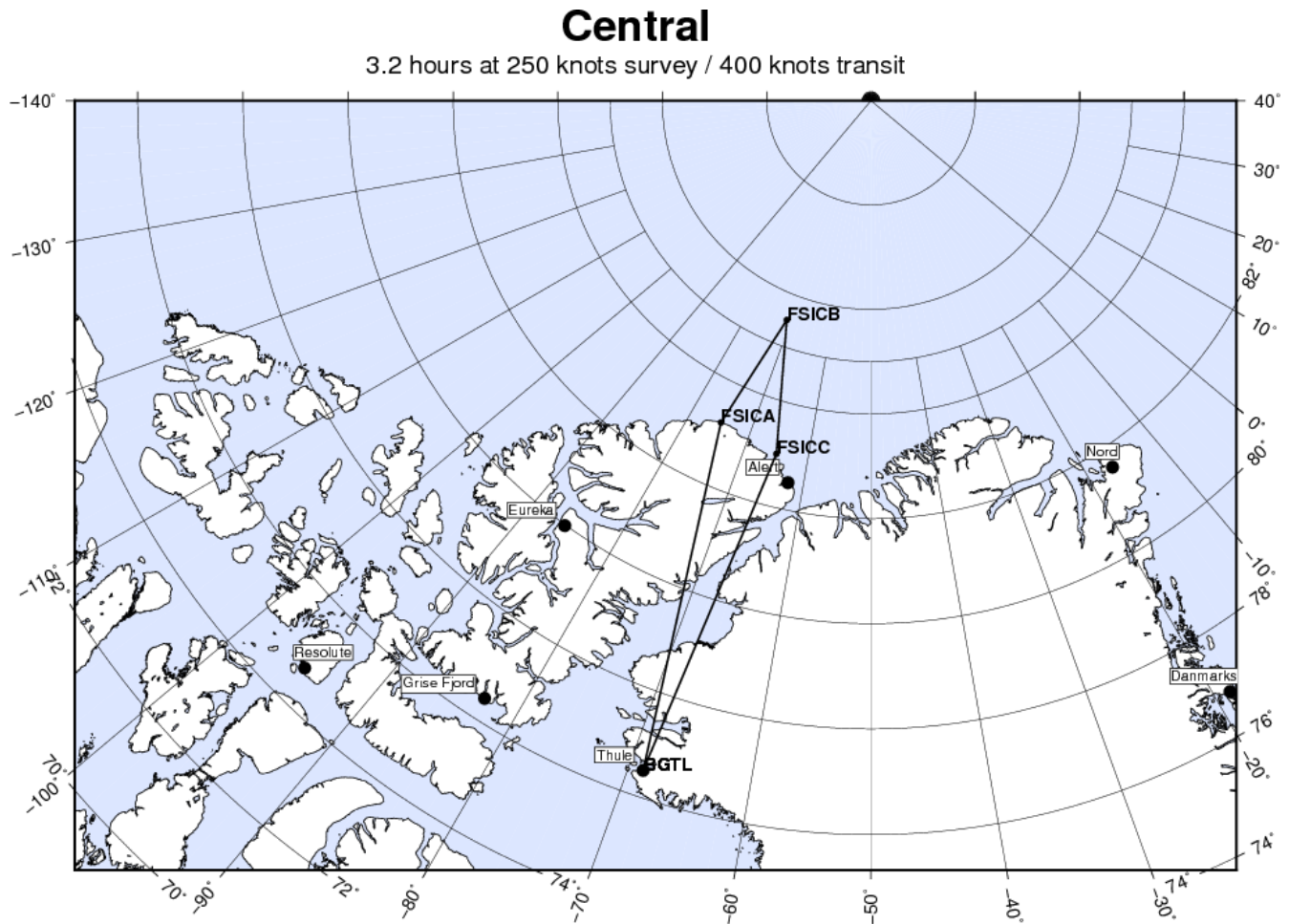
Remaining Design Issues: redesign using propagated coordinates if reflown



Central

This mission is primarily intended to broaden our sampling of the sea ice in the western Lincoln Sea. If practical, we will modify this flightline to incorporate a portion of a spring mission, propagated forward in time to the day of this flight according to ice motion.

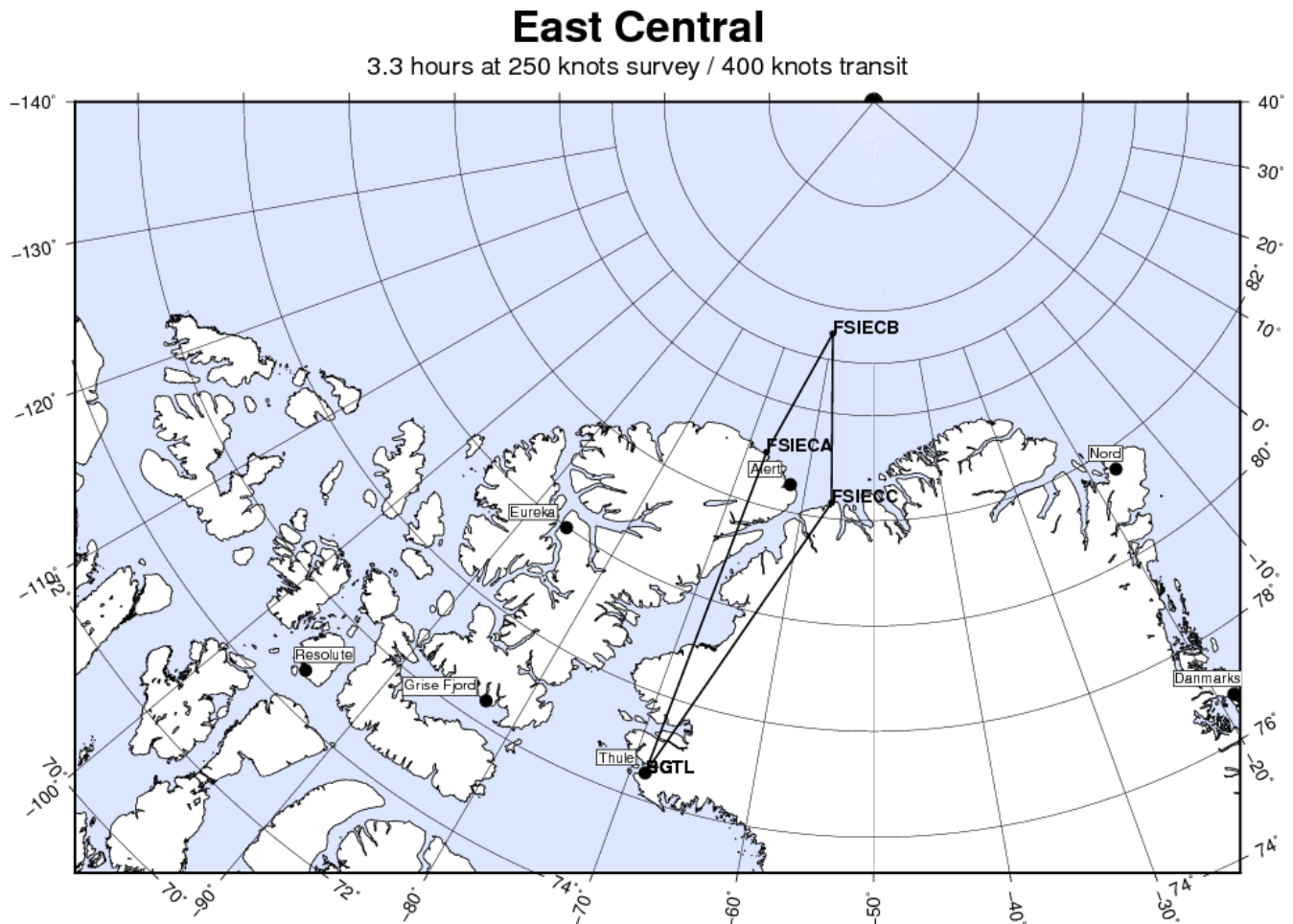
Remaining Design Issues: redesign using propagated coordinates if reflow



East Central

This mission is primarily intended to broaden our sampling of the sea ice in the central Lincoln Sea. If practical, we will modify this flightline to incorporate a portion of a spring mission, propagated forward in time to the day of this flight according to ice motion.

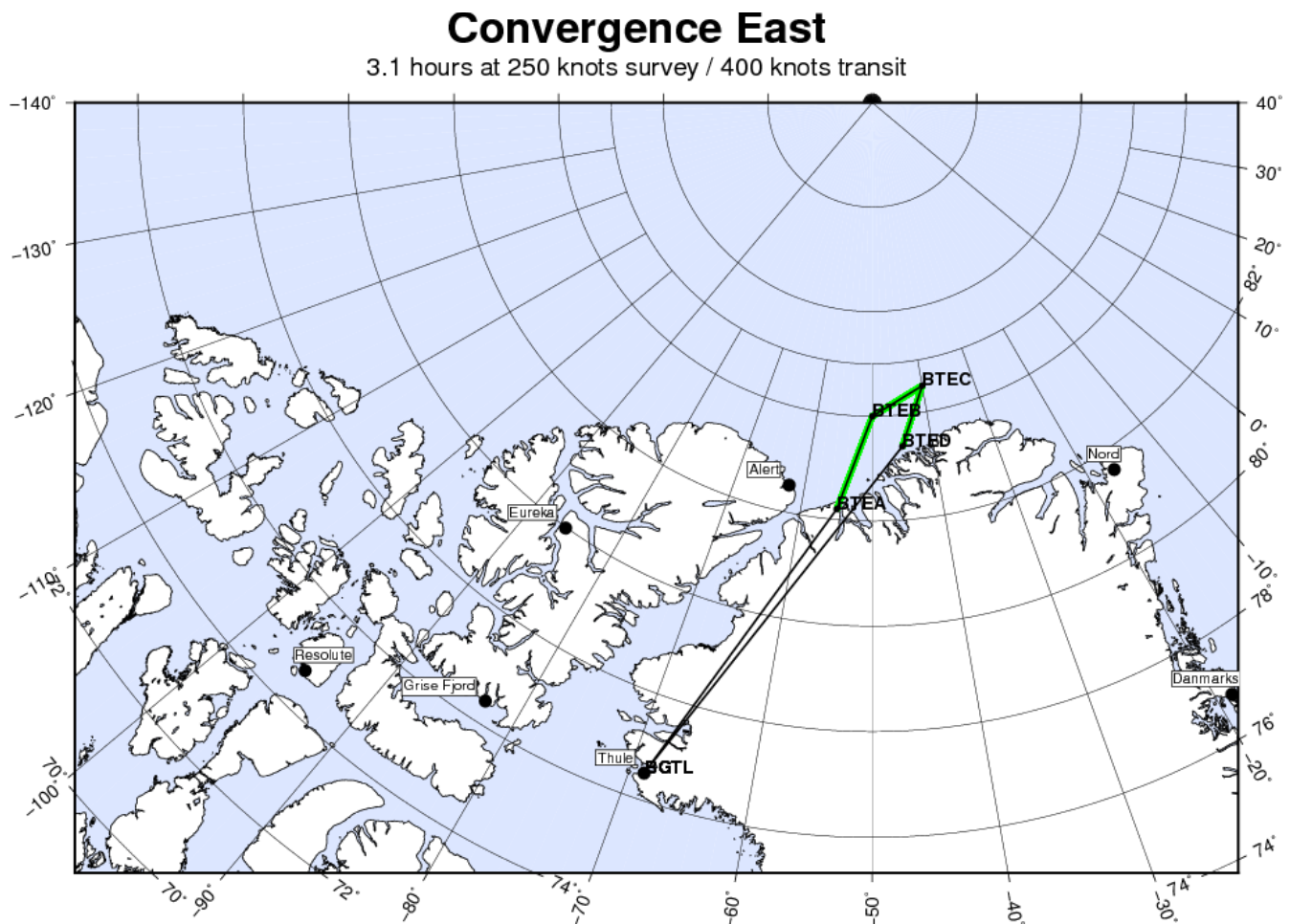
Remaining Design Issues: redesign using propagated coordinates if reflow



Convergence East

This mission is primarily intended to measure the process of convergence of the sea ice in this area as winds and currents push it toward the northern coast of Greenland, compressing it against the land. The intention is to fly this mission (or its companion to the west) as early as possible during the campaign, then reflly it after the passage of approximately one week using coordinates propagated according to ice motion during the interim, to measure the resulting deformation. In addition, we have requested Worldview satellite imagery along these particular coordinates.

Remaining Design Issues: redesign using propagated coordinates if reflight



Hiawatha Lakes

This short mission is intended to measure properties of the numerous supraglacial lakes that form during summer in the area above Hiawatha Glacier. It is expected that the new narrow-pulse laser of the ATM may be able to measure the depth of these lakes with fairly high resolution.

Remaining Design Issues: none

Hiawatha Lakes

2.4 hours at 250 knots

