

**GCP-2016**

Ocean Research Project 501c3

**DESCRIPTIVE REPORT**

*Type of Survey:*

**Hydrographic Survey**

**LOCALITY**

*Territory:* Greenland

*General Locality:* NW Greenland Inglefield Fjord

*Sub-locality:* Inglefield Gulf, Whale Sound, Murchison Channel

**2016**

Field Operations Scientist  
**Nicole Trenholm, Ocean Research Project Inc 501c3**

SUBMISSION DATE 5/22/2017

GCP-2016  
Greenland Climate Project  
Ocean Research Project Inc 501c3

## HYDROGRAPHIC TITLE SHEET



State/Territory: **Greenland**

General Locality: **NW Greenland Inglefield Fjord**

Sub-Locality: **Inglefield Gulf, Whale Sound, Murchison Sound & Channel**

Dates of Survey: **07/11/2016 to 08/16/2016**

Instructions Dated: **06/16/2016**

Project Number: **GCP-2016**

Vessel: **R/V Ault**

Captain: **Matt Rutherford**

Field Operations Scientist: **Nicole Trenholm**

Surveyed by: **R/V Ault Survey Crew**

Soundings by: **ODOM CV200  
Simrad NSS7 BMS1**

Remarks:

**3) Ellipsoid NAD83, Projection is UTM Zone 19 North. All depths are in meters.**

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**DESCRIPTIVE REPORT**

to accompany  
Hydrographic Survey Inglefield Fjord

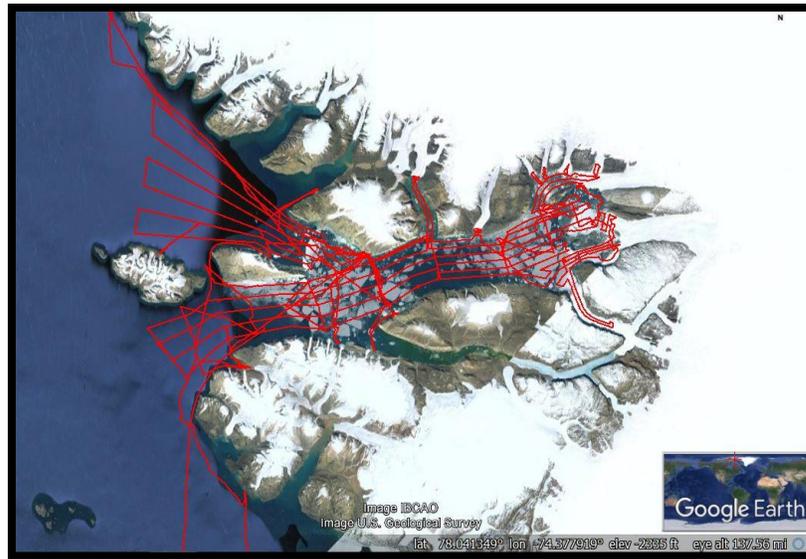
Year of Survey: 2016  
ORP R/V Ault

**A. AREA SURVEYED**

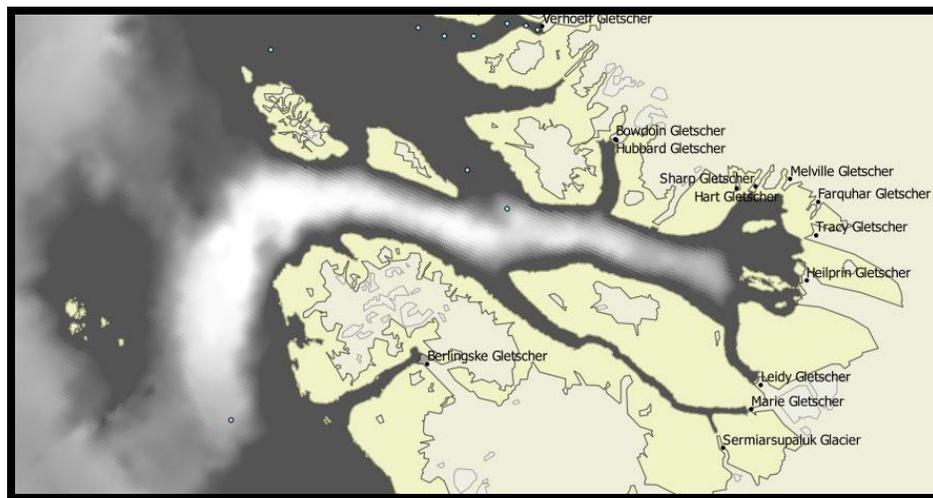
This survey was conducted in accordance with ORP\_UW\_SOW\_03292016.pdf. The statement of work is dated 29 March, 2016 and can be referred to in Appendix I. Survey area project modification requests were agreed upon by NASA Jet Propulsion Laboratory, Ocean Melting Greenland Principle Investigators on 7/22/2016 and 8/2/2016 during the field campaign. Related correspondence can be provided upon request.

The survey covers Inglefield Gulf, including Whale Sound and extending North past Murchison Channel into Murchison Sound. The survey area is bounded by the coordinates (77°51'N, 072°06'W), then eastward to (77°33'N, 066°02'W), then southwestward to (77°33'N, 071°29'W). A large percentage of this area is located within Inglefield Fjord, a tidal glacial fjord system which includes several prominent terminating retreating glaciers.

This survey responds to requests from to requests between University of Washington and NASA JPL Ocean Melting Greenland Campaign. The subsurface geometry was recorded extending up against Northwest Greenland's terminating glaciers and a series of CTD profile data recording was performed at agreed upon sites by the R/V Ault of the Ocean Research Project Inc. 501c3.



**AREA SURVEYED: INGLEFIELD BREDNING**



**Survey Metrics**

Linear nautical miles of single beam sounding lines	1164
Total square nautical miles	1257
# of CTD Casts	122

**Dates of Data Acquisition**

Month	Date
July	11-15, 18, 20-24, 27-30
August	2, 5-16

## **B. DATA ACQUISITION AND PROCESSING**

### **B.1. EQUIPMENT**

R/V Ault a 13.7 meter (m) vessel with a 1.37m draft, acquired all survey data. All bathymetric data was acquired with high frequency Odom CV200 at 200 to 24 kHz operating to 5000 feet deep or Simrad's NSS7 evo2's paired with Navico's BSM-1 and Airmar Lowrance sonar hub module the 1 kW SS260 operating at 200 to 50 kHz to 2500 feet.. DGPS was acquired with a Hemisphere Vector V104 GPS Smart Antenna while using the Odom CV200. The Simrad NSS7 evo2 used an integrated high-gain 10Hz GPS/GLONASS receiver for its GPS positioning. The DGPS positioning was utilized for 87% of the survey. R/V Ault acquired all survey data for the Inglefield Fjord & Murchison Channel Survey.



All 122 CTD casts offshore, throughout the fjord and up in front of the glacier facers were acquired by manually deploying an RBR Concerto CTD Profiler with an electric potpuller. R/V Ault had 1027m of line for deploying a CTD. 46.7% of the acquired CTD casts were collected within 10m of the seabed.

**B.2 QUALITY CONTROL: CORRECTIONS TO CTD & ECHO SOUNDING**

The CTD data was processed with the R programming software. Dr. Clark Richards processed the data and has provided a related report and calibration and accuracy test results. Please refer this documentation in Appendix II. Surface sound speed data from the CTD profiler was applied to the survey bathymetry as a single beam processing correction in hydrographic processing software Hypack and NaviEdit. Position drift during a CTD cast duration was addressed by finding the official CTD cast position by identifying the average position between the geographic deployment and retrieval locations.

This survey was not tidally corrected. The nearest tide station is 95 km south of Inglefield Bredning at Thule Air Base the Pittufik which showed no more than a maximum tidal offset of 3.3 meters during the survey period in 2016.

Hypack and EIVA's NaviEdit were used to acquire and process sonar bathymetry data. Where positioning dropped out from the DGPS unit during survey operations the positioning of the Simrad was substituted. Hypack logged the first third of the bathymetry files required with the Odom CV200 sonar. The Odom CV200 sonar topside unit overheated and failed considered due to a faulty cable. This data was reviewed during real-time acquisition for quality by monitoring of sufficient bottom tracking and tuning quality in Odom CV200's software Odom eChart. Once data was weakly recording and overheating addressed the survey switched dominant sonar devices to utilize the Simrad sonar.

Simrad bathymetric data made up the remainder of the bathymetric dataset and was monitored and tuned during survey operations using the Simrad NSS7 Evo2 chartplotter interface. When the Simrad was in predominant use, survey line plans continued to be followed closely referencing survey transit path displayed by Hypack survey acquisition map interface in order meet survey requirements as conditions

allowed. Simrad's transducer vertical accuracy is +/- 1 a foot as stated by Crystal Smith Technical Services Supervisor at Lowrance Electronics, whom had discussed the accuracy specification with the lead R & D manager in May 2017.

A data quality appended characteristics version of the survey bathymetry has been submitted in OMG's shared Google Drive folder, OMG. This .CSV file has data quality attributes relating the positioning status during survey acquisition and what sonar was in use. After the x,y,z data, column 4 header is GPS type which will indicate SA for standalone GPS or D for DGPS while column 5 will have a header of DEV for sonar device where O stands for Odom CV200 and S stands for Simrad. The Simrad sonar data was paired with a high-gain 10 Hz GPS/GLONASS receiver that received WASS, MSAS, EGNOS and GLONASS correctors with a horizontal position accuracy of 3m only when Hemisphere DGPS VR2 data was not available. Hemisphere's offers a 1m accuracy from corrections of WASS, EGNOS, MSAS, etc.

### **B.3 DATA PROCESSING**

The horizontal datum used for this survey in the North American Datum of 1983 (NAD 83). The projection is Universal Transverse Mercator (UTM-Zone 19N). All data is reflects this geodesy and depth is in meters + down. Simrad bathymetry needed to be reformatted by cBiobase, a Navico company in order to be capable of applying post-processing corrections and a final combined bathymetric .XYZ output. The data was altered from a proprietary format to a workable format, a .GPX file resulted. This file format was edited in Excel to eliminate major depth fliers at 0 and where DGPS positioning could supersede GPS positions. The data was imported into EIVA's NaviEdit as an ASCII .CSV for further processing where sound velocity correction could be applied then exported as both a .XYZ file and .GPX

for a geographic placement check in qGIS and ArcGIS. Survey metrics were determined with measuring tools in qGIS. The final combined data is in a OMG google drive location managed by Sean Hardman and shared with other OMG PI's. It is in the .XYZ format. EIVA's NaviModel was used to create view surface to isolate identified fliers for removal, where all geographic and unit properties could be reviewed.

On December 8<sup>th</sup>, 2016 the first batch of processed data was submitted. This included the CTD data both raw and processed and the required documentation. On 11/29/2016, 12/25/2016, and 3/3/2017 bathymetry and raw data and required documentation were submitted. Data processing and product submission extensions were required as necessary due to the additional post processing time required to generate final submission deliverables and tracking down equipment accuracy specifications from vendors. Final submission occurred on May 22<sup>st</sup>, 2017.

**B. APPROVAL SHEET**

Field operations for this survey were conducted under my daily supervision with frequent checks of progress and adequacy in coordination with OMG PI's. All bathymetry data, this descriptive report and accompanying records and data are approved.

Respectfully Submitted:

Field Operations Scientist

Nicole Trenholm

A handwritten signature in black ink that reads "Nicole Trenholm". The signature is written in a cursive style with a large, stylized initial "N".

5/22/2017