DSSV Pressure Drop: Descriptive Report

Java Trench Transit Leg

March 2019

Report developed for Five Deeps Expedition by Cassie Bongiovanni

Introduction

DSSV *Pressure Drop* left Freemantle, Australia on March 21st heading north toward the Java Trench as part of the Indian Ocean leg of the Five Deeps Expedition. The transit to the start of the Java Trench survey lasted from March 21st to March 25th. After a couple days on site, the ship then transited to its end destination of Bali, Indonesia – arriving on April 1st. The total transit time was six days. The Kongsberg EM 124 multibeam echosounder system (MBES) installed onboard was operated to acquire bathymetric, backscatter and water column data throughout the transit leg.

This document serves as the metadata and descriptive report of the Java Trench Transit Leg's data acquisition, processing and interpretation.

Survey Details

Vessel : DSSV *Pressure Drop*
Survey Dates : 21 March – 01 April 2019

Data Acquisition and Processing System

- Hardware
  - MBES : Kongsberg EM 124
  - Positioning : Seapath 380, stand-alone
  - Motion Sensor : Kongsberg Seatex MRU 5+
  - Sound Speed : Teledyne Reson SVP70 (at transducer)

- Software
  - Acquisition : SIS v5.1.1.153 Build date 2018-12-06
    Sound Speed Manager v2018.1.50 for Sound Speed Profile
  - Processing : QPS Qimera v1.7.4
    QPS FM Midwater v7.8.6
    KMALL to ALL Datagram Converter

Survey Parameters

Survey Speed : 9 – 11 knots
Swath Angle (Sector) : ranging from 40 – 65 degrees each side (port and starboard)
Beam Spacing : Equidistance
Dual Swath Mode : ON

Data Coverage and Statistics

Total area covered	: 27,462 km^2	Total number of lines	: 233
Depth range	: 2,180 – 7,182 m	Data formats included	: *kmall, *all, *gsf
Average Swath Width	: 9,000 m	Northwest Lat/Long	: 10.261° S, 109.666° E
Average Uncertainty	: ± 11 m	Southeast Lat/Long	: 30.662° S, 115.073° E

Mapper

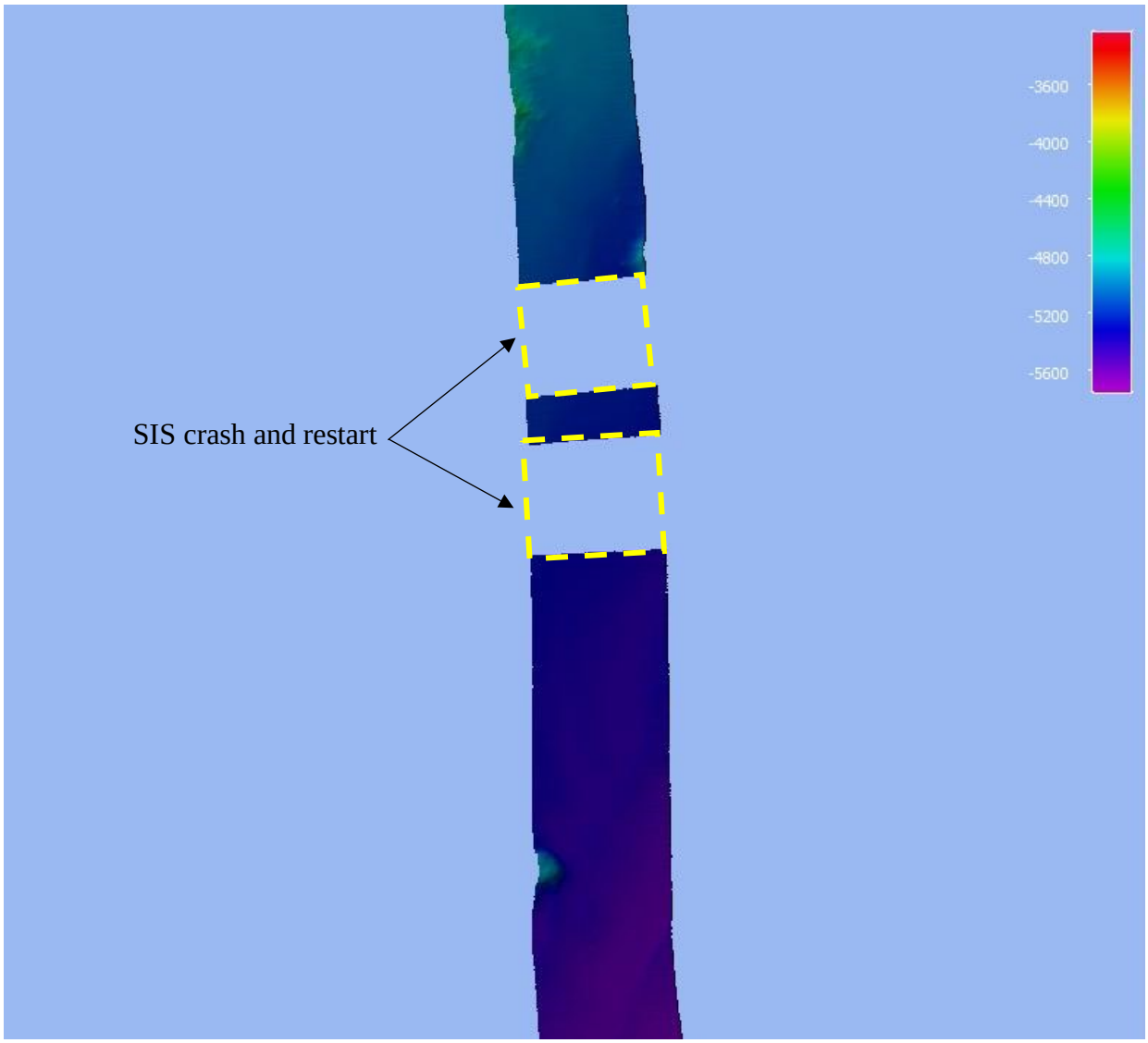
Cassie Bongiovanni – Caladan Oceanic LLC (USA)
Seeboruth Sattiabaruth – Government Surveyor (Mauritius)

Data Acquisition Notes

1. **Sound Speed Profile**
   The mapping team used sound speed profile from the Sound Speed Manager tool which is based on the World Ocean Atlas 2009 for the entire transit.

2. **Sea State and Vessel Movement**
   The sea state was calm for the entire transit – ideal for surveying.

3. **SIS Errors and Troubleshooting**
   There were instances when SIS crashed, couldn't find bottom, not responding and PU encountered errors that SIS and/or the PU needed to be restarted – leaving gap/holidays in the coverage.

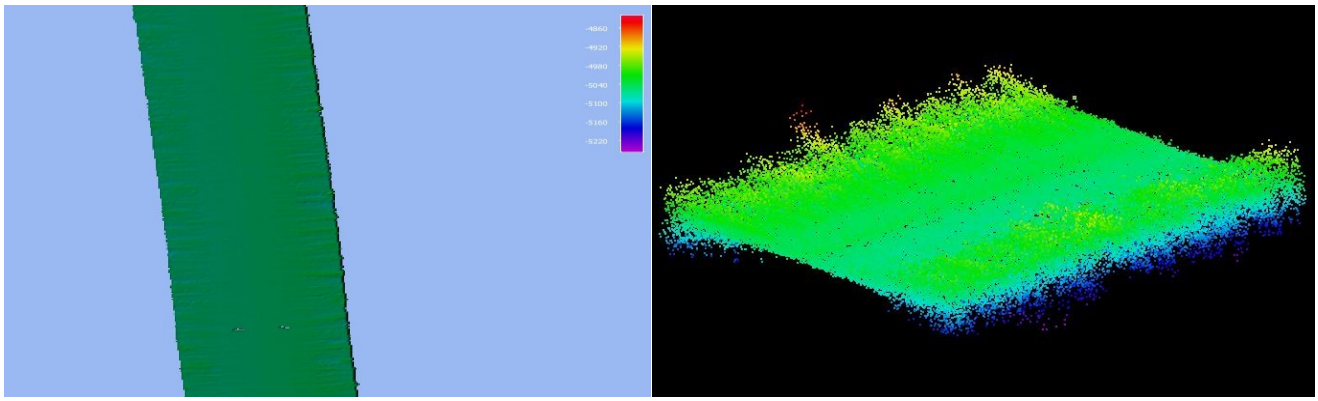


Data Processing Notes

1. Qimera Project Parameters
   Coordinate System : FP_WGS_84_UTM_zone_49S
   (Horizontal Datum: WGS 84, Projection: UTM_zone_49S)
   Dynamic Surface : CUBE at 75m resolution with Hypothesis Resolution Algorithm: Number of Samples + Neighborhood

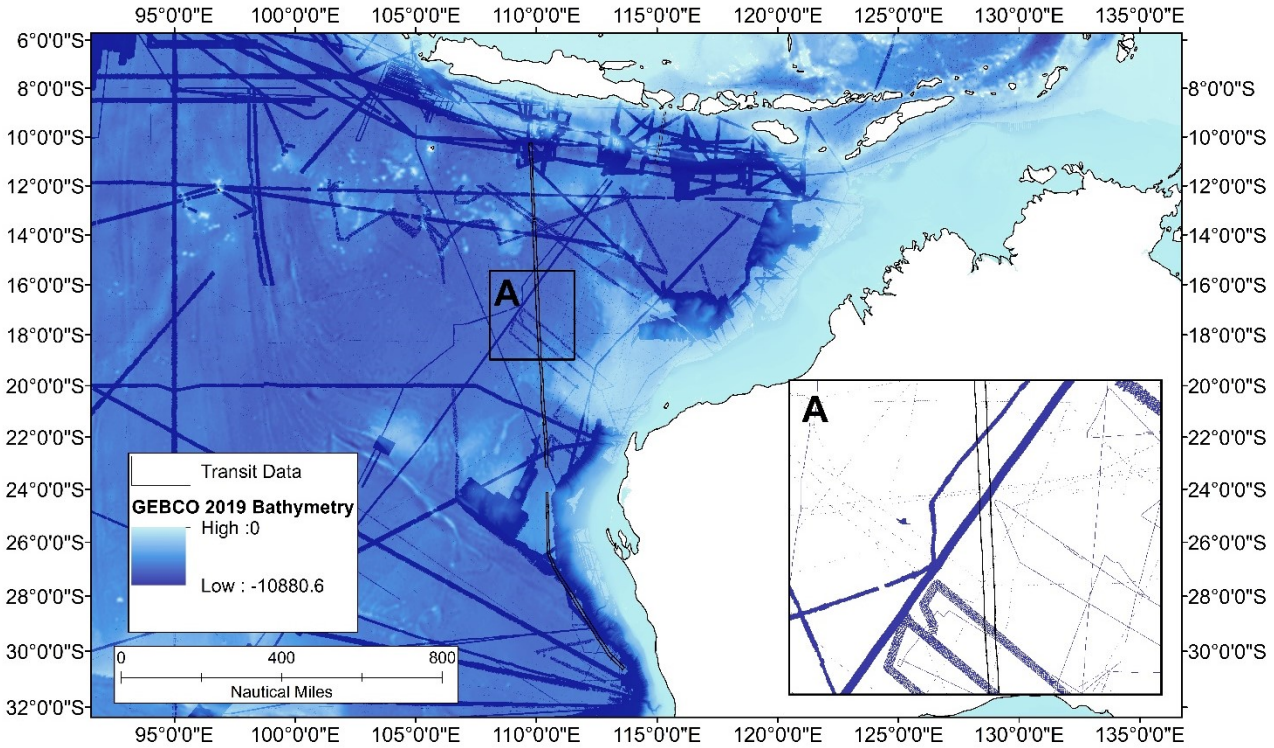
2. CUBE sometimes rejects some reasonable/valid soundings hence making holiday on the coverage. The processor checks these holidays and un-reject the soundings as deemed necessary.

3. Some outer beam noise, but minimal.



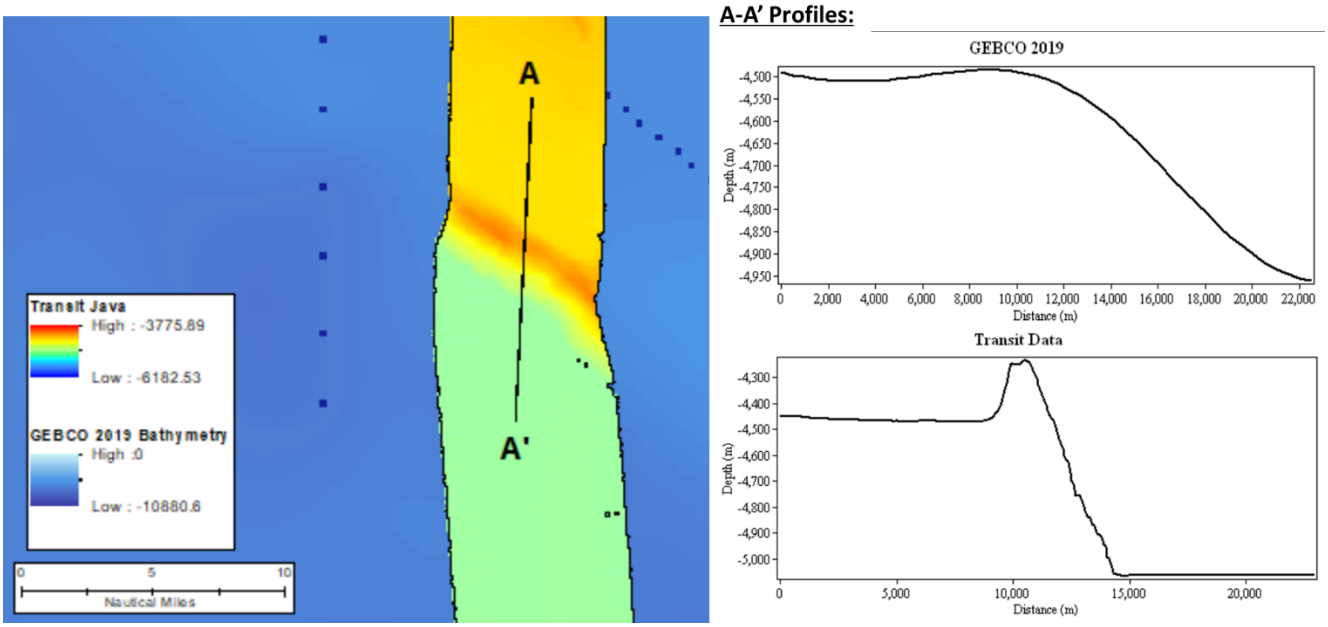
Comparison with publicly available base surface

A bathymetric grid was extracted from the GEBCO 2014 30 arc-second compilation grid and was used as the base surface while the vessel is transiting and collecting data. However, since their collection the GEBCO 2019 came out and is used in this report for the most up-to-date comparisons.
The map below illustrates the transit data coverage and the data sources of GEBCO2019 grid.

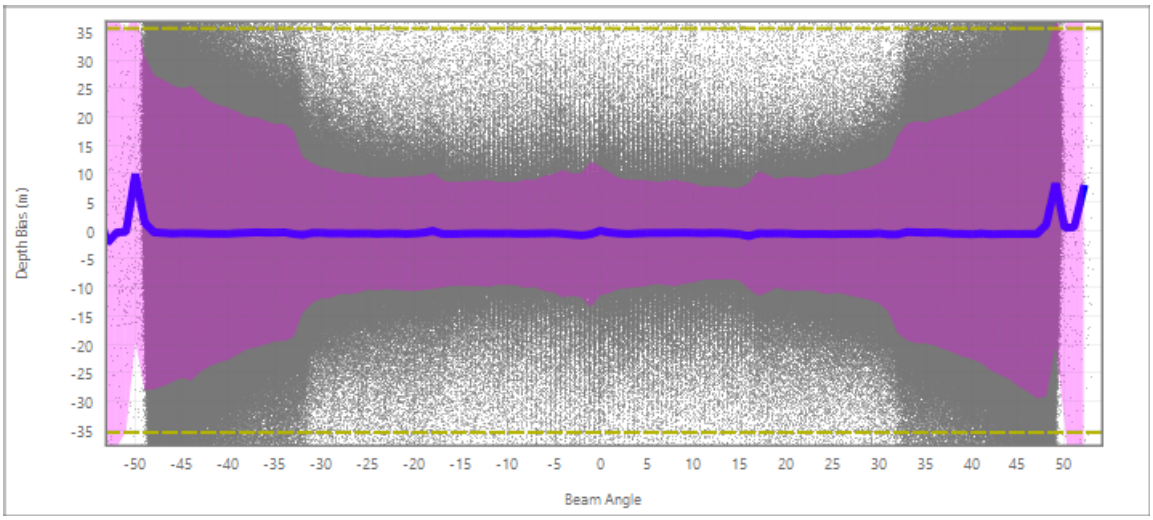


Majority of the transit data did not intersect sounding data from multibeam and single beam. Specifically, 71% of these transit data covered interpolated areas and are new data to the world. Only 29% covering previously collected transit datasets already included in the GEBCO 2019 grid.

The figure below shows the transit data coverage over a large ridge with the GEBCO2019 grid on the background. The profiles on the right illustrate the difference between the two surfaces – the definition of the ridge is not depicted in the GEBCO2019 grid.



These data meet IHO Special Order specifications and are anticipated to supersede any data.

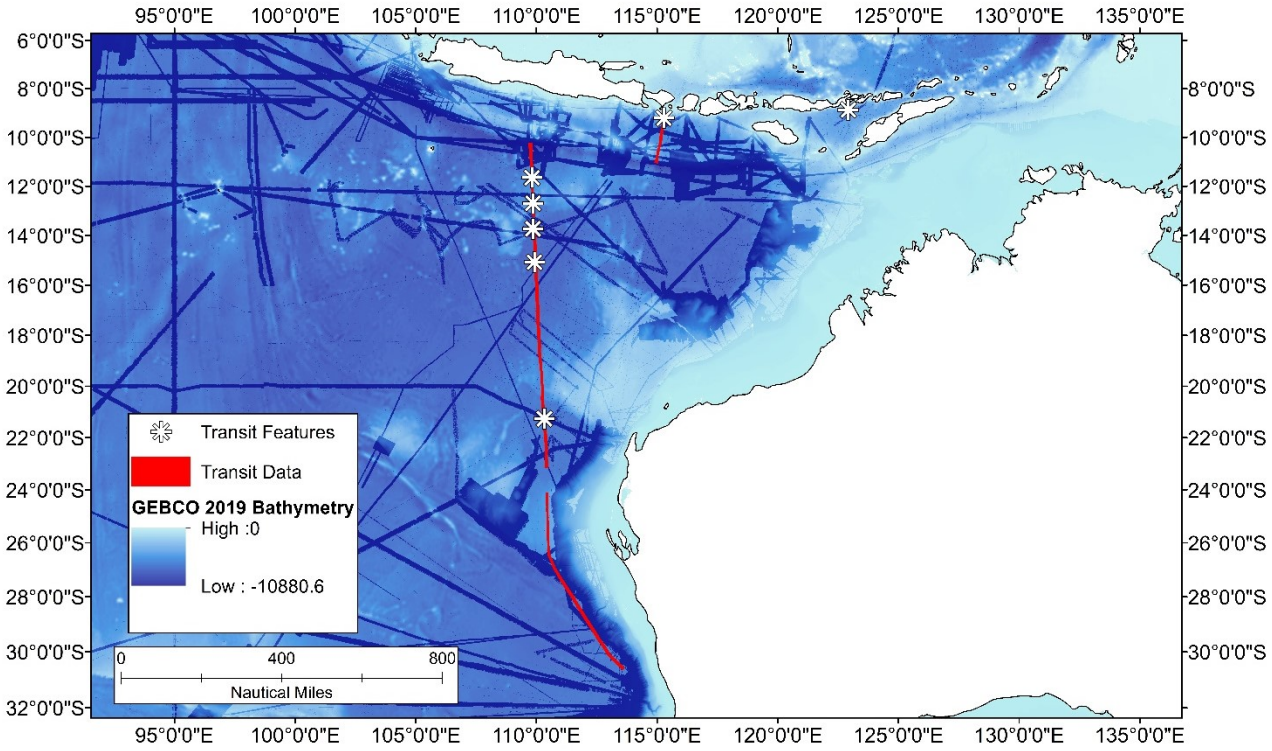


The yellow-dashed line is the IHO Special Order uncertainty requirements in comparison to the transit data in purple, thus proving these data meet the quality requirements.

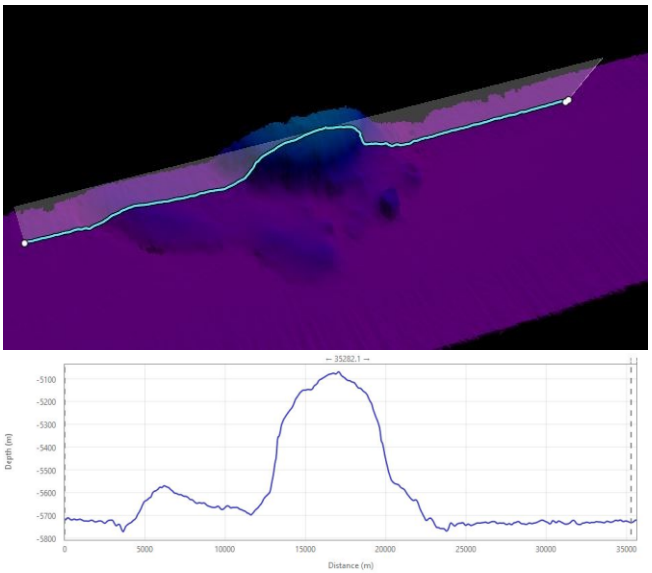
Features

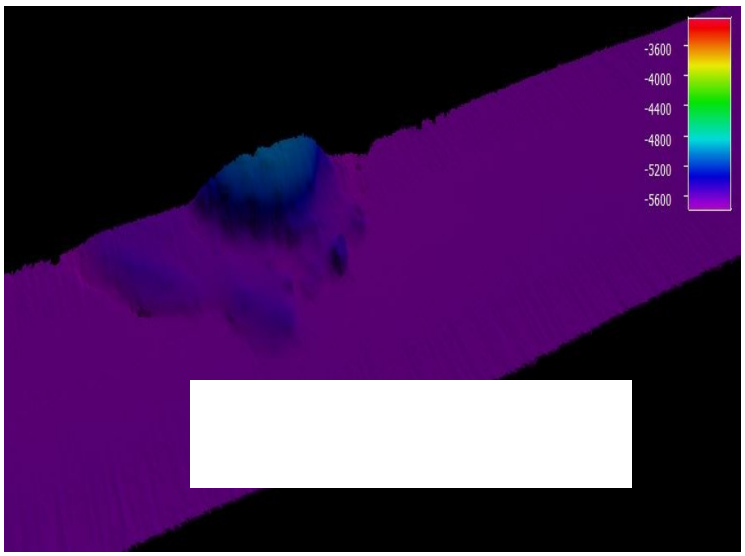
There are six undersea geological features that were covered by the transit data, either partially or totally. It has already been suggested that name proposals be made and submitted to the GEBCO Sub-Committee on Undersea Feature Naming (SCUFN).

Below are some images of the features found.

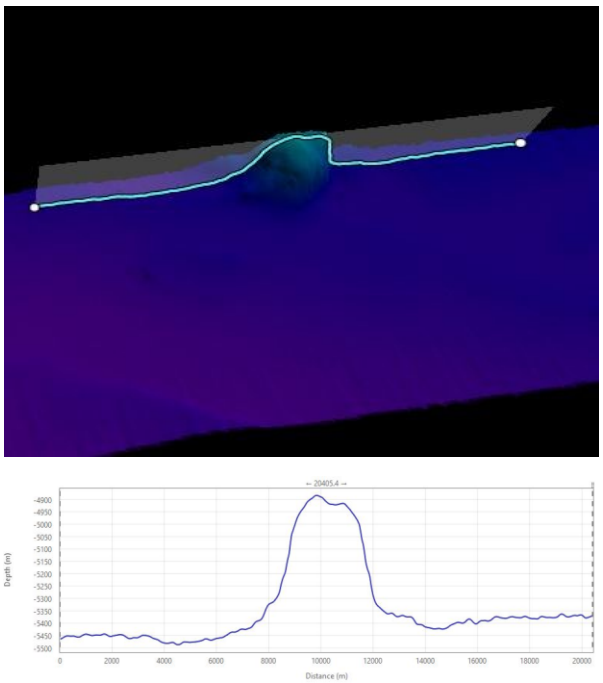


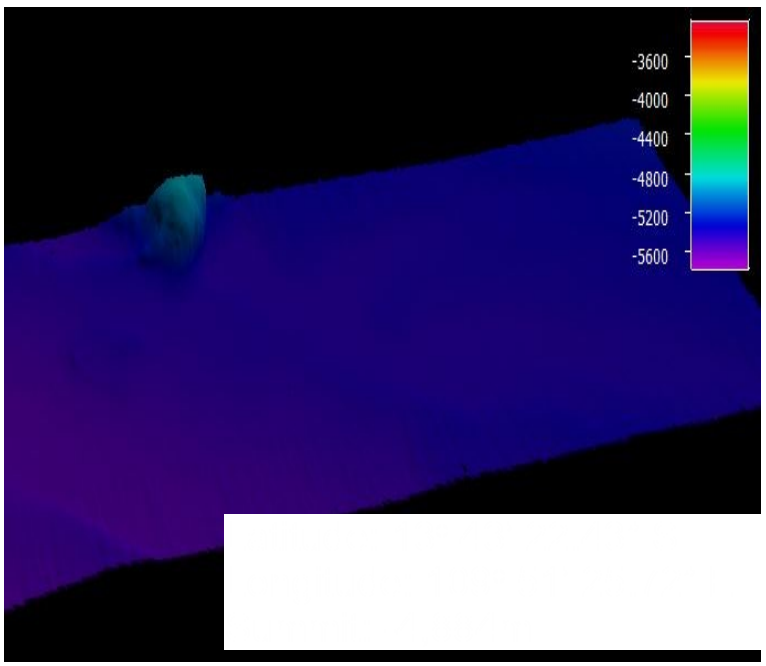
1. Hill



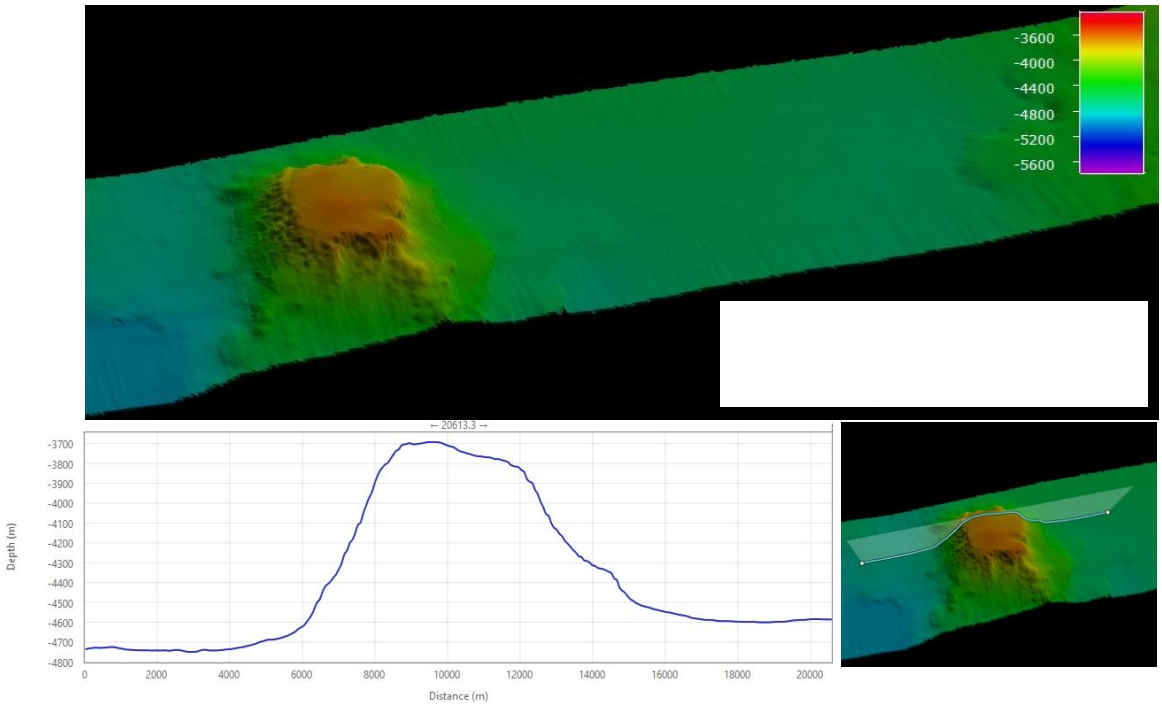


2. Hill

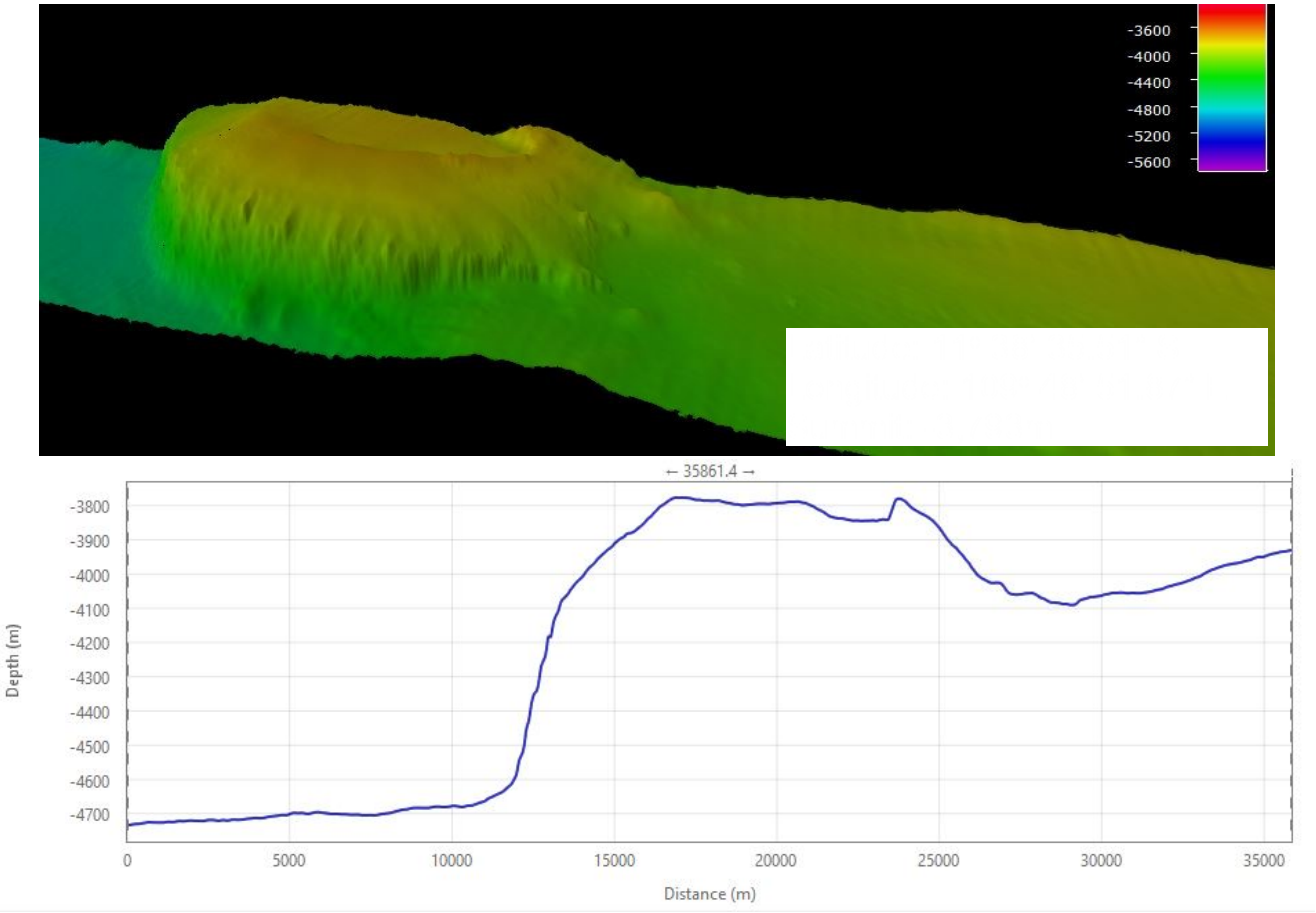




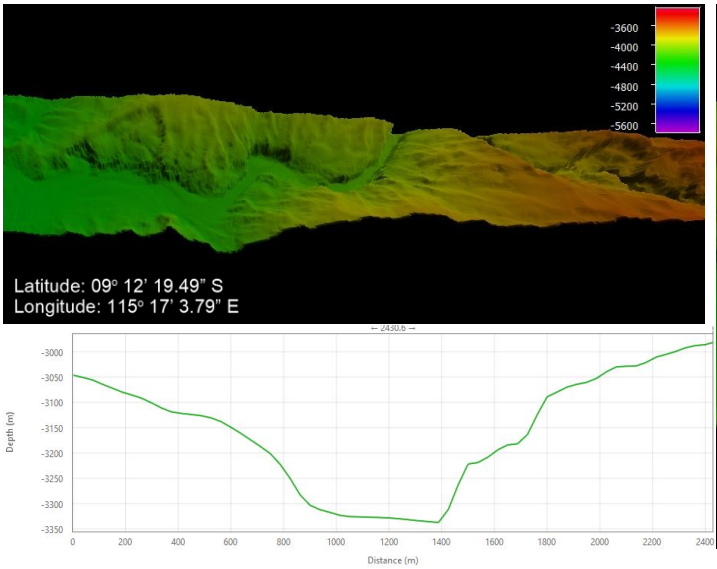
3. Guyot

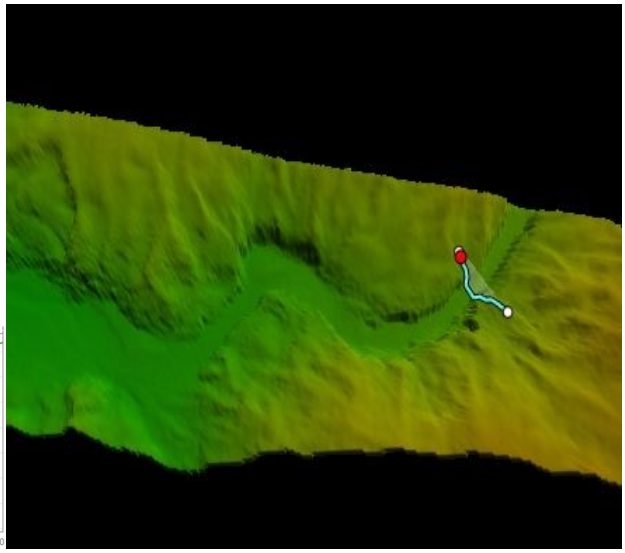


4. Caldera



5. Channel





6. Ridge