H13086

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13086

LOCALITY

State(s):	California
General Locality:	California
Sub-locality:	North of Santa Rosa Island

2018

CHIEF OF PARTY
Benjamin K. Evans, CDR/NOAA

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13086**

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

State(s):	**California**
General Locality:	**California**
Sub-Locality:	**North of Santa Rosa Island**
Scale:	**20000**
Dates of Survey:	**09/25/2018 to 11/02/2018**
Instructions Dated:	**08/17/2018**
Project Number:	**OPR-L397-RA-18**
Field Unit:	**NOAA Ship *Rainier***
Chief of Party:	**Benjamin K. Evans, CDR/NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via http://www.ncei.noaa.gov/.

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Descriptive Report to Accompany Survey H13086

Project: OPR-L397-RA-18

Locality: California

Sublocality: North of Santa Rosa Island

Scale: 1:20000

September 2018 - November 2018

NOAA Ship *Rainier*

Chief of Party: Benjamin K. Evans, CDR/NOAA

A. Area Surveyed

The survey area is referred to as H13086, "North of Santa Rosa Island" (sheet 2) within the Project Instructions. The area encompasses approximately 16 square nautical miles of Santa Rosa Island's northern coast, extending from Talcott Shoal (northeast of Sandy Point) eastward to Cañada Lobos.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
34° 3' 55.48" N 120° 13' 23.99" W	34° 0' 38.75" N 120° 5' 32.11" W

Table 1: Survey Limits

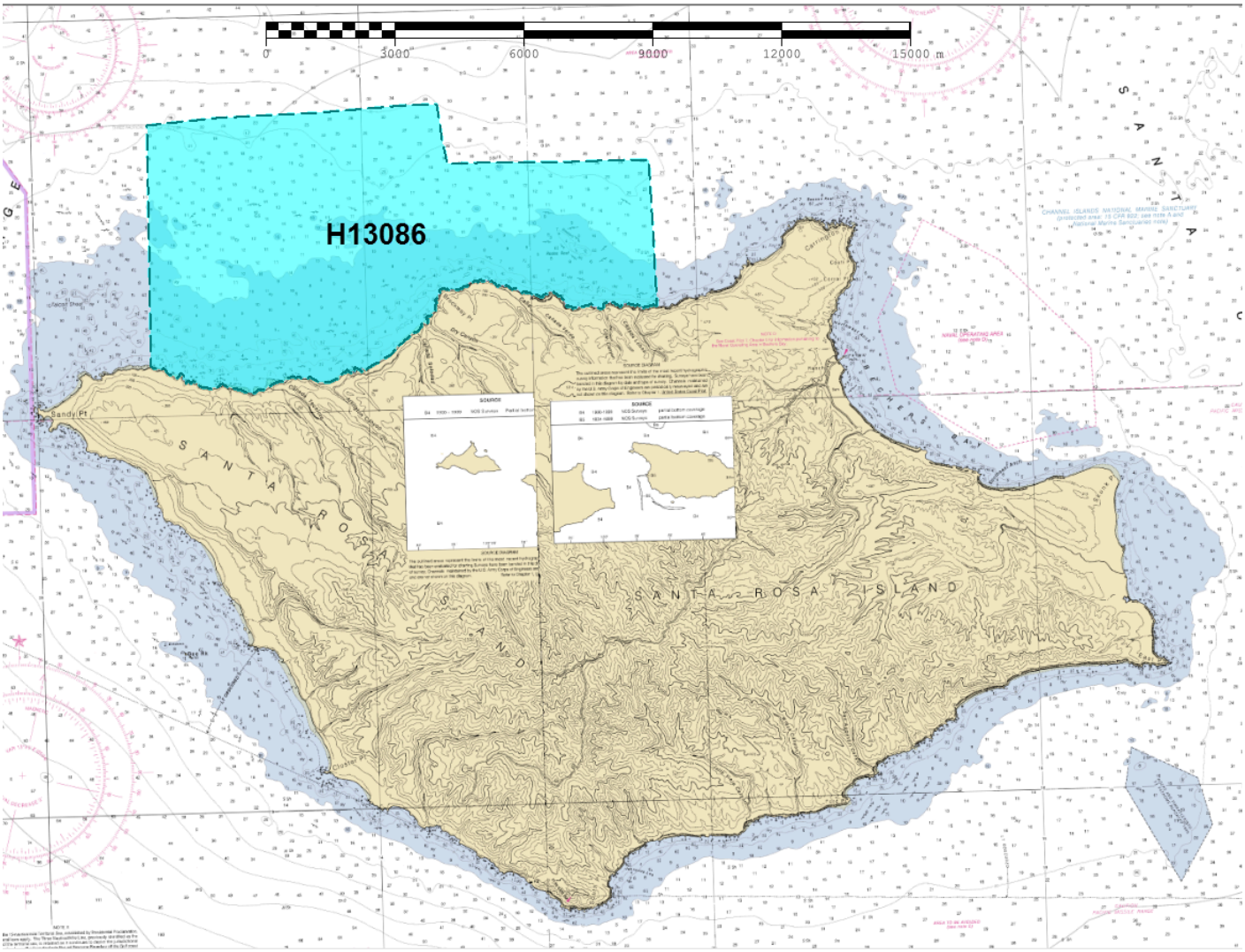


Figure 1: H13086 assigned survey area (Charts 18727 and 18728).

Data were acquired within the assigned survey limits as required in the Project Instructions and HSSD unless otherwise noted in this report.

A.2 Survey Purpose

The objective of survey H13086 is to acquire multibeam bathymetry and backscatter data on the north side of Santa Rosa Island in the Channel Islands Marine Sanctuary (CINMS). The area encompassing H13086 is exposed to winds and seas and is home to pinniped and seabird populations and rare species of flora. The multibeam data will provide crucial updates to nautical charts, enhancing navigational safety, and the backscatter data will be used in habitat mapping and substrate analyses to aid sanctuary managers, planners, and researchers in their conservation efforts.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Pydro QC Tools 2 Grid QA was used to analyze H13086 multibeam echsounder (MBES) data density. The submitted H13086 variable-resolution (VR) surface met HSSD density requirements as shown in the histogram below.

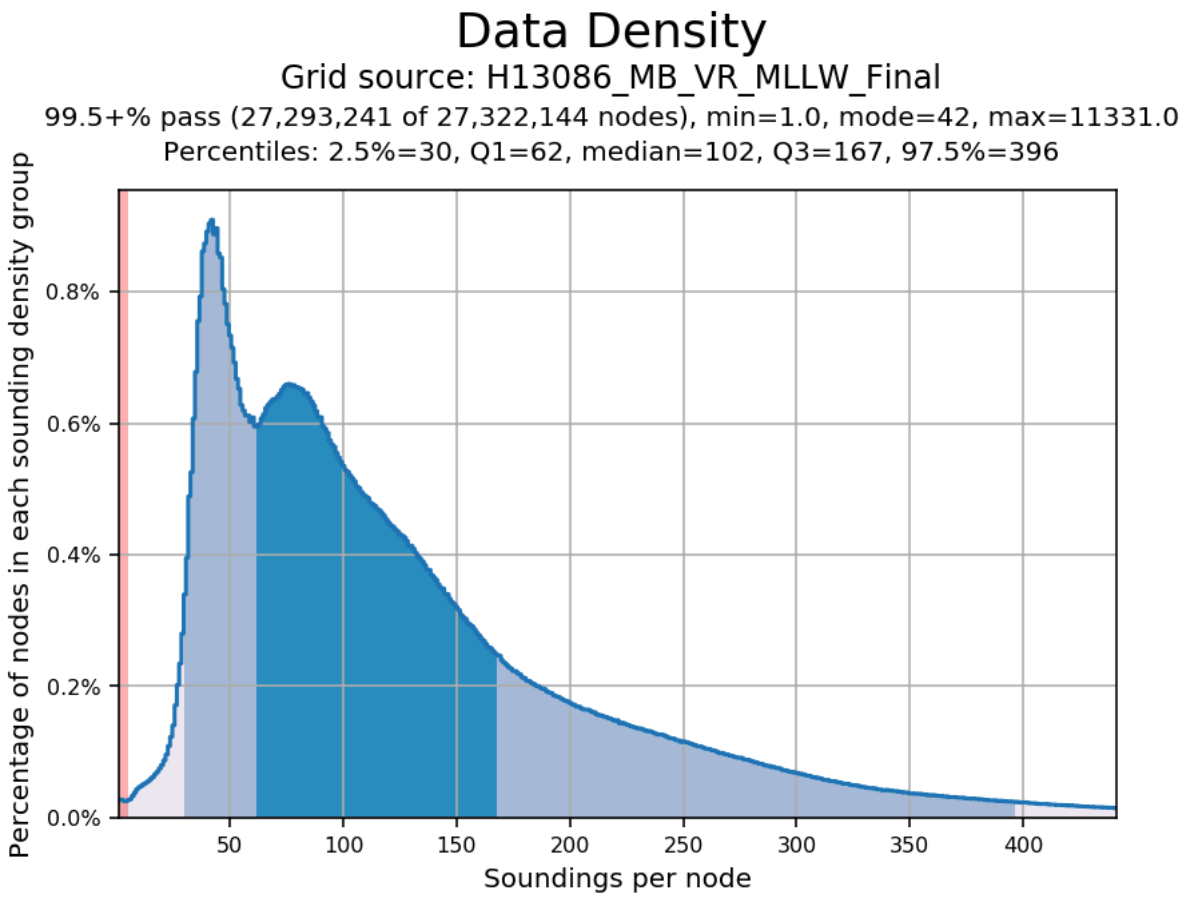


Figure 2: Pydro derived plot showing HSSD density compliance of H13086 finalized variable-resolution MBES data.

A.4 Survey Coverage

The following table lists the coverage requirements for this survey as assigned in the project instructions:

Water Depth	Coverage Required
All waters in survey areas	Complete Coverage (Refer to HSSD Section 5.2.2.3)
All waters in survey area	Acquire backscatter data during all multibeam data acquisition (Refer to HSSD section 6.2)

Table 2: Survey Coverage

Complete multibeam echosounder coverage was acquired to the inshore limit of hydrography, the Navigable Area Limit Line (NALL). The NALL is defined as the most seaward of the following: the surveyed 3.5-meter depth contour, the line defined by the distance seaward from the observed MHW line which is equivalent to 0.8 millimeters at chart scale (the assigned sheet limits closely reflect this), or the inshore limit of safe navigation. Most of the shoreline in H13086 survey area was unapproachable because of thick kelp or breaking waves. In these areas, the NALL was defined by the inshore limit of safe navigation, rather than depth or distance from shore (Figure 3).

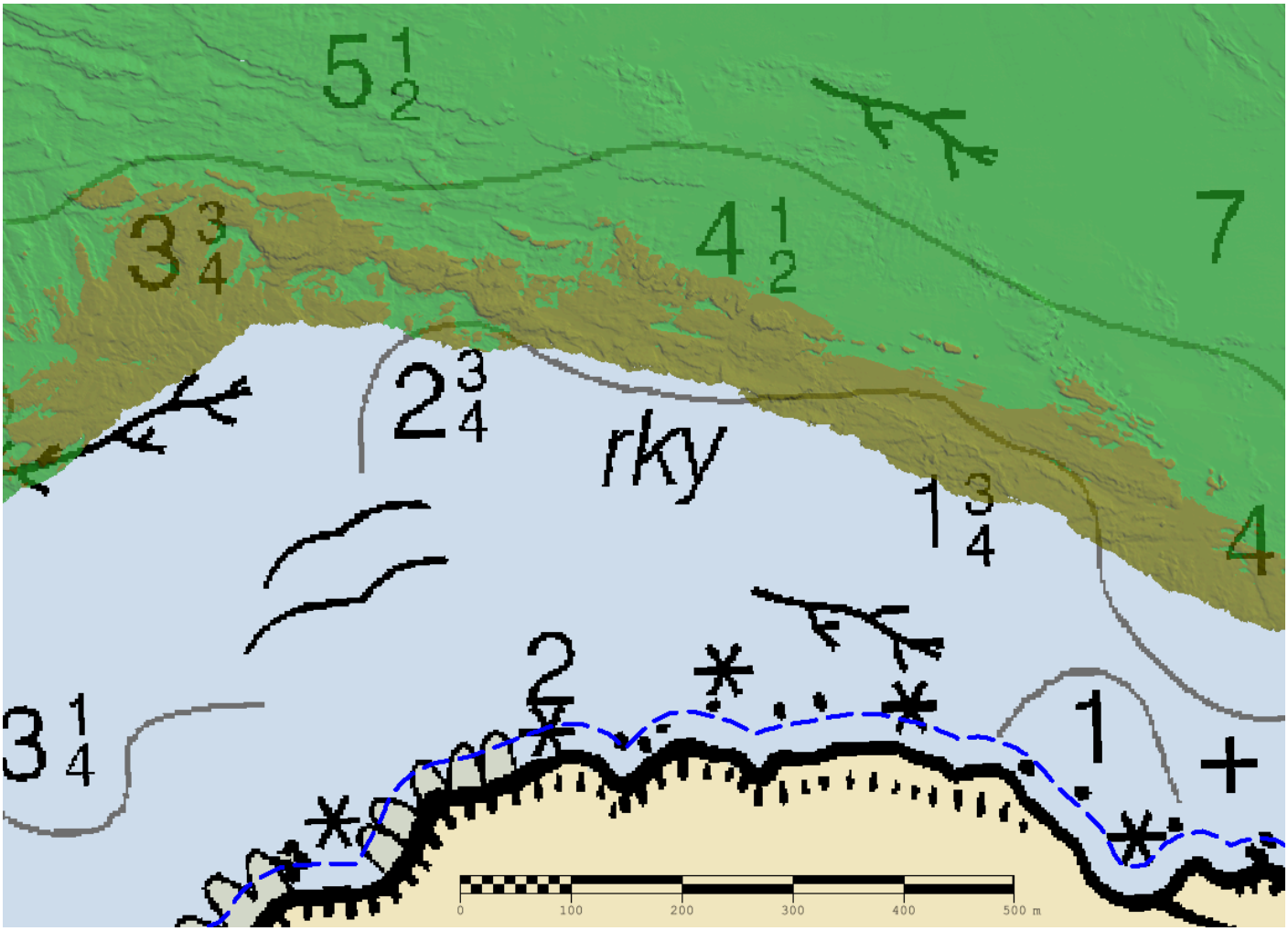


Figure 3: Example of Navigable Area Limit Line (NALL) determination northeast of Brockway Point; the blue dashed line indicates assigned sheet limits. NALL was determined by thick kelp and breaking waves nearshore.

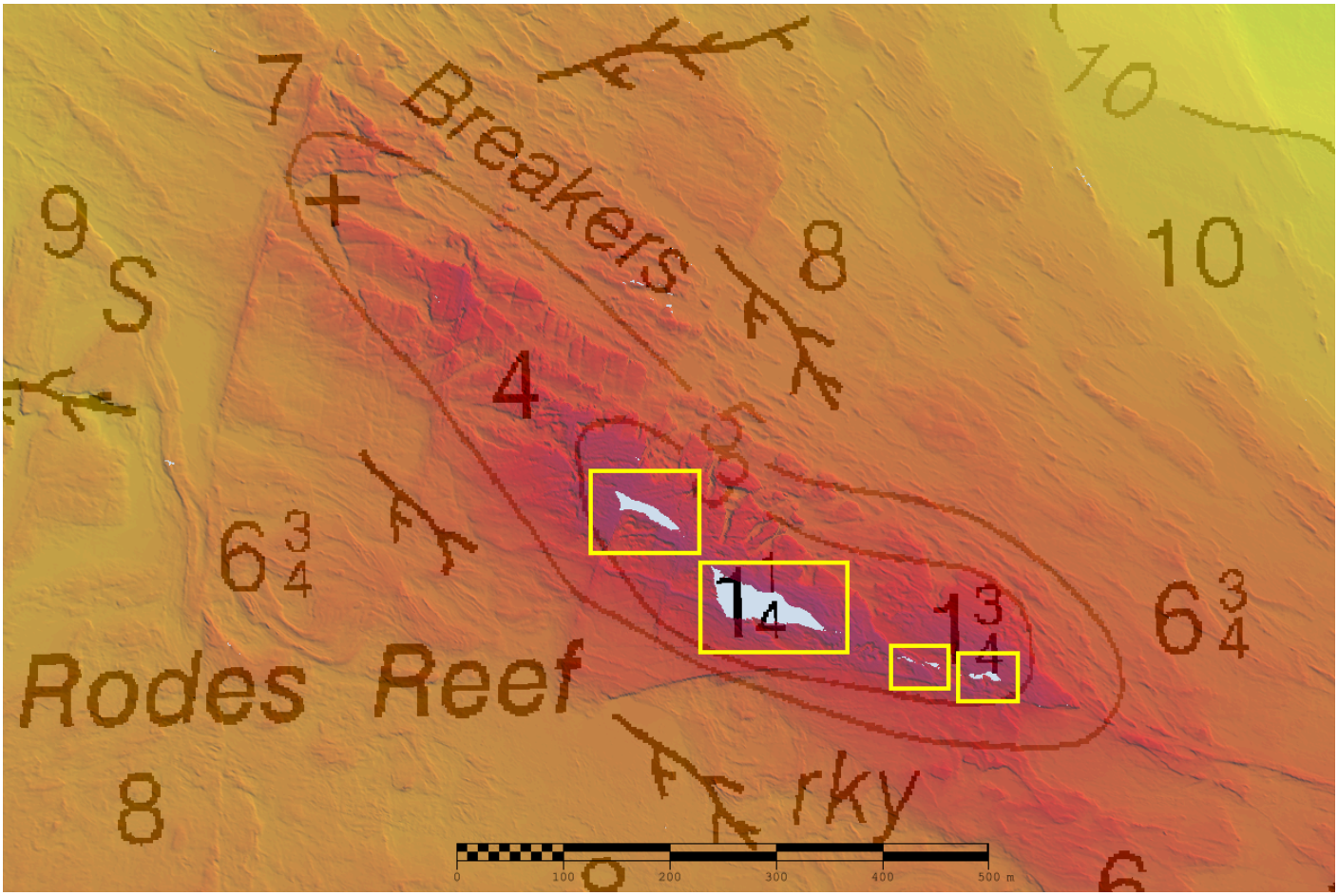


Figure 4: Holidays were caused by breaking waves over the top of Rodes Reef. The shoalest sounding recorded on the reef is 2.1 meters.

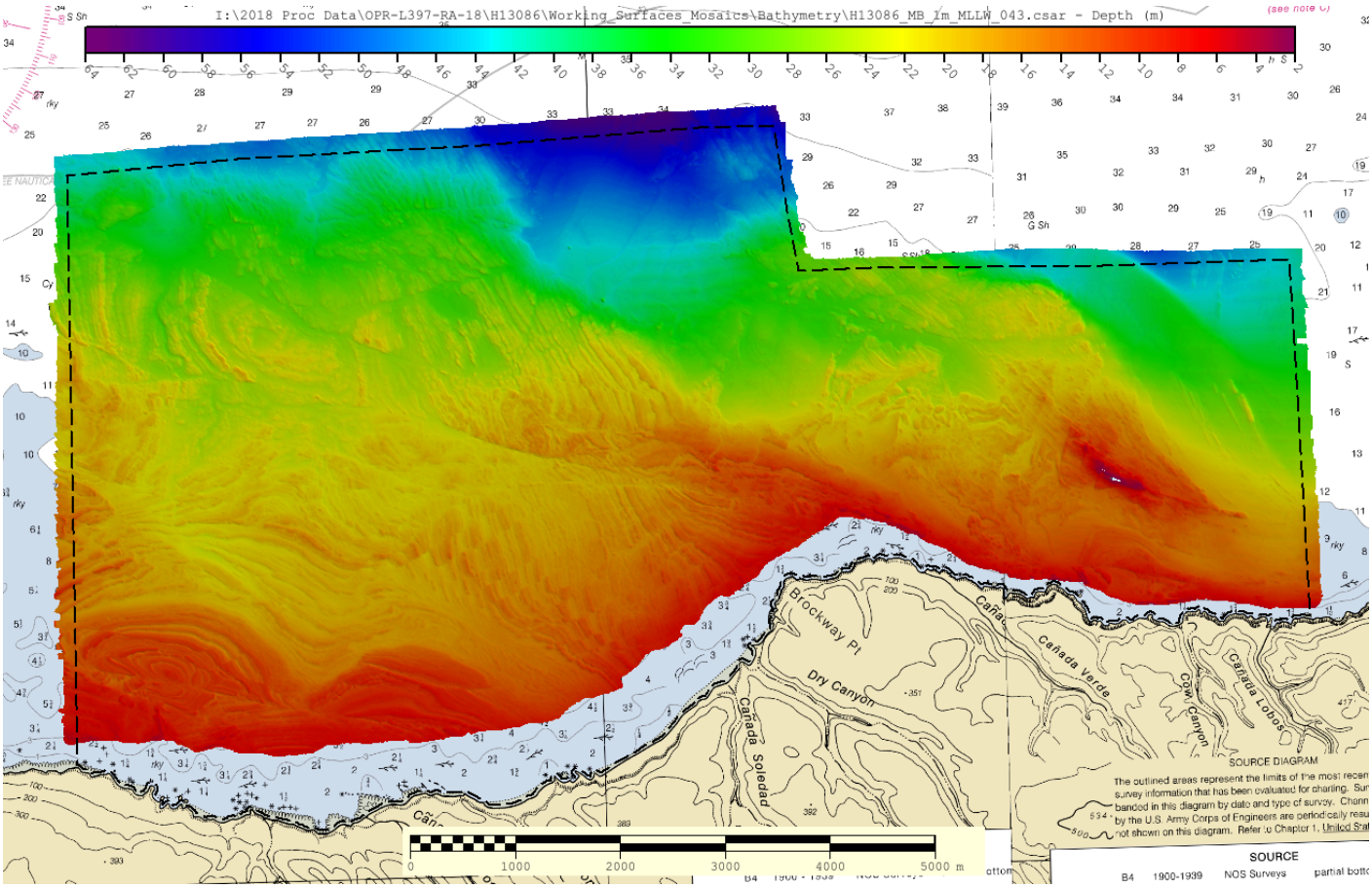


Figure 5: H13086 MBES coverage and assigned survey limits (Charts 18727 and 18278).

A.5 Survey Statistics

The following table lists the mainscheme and crossline acquisition mileage for this survey:

	HULL ID	*2801*	*2802*	*2803*	*2804*	*Total*
LNM	SBES Mainscheme	0	0	0	0	0
	MBES Mainscheme	93.93	7.77	213.09	189.89	504.68
	Lidar Mainscheme	0	0	0	0	0
	SSS Mainscheme	0	0	0	0	0
	SBES/SSS Mainscheme	0	0	0	0	0
	MBES/SSS Mainscheme	0	0	0	0	0
	SBES/MBES Crosslines	0	17.27	1.40	3.38	20.05
	Lidar Crosslines	0	0	0	0	0
Number of Bottom Samples						0
Number Maritime Boundary Points Investigated						0
Number of DPs						0
Number of Items Investigated by Dive Ops						0
Total SNM						15.66

Table 3: Hydrographic Survey Statistics

The following table lists the specific dates of data acquisition for this survey:

Survey Dates	Day of the Year
09/27/2018	270
09/28/2018	271

Survey Dates	Day of the Year
10/01/2018	274
10/02/2018	275
10/03/2018	276
10/04/2018	277
10/09/2018	282
10/19/2018	292

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are discussed in the following sections.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	*2801*	*2802*	*2803*	*2804*
LOA	8.8 meters	8.8 meters	8.8 meters	8.8 meters
Draft	1.1 meters	1.1 meters	1.1 meters	1.1 meters

Table 5: Vessels Used

Figure 6: NOAA Ship RAINIER in Channel Islands with survey launches 2701 (RA-2), 2801 (RA-4), and 2804 (RA-6).

All multibeam data for H13086 were acquired by NOAA Ship RAINIER survey launches 2801 (RA-4), 2802 (RA-5), 2803 (RA-3), and 2804 (RA-6). These vessels acquired depth soundings, backscatter, and sound speed profiles.

B.1.2 Equipment

The following major systems were used for data acquisition during this survey:

Manufacturer	Model	Type
Applanix	POS MV 320 v5	Positioning and Attitude System
Kongsberg Maritime	EM 2040	MBES
Teledyne RESON	SVP 70	Sound Speed System
Sea-Bird Scientific	SBE 19plus	Conductivity, Temperature, and Depth Sensor

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Multibeam/single beam echo sounder/side scan sonar crosslines acquired for this survey totaled 4.37% of mainscheme acquisition.

RAINIER launches 2802 (RA-5), 2803 (RA-3), and 2804 (RA-6) acquired 22.05 nautical miles of multibeam crosslines. H13086 crossline data is adequate for verifying and evaluating the internal consistency of survey data. The Compare Grids function in Pydro Explorer analyzed finalized VR surfaces of H13086 crossline-only data and mainscheme-only data. In the difference surface, 99.5% of nodes met IHO allowable Total Vertical Uncertainty (TVU) standards. Figures 8-11 provide additional results.

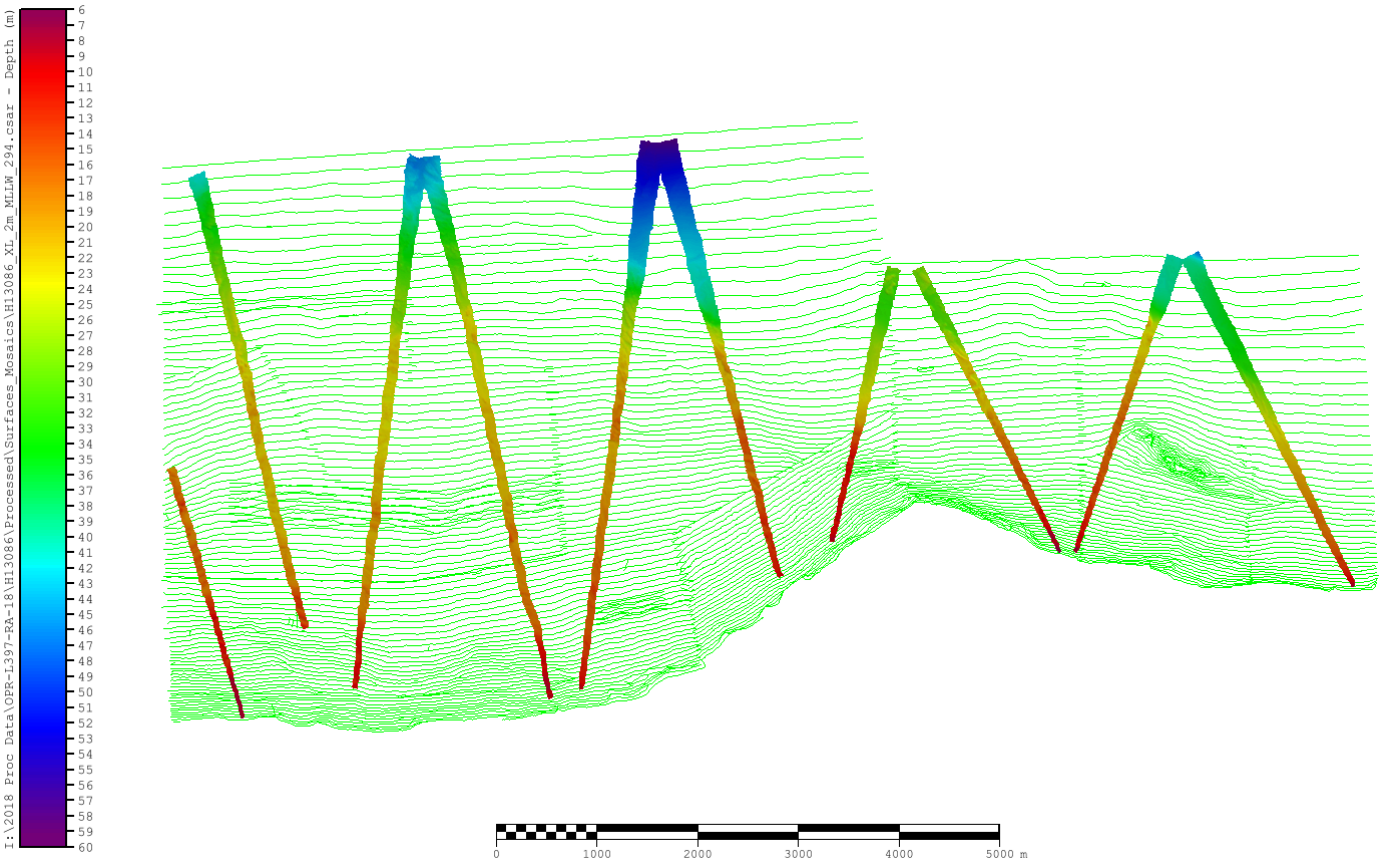


Figure 7: H13086 crossline surface overlaid on mainscheme tracklines.

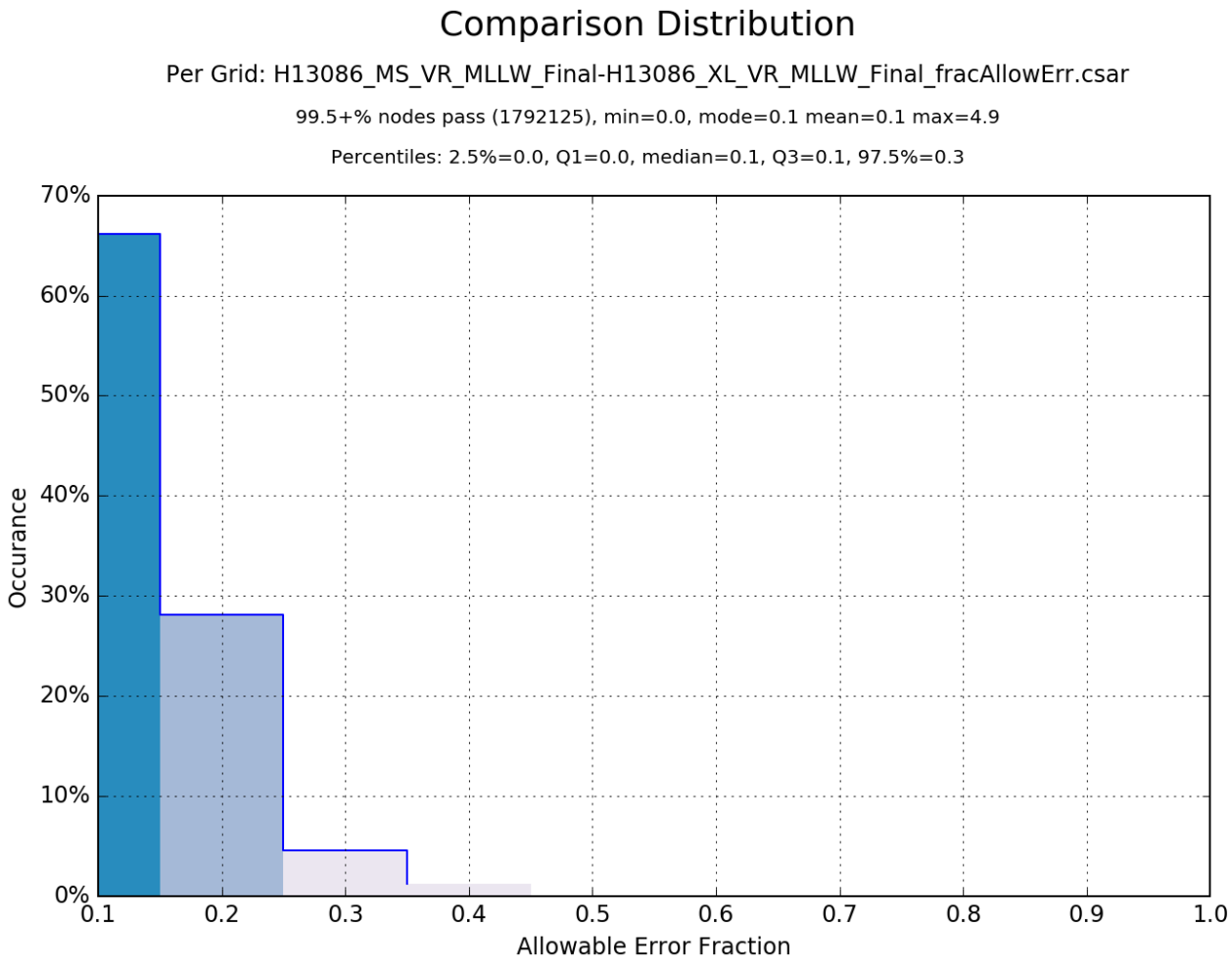
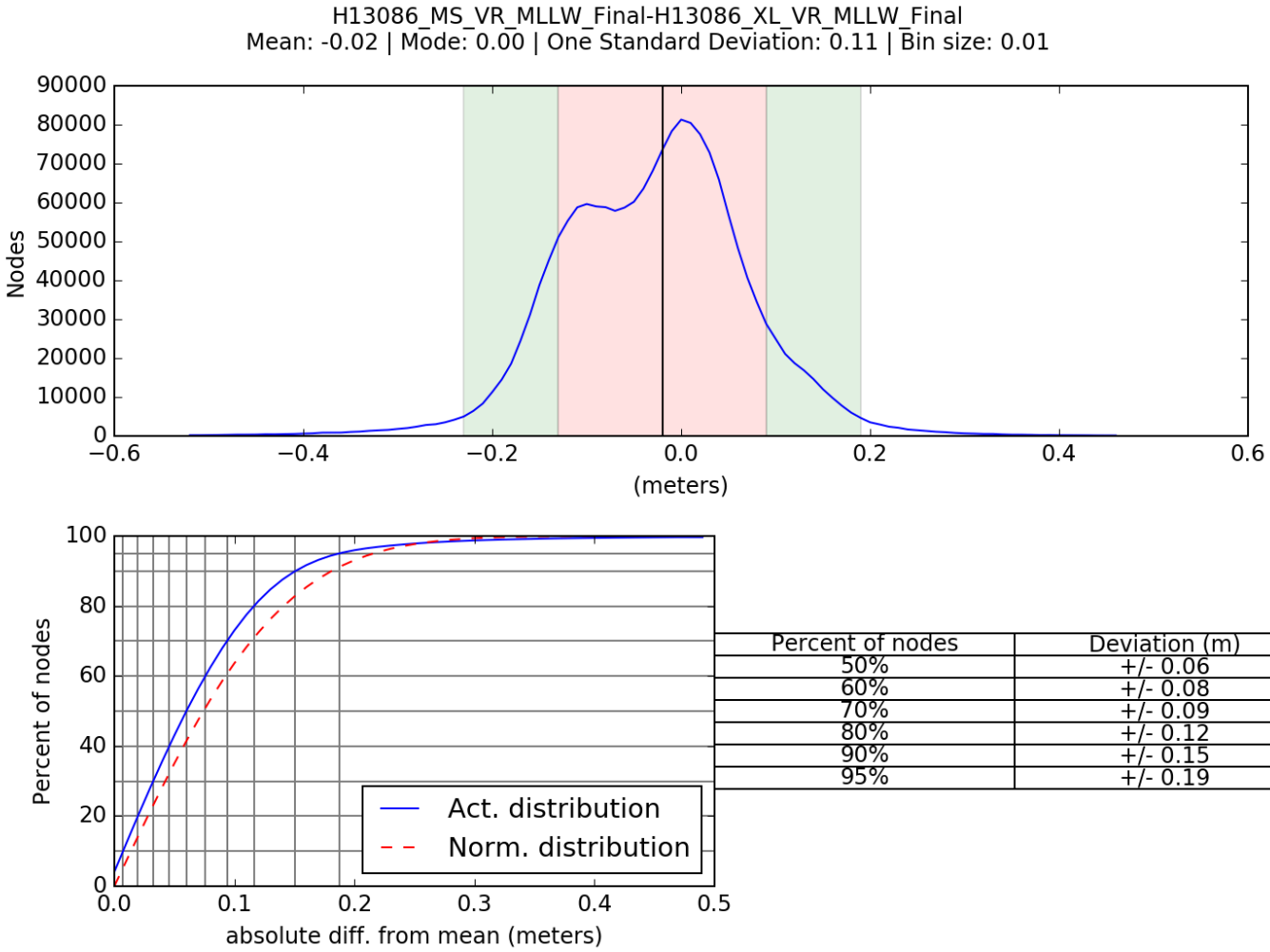


Figure 8: Pydro derived plot showing percentage-pass value of H13086 mainscheme to crossline data.



Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.08
70%	+/- 0.09
80%	+/- 0.12
90%	+/- 0.15
95%	+/- 0.19

Figure 9: Pydro derived plot showing absolute difference statistics of H13086 mainscheme to crossline data.

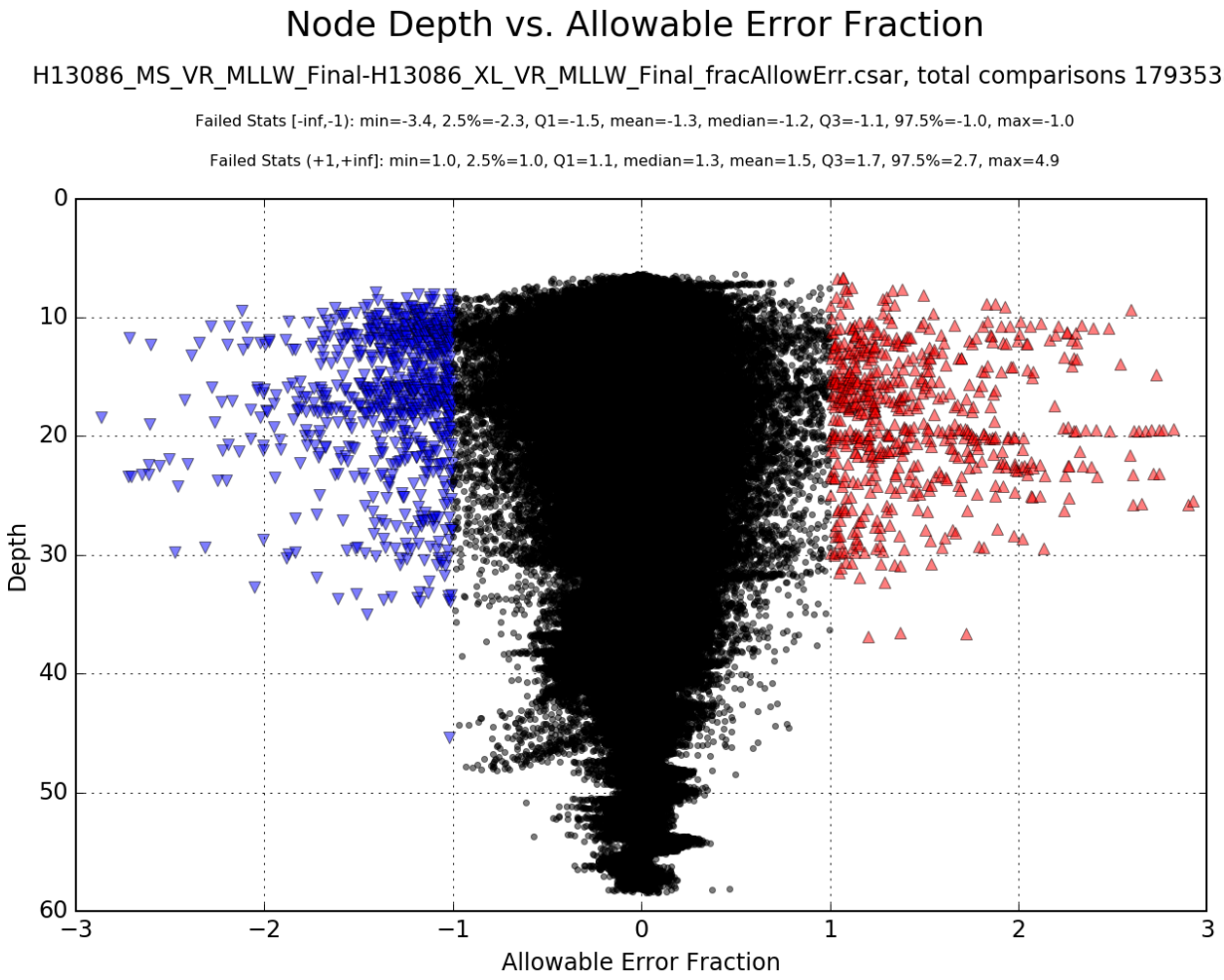


Figure 10: Pydro derived plot showing node depth vs. allowable error fraction of H13086 mainscheme to crossline data.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0 meters	0.083 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
2801, 2802, 2803, 2804	3 meters/second	N/A meters/second	0.05 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for survey H13086 were derived from a combination of fixed values for equipment and vessel characteristics, as well as from field assigned values for sound speed uncertainties. A tidal zoning uncertainty of 0.082867 meters was provided with the VDatum separation model for this project. See the 2018 DAPR for further information.

In addition to the these uncertainty estimates, some real-time and post-processing uncertainty sources were also incorporated into the depth estimates of this survey. Real-time uncertainties from Kongsberg MBES sonars were recorded and applied in post-processing. Applanix TrueHeave (POS) files, which record estimates of heave uncertainty, were applied during post-processing. Finally, the post-processed uncertainties associated with vessel roll, pitch, yaw, and position were applied in Caris HIPS using SBET and RMS files generated using POSPac MMS software.

Uncertainty values of the submitted finalized grid was calculated in Caris using "Greater of the Two" of uncertainty and standard deviation (scaled to 95%). Grid QA v5 within Pydro QC Tools 2 was used to analyze H13086 TVU compliance (Figure 12).

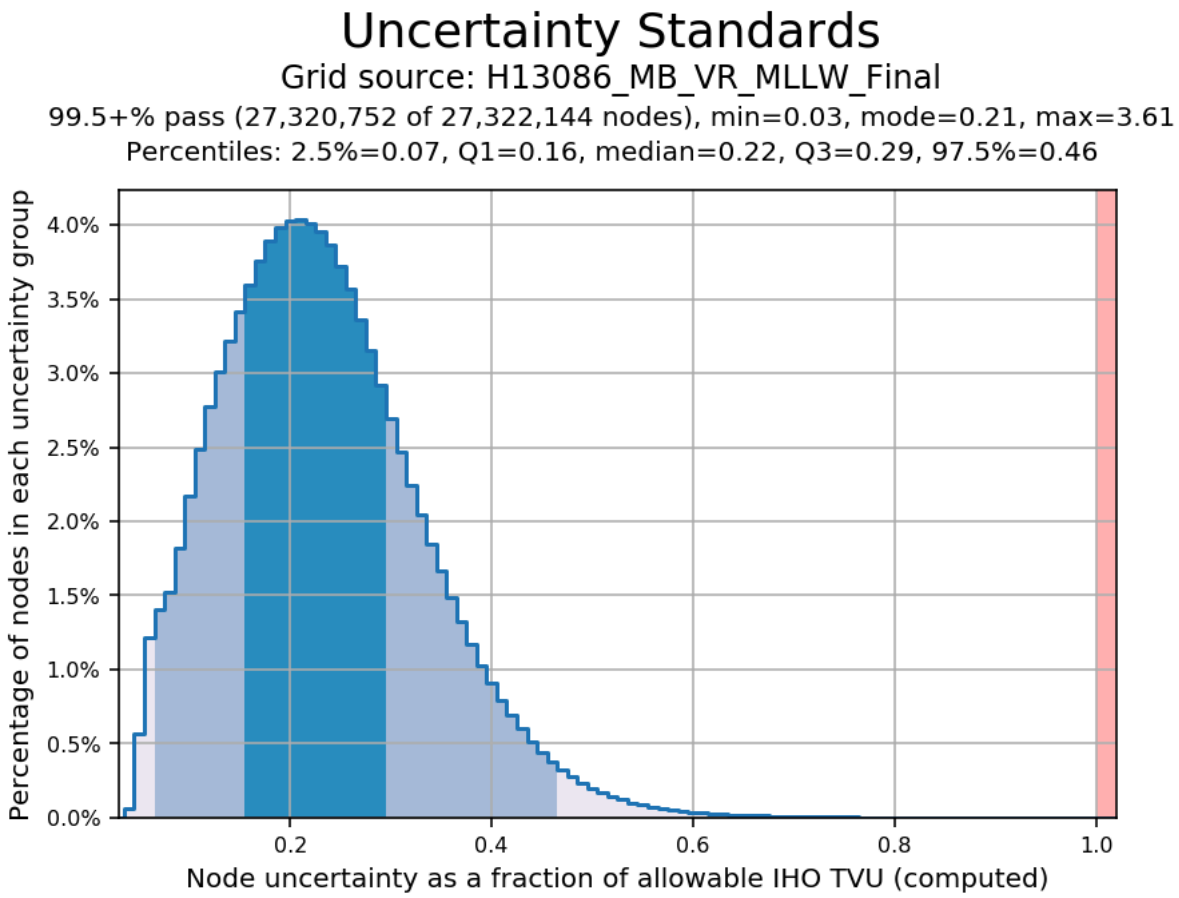


Figure 11: Pydro derived plot showing TVU compliance of H13086 finalized variable-resolution MBES data.

B.2.3 Junctions

Two junction comparisons were completed for survey H13086. Surveys H13085 and H13087 were acquired concurrently with this survey.

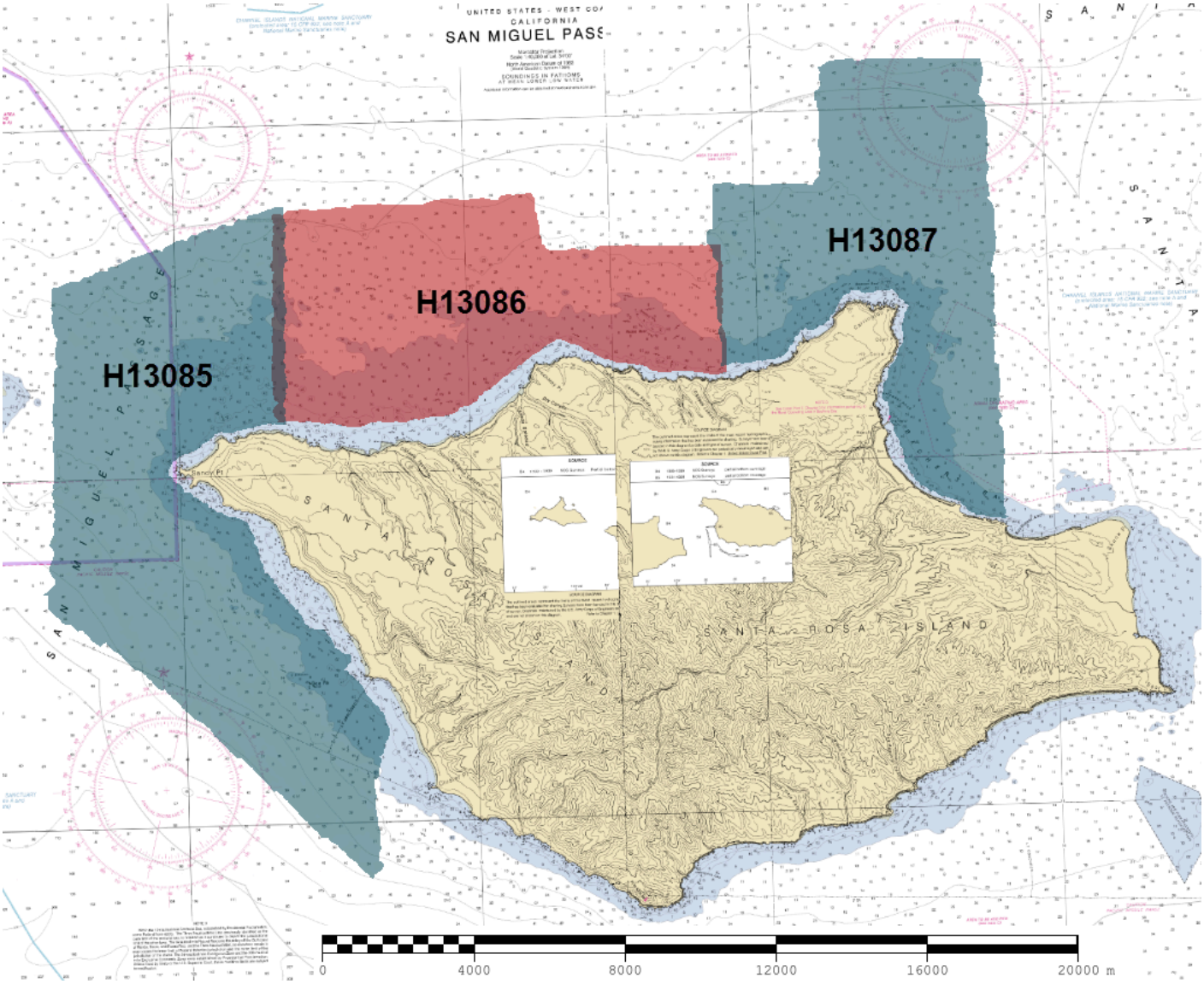


Figure 12: H13086 junctions with surveys H13085 and H13087.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13085	1:20000	2018	NOAA Ship RAINIER	W
H13087	1:20000	2018	NOAA Ship RAINIER	E

Table 9: Junctioning Surveys

H13085

The junction with survey H13085 encompasses 0.57 square nautical miles along the western boundary of survey H13086. The Compare Grids function of Pydro Explorer derived a difference surface from the variable-resolution CUBE surfaces of each survey for comparison. Analysis of the difference surface indicated that survey H13085 is an average of 0.02 meters shallower than survey H13086 with a standard deviation of 0.12 meters.

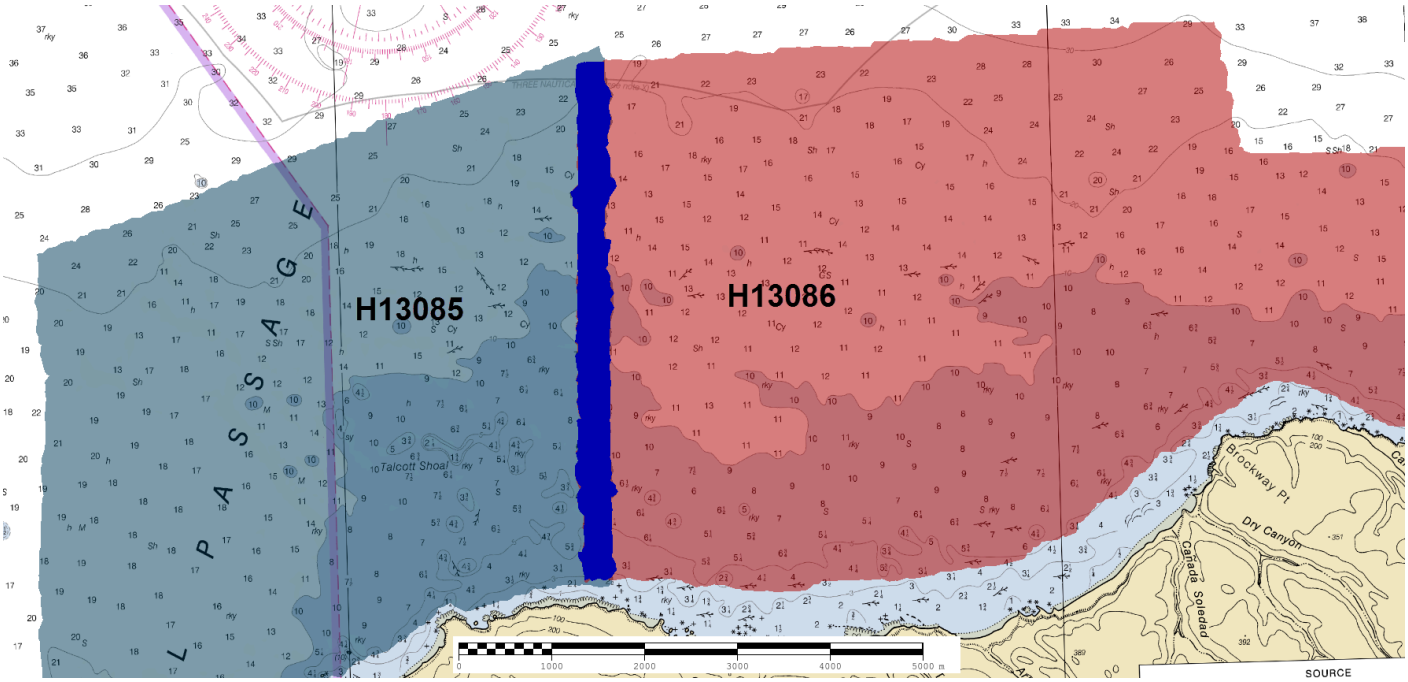


Figure 13: H13086 and H13085 junction difference surface.

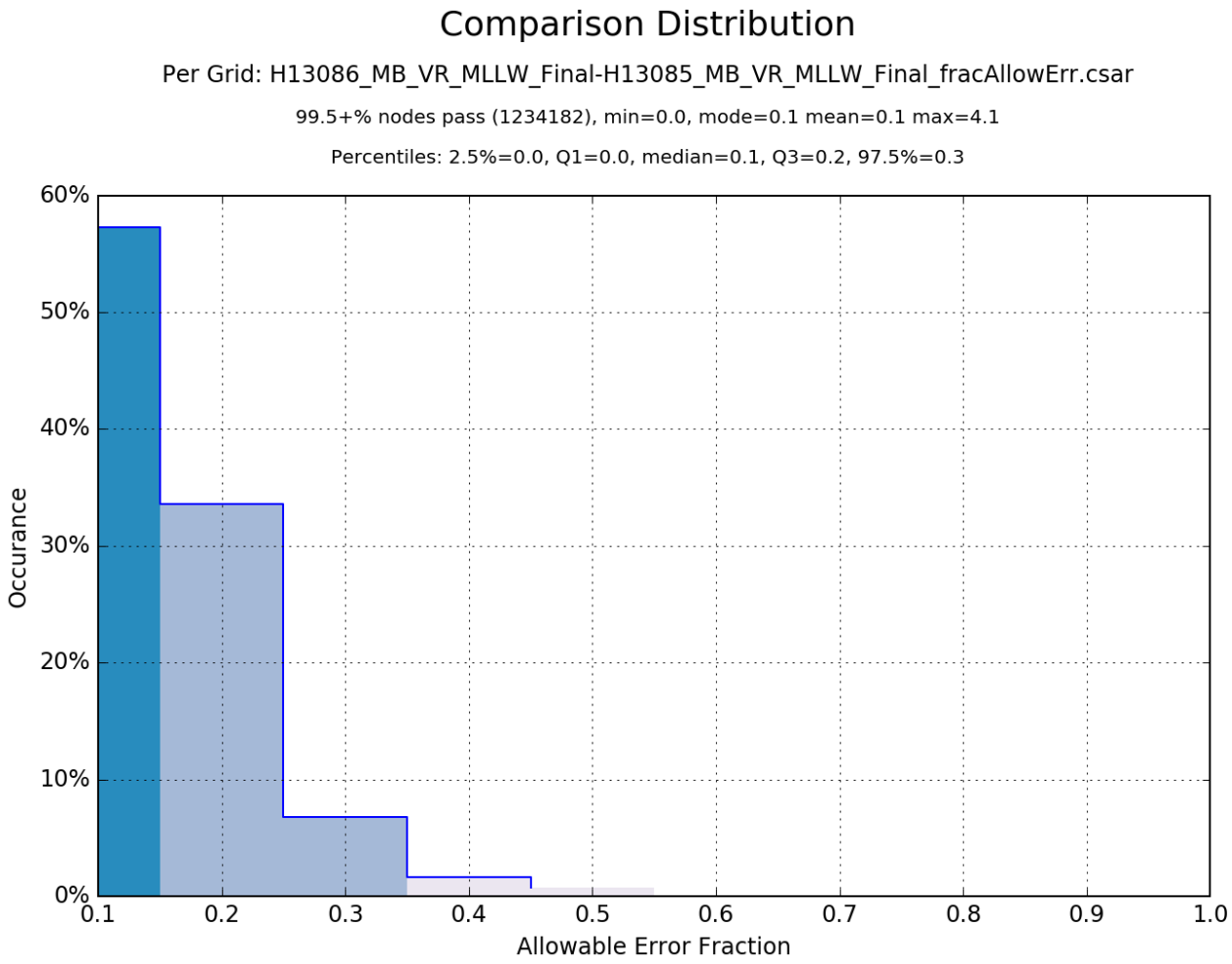
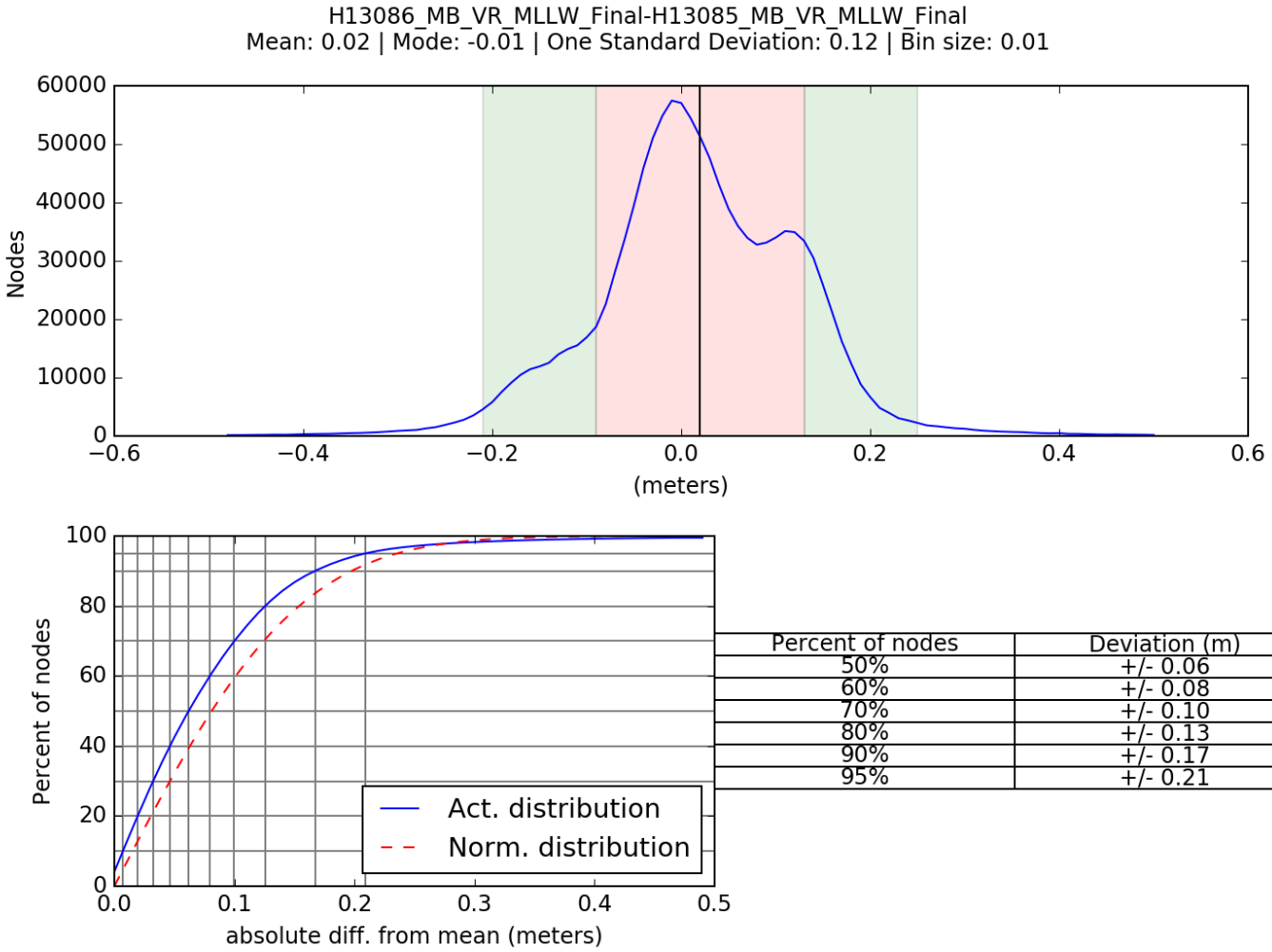


Figure 14: Pydro derived plot showing percentage-pass value of the junction between surveys H13086 and H13085.



Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.08
70%	+/- 0.10
80%	+/- 0.13
90%	+/- 0.17
95%	+/- 0.21

Figure 15: Pydro derived plot showing absolute difference statistics of the junction between surveys H13086 and H13085.

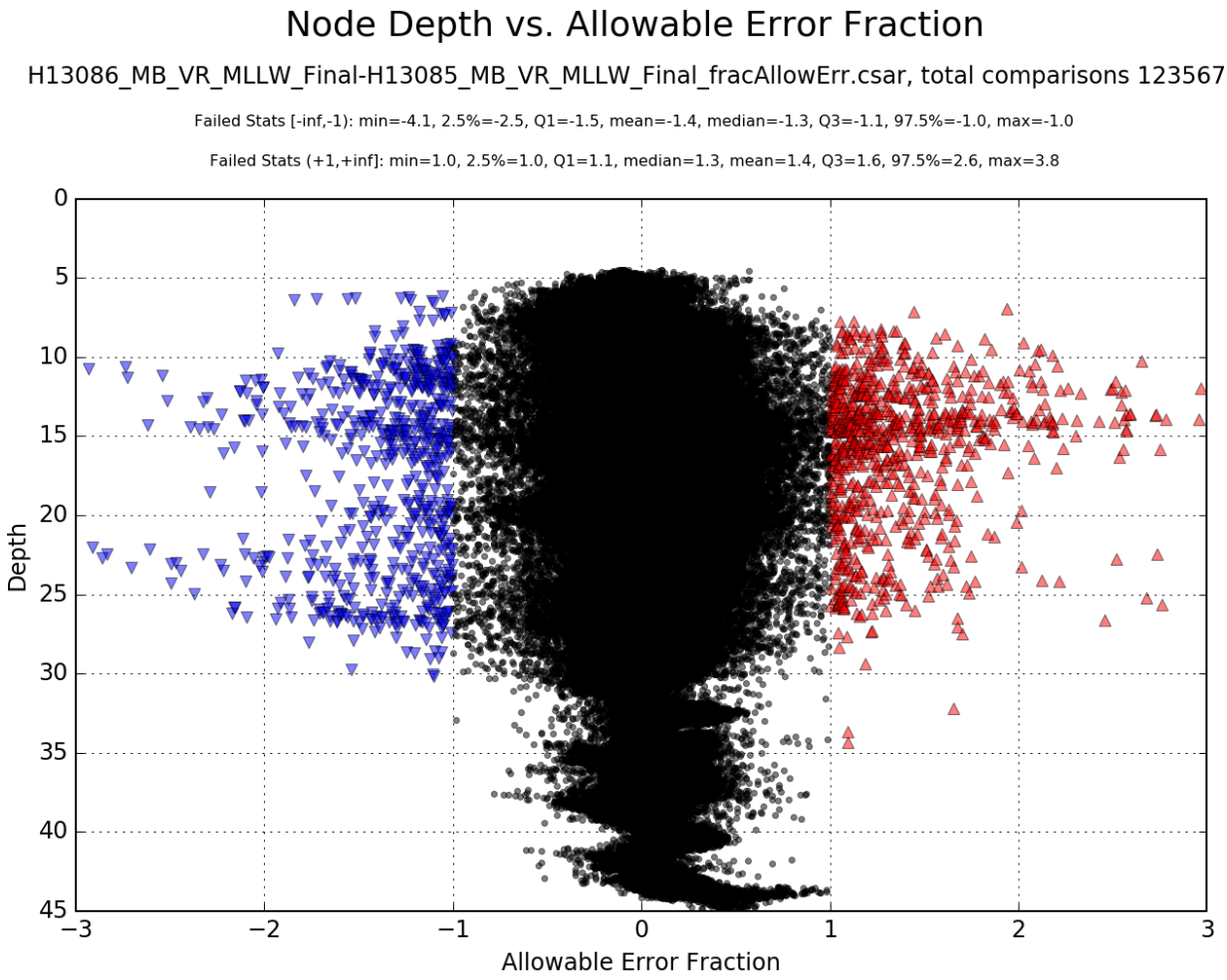


Figure 16: Pydro derived plot showing node depth vs. allowable error fraction of the junction between surveys H13086 and H13085.

H13087

The junction with survey H13087 encompasses 0.20 square nautical miles along the eastern boundary of survey H13086. The Compare Grids function of Pydro Explorer derived a difference surface from the variable-resolution CUBE surfaces of each survey for comparison. Analysis of the difference surface indicated that survey H13087 is an average of 0.02 meters shallower than survey H13086 with a standard deviation of 0.10 meters.

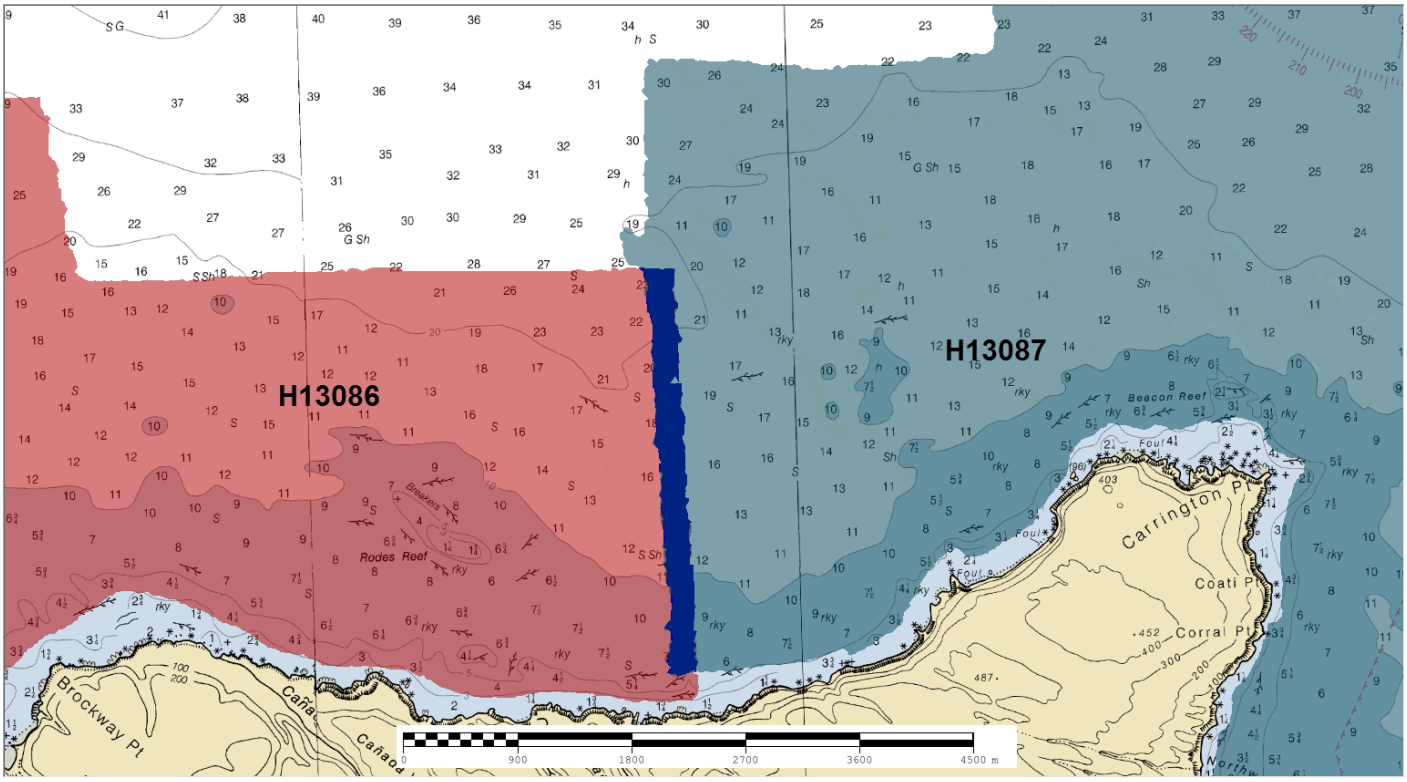


Figure 17: H13086 and H13087 junction difference surface.

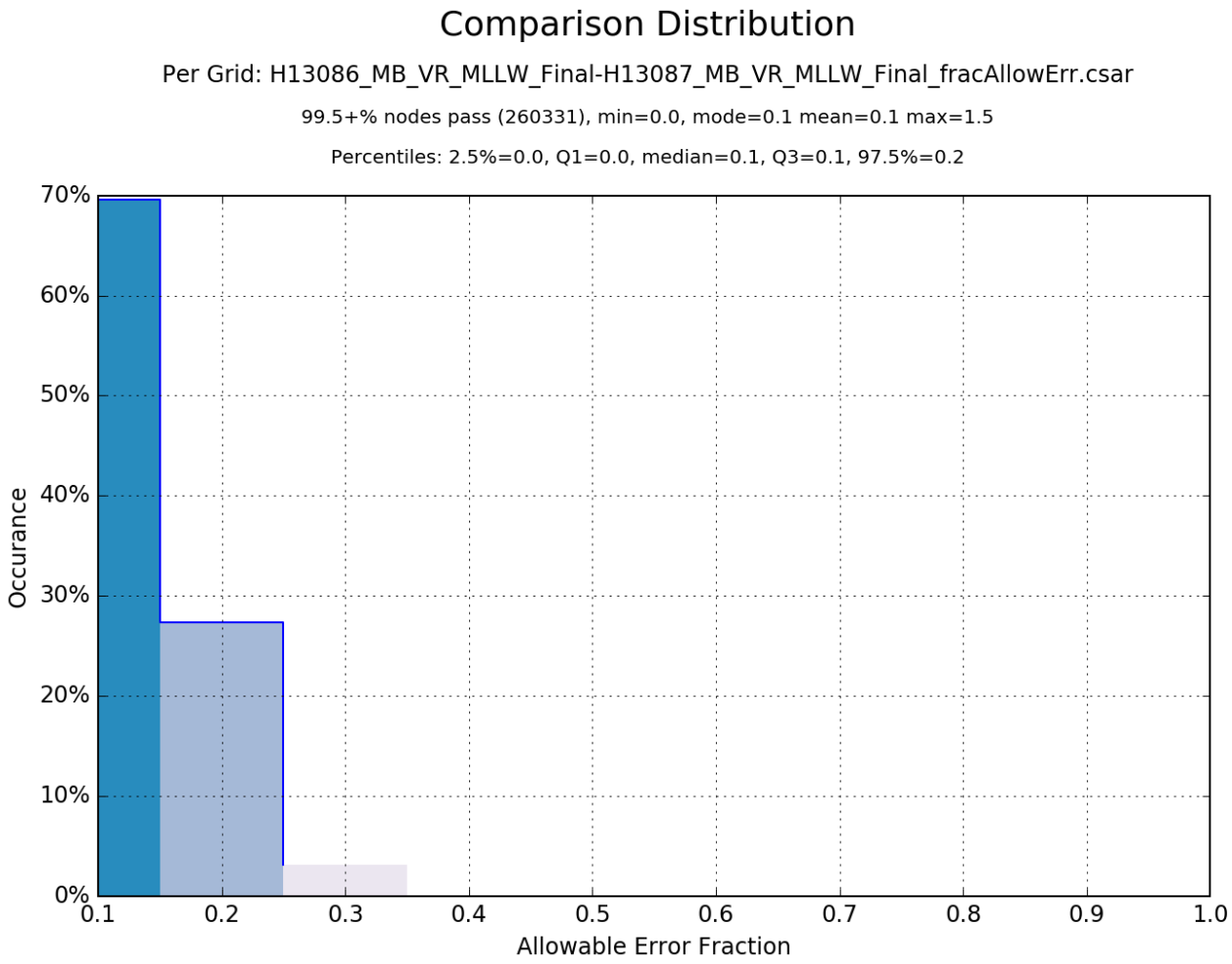
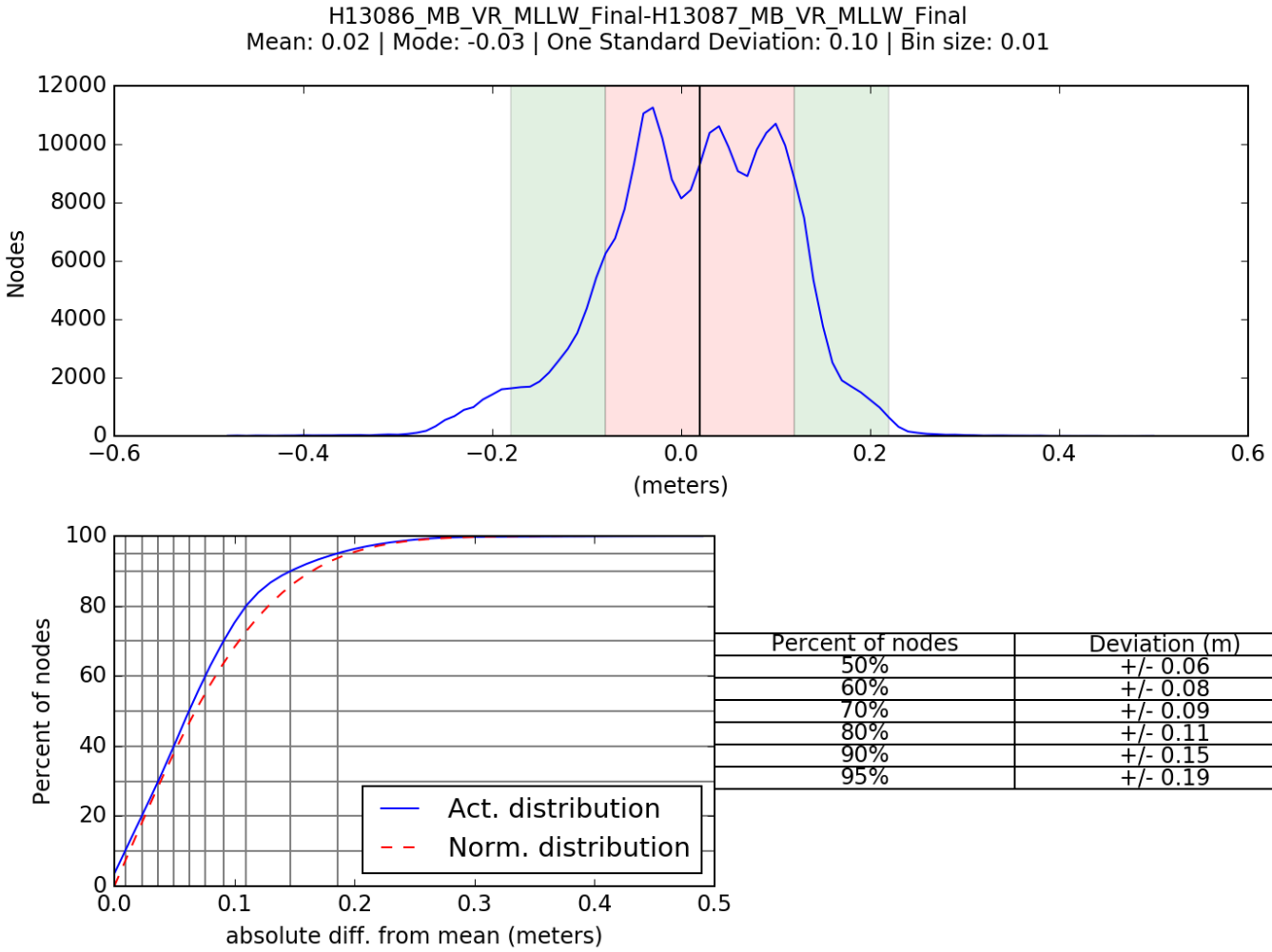


Figure 18: Pydro derived plot showing percentage-pass value of the junction between surveys H13086 and H13087.



Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.08
70%	+/- 0.09
80%	+/- 0.11
90%	+/- 0.15
95%	+/- 0.19

Figure 19: Pydro derived plot showing absolute difference statistics of the junction between surveys H13086 and H13087.

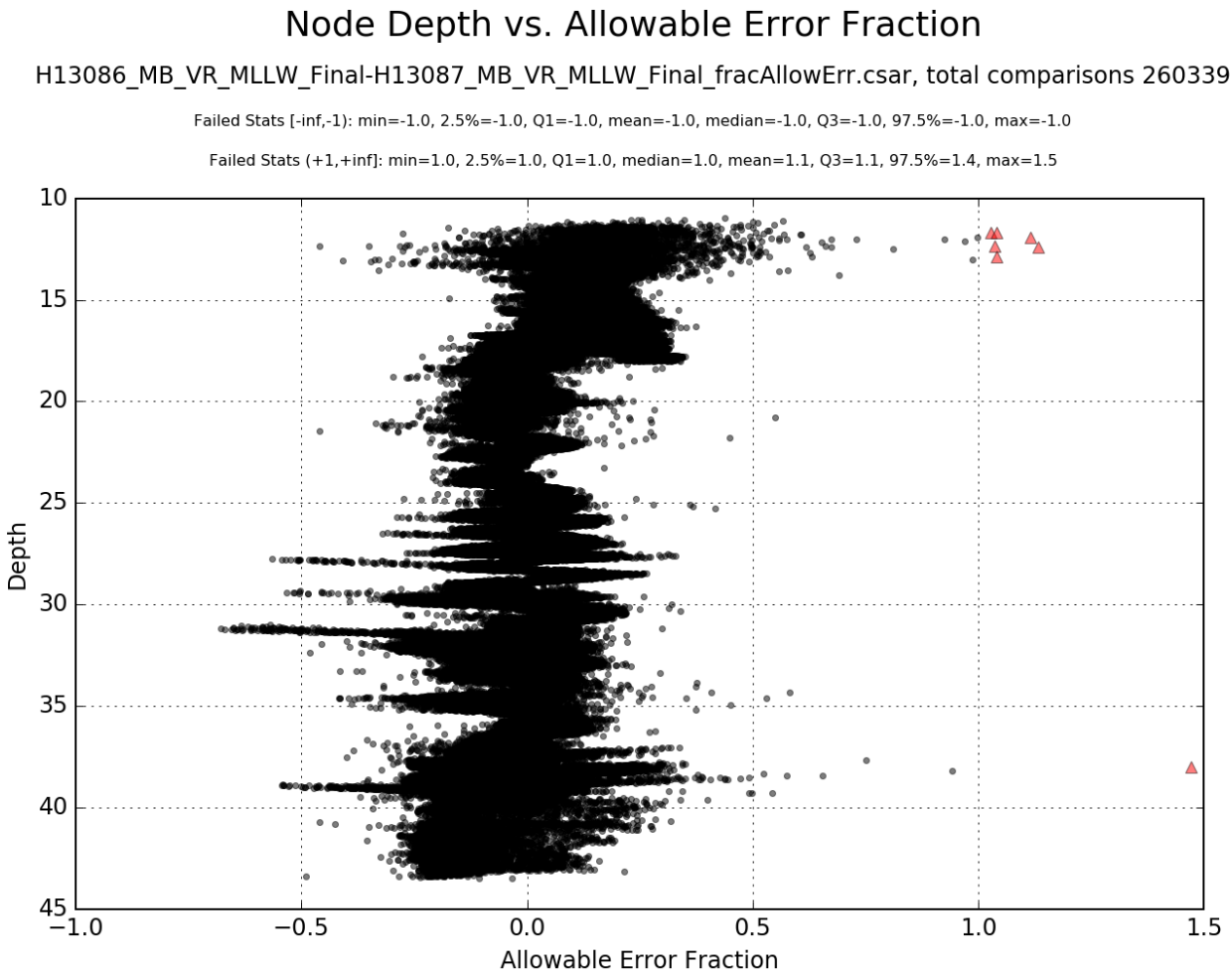


Figure 20: Pydro derived plot showing node depth vs. allowable error fraction of the junction between surveys H13086 and H13087.

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR.

B.2.5 Equipment Effectiveness

Sonar Pulse Length

Survey H13086 was acquired to produce bathymetric data and high quality backscatter data. In order to acquire the high quality backscatter, minimal changes to the sonar's operating mode were required. Instead

of operating sonar pulse length automatically, it was manually switched between long pulse in depths greater than 20 meters and short pulse in depth less than 20 meters to create more consistent backscatter imagery and simplify data processing. The hydrographer monitored the effects of these manual changes and found no issues in the resulting data.

2801 Roll Bias Adjustment

An intermittent, minor roll bias was noted in the H13086 multibeam data. Numerous possible equipment and software related issues were investigated, however, at the time of this report, a conclusive cause of the offset has yet to be determined. A value of -0.204 degrees roll was added to 2801_EM2040.hvf in order to address this slight bias. All submitted H13086 MBES data meet HSSD specifications. TPU and Crosslines Comparison analysis also indicate an improvement in data correlation.

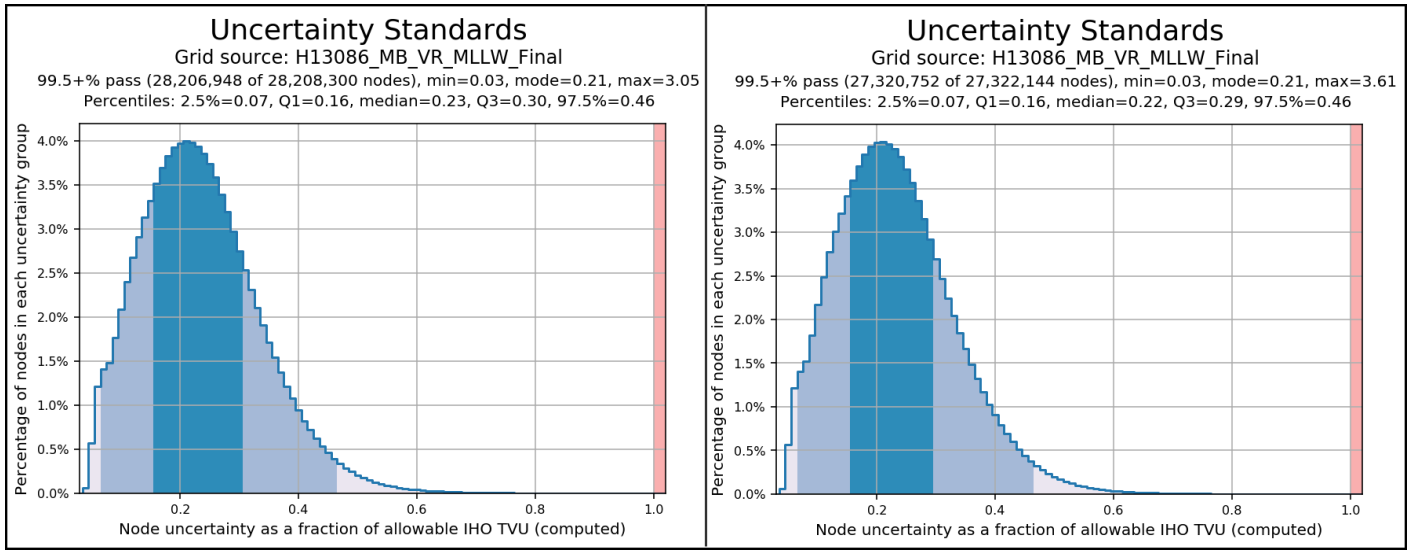


Figure 21: Pydro derived QC TVU histograms of pre (left) and post (right) roll corrected H13086 MBES data.

B.2.6 Factors Affecting Soundings

Sound Speed Offsets

Sound speed offsets were seen in the multibeam data in the northern-central area of the survey collected by 2804 on day 274 (Figure 24) and in the upper eastern survey area collected by 2803 on day 276. These offsets were caused by sound velocity casts taken only in the shallower waters to the west, thus not providing a full sound speed profile for the deeper waters surveyed towards the east (Figure 25). The casts that are closest in distance to the affected tracklines were taken on several different days following data collection and were deemed as not suitable replacements for sound velocity on the affected tracklines. (Figure 26). The

offsets are seen in 35-45 meters of water and stand 1-2 meters off the bottom. The sound speed offsets were cleaned out by the hydrographer as effectively as possible (Figure 27).

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Launches took casts at least once every four hours (before MBES acquisition, middle of the day, and near the end of the day).

Additional casts were taken when significant changes to surface sound speed were observed or when operating in a new area. Sound speed profiles were acquired using Sea-Bird 19plus SEACAT Profilers. All casts were concatenated into a master file and applied to MBES data in Caris HIPS using the "Nearest in distance within time" (4 hours) profile selection method.

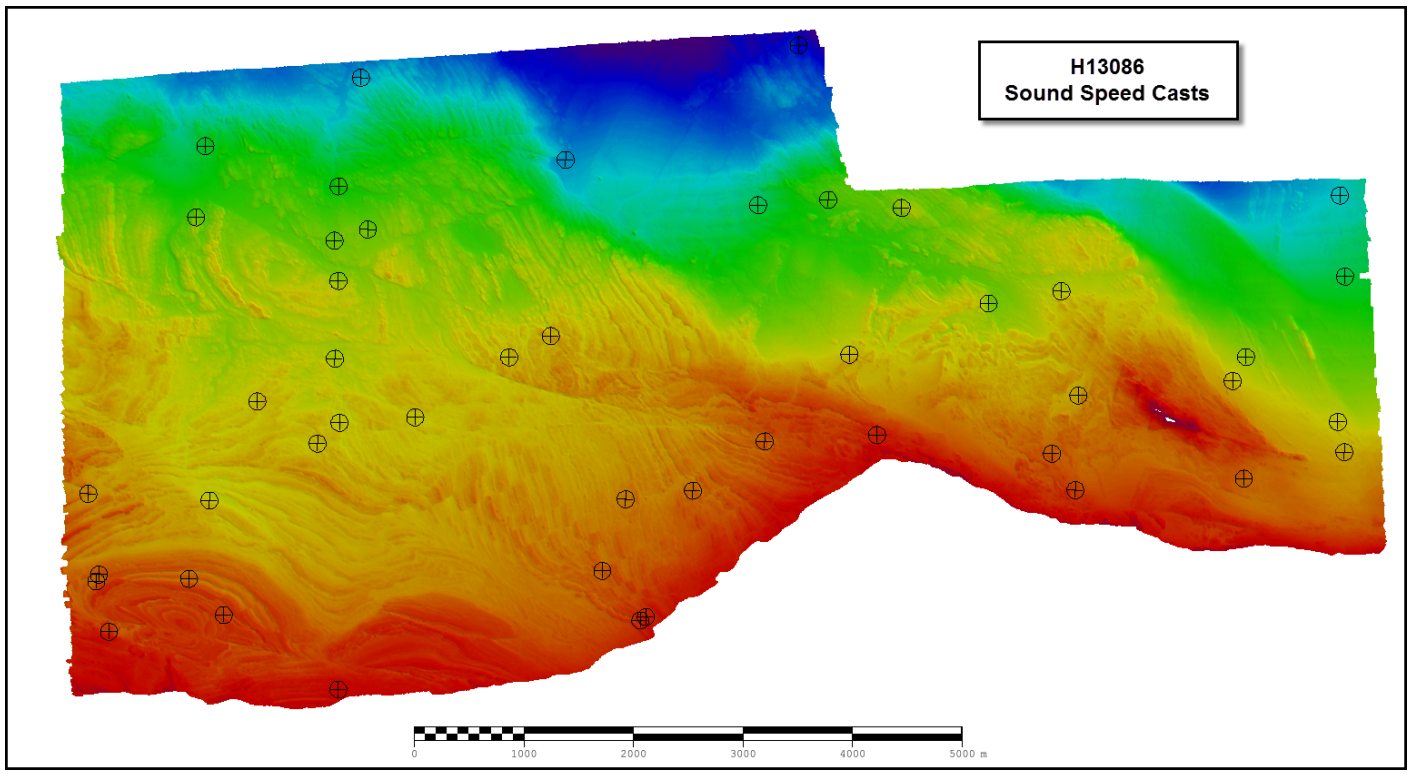


Figure 22: H13086 sound speed cast locations.

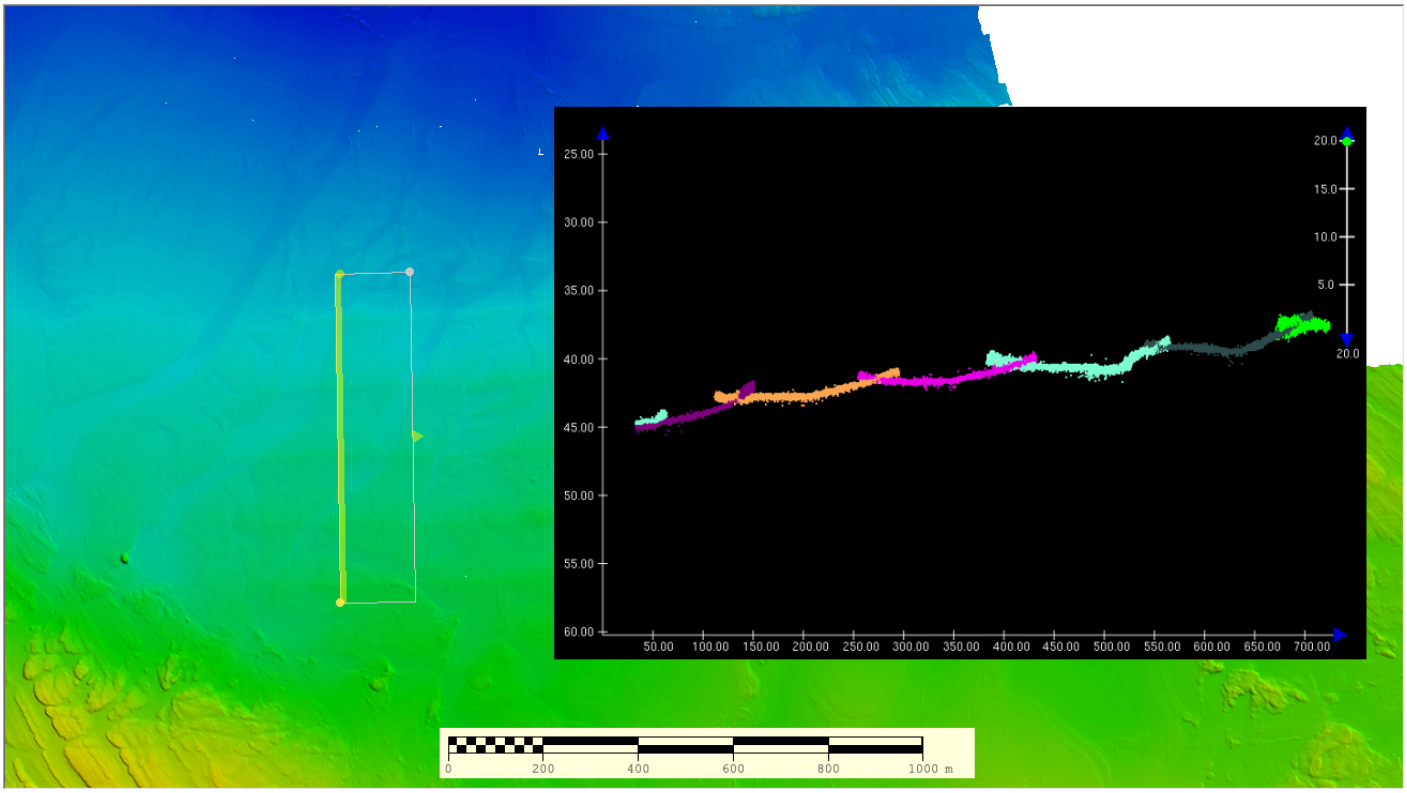


Figure 23: Example of sound speed offset in subset editor.

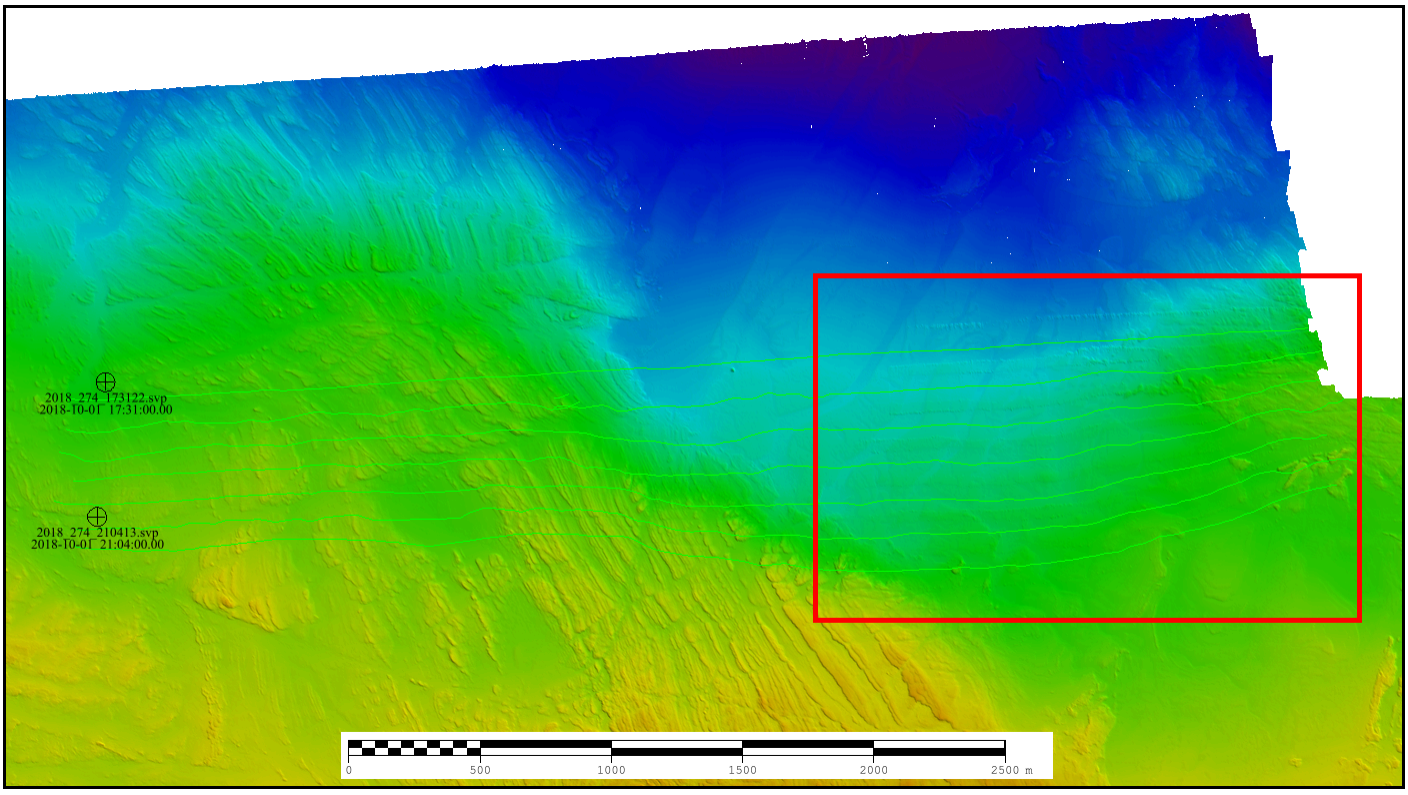


Figure 24: Area in H13086 affected by sound speed offsets.

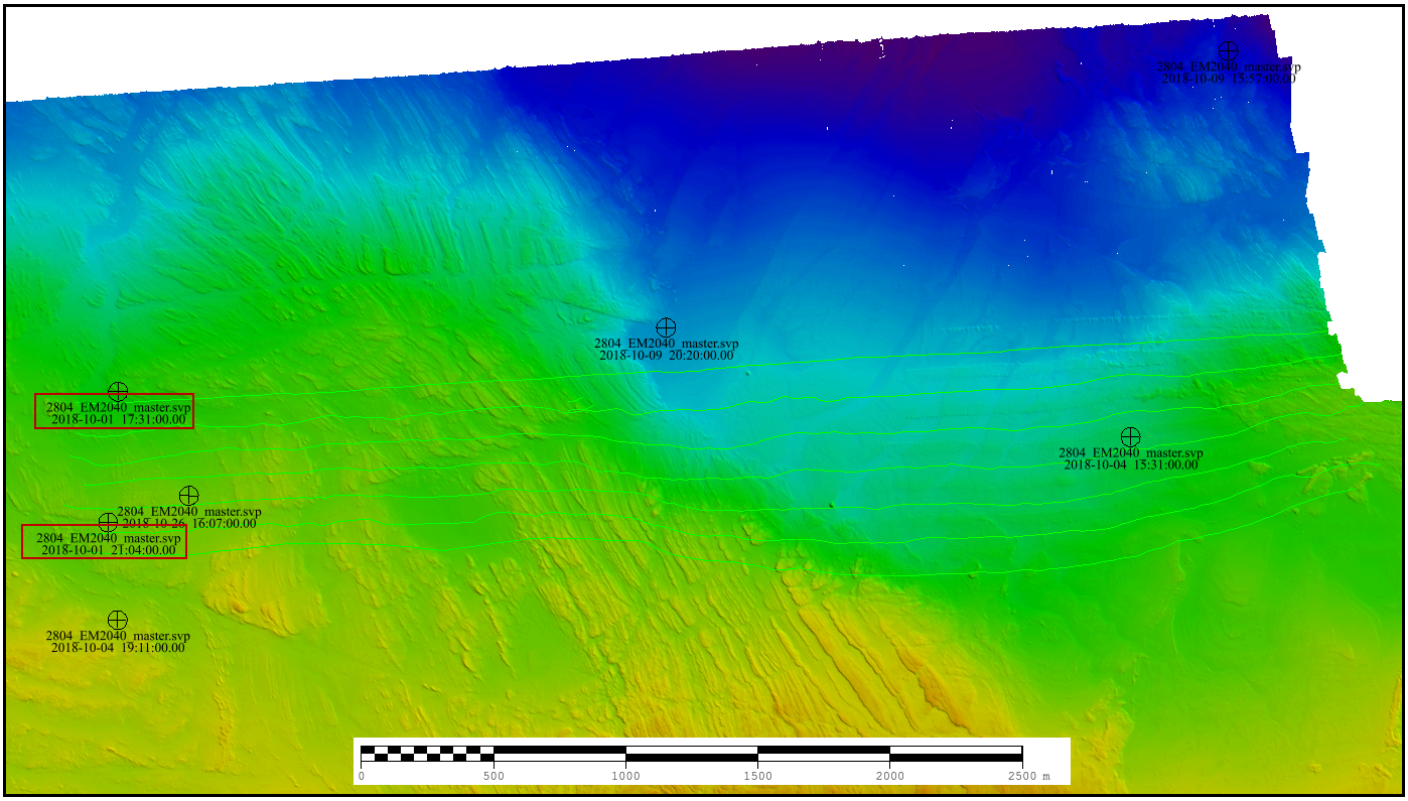


Figure 25: Locations of others casts taken in the vicinity of the affected multibeam data.

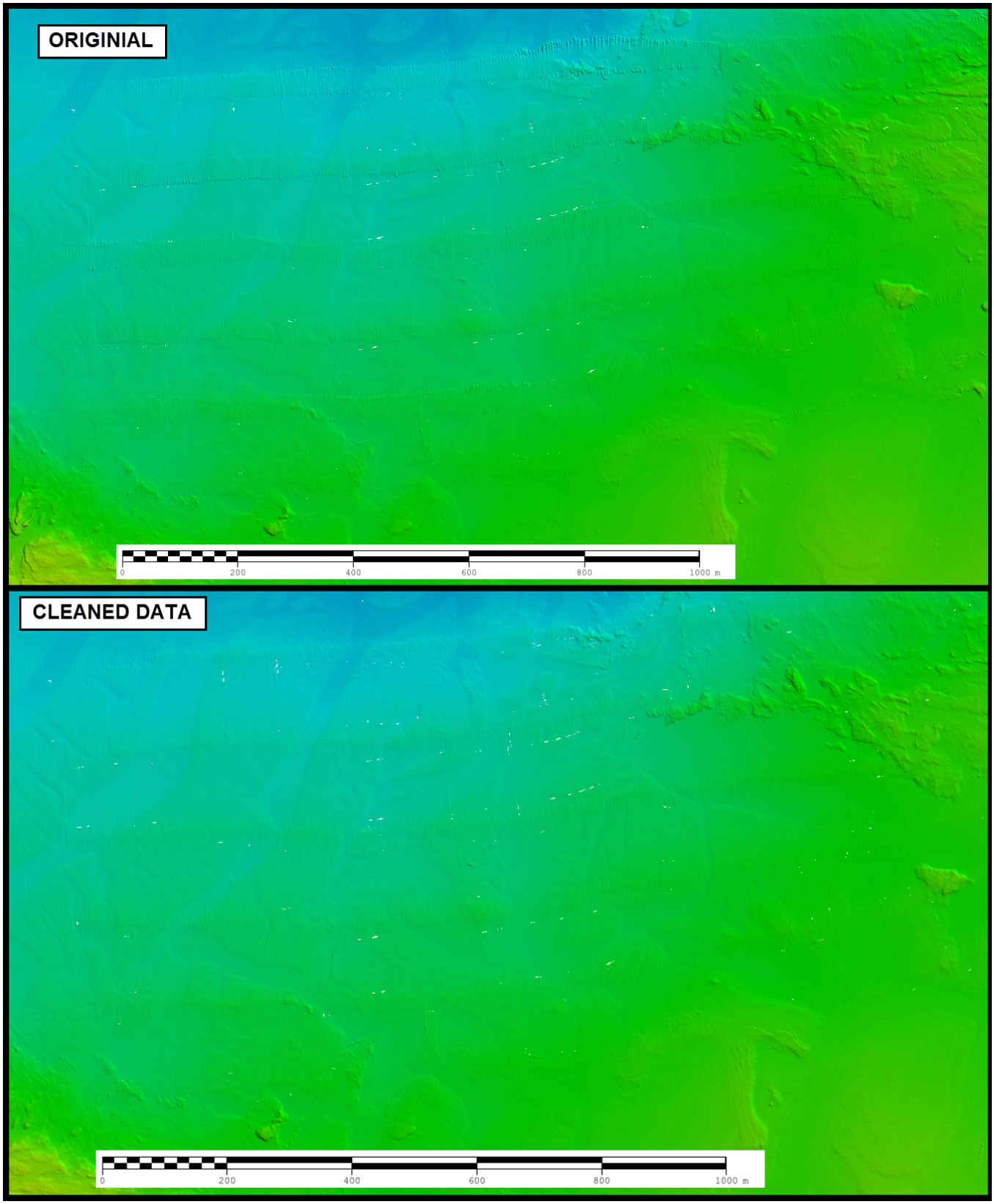


Figure 26: Results of cleaned out sound speed offsets in a 1-meter single resolution surface (no exaggeration).

B.2.8 Coverage Equipment and Methods

All equipment and survey methods were used as detailed in the DAPR.

B.2.9 Detect Fliers

Pydro QC Tools 2 v2.6.7 Detect Fliers v5 was used to find fliers in the finalized variable resolution surface. Detect Fliers settings: Checks included Gaussian Curvature, Adjacent Cells, Edge Slivers, and Isolated Nodes; Filters were defined as Distance <= 1.0 nodes and Delta Z <= 0.01 meters. "Features from S57 File" and "Designated (SR BAG only)" were not used. Flier height was not restricted. Obvious noise was rejected by the hydrographer in Caris subset editor. After data cleaning, Detect Fliers was run again and found 4 fliers in the surface. These were investigated and found to be false positives. The results of the Detect Fliers tool are included as a .000 file in the Separates section of this report.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the DAPR.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Raw backscatter data was acquired as .all files logged during MBES operations and processed by the field unit. The .GSF files created during processing and one backscatter mosaic per vessel per frequency has been delivered with this report. Backscatter processing procedures are described in the DAPR.

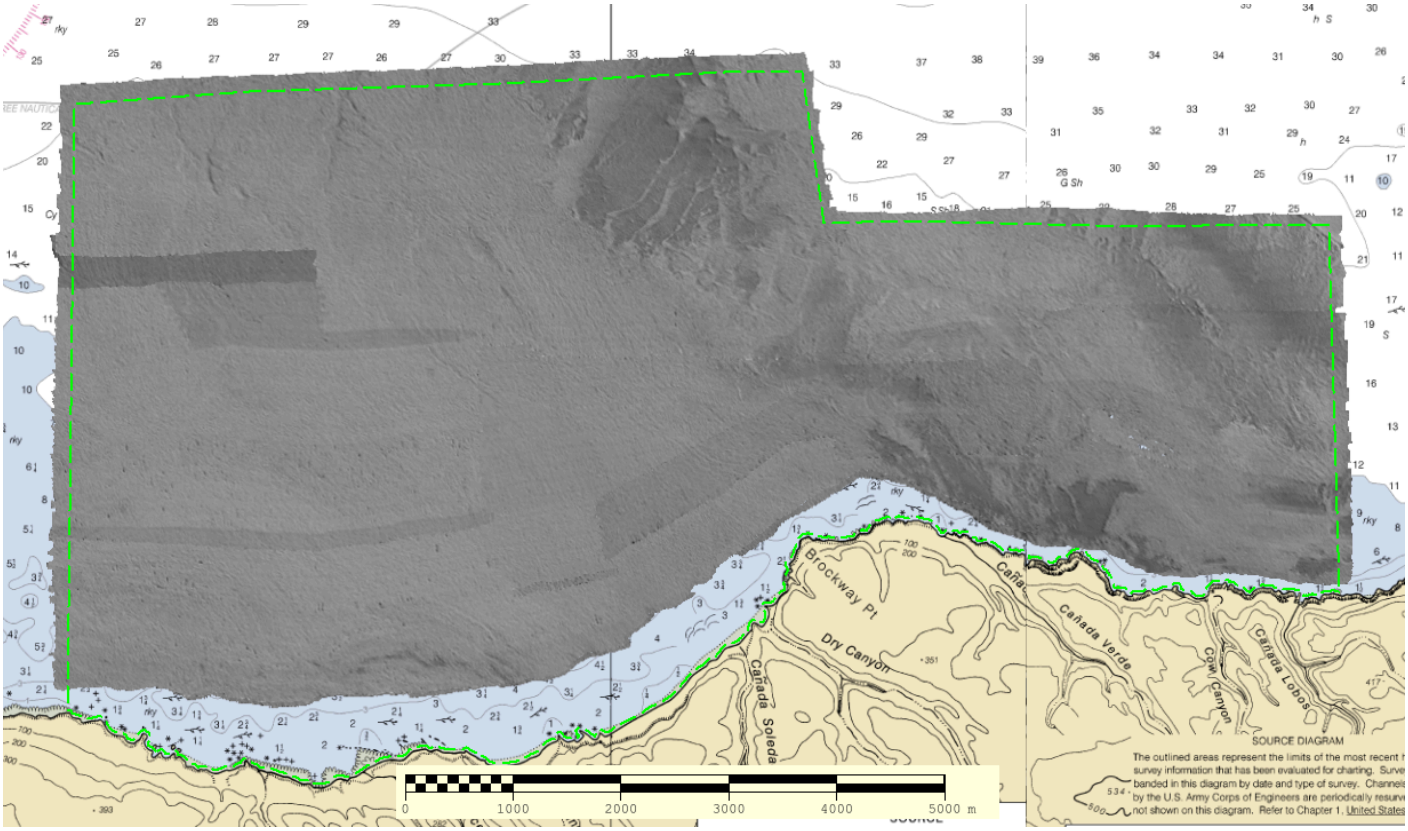


Figure 27: Overview of H13086 backscatter mosaics (Charts 18727 and 18728).

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following software program was the primary program used for bathymetric data processing:

Manufacturer	Name	Version
Caris	HIPS/SIPS	10.3

Table 10: Primary bathymetric data processing software

The following software program was the primary program used for imagery data processing:

Manufacturer	Name	Version
QPS	Fledermaus Geocoder Tool Box (FMGT)	7.8.1

Table 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Extended Attribute File V_5_7.

B.5.2 Surfaces

The following surfaces and/or BAGs were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H13086_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	2.2 meters - 62.8 meters	NOAA_VR	Complete MBES
H13086_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	2.2 meters - 62.8 meters	NOAA_VR	Complete MBES

Table 12: Submitted Surfaces

Submitted surfaces were generated using the NOAA recommended parameters for depth-based (Ranges) Caris variable-resolution bathymetric grids as specified in 2018 HSSD.

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying 2018 DAPR.

C.1 Vertical Control

The vertical datum for this project is Mean Lower Low Water.

ERS Methods Used:

ERS via VDATUM

Ellipsoid to Chart Datum Separation File:

OPR_L397_RA_18_lgECpoly_xyNAD83-MLLW_geoid12b.csar

C.2 Horizontal Control

The horizontal datum for this project is North American Datum 1983 (NAD83).

The projection used for this project is Universal Transverse Mercator (UTM) Zone 10N.

Post Processed-Real-Time Extended (PP-RTX) processing methods were used in Applanix POSPac MMS 8.2.1 software to produce SBETs for post-processing horizontal correction.

D. Results and Recommendations

D.1 Chart Comparison

H13086 survey data was compared to Electronic Navigation Charts (ENC) US5CA64M and US5CA66M using a variable resolution CUBE surface, selected soundings, and contours created in CARIS. Both charts were required to gain full coverage of the survey area for comparison.

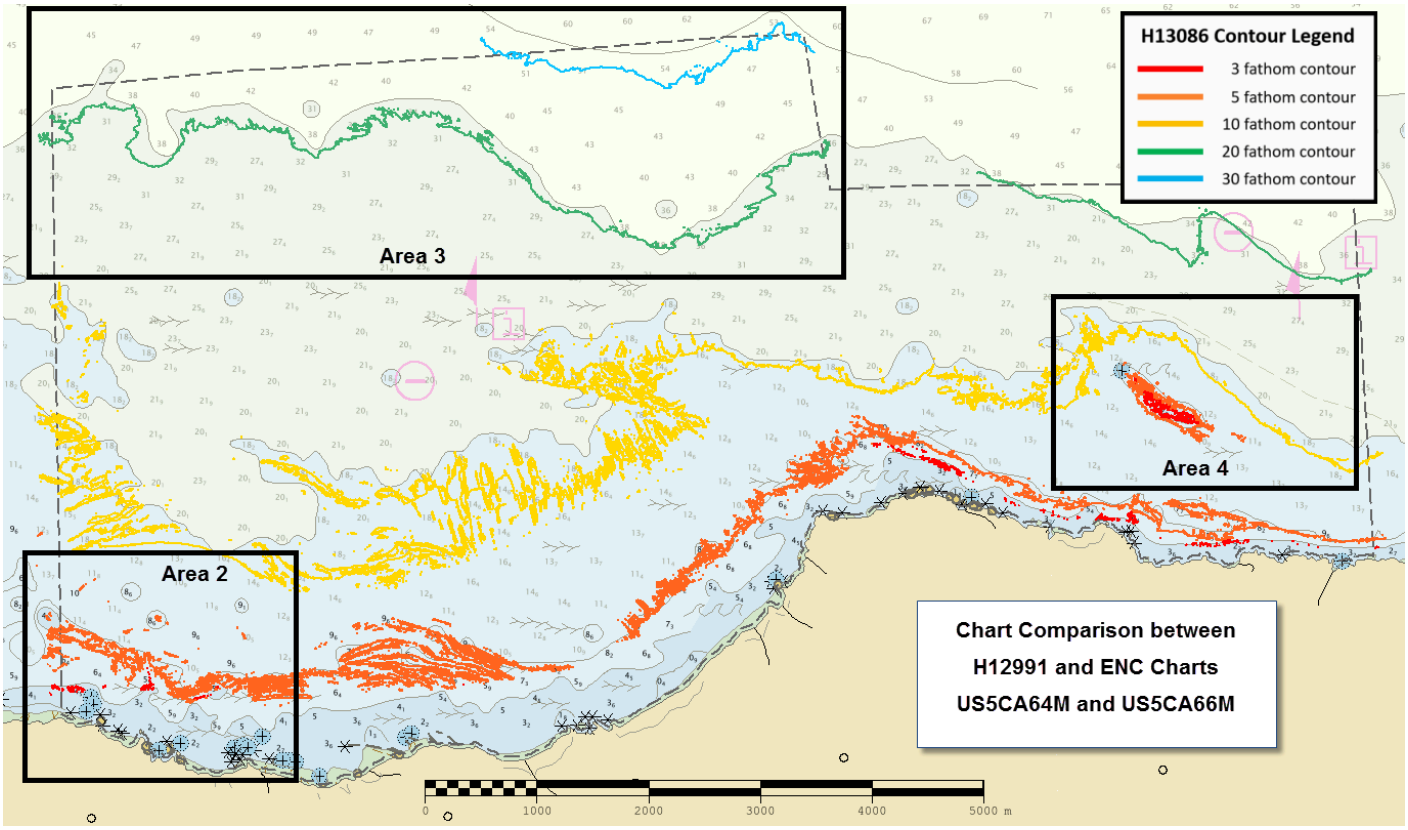


Figure 28: Survey H13086 contours overlaid on ENCs US5CA64M and US5CA66M.

D.1.1 Electronic Navigational Charts

The following are the largest scale ENCs, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US5CA64M	1:20000	10	08/24/2017	10/30/2018	NO
US5CA66M	1:20000	4	08/24/2017	08/24/2017	NO

Table 13: Largest Scale ENCs

US5CA64M

- Area 1: Survey H13086 disproved the majority of the isolated charted shoals seaward of the 10 fathom curve (Figure 30).

- Area 2: Survey data located 5 fathom shoal areas within the 10 fathom survey contour (Figure 31).

- Area 3: Survey data determined that the 20 and 30 fathom survey contours are ~200-300 meters inshore of their charted depth curves in some areas (Figure 32).

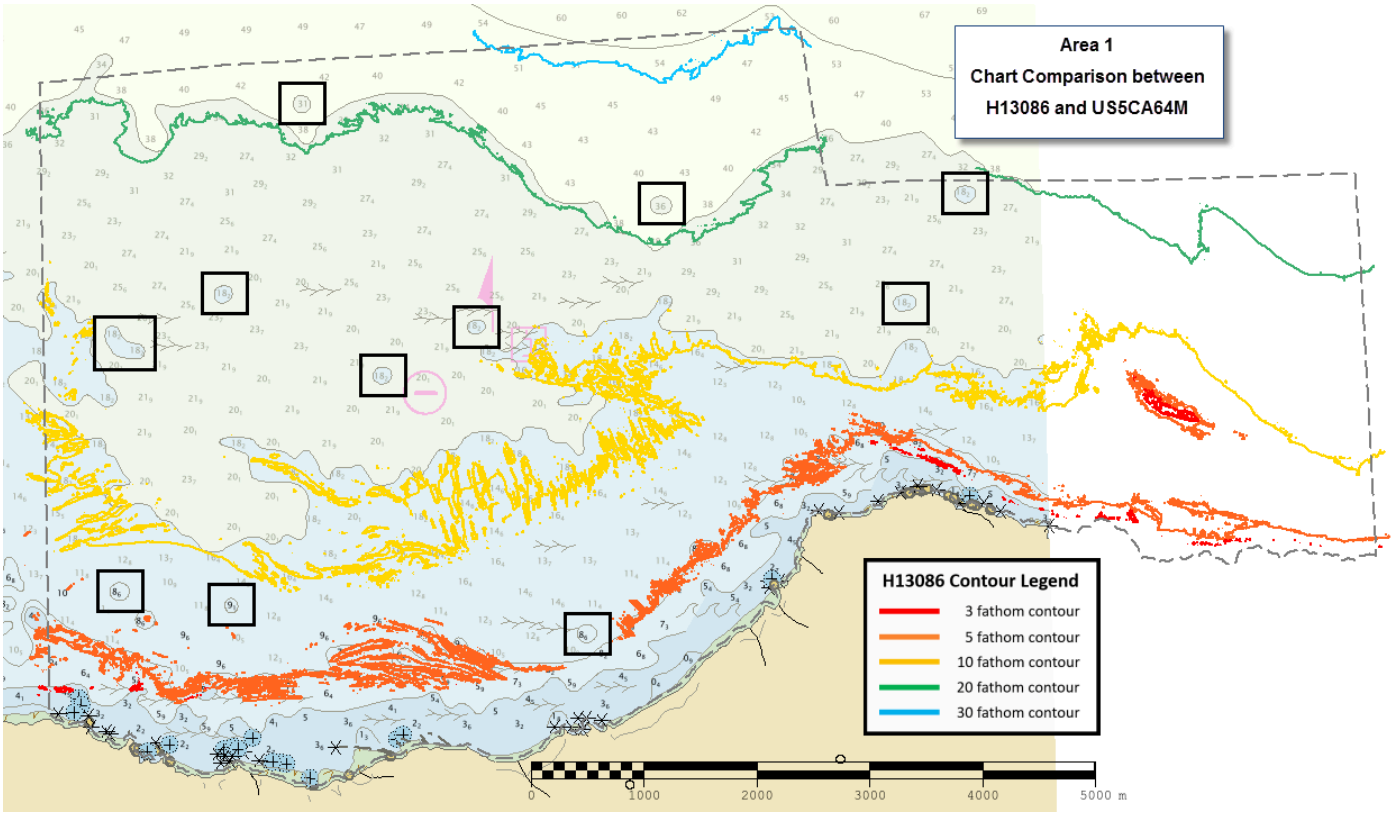


Figure 29: Example 1 of contour offsets between H13086 and US5CA64M.

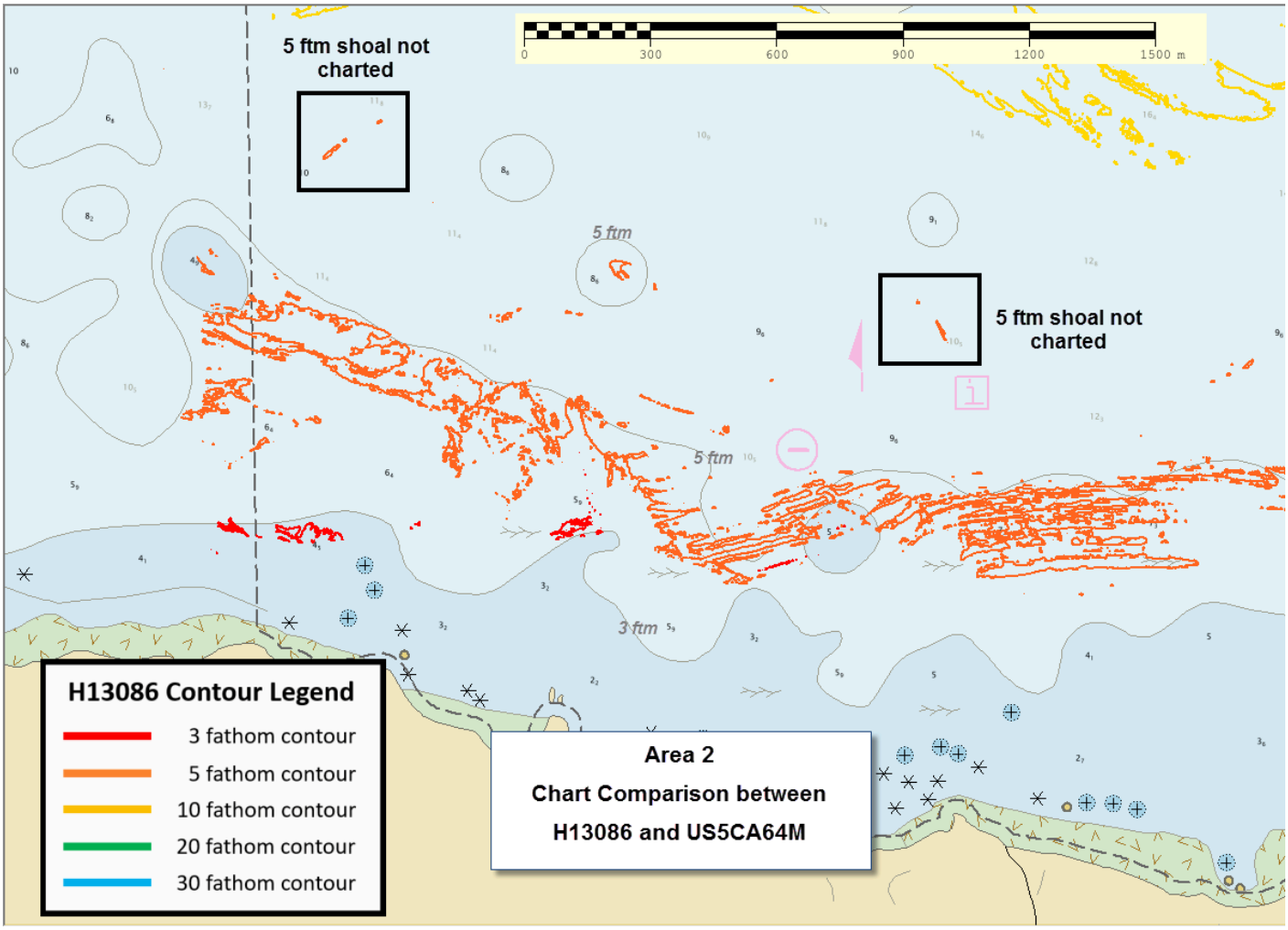


Figure 30: Example 2 of contour offsets between H13086 and US5CA64M.

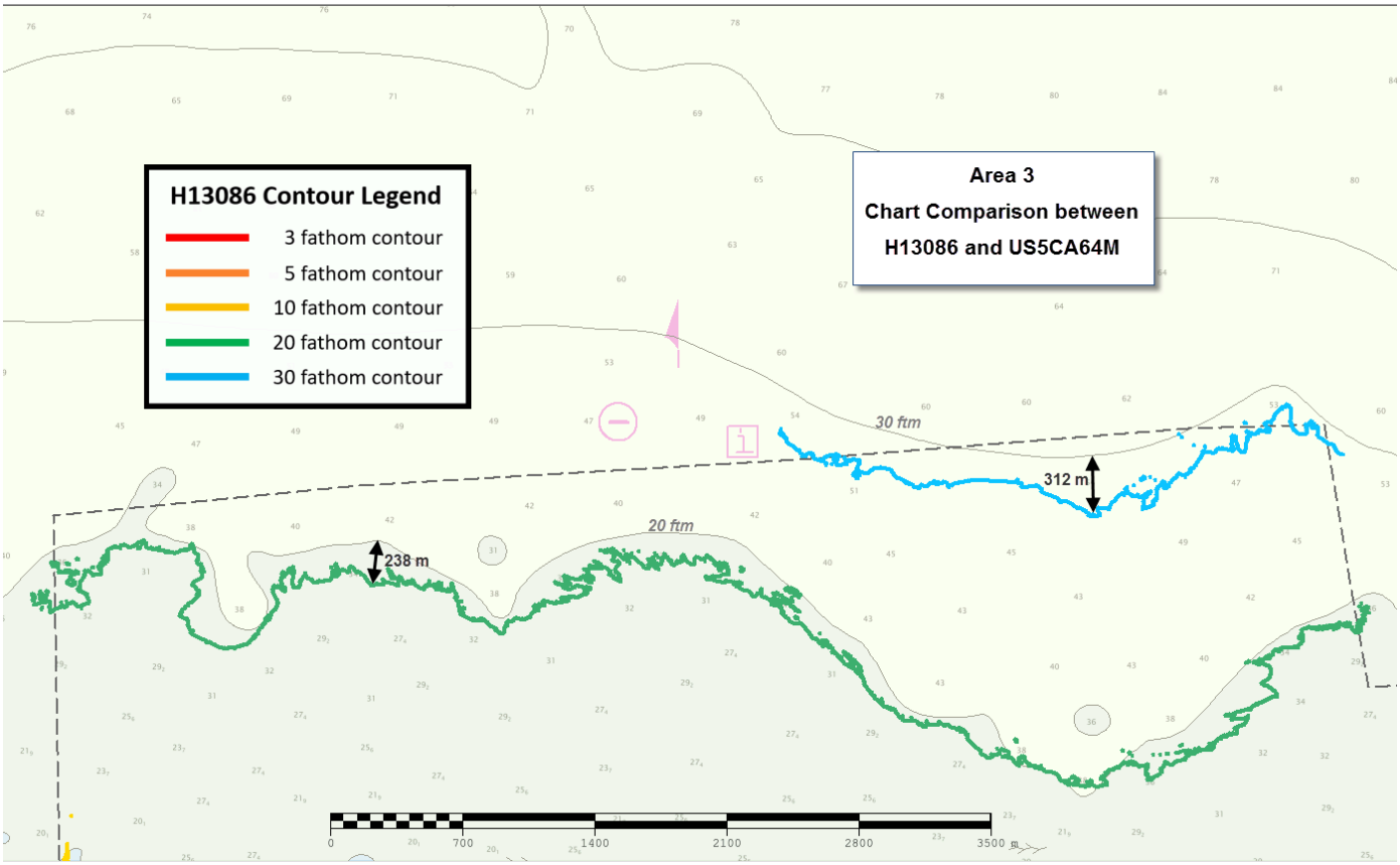


Figure 31: Example 3 of contour offsets between H13086 and US5CA64M.

US5CA66M

- Area 4: Survey data determined that the 10 fathom survey contour is consistently 150-200 meters inshore of its charted depth curve; survey data also discovered an uncharted 5 fathom shoal southeast of Rodes Reef and an uncharted 3 fathom shoal in the northwest of Rodes Reef (Figure 33).

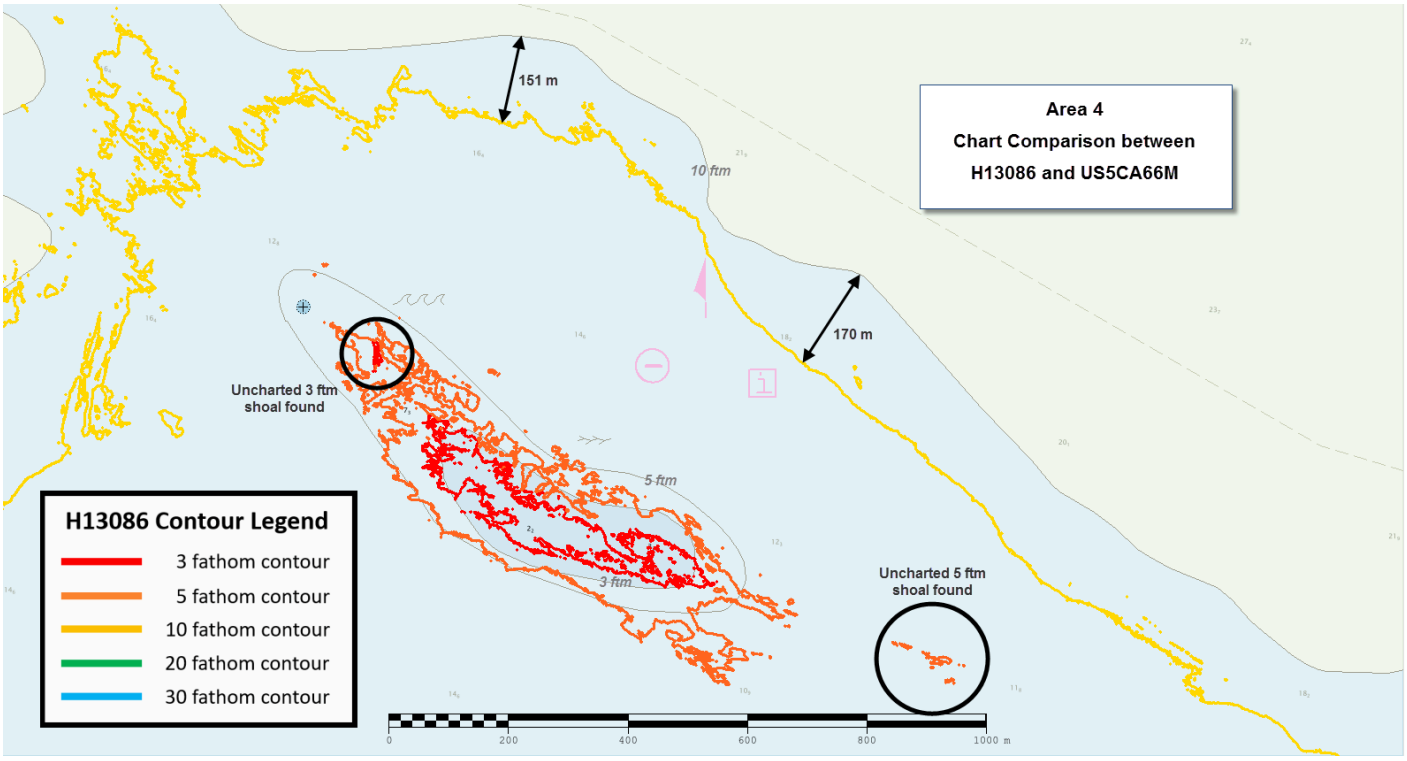


Figure 32: Example 1 of contour offsets between H13086 and US5CA66M.

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

See Final Feature File for more information.

D.1.4 Uncharted Features

No uncharted features exist for this survey.

D.1.5 Shoal and Hazardous Features

Field unit collected multibeam data over Rodes Reef. See Figure 5 and chart comparison for more information.

D.1.6 Channels

No channels exist for this survey. There are no designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines within the survey limits.

D.1.7 Bottom Samples

No bottom samples were required for this survey.

D.2 Additional Results

D.2.1 Shoreline

Shoreline was assigned in the Hydrographic Survey Project Instructions but could not be investigated. The field party made repeated attempts to investigate the assigned shoreline features. In each case, high sea state and/or low visibility during the available periods of low water made near-shore operations unsafe.

D.2.2 Prior Surveys

No prior survey comparisons exist for this survey.

D.2.3 Aids to Navigation

No Aids to Navigation (ATONs) exist for this survey.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

No submarine features exist for this survey.

D.2.6 Platforms

No platforms exist for this survey.

D.2.7 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.8 Abnormal Seafloor and/or Environmental Conditions

Survey H13086 contains a significant number of geologic features including ancient shorelines, transform faults, and shifted seafloor that may take on the appearance of erroneous vertical and horizontal offsets in the depth data. They occur throughout the survey area but are most noticeable in the southwestern section of the survey.

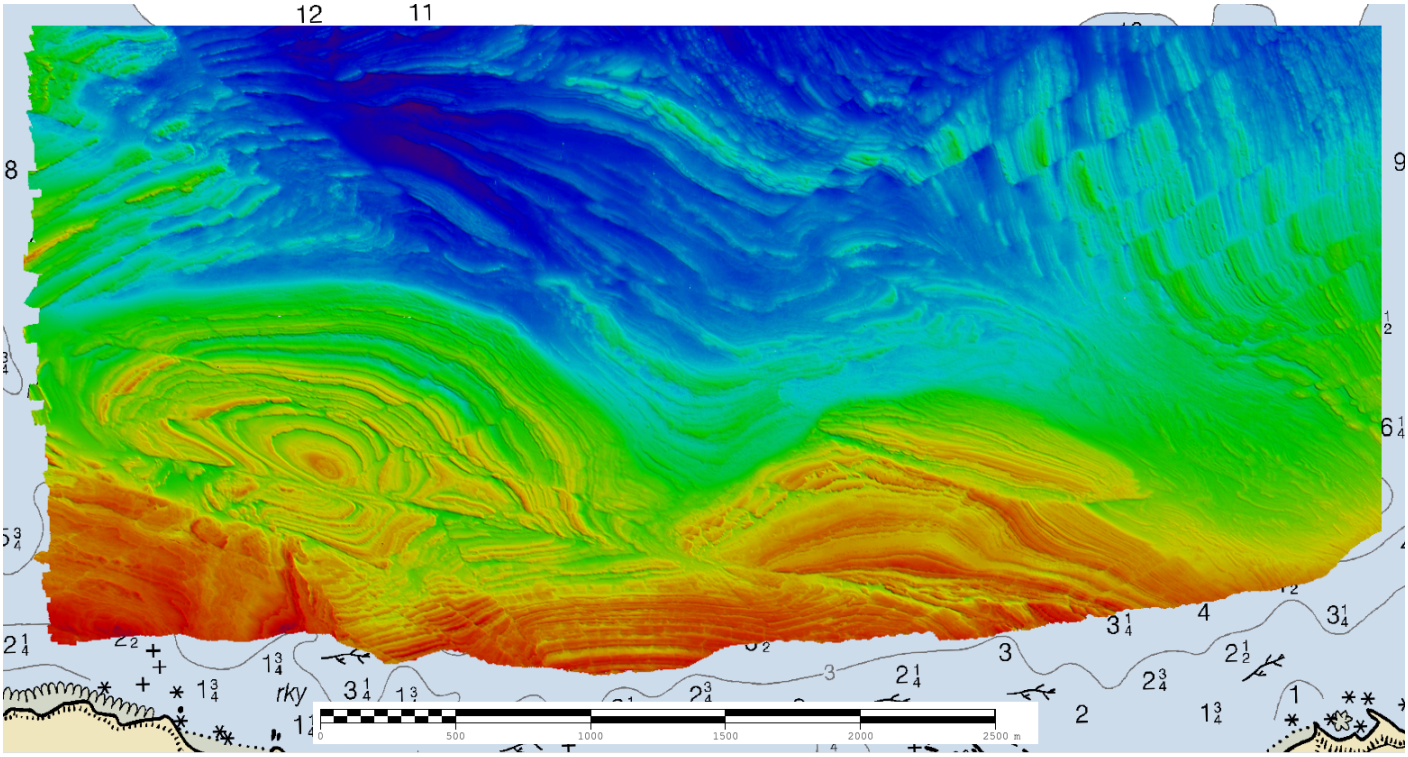


Figure 33: Depth image of multibeam data from the southwestern portion of H13086 featuring multiple significant seafloor features (no exaggeration).

D.2.9 Construction and Dredging

No present or planned construction or dredging exist within the survey limits.

D.2.10 New Survey Recommendation

No new surveys or further investigations are recommended for this area.

D.2.11 Inset Recommendation

No new insets are recommended for this area.

E. Approval Sheet

As Chief of Party, field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys Specifications and Deliverables, Field Procedures Manual, Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

Approver Name	Approver Title	Approval Date	Signature
Benjamin K. Evans, CDR/NOAA	Commanding Officer	04/19/2019	Digitally signed by EVANS.BENJAMIN.K.1237217094 Date: 2019.04.20 15:14:22 -07'00'
Hadley A. Owen, LT/NOAA	Field Operations Officer	04/19/2019	Digitally signed by OWEN.HADLEY.ANNE.1410967070 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=NOAA, cn=OWEN.HADLEY.ANNE.1410967070 Date: 2019.04.19 16:18:59 -07'00'
James B. Jacobson	Chief Survey Technician	04/19/2019	JACOBSON.JAMES.BRYAN.1269664017 I have reviewed this document 2019.04.24 06:13:27 -07'00'
Amanda M. Finn	Survey Technician	04/19/2019	FINN.AMANDA.MARIA.1540474253 Digitally signed by FINN.AMANDA.MARIA.1540474253 Date: 2019.04.19 08:22:16 -07'00'

F. Table of Acronyms

Acronym	Definition
AHB	Atlantic Hydrographic Branch
AST	Assistant Survey Technician
ATON	Aid to Navigation
AWOIS	Automated Wreck and Obstruction Information System
BAG	Bathymetric Attributed Grid
BASE	Bathymetry Associated with Statistical Error
CO	Commanding Officer
CO-OPS	Center for Operational Products and Services
CORS	Continually Operating Reference Staiton
CTD	Conductivity Temperature Depth
CEF	Chart Evaluation File
CSF	Composite Source File
CST	Chief Survey Technician
CUBE	Combined Uncertainty and Bathymetry Estimator
DAPR	Data Acquisition and Processing Report
DGPS	Differential Global Positioning System
DP	Detached Position
DR	Descriptive Report
DTON	Danger to Navigation
ENC	Electronic Navigational Chart
ERS	Ellipsoidal Referenced Survey
ERZT	Ellipsoidally Referenced Zoned Tides
FFF	Final Feature File
FOO	Field Operations Officer
FPM	Field Procedures Manual
GAMS	GPS Azimuth Measurement Subsystem
GC	Geographic Cell
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
HSD	Hydrographic Surveys Division
HSSD	Hydrographic Survey Specifications and Deliverables

Acronym	Definition
HSTP	Hydrographic Systems Technology Programs
HSX	Hypack Hysweep File Format
HTD	Hydrographic Surveys Technical Directive
HVCR	Horizontal and Vertical Control Report
HVF	HIPS Vessel File
IHO	International Hydrographic Organization
IMU	Inertial Motion Unit
ITRF	International Terrestrial Reference Frame
LNM	Linear Nautical Miles
MBAB	Multibeam Echosounder Acoustic Backscatter
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NAIP	National Agriculture and Imagery Program
NALL	Navigable Area Limit Line
NM	Notice to Mariners
NMEA	National Marine Electronics Association
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRT	Navigation Response Team
NSD	Navigation Services Division
OCS	Office of Coast Survey
OMAO	Office of Marine and Aviation Operations (NOAA)
OPS	Operations Branch
MBES	Multibeam Echosounder
NWLON	National Water Level Observation Network
PDBS	Phase Differencing Bathymetric Sonar
PHB	Pacific Hydrographic Branch
POS/MV	Position and Orientation System for Marine Vessels
PPK	Post Processed Kinematic
PPP	Precise Point Positioning
PPS	Pulse per second

Acronym	Definition
PRF	Project Reference File
PS	Physical Scientist
PST	Physical Science Technician
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
SSSAB	Side Scan Sonar Acoustic Backscatter
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPE	Total Propagated Error
TPU	Topside Processing Unit
USACE	United States Army Corps of Engineers
USCG	United Stated Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDA	Global Positiong System timing message
ZDF	Zone Definition File

APPROVAL PAGE

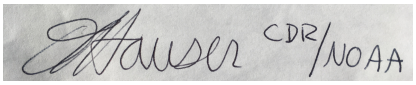
H13086

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NCEI for archive

- Descriptive Report
- Collection of Bathymetric Attributed Grids (BAGs)
- Collection of backscatter mosaics
- Processed survey data and records
- GeoPDF of survey products

The survey evaluation and verification has been conducted according current OCS Specifications, and the survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.



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Approved:_____

Commander Olivia Hauser, NOAA
Chief, Pacific Hydrographic Branch