H13617

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13617

LOCALITY

State(s):	Ohio
General Locality:	Lake Erie
Sub-locality:	4 NM North of Lorain Harbor

2022

CHIEF OF PARTY
Matthew J. Jaskoski, CDR/NOAA

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13617**

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):	**Ohio**
General Locality:	**Lake Erie**
Sub-Locality:	**4 NM North of Lorain Harbor**
Scale:	**10000**
Dates of Survey:	**05/17/2022 to 06/26/2022**
Instructions Dated:	**04/19/2022**
Project Number:	**OPR-W386-TJ-22**
Field Unit:	**NOAA Ship *Thomas Jefferson***
Chief of Party:	**Matthew J. Jaskoski, CDR/NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Atlantic Hydrographic Branch**
Soundings Acquired in:	**meters at Low Water Datum IGLD-1985**

Remarks:

Any revisions to the Descriptive Report (DR) applied during office processing are shown in red italic text. The DR is maintained as a field unit product, therefore all information and recommendations within this report are considered preliminary unless otherwise noted. The final disposition of survey data is represented in the NOAA nautical chart products. All pertinent records for this survey are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via https://www.ncei.noaa.gov/. Products created during office processing were generated in NAD83 UTM 17N, LWD - IGLD 1985. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

Table of Contents

List of Tables

List of Figures

Descriptive Report to Accompany Survey H13617

Project: OPR-W386-TJ-22

Locality: Lake Erie

Sublocality: 4 NM North of Lorain Harbor

Scale: 1:10000

May 2022 - June 2022

NOAA Ship *Thomas Jefferson*

Chief of Party: Matthew J. Jaskoski, CDR/NOAA

A. Area Surveyed

Survey H13617, located 4NM North of Lorain Harbor in Lake Erie, OH, was conducted in accordance with coverage requirements set forth in the Project Instructions (PI) OPR-W386-TJ-22. The survey area is approximately 40 square nautical miles.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
41° 34' 38.38" N 82° 16' 40.06" W	41° 32' 10.31" N 81° 59' 26.86" W

Table 1: Survey Limits

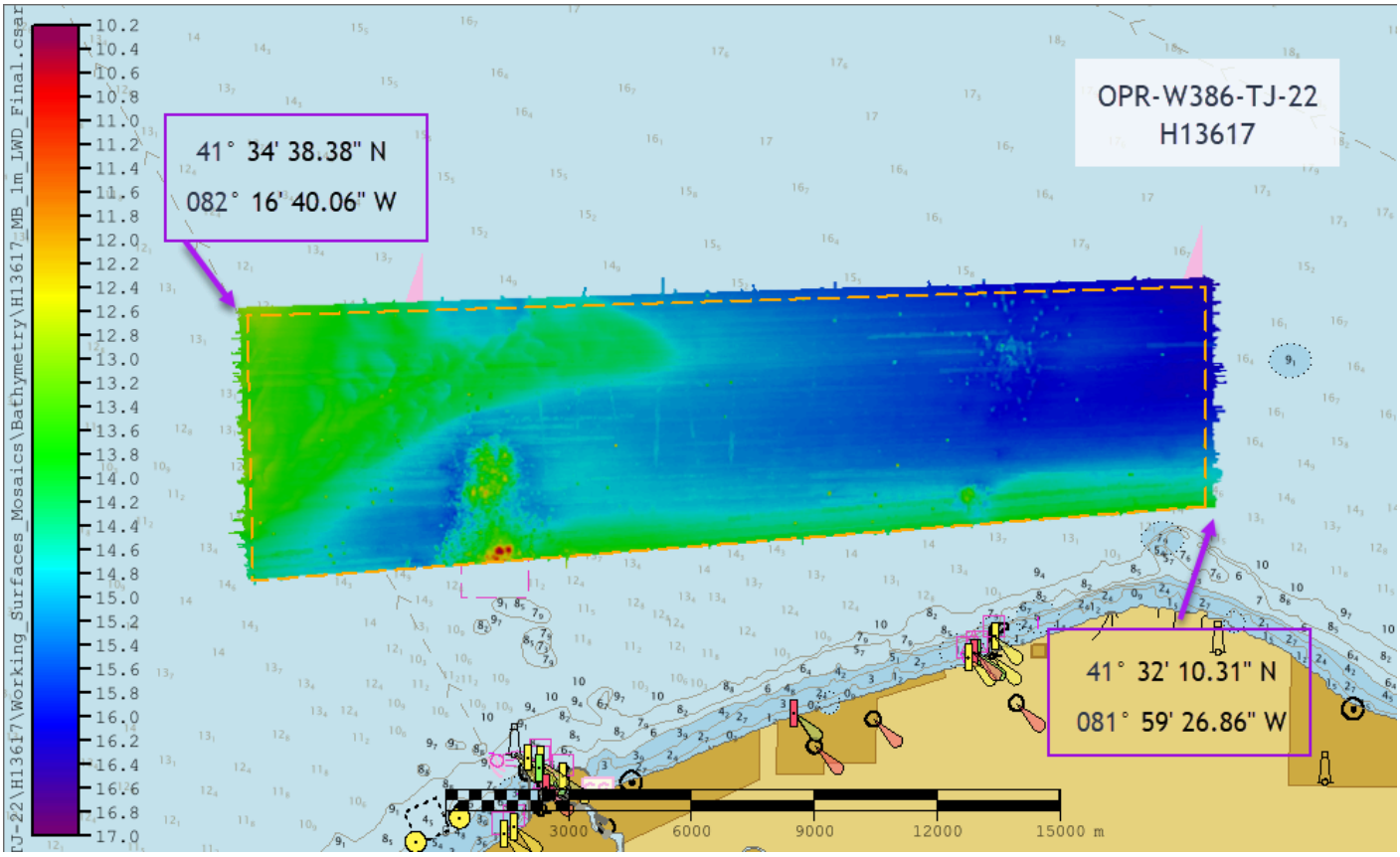


Figure 1: Survey layout for H13617, plotted over ENC US4OH01M. Orange outline represents the survey limits set forth in the Project Instructions.

42.55 square nautical miles of survey data were acquired in accordance with the requirements set forth by the PI and the 2022 Hydrographic Survey Specifications and Deliverables (HSSD) (Figure 1).

A.2 Survey Purpose

The Port of Cleveland is one of the largest ports on the Great Lakes and ranks within the top 50 ports in the United States. Roughly 13 million tons of cargo are transported through Cleveland Harbor each year supporting over 20,000 jobs and $3.5 billion in annual economic activity.(1) This project will provide modern bathymetric data for the Cleveland area as well as the vicinity of South Bass Island and Presque Isle. The project area was identified as a statistically significant hot spot within the 2018 hydrographic health model, a risk model that Coast Survey uses for evaluating priorities based upon navigational risks and the necessary quality of data to support modern traffic. Most of this area has not been surveyed since the 1940s, and experiences significant vessel traffic.

Conducting a modern bathymetric survey in this area will identify hazards and changes to the seafloor, provide critical data for updating National Ocean Service (NOS) nautical charting products and improve

maritime safety. Survey data from this project is intended to supersede all prior survey data in the common area.

1 https://www.portofcleveland.com/

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13617 meet complete coverage requirements as specified by the 2022 HSSD with complete multibeam echo sounder (MBES) coverage (see Section 5.2.2.3, Option A). This includes crosslines (see Section 5.2.4.2), NOAA allowable uncertainty (see Section 5.1.3), and density requirements (see Section 5.2.2.3, Option A).

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 area	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 2022 HSSD Section 6.2)

Table 2: Survey Coverage

Survey coverage is in accordance with requirements listed in the 2022 HSSD. Coverage requirements were met with 100% multibeam echosounder (MBES) coverage with contacts and features developed to complete coverage specifications.

One small holiday exists in the coverage achieved for H13617, outside of the assigned sheet limits (Figure 2). Due to the location of the holiday outside of the sheet limits, and since the hydrographer deemed it not navigationally significant, the holiday was not collected.

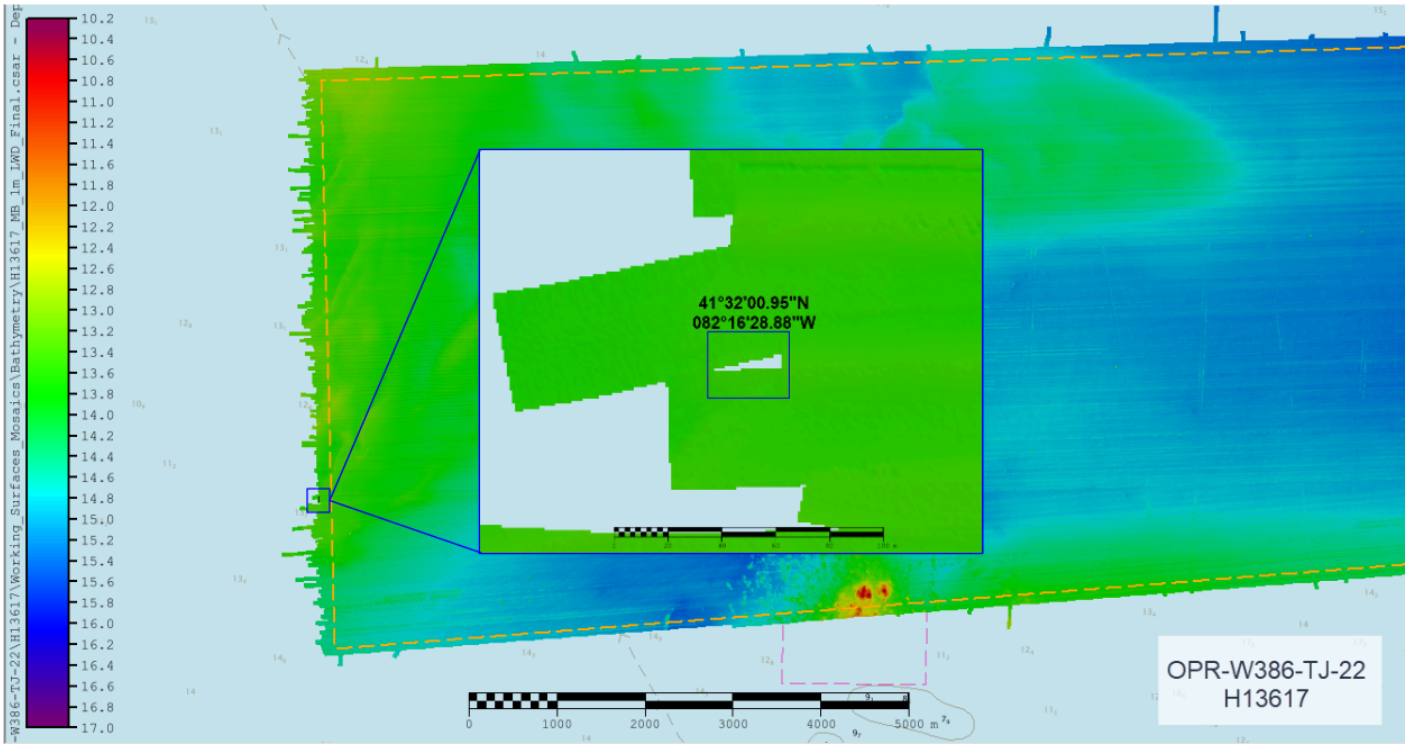


Figure 2: Holiday in coverage acquired by H13617. Orange line represents assigned sheet limits.

A.6 Survey Statistics

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

	HULL ID	*S222*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0
	MBES Mainscheme	2209.18	2209.18
	Lidar Mainscheme	0.0	0.0
	SSS Mainscheme	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0
	MBES/SSS Mainscheme	0.0	0.0
	SBES/MBES Crosslines	86.45	86.45
	Lidar Crosslines	0.0	0.0
Number of Bottom Samples			9
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			42.55

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
05/17/2022	137
05/18/2022	138

Survey Dates	Day of the Year
05/19/2022	139
05/20/2022	140
05/21/2022	141
05/22/2022	142
05/23/2022	143
05/24/2022	144
05/25/2022	145
05/26/2022	146
05/27/2022	147
06/15/2022	166
06/16/2022	167
06/17/2022	168
06/20/2022	171
06/21/2022	172
06/22/2022	173
06/26/2022	177

Table 4: Dates of Hydrography

MBES data acquisition started on 05/17/2022 and ended on 06/26/2022.

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	***S222***
LOA	63.4 meters
Draft	4.6 meters

Table 5: Vessels Used

Figure 3: NOAA Ship Thomas Jefferson (S222)

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg Maritime	EM 2040	MBES
Kongsberg Maritime	EM 2040	MBES Backscatter
AML Oceanographic	MVP200	Conductivity, Temperature, and Depth Sensor
AML Oceanographic	MVP-X	Conductivity, Temperature, and Depth Sensor
Valeport	Thru-Hull SVS	Sound Speed System
Applanix	POS MV 320 v5	Positioning and Attitude System
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor

Table 6: Major Systems Used

Vessel configurations, equipment operations, data acquisition, and processing were consistent with specifications described in the DAPR.

B.2 Quality Control

B.2.1 Crosslines

Hydrographic survey vessel S222 collected 86.45 linear nautical miles of MBES crosslines, or 3.91% of mainscheme MBES data. The crosslines acquired represent good spatial diversity for this survey area (Figure 4). A 1m gridded Combined Uncertainty and Bathymetry Estimator (CUBE) surface of mainscheme data and a 1m gridded CUBE surface of crossline data were differenced; the resulting mean was 0.02m with a standard deviation of 0.07m (Figure 5). 100% of nodes are compliant with fraction of allowable error standards (Figure 6). Visual inspection of the differenced surfaces indicated no systematic issues.

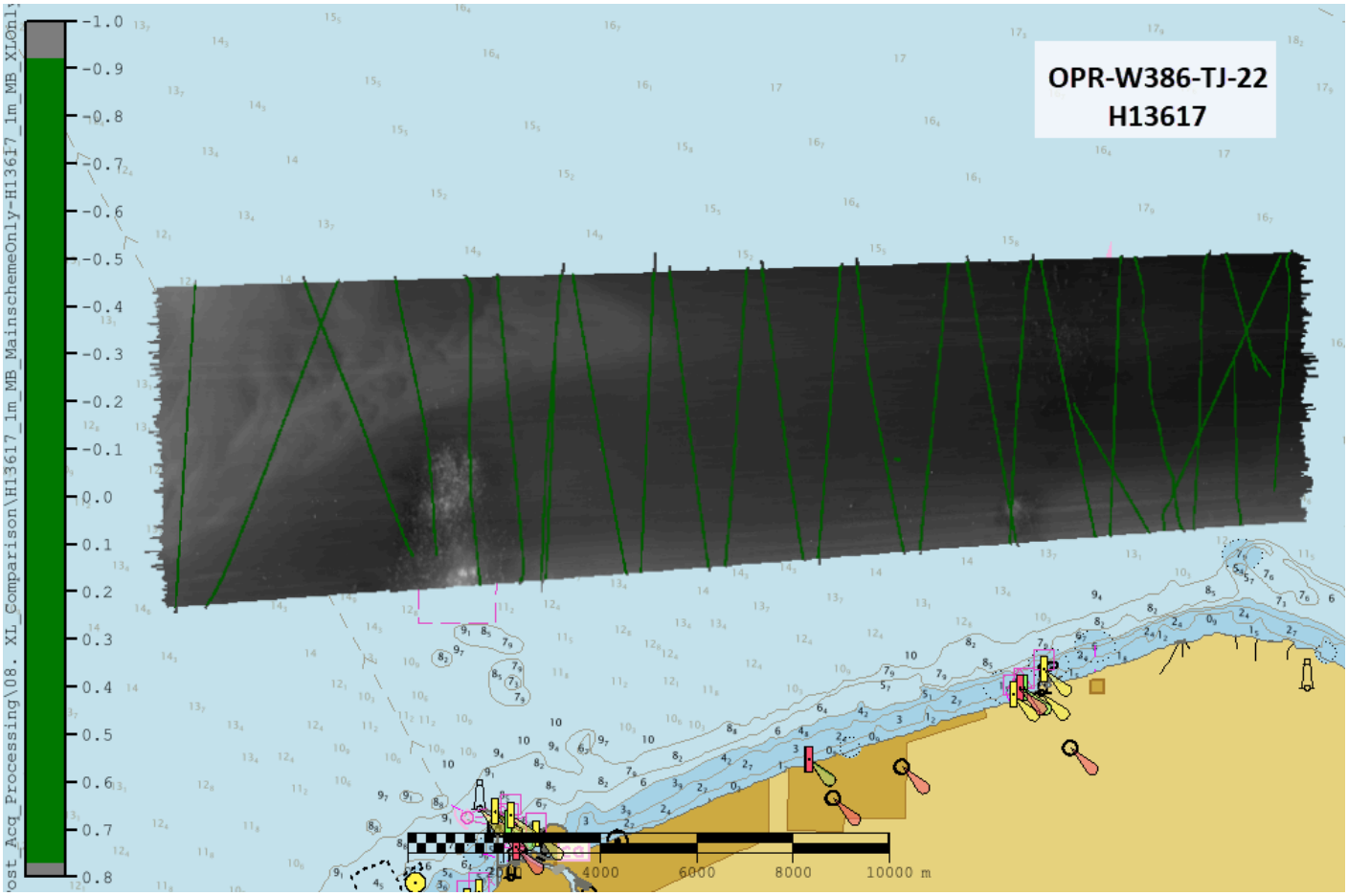
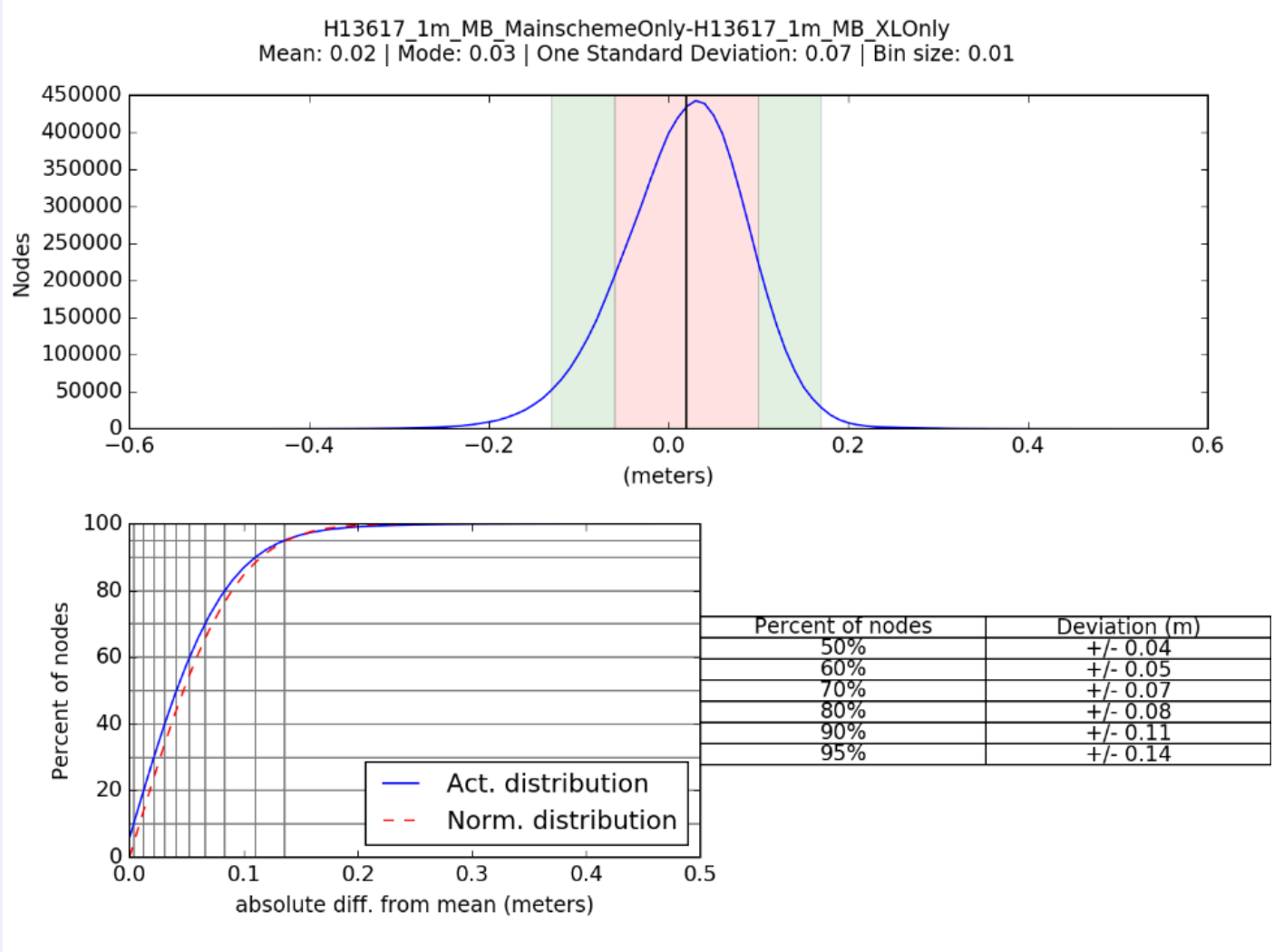


Figure 4: H13617 MBES crossline data, shown in fraction of allowable error difference statistics, overlaid on mainscheme data, shown in greyscale, plotted on ENC US4OH01M.



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.05
70%	+/- 0.07
80%	+/- 0.08
90%	+/- 0.11
95%	+/- 0.14

Figure 5: H13617 crossline/mainscheme comparison statistics.

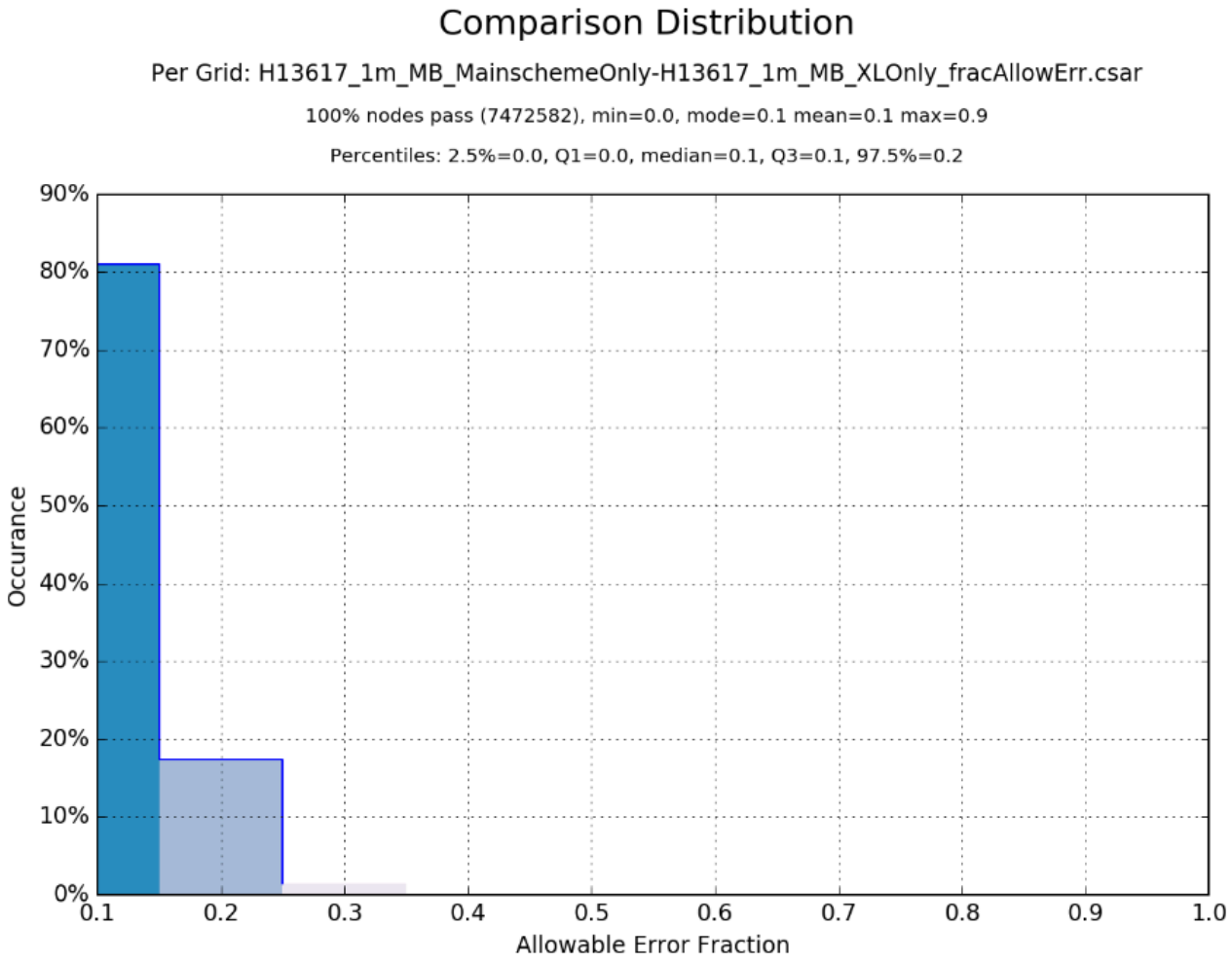


Figure 6: H13617 crossline fraction of allowable error statistics.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.0 meters	0.045 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
S222	4 meters/second	4 meters/second	N/A meters/second	0.2 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

The bathymetric surface's uncertainty layer is compliant with 2022 HSSD uncertainty standards. 100% of all nodes pass uncertainty standards (Figure 7).

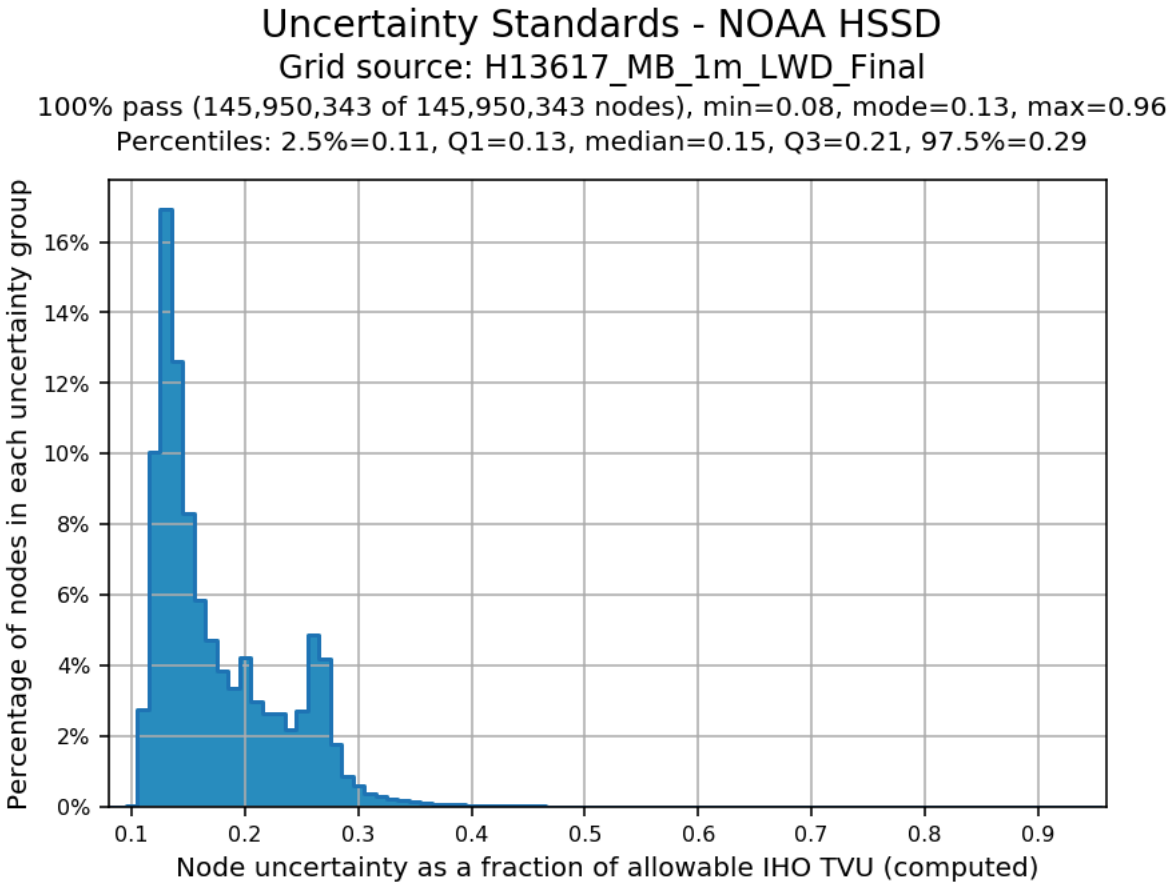


Figure 7: H13617 uncertainty standards.

B.2.3 Junctions

Survey H13617 junctions with three contemporary sheets within the OPR-W386-TJ-22 project: H13614, H13616, and H13687.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13616	1:5000	2022	NOAA Ship Thomas Jefferson	E
H13614	1:5000	2022	NOAA Ship Thomas Jefferson	S
H13687	1:10000	2022	NOAA Ship Thomas Jefferson	N

Table 9: Junctioning Surveys

H13616

The eastern edge of sheet H13617 junctions with sheet H13616. A 1m Single Resolution (SR) CUBE surface of H13617 data and a 1m SR CUBE surface of H13616 data were differenced (Figure 8). The mean difference between bathymetric surface nodes was 0.01m with a standard deviation of 0.06m (Figure 9). 99.5+% of nodes are compliant with fraction of allowable error standards (Figure 10). Statistics and visual inspection indicate that surveys H13617 and H13616 are in general agreement.

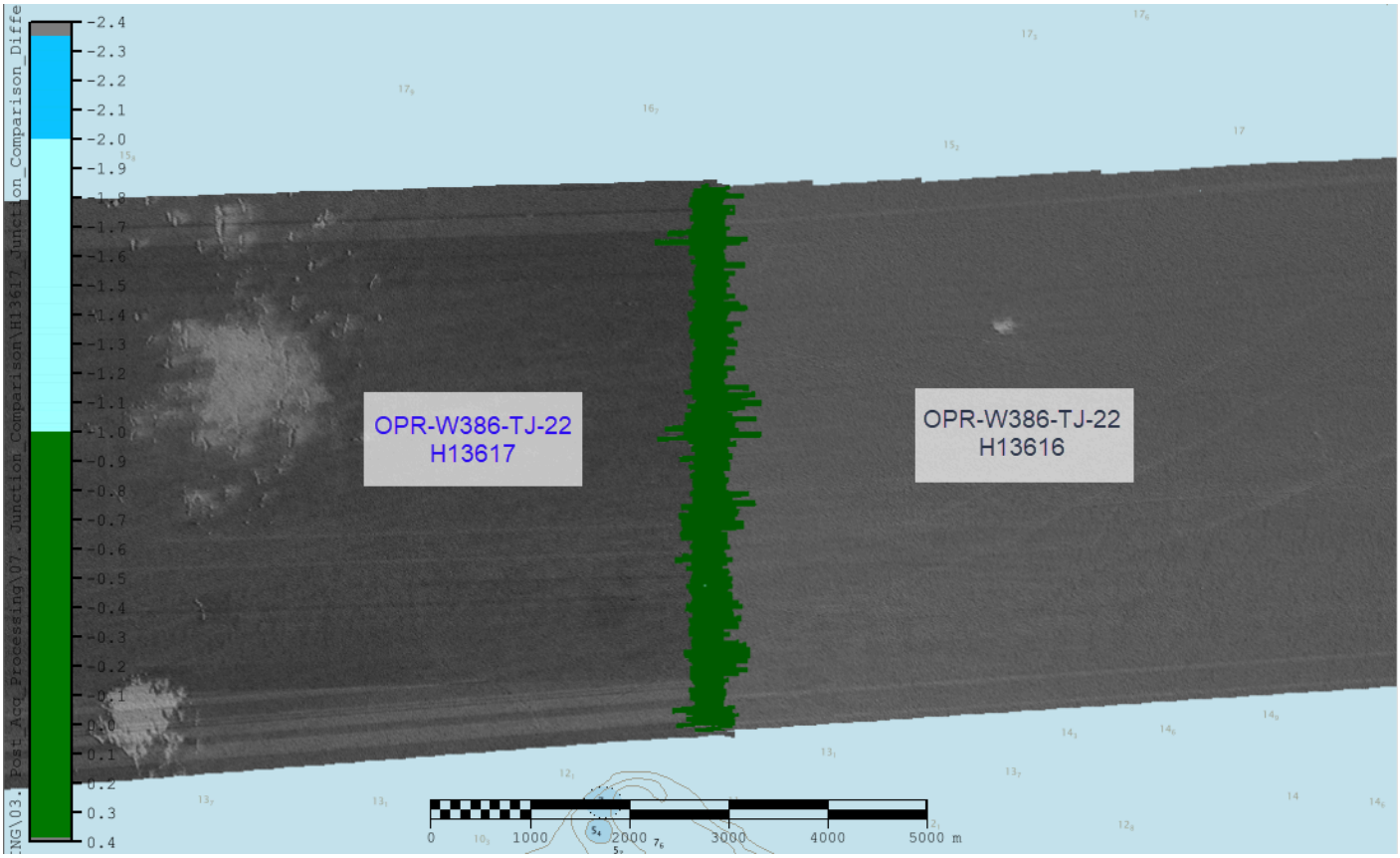
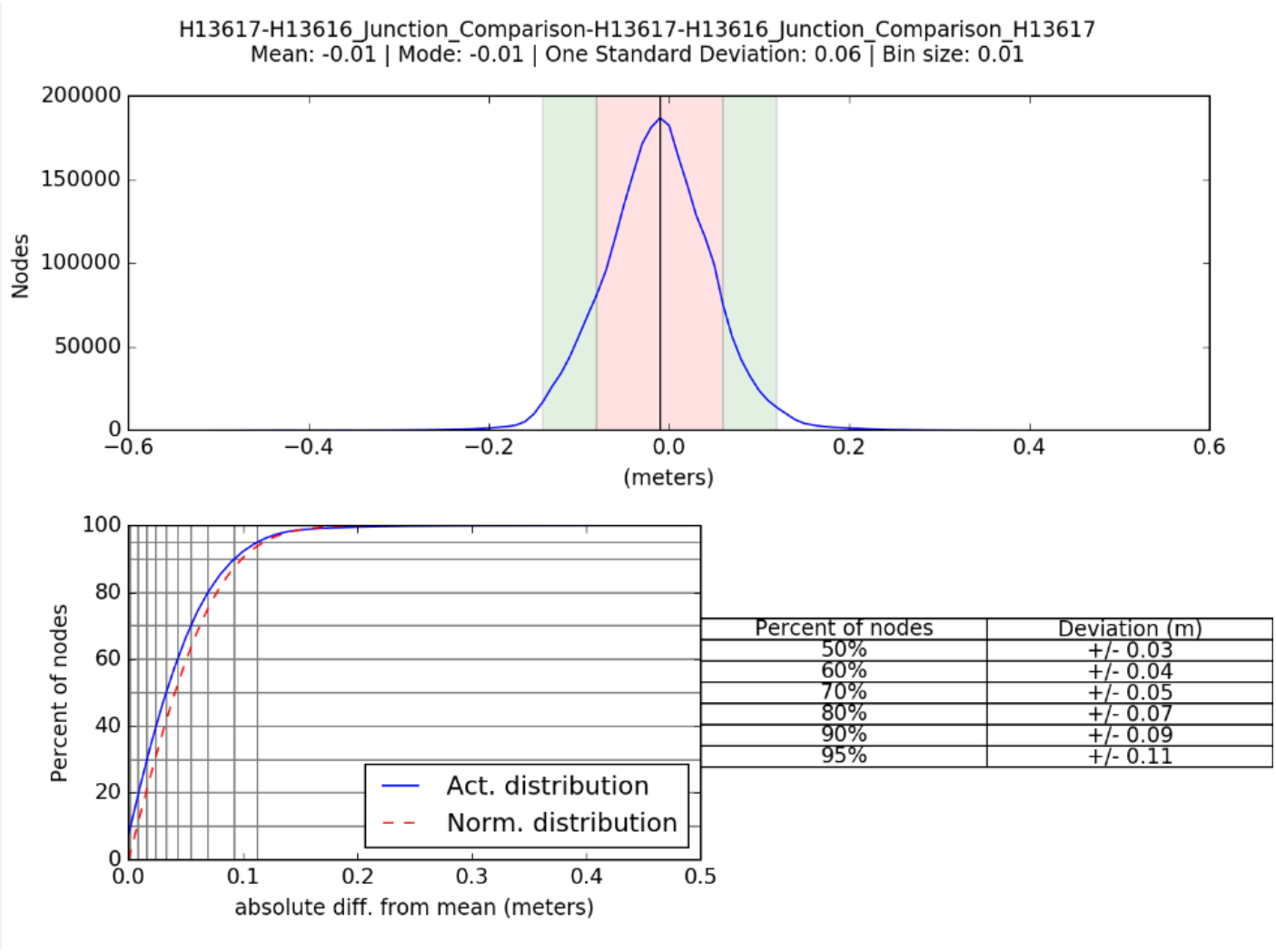


Figure 8: Fraction of allowable error surface difference comparison in color between H13617 and H13616, plotted over ENC US4OH01M.



Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.04
70%	+/- 0.05
80%	+/- 0.07
90%	+/- 0.09
95%	+/- 0.11

Figure 9: H13617 and H13616 surface difference comparison statistics.

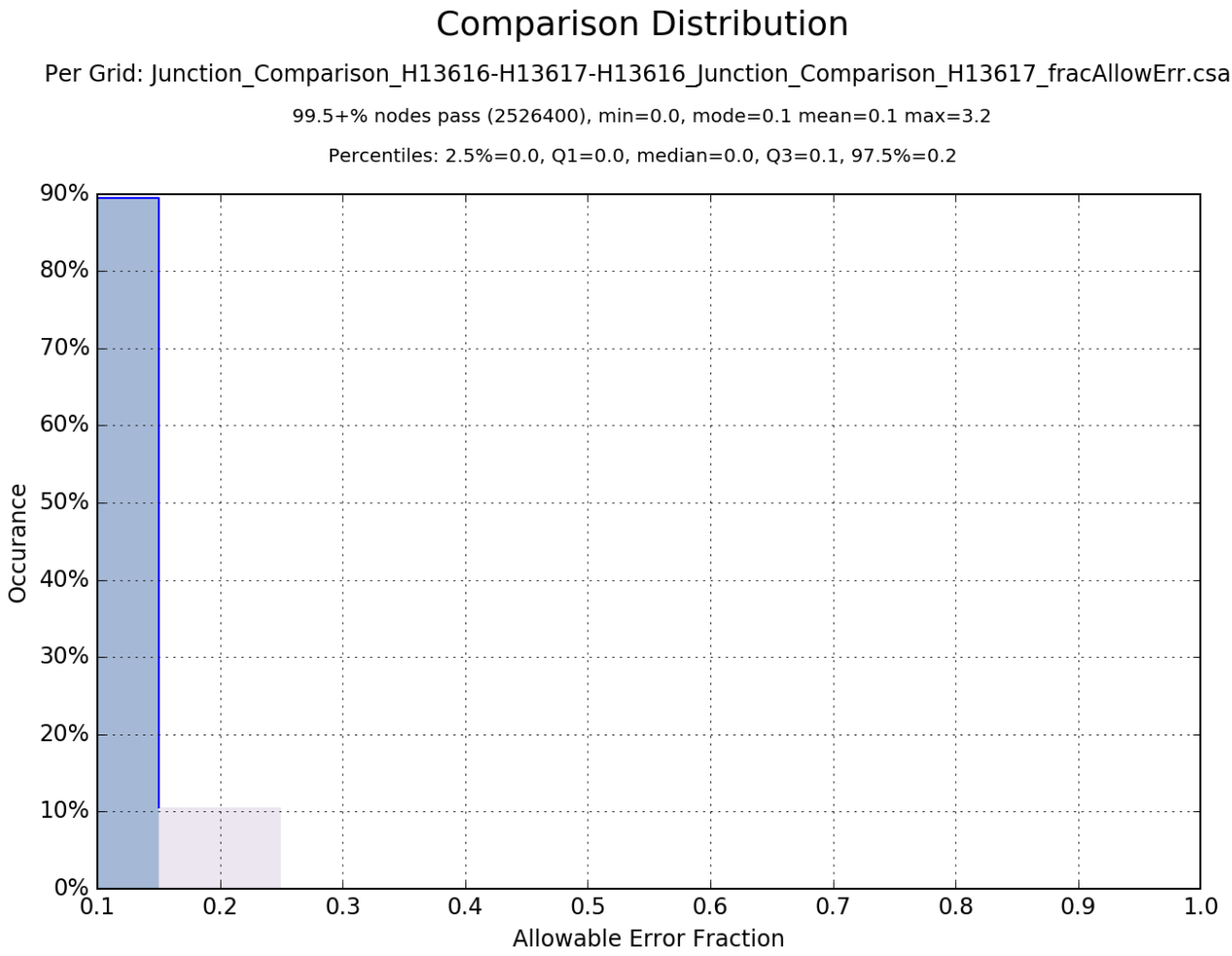


Figure 10: H13617 and H13616 fraction of allowable error statistics.

H13614

The southern edge of sheet H13617 junctions with sheet H13614. A 1m SR CUBE surface of H13617 data and a 1m SR CUBE surface of H13614 data were differenced (Figure 11). The mean difference between bathymetric surface nodes was 0.06m with a standard deviation of 0.06m (Figure 12). 99.5+% of nodes are compliant with fraction of allowable error standards (Figure 13). Statistics and visual inspection indicate that surveys H13617 and H13614 are in general agreement.

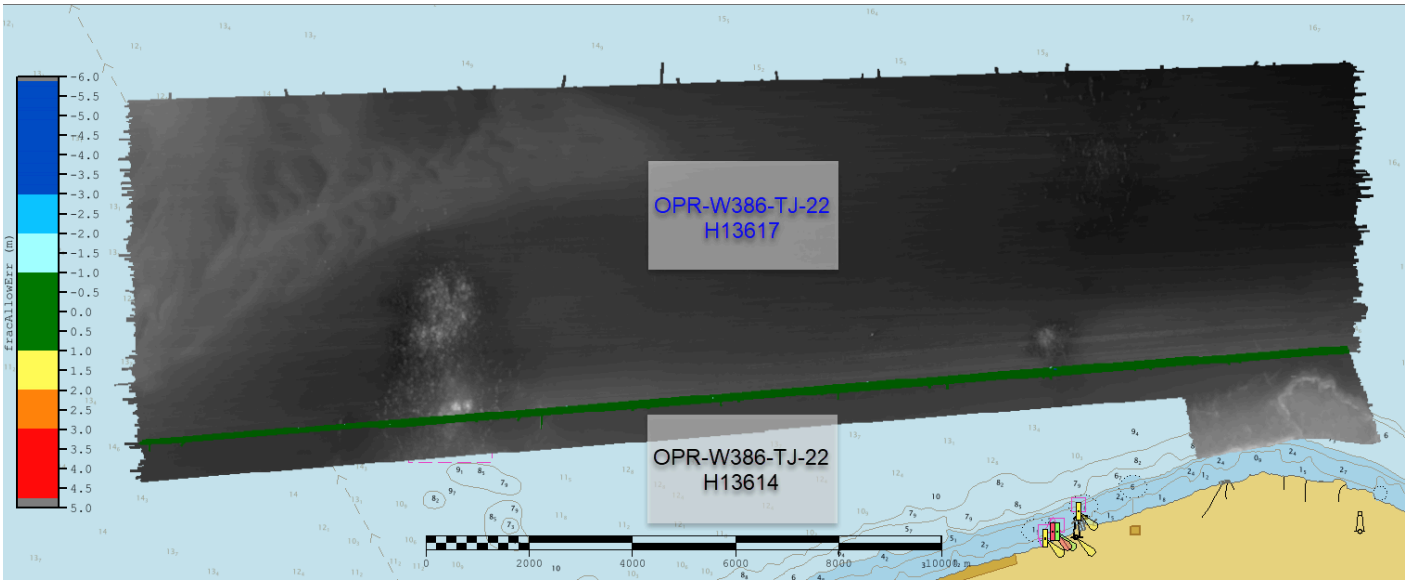
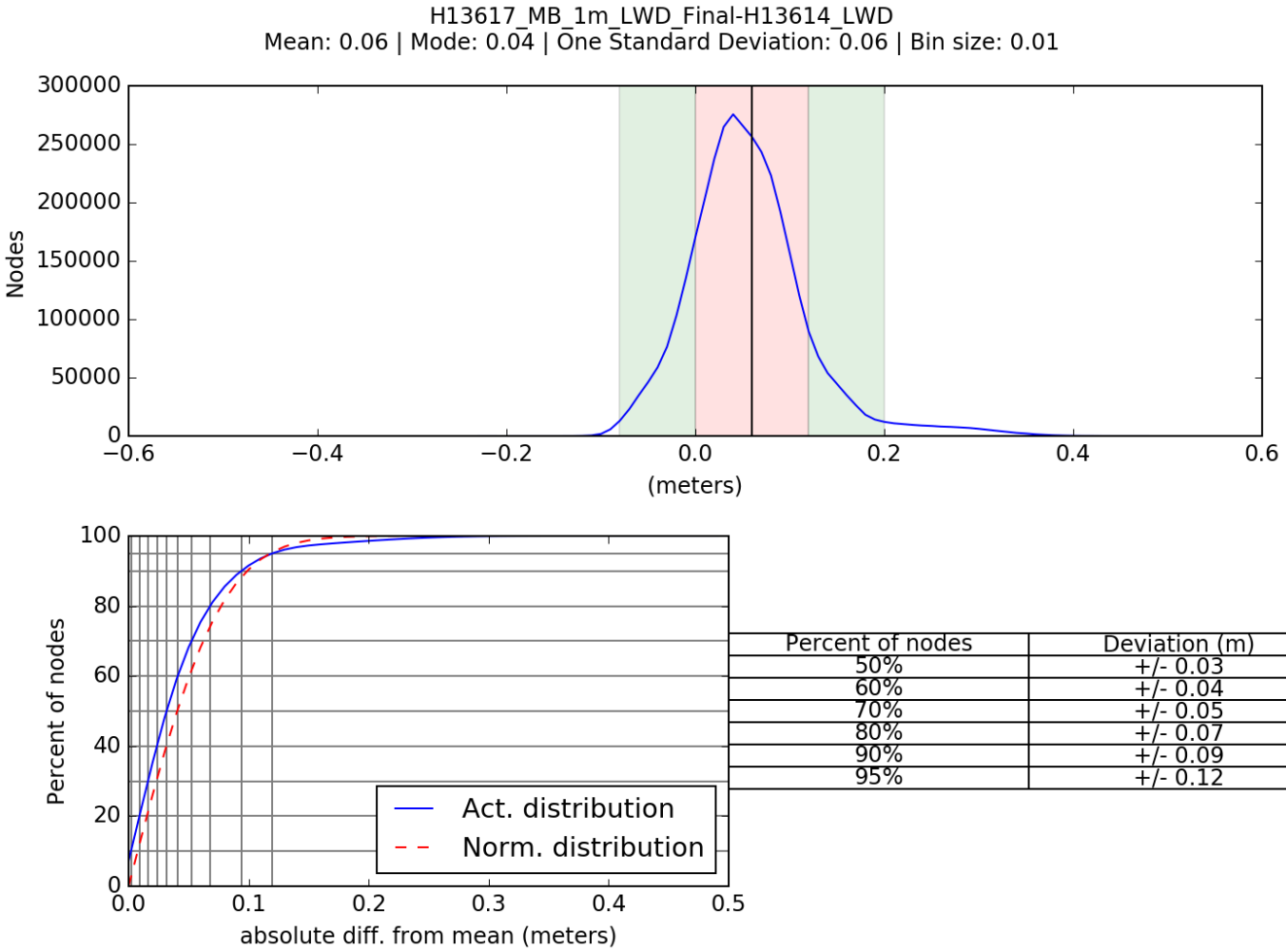


Figure 11: Fraction of allowable error surface difference comparison in color between H13617 and H13614, plotted over ENC US4OH01M.



Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.04
70%	+/- 0.05
80%	+/- 0.07
90%	+/- 0.09
95%	+/- 0.12

Figure 12: H13617 and H13614 surface difference comparison statistics.

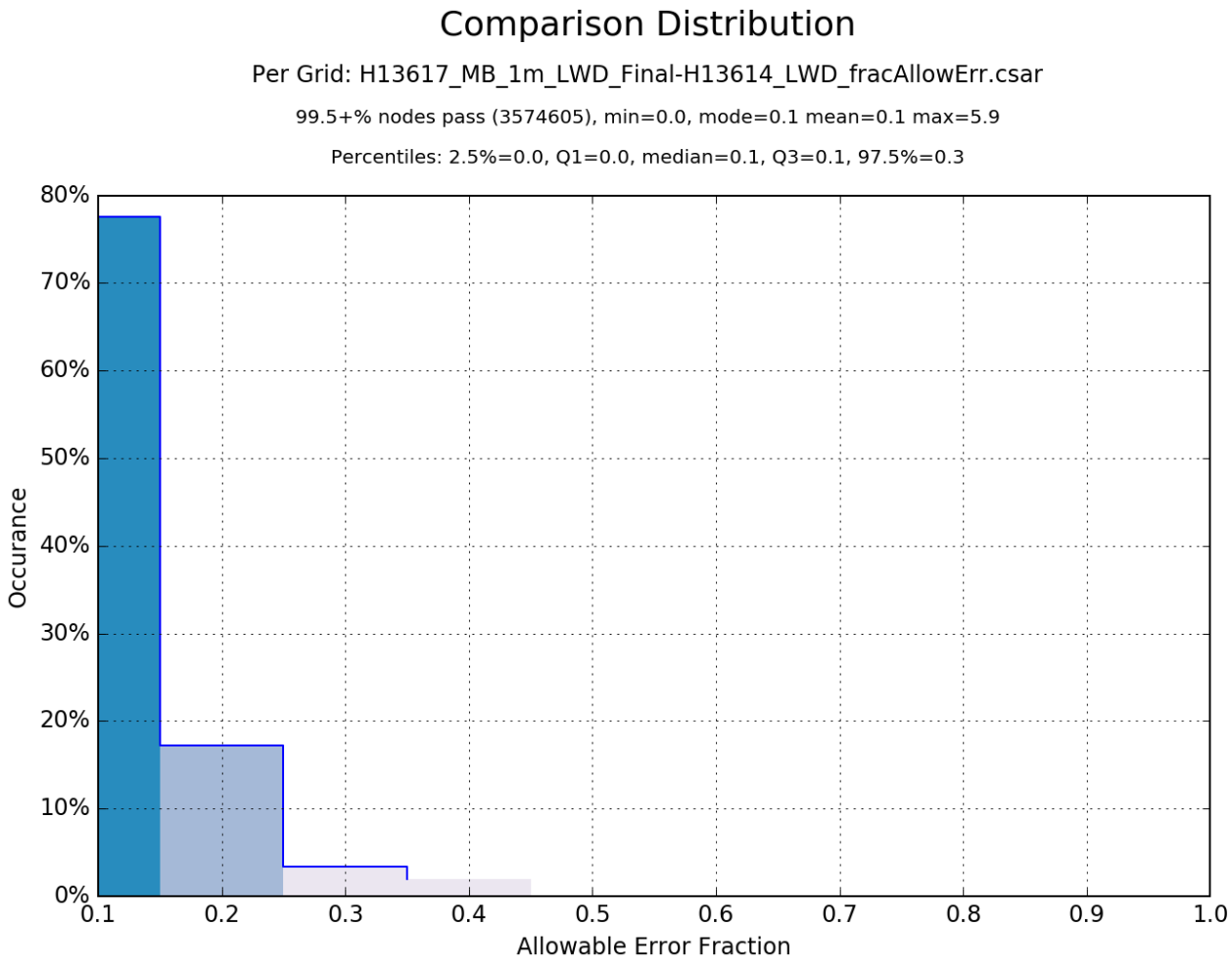


Figure 13: H13617 and H13614 fraction of allowable error statistics.

H13687

The northern edge of sheet H13617 junctions with sheet H13687. A 1m SR CUBE surface of H13617 data and a 2m SR CUBE surface of H13687 data were differenced (Figures 14 and 15). The mean difference between bathymetric surface nodes was 0.07m with a standard deviation of 0.04m (Figure 16). 99.5+% of nodes are compliant with fraction of allowable error standards (Figure 17). Statistics and visual inspection indicate that surveys H13617 and H13687 are in general agreement.

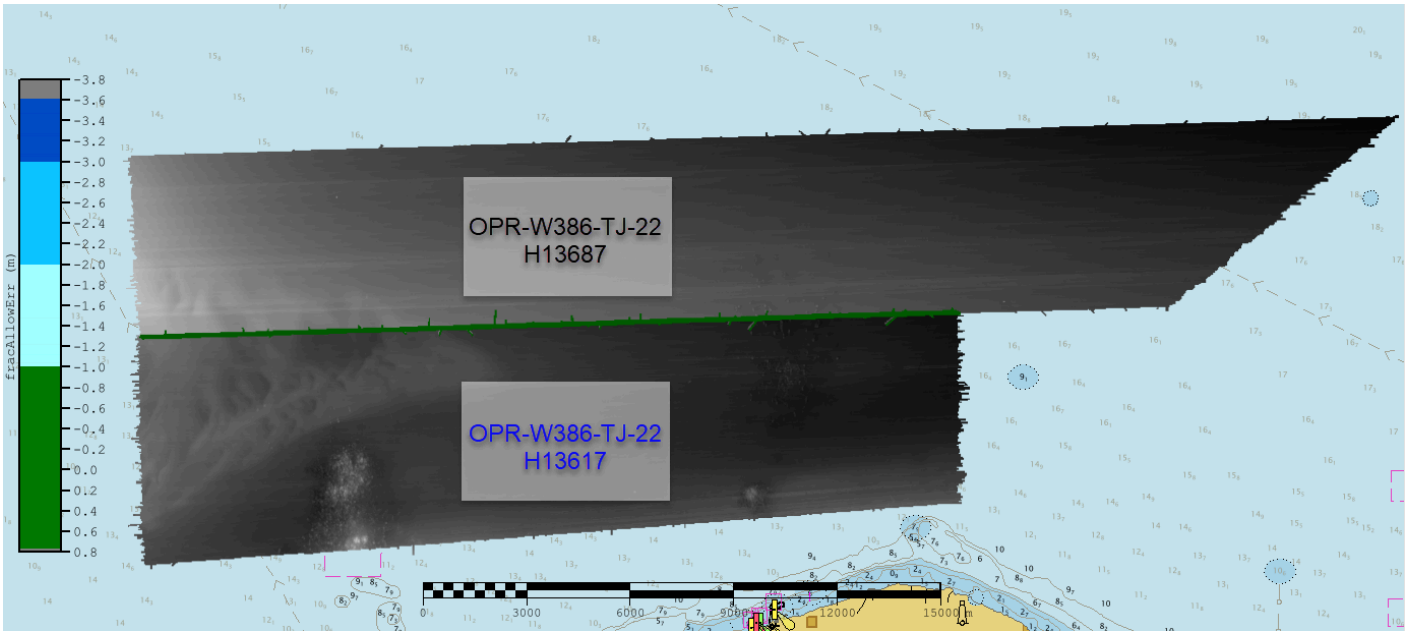


Figure 14: Fraction of allowable error surface difference comparison in color between H13617 and H13687, plotted over ENC US4OH01M.

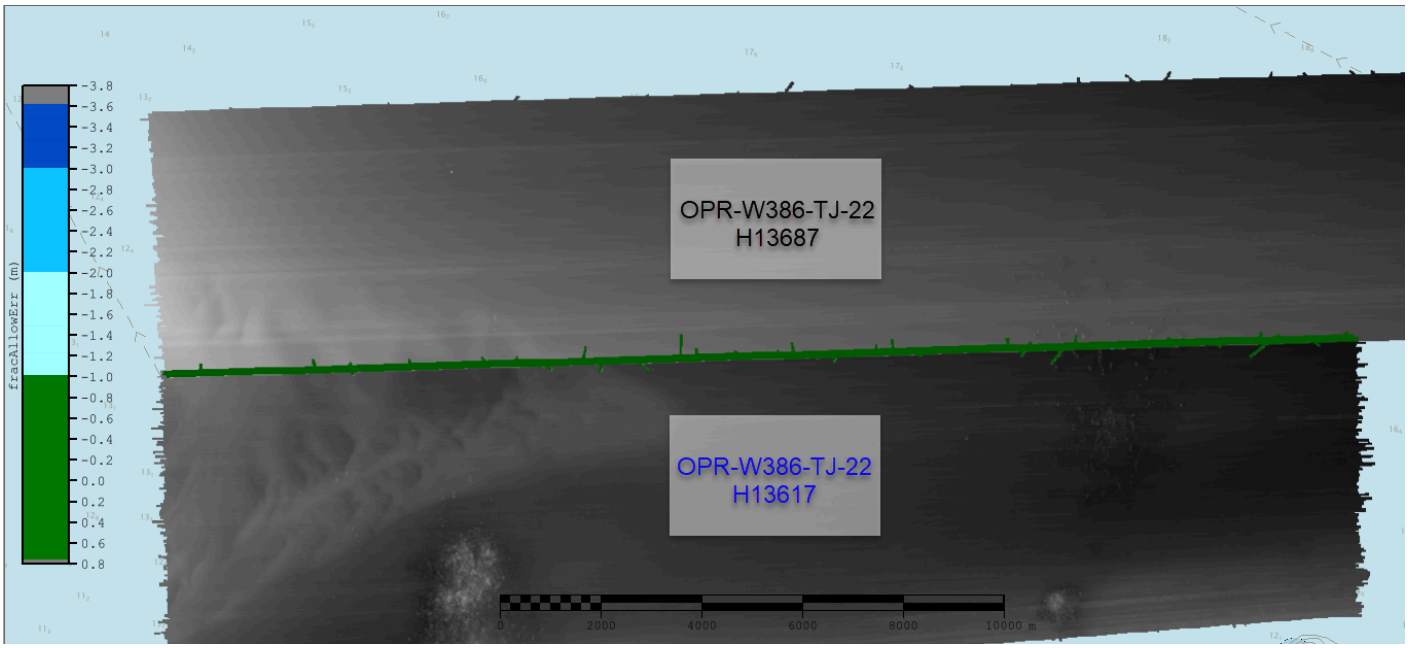
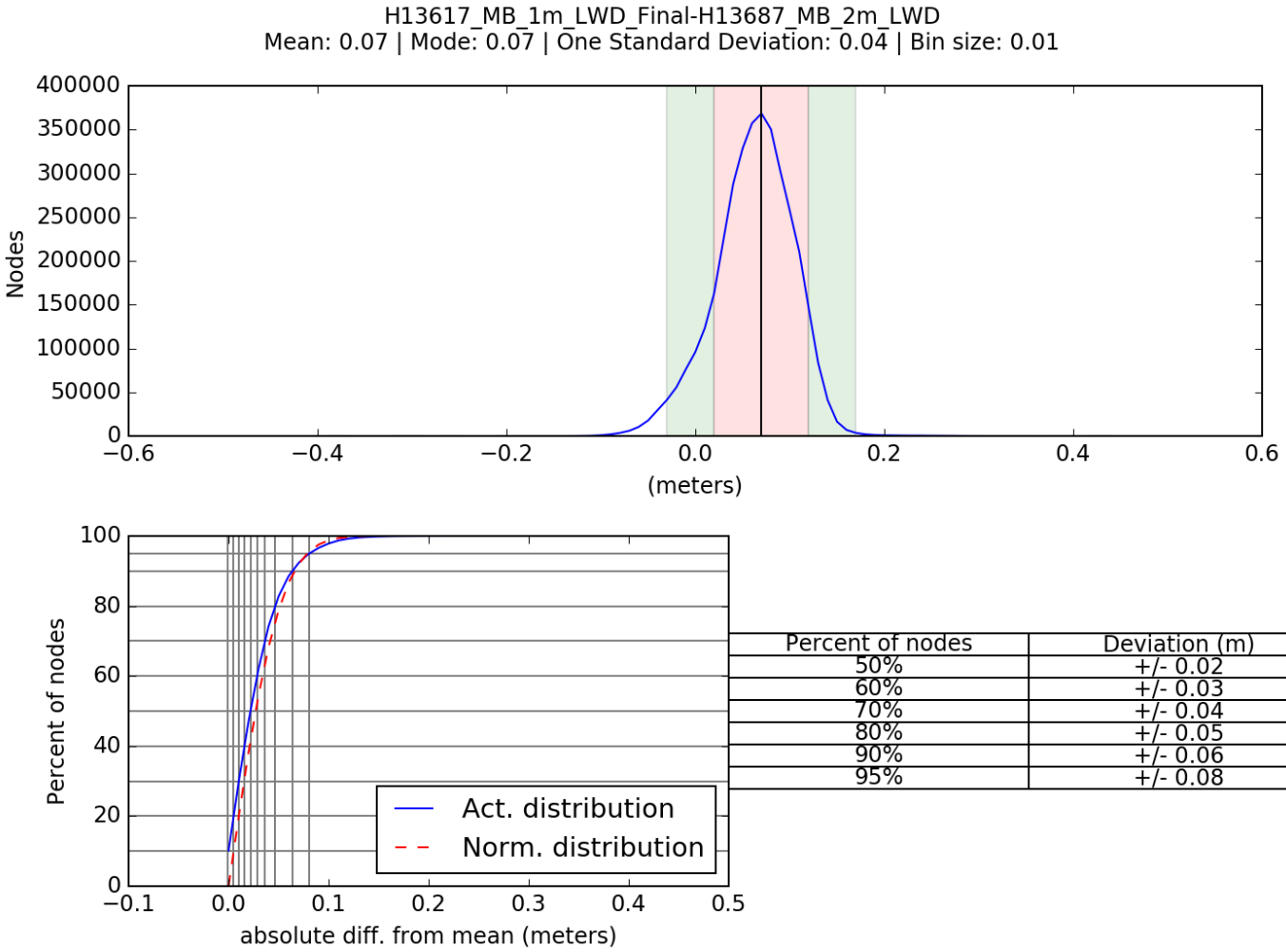


Figure 15: Close-up view of the fraction of allowable error surface difference comparison in color between H13617 and H13687, plotted over ENC US4OH01M.



Percent of nodes	Deviation (m)
50%	+/- 0.02
60%	+/- 0.03
70%	+/- 0.04
80%	+/- 0.05
90%	+/- 0.06
95%	+/- 0.08

Figure 16: H13617 and H13687 surface difference comparison statistics.

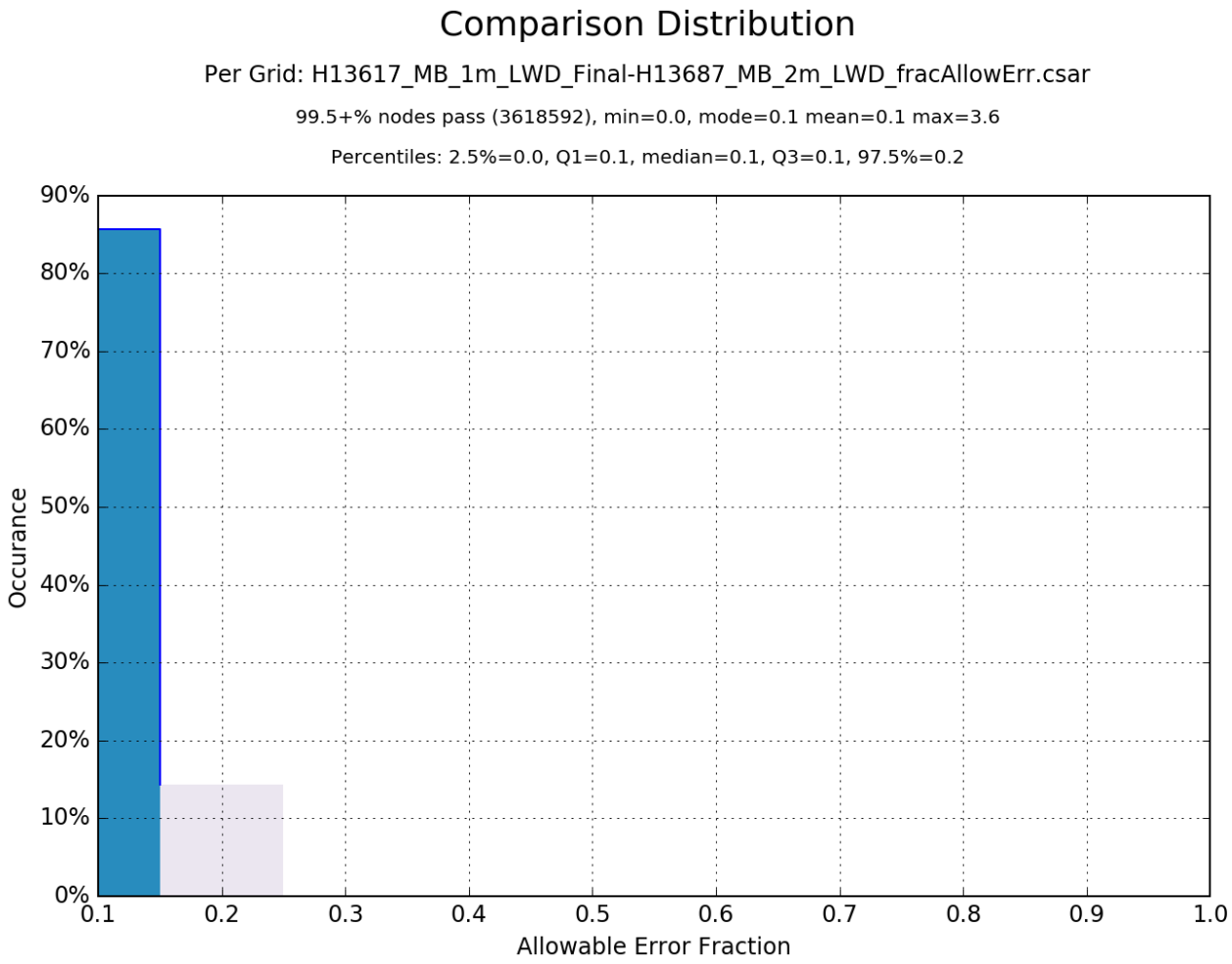


Figure 17: H13617 and H13687 fraction of allowable error statistics.

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

There were no conditions or deficiencies that affected equipment operational effectiveness.

B.2.6 Factors Affecting Soundings

Sound Speed Refraction

H13617 is located in an area that exhibits intense thermal stratification in the water column. This thermal layering greatly affects sound speed and results in refraction that can be observed in the MBES surface (Figure 18). The impacts on sounding depth accuracy are within allowable uncertainty standards, as outlined in the 2022 HSSD.

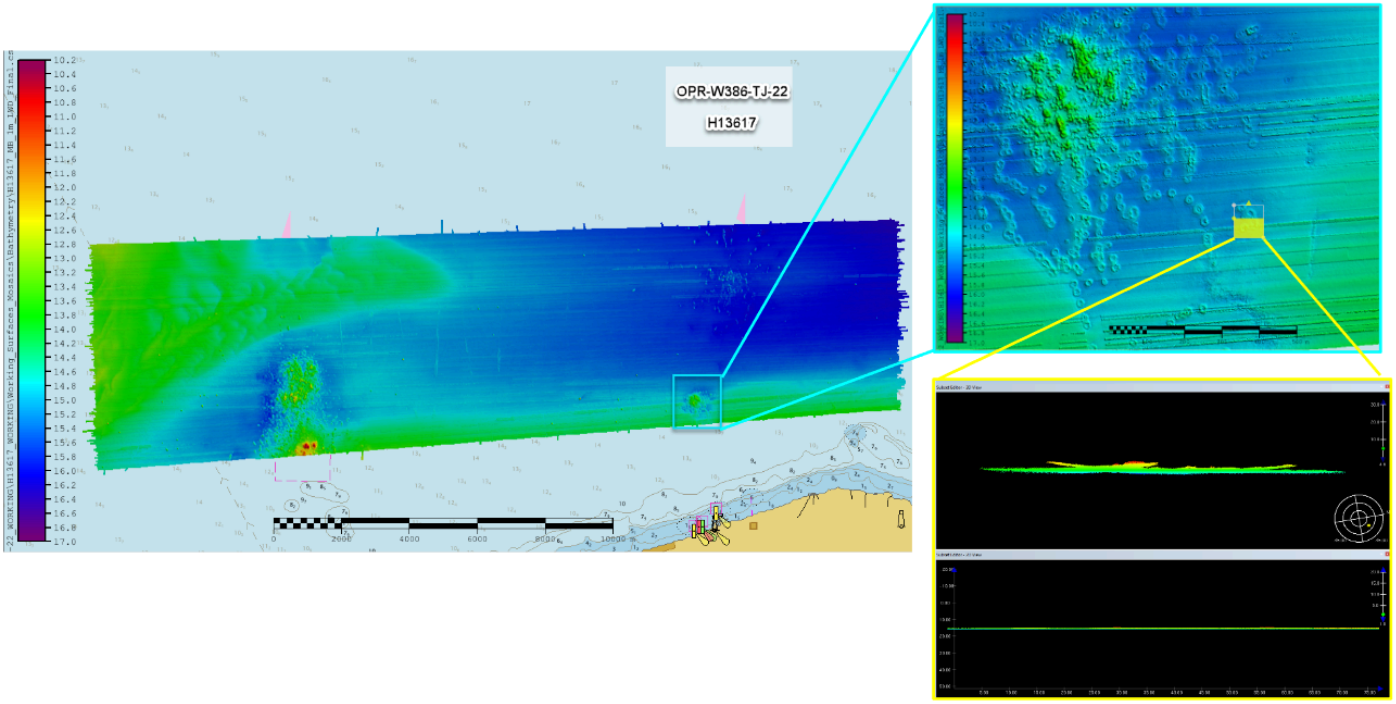


Figure 18: Example of the impact of sound speed seen throughout H13617 in subset editor, with the surface shown at 10x vertical exaggeration.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Casts to acquire sound velocity profiles were conducted using a MVP-200 and a Seabird SeaCat 19+ V2 CTD at the start of each acquisition day and at a minimum of once every four hours during acquisition. Cast frequency was increased in areas where a change in surface sound speed of greater than two meters per second was detected. All sound speed methods were used as detailed in the DAPR.

A total of 258 sound speed profiles were collected within the survey limits of H13617 and display good spatial diversity (Figure 19). One of these casts was located outside of the sheet limits, not more than 500m away, and displays a profile representative of the area. All sound speed profile data were concatenated into a master file for the sheet. MBES data were corrected by applying profiles taken nearest in distance within time (4 hours) using this master file.

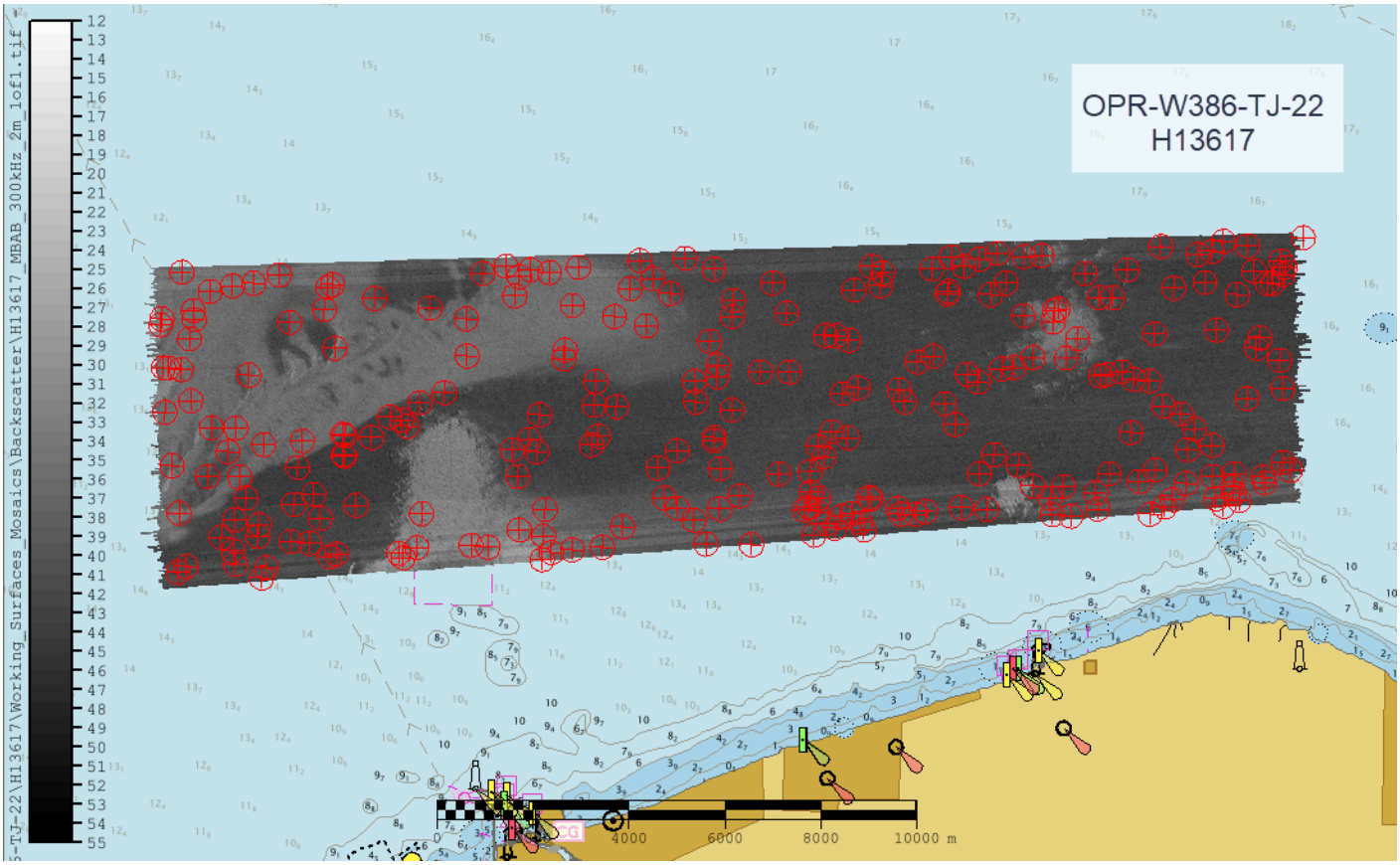


Figure 19: Overview of all sound speed casts collected on H13617. Cast locations shown as red targets overlaid on greyscale 300kHz backscatter mosaic.

B.2.8 Coverage Equipment and Methods

Complete coverage requirements were met by 100% complete coverage MBES as specified under section Section 5.2.2.3, Option A of the 2022 HSSD. Vessel S222 was outfitted with a Kongsberg EM2040 MBES system, and was used to acquire 100% complete coverage MBES, crosslines, developments, and holidays.

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

All equipment and survey methods were used as detailed in the DAPR. Raw MBES backscatter was flagged as part of the .all file from the Kongsberg EM2040 systems. Backscatter was processed in the QPS Fledermaus GeoCoder Toolbox (FGMT) software, and the exported geotiffs are included in the final processed data submission package (Figure 20).

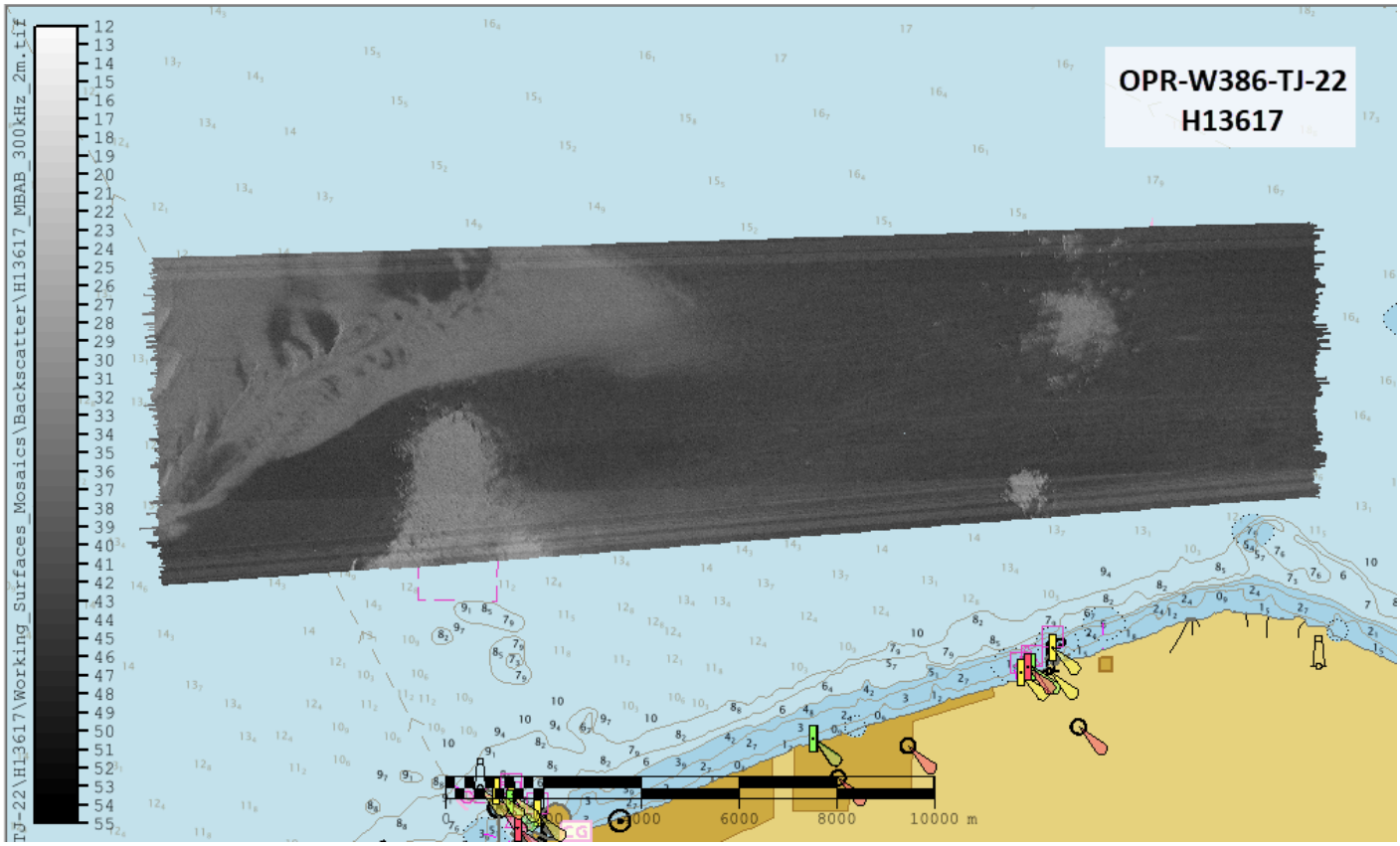


Figure 20: S222's 300kHz multibeam acoustic backscatter mosaic at 2m resolution.

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following Feature Object Catalog was used: NOAA Profile Version 2022.

Feature Object Catalog NOAA Profile Version 2022 was used for all S-57 attribution in the Final Feature File. All other software were used as detailed in the DAPR.

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
H13617_1m_MB_LWD	CARIS Raster Surface (CUBE)	1 meters	10.29 meters - 16.94 meters	NOAA_1m	Complete MBES
H13617_MB_1m_LWD_Final	CARIS Raster Surface (CUBE)	1 meters	10.29 meters - 16.94 meters	NOAA_1m	Complete MBES
H13617_MBAB_300kHz_2m_S222_1of1	MB Backscatter Mosaic	2 meters	-	N/A	Complete MBES

Table 10: Submitted Surfaces

H13617_MB_1m_LWD_Final uncertainty layer is resolved from the maximum of H13617_MB_1m_LWD nodal TVU and standard deviation values. Complete coverage requirements were met with 100% MBES coverage as specified under section 5.2.2.3 of the 2022 HSSD. A surface with a 1m resolution was created and was found to be an accurate representation of observed bathymetry. The 1m grid was assessed for compliance with the specifications outlined in the 2022 HSSD and was found to meet uncertainty (Section 5.1.3) and density standards (Figure 21).
While there are visible gaps in the bathymetric surface in areas of 100% complete MBES coverage, they are not large enough to meet the definition of a holiday for complete coverage requirements. There were no fliers or holidays, other than that mentioned in Section A.4, that exist within the submitted surface as analyzed by NOAA QC Tool Flier Finder available in the Pydro XL-19 suite.

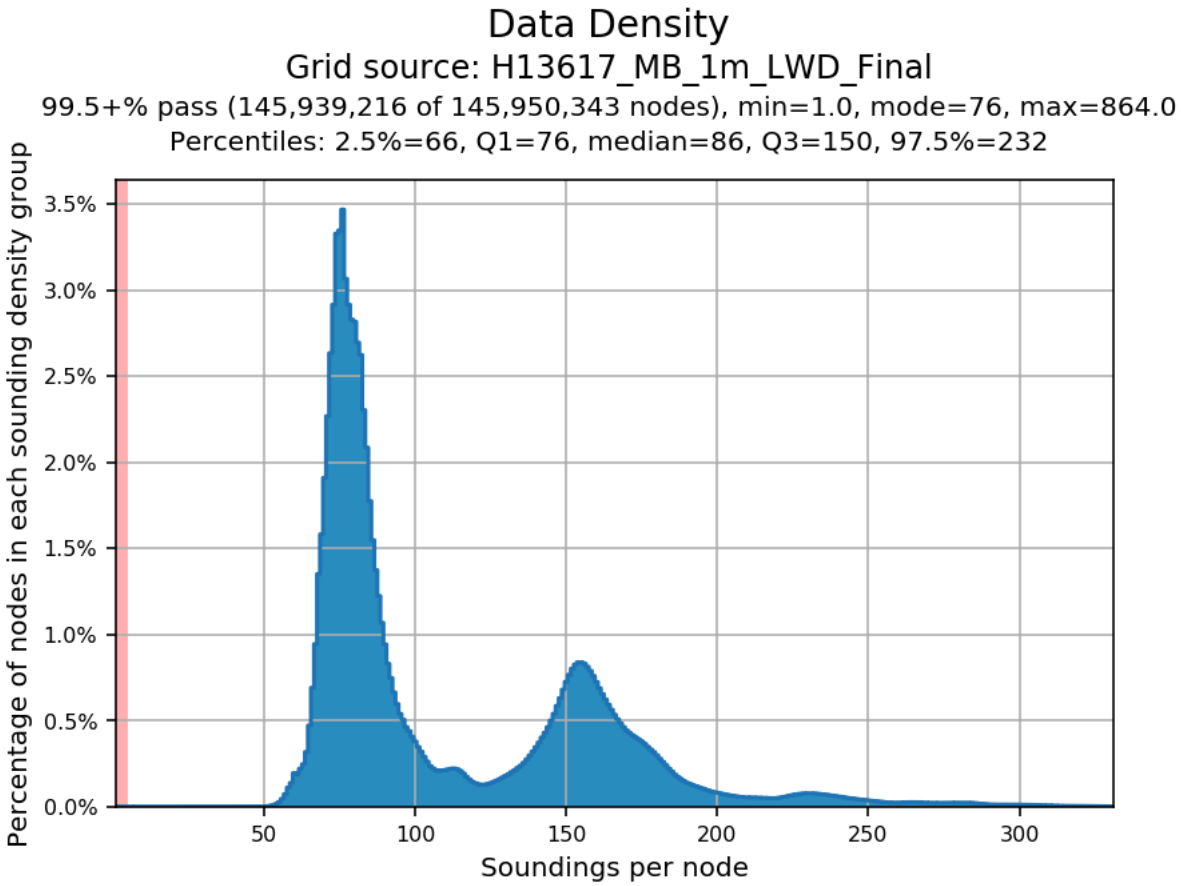


Figure 21: H13617 data density standards.

C. Vertical and Horizontal Control

Field-installed tide and GPS stations were not utilized for this survey. There is no HVCR report included with the submission of H13617.

C.1 Vertical Control

The vertical datum for this project is Low Water Datum IGLD-1985.

ERS Datum Transformation

The following ellipsoid-to-chart vertical datum transformation was used:

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	OPR-W386-TJ-22_NAD83_2011_VDatum_LWD_IGLD85

Table 11: ERS method and SEP file

All soundings submitted for H13617 are reduced to LWD IGLD-85 using VDatum techniques as outlined in the DAPR.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD 83).

The projection used for this project is Universal Transverse Mercator (UTM) Zone 17.

The following PPK methods were used for horizontal control:

- RTX

Trimble-RTX service was used with an Applanix POS MVv5 GNSS_INS system and POSPac MMS software to obtain highly accurate ellipsoidally referenced position data to meet ERS specifications in accordance with the 2022 HSSD for H13617 MBES data from vessel S222.

WAAS

The Wide Area Augmentation System (WAAS) was used for real-time horizontal control during data acquisition on vessel S222.

D. Results and Recommendations

D.1 Chart Comparison

Surveyed soundings were compared against previously charted data on ENC US4OH01M. Depth values were found to be in general agreement with previously charted soundings.

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
US4OH01M	1:80000	16	04/27/2018	05/15/2020

Table 12: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.3 Charted Features

No charted features exist for this survey.

D.1.4 Uncharted Features

A total of five uncharted features were identified and investigated using 100% complete coverage MBES. None of the features were considered to be Dangers to Navigation (DTONs). Reference the Final Feature File included with the submission of this project for further information.

D.1.5 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.2 Additional Results

D.2.1 Aids to Navigation

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

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

A total of nine bottom samples were assigned for investigation. However, the hydrographer chose to collect nine bottom samples in alternate locations within the sheet guided by differences observed in the backscatter intensity, possibly representing different types of bottom substrate. These nine bottom samples were investigated and included in the Final Feature File (Figure 22).

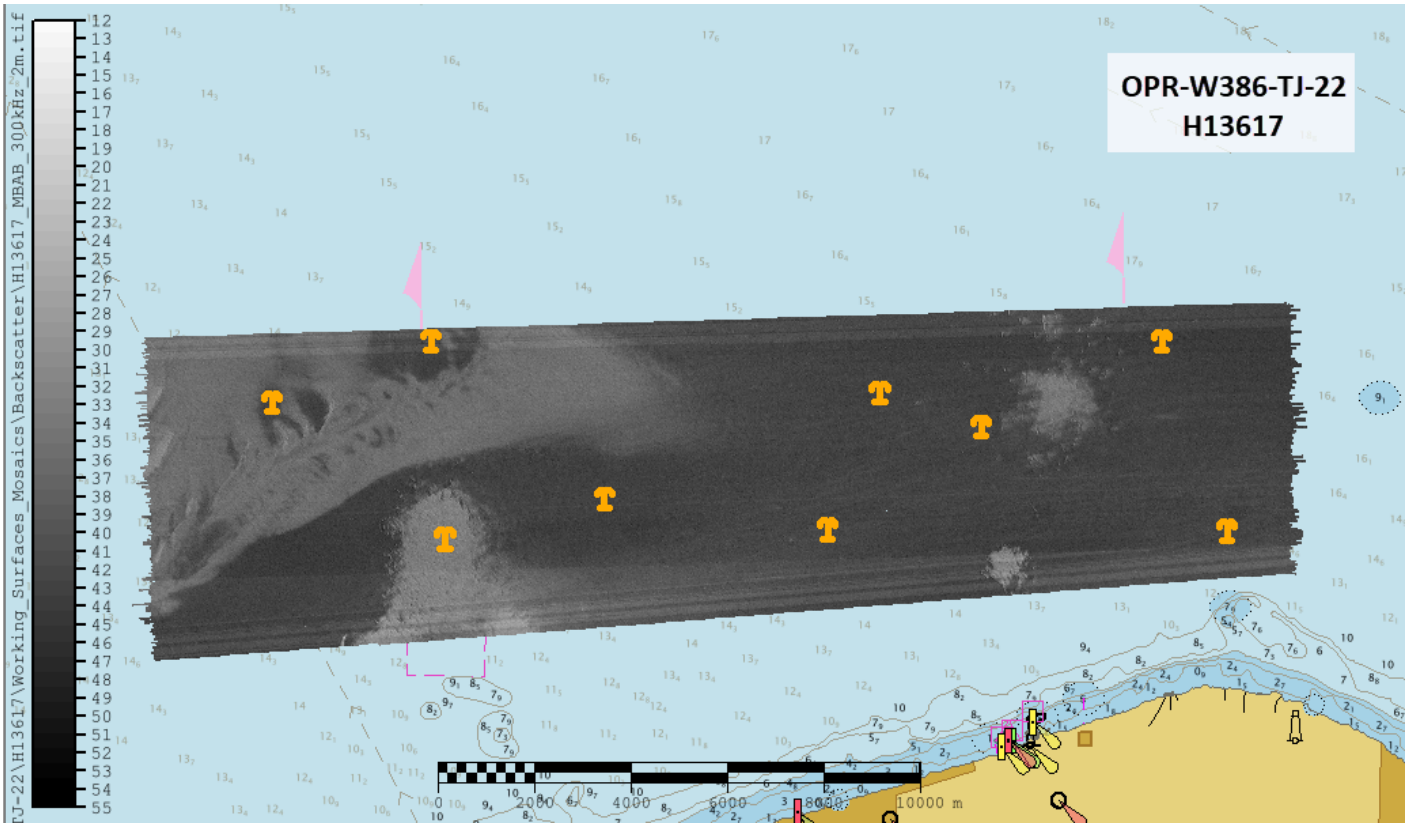


Figure 22: H13617 bottom sample locations plotted over H13617 backscatter data.

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 or Environmental Conditions

Many large piles of sediment were found throughout H13617, particularly in three areas of the sheet (Figure 23). These piles are not large enough to qualify as DtoNs. The sediment mounds appear to be anthropogenic in origin and possibly the leftovers from dredging.

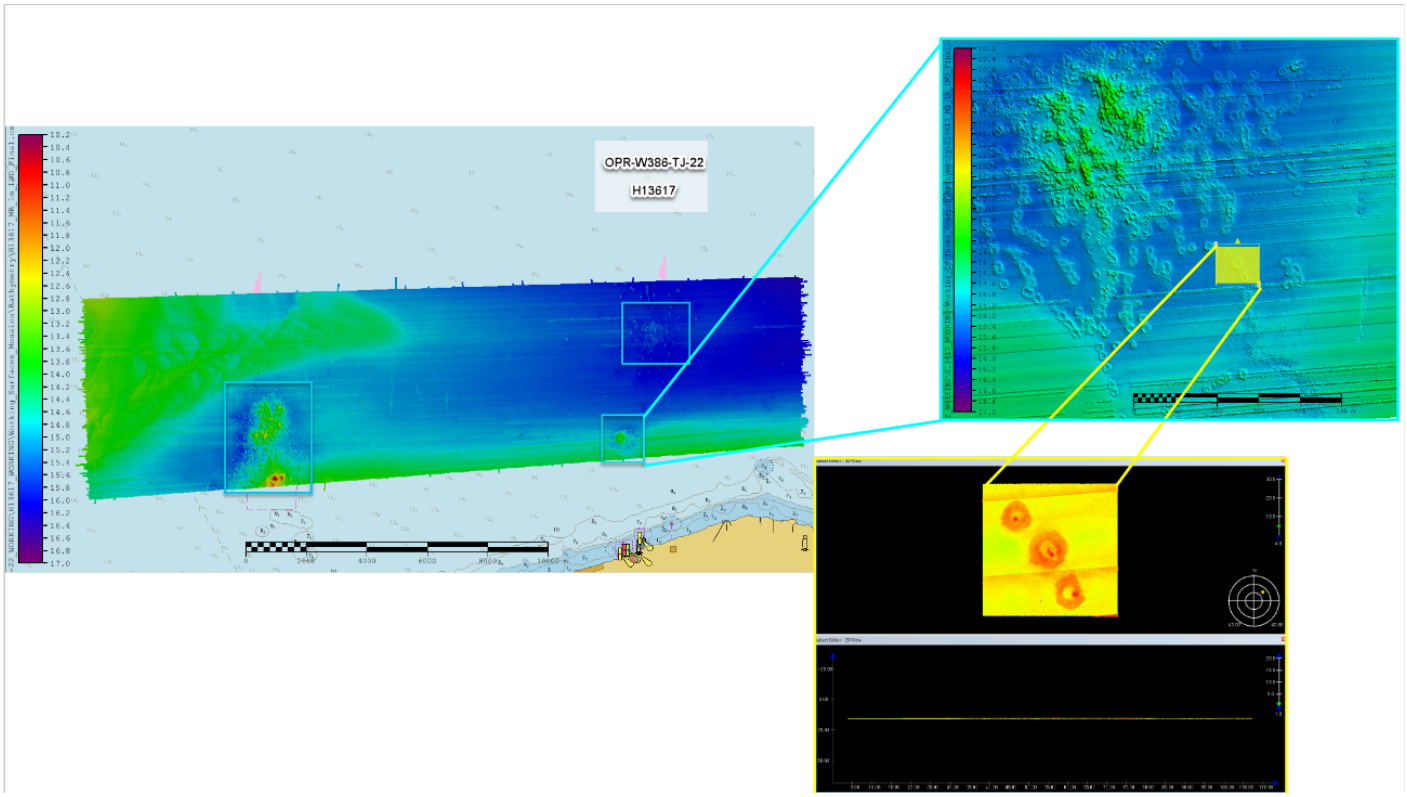


Figure 23: Three main areas in H13617 with many piles of sediment, possibly dredging spoils, are surrounded by blue rectangles. The surface is shown at 10x vertical exaggeration. On the right is an example of a few piles of sediment seen in subset editor.

D.2.9 Construction and Dredging

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

D.2.10 New Survey Recommendations

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

D.2.11 ENC Scale Recommendations

No new ENC scales 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
Matthew J. Jaskoski, CDR/NOAA	Chief of Party	10/20/2022	JASKOSKI.MATTHEW.JACOB.1275636262 2022.10.20 13:19:52 -04'00'
Michelle M. Levano, LT/NOAA	Field Operations Officer	10/20/2022	Digitally signed by LEVANO.MICHELLE.MARIE.1516645888 Date: 2022.10.20 13:13:06 -04'00'
Chloe E. Arboleda	Chief Survey Technician	10/20/2022	ARBOLEDA.CHLOE ELIZABETH.B.1550062760 Digitally signed by ARBOLEDA.CHLOE ELIZABETH.B.1550062760 Date: 2022.10.20 14:10:33 -04'00'
Sophia Caradine-Taber	Sheet Manager	10/20/2022	

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	Continuously Operating Reference Station
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
ERTDM	Ellipsoidally Referenced Tidal Datum Model
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

Acronym	Definition
HSSD	Hydrographic Survey Specifications and Deliverables
HSTB	Hydrographic Systems Technology Branch
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
NALL	Navigable Area Limit Line
NTM	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
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
RTX	Real Time Extended
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
TPU	Total Propagated Uncertainty
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDF	Zone Definition File