H13749

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13749

LOCALITY

State(s):	North Carolina
General Locality:	Wilmington, North Carolina
Sub-locality:	42 NM Southeast of Carolina Beach Inlet

2023

CHIEF OF PARTY
Commander William Winner, NOAA

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13749**

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):	**North Carolina**
General Locality:	**Wilmington, North Carolina**
Sub-Locality:	**42 NM Southeast of Carolina Beach Inlet**
Scale:	**40000**
Dates of Survey:	**09/09/2023 to 10/06/2023**
Instructions Dated:	**02/02/2023**
Project Number:	**OPR-F324-FH-23**
Field Unit:	**NOAA Ship *Ferdinand R. Hassler***
Chief of Party:	**Commander William Winner, NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Atlantic Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

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 18N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

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Descriptive Report to Accompany Survey H13749

Project: OPR-F324-FH-23

Locality: Wilmington, North Carolina

Sublocality: 42 NM Southeast of Carolina Beach Inlet

Scale: 1:40000

September 2023 - October 2023

NOAA Ship *Ferdinand R. Hassler*

Chief of Party: Commander William Winner, NOAA

A. Area Surveyed

The survey area is located near Wilmington, North Carolina approximately 42 NM Southeast of Carolina Beach Inlet.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
33° 36' 21.82" N 77° 28' 56.49" W	33° 24' 30.11" N 77° 12' 0.24" W

Table 1: Survey Limits

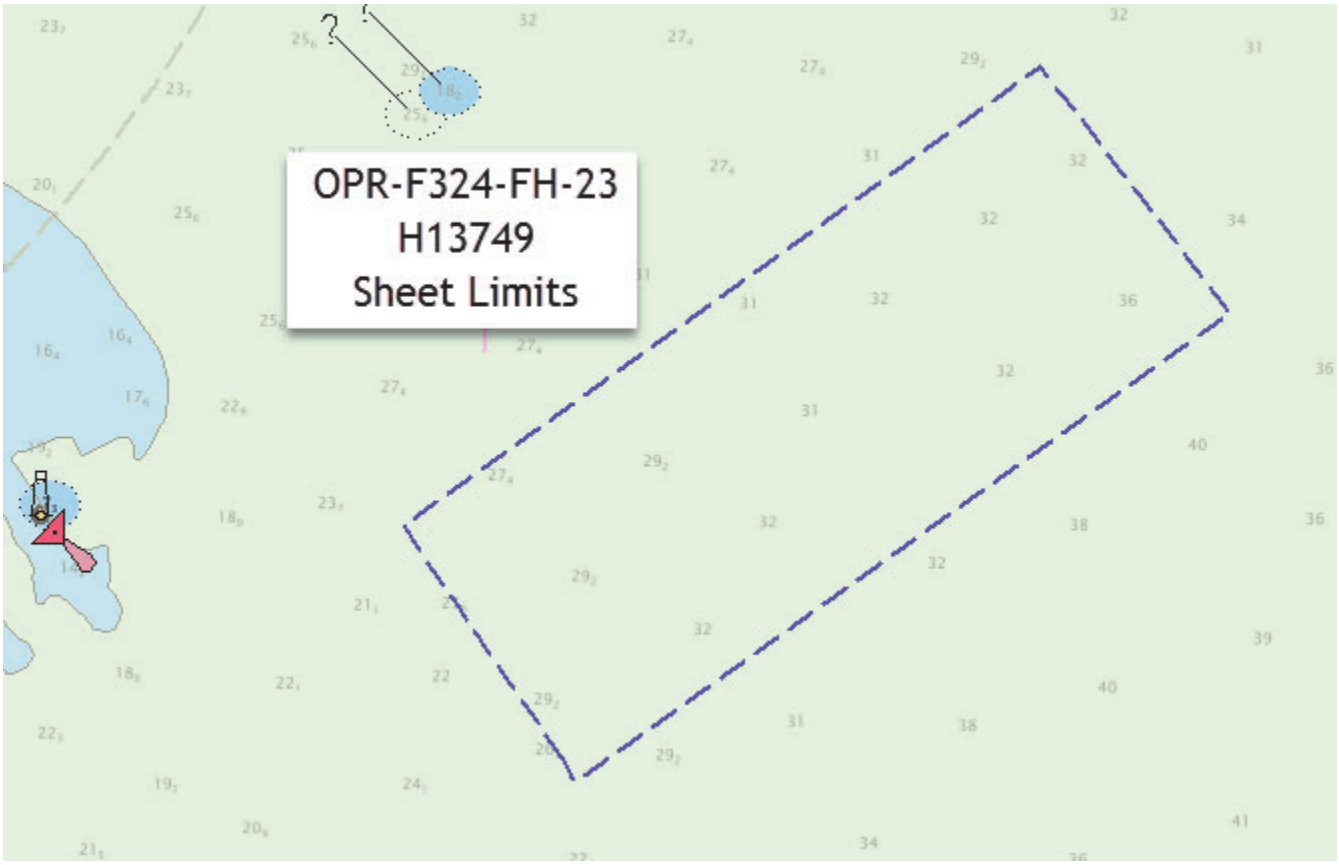


Figure 1: H13749 sheet limits (in blue) overlaid onto Chart US3SC10M.

Data were acquired to the survey limits, shown in Figure 1, in accordance with the requirements in the Project Instructions and the March 2022 NOS Hydrographic Surveys Specifications and Deliverables (HSSD).

A.2 Survey Purpose

The region around Wilmington, North Carolina experiences high vessel traffic transiting the eastern seaboard of the U.S. as well as traffic to and from the port. The Port of Wilmington has been updating its facilities expanding capacity in recent years, including the ability to handle two post-Panamax vessels concurrently, and in 2020, ranked 67 in tonnage of all U.S. ports, handling over 6,000,000 short tonnes of cargo.1,2,3

Numerous historic storms and hurricanes have impacted this region, potentially having changed the seafloor from the last surveys in the 1940s and 1960s. Additionally a portion of this project is in the top 10% of NOAA's Hydrographic Health need emphasizing a high need for modern bathymetry for this area. This project will identify hazards and changes to the seafloor, provide critical data for updating National Ocean Service (NOS) nautical charting products, and improve maritime safety. It will also address data gaps to support the Seabed 2030 global mapping initiative.

1 https://usace.contentdm.oclc.org/digital/collection/p16021coll2/id/7447/rec/26
2 https://www.wect.com/2022/08/11/port-wilmington-receive-18-million-upgrade-increase-processing-rate/
3 https://ncports.com/port-improvements/completed-upgrades/

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired on H13749 meet multibeam echo sounder (MBES) coverage requirements for complete coverage, as required by the HSSD, including NOAA allowable uncertainty (see Section B.2.2), and density requirements (see Section B.2.3). Exceptions are described in this report including sections B.2.1 (Crosslines) and B.2.11 (Holidays).

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 the survey area	Complete Coverage per HSSD Section 5.2.2.3

Table 2: Survey Coverage

On DN 279, the ship suffered a season ending mechanical failure that forced its return to port. This kept the ship from surveying the entire assigned area to the sheet limits as seen in Figure 2. The area covered on H13749 was acquired with complete coverage multibeam, meeting the requirements listed above and in the HSSD, except as described in this report.

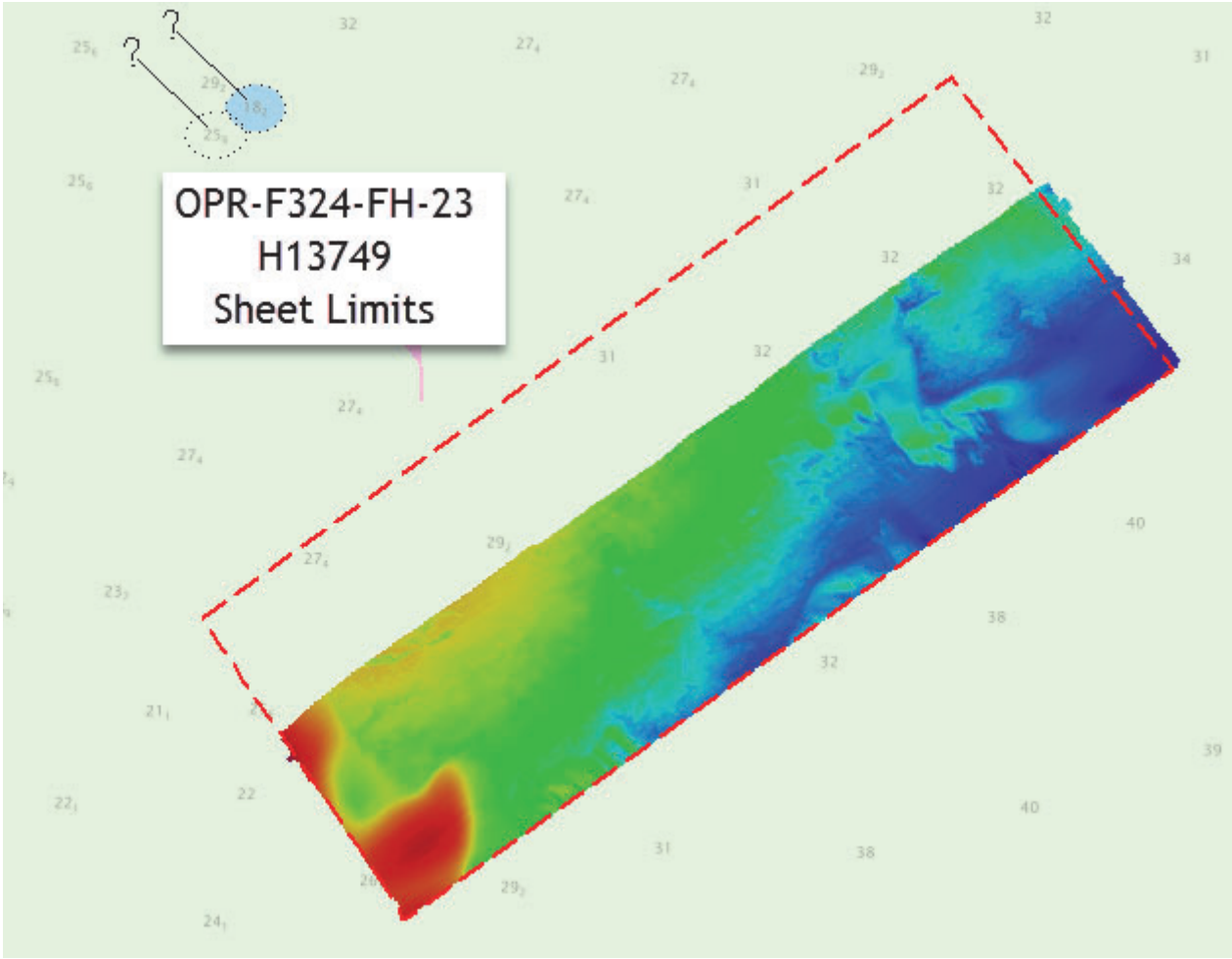


Figure 2: H13749 survey coverage (2 meter surface) overlaid onto Chart US3SC10M

A.6 Survey Statistics

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

	HULL ID	*S250*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0
	MBES Mainscheme	545.4	545.4
	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	17.0	17.0
	Lidar Crosslines	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			39.56

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
09/09/2023	252
09/10/2023	253

Survey Dates	Day of the Year
09/11/2023	254
10/05/2023	278
10/06/2023	279

Table 4: Dates of Hydrography

Line 2023-252-0011 was a short erroneous line and was removed from the processed data.

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the OPR-F324-FH-23 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	*S250*
LOA	37.7 meters
Draft	3.85 meters

Table 5: Vessels Used

Figure 3: NOAA Ship Ferdinand R. Hassler

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
Applanix	POS MV 320 v5	Positioning and Attitude System
AML Oceanographic	MVP200	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	Sound Speed System

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines were collected, processed, and compared in accordance with Section 5.2.4.3 of the HSSD. To evaluate crosslines, a 2 meter CUBE surface using strictly mainscheme lines, and a 2 meter CUBE surface using strictly crosslines were created. From these two surfaces, a difference surface (mainscheme - crosslines = difference surface) was generated using Pydro's Compare Surfaces tool at a 2 meter resolution (Figure 4). Statistics show the mean difference between the depths derived from mainscheme and crosslines was 0.00 meters and 95% of nodes fall within 0.15 meters (Figure 5). For the respective depths, the difference surface was compared to the allowable NOAA uncertainty standards using Compare Surfaces. In total, 100% of the depth differences between H13749 mainscheme and crossline data were within allowable NOAA uncertainties (Figure 6).

It should be noted that the ship was not able to acquire the required 4% of crosslines to mainscheme; only a 3.1% ratio was achieved. Additionally, the crosslines that were acquired did not cross every day of mainscheme. This was due to a season ending mechanical failure.

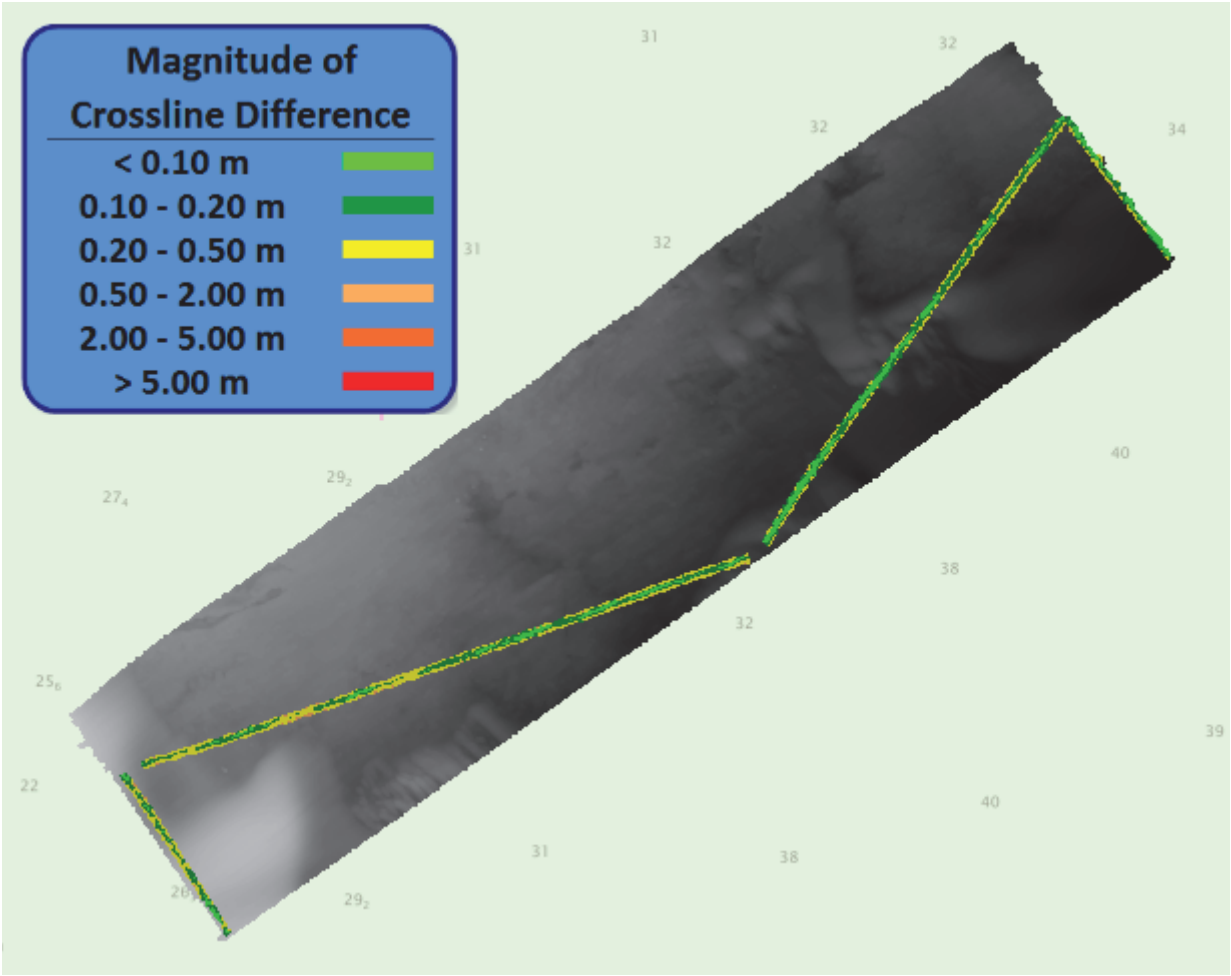
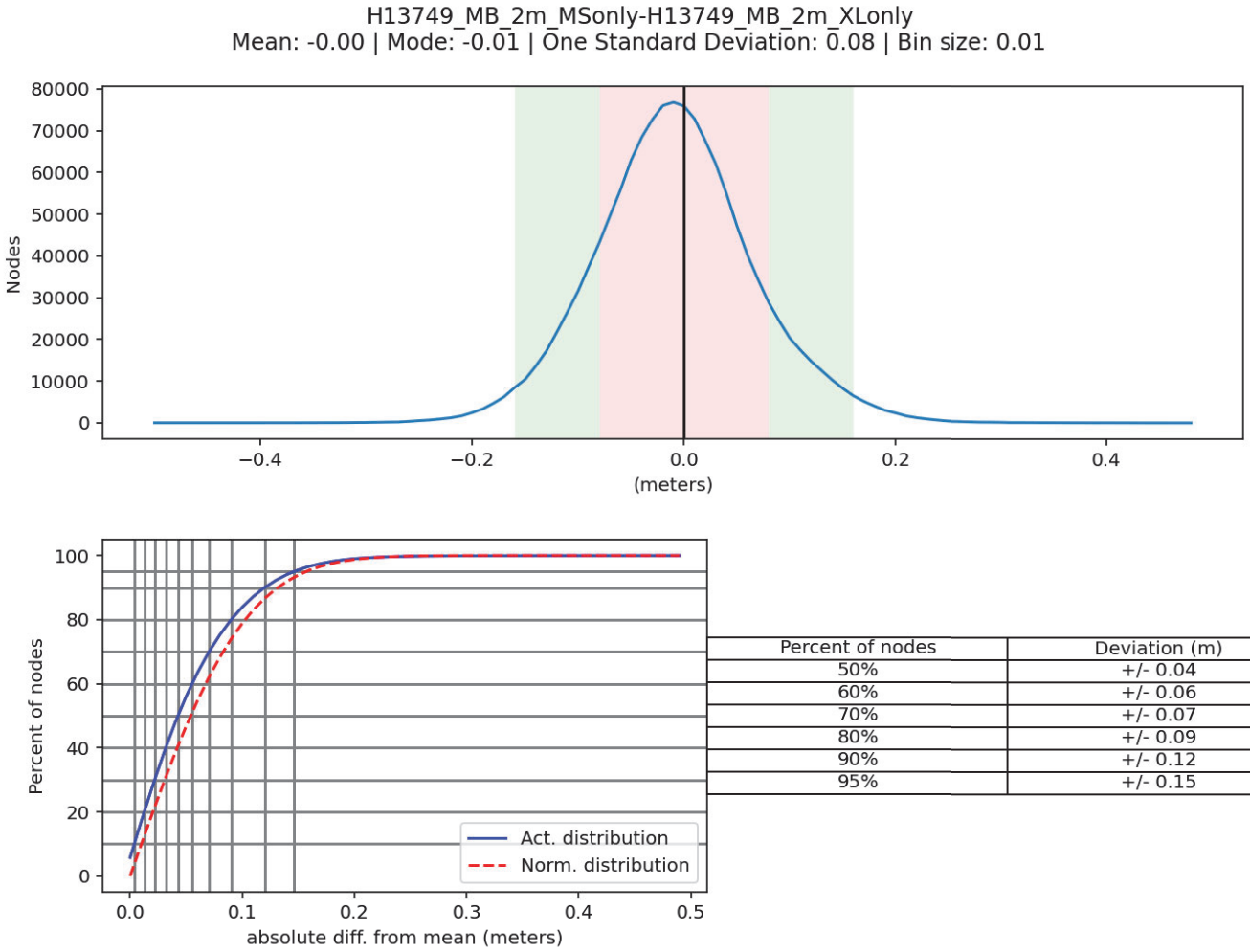


Figure 4: Overview of H13748 crosslines.



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.06
70%	+/- 0.07
80%	+/- 0.09
90%	+/- 0.12
95%	+/- 0.15

Figure 5: H13748 crossline and mainscheme difference statistics.

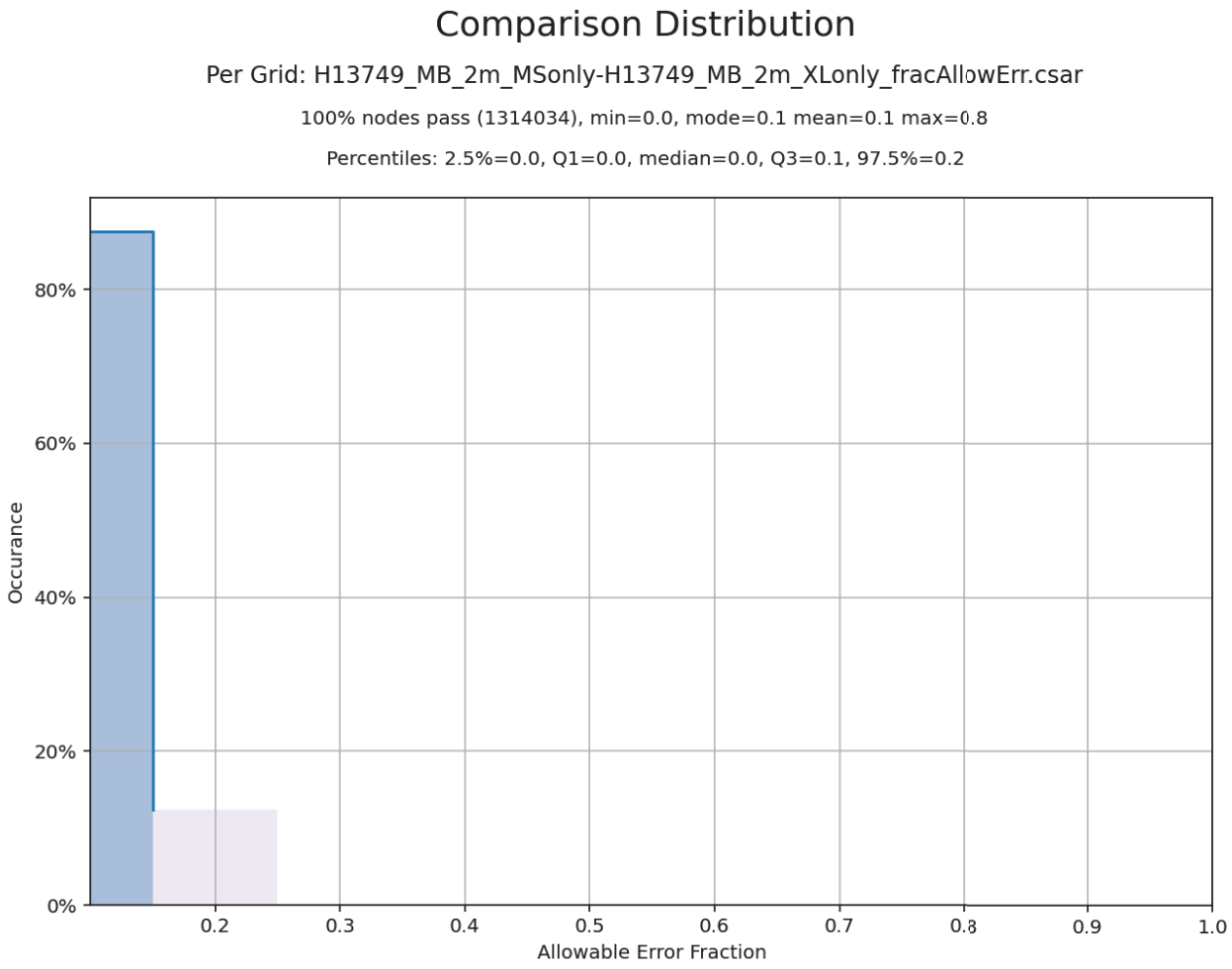


Figure 6: H13748 crossline and mainscheme NOAA allowable uncertainty statistics

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.126 meters	N/A

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
S250	N/A	2 meters/second	- meters/second	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

In addition to the usual a priori estimates of uncertainty provided via device models for vessel motion and VDATUM, real-time and post-processed uncertainty sources were also incorporated into the depth estimates of survey H13749. Real-time uncertainties were provided via EM 2040 MBES data, Applanix Delayed Heave RMS. Following post-processing of the real-time vessel motion, recomputed uncertainties of vessel roll, pitch, gyro, and navigation were applied in CARIS HIPS and SIPS via a Smoothed Best Estimate of Trajectory (SBET) RMS file generated in Applanix POSPac.

B.2.3 Junctions

H13749 junctions with 2 surveys from prior projects, H12931 and H12934, as well as another sheet from this project, H13748, as shown in Figure 7. Data overlap between H13749 and each adjacent survey was achieved. To evaluate junction agreements, a BAG or CSAR surface from each junction surface was compared to a CSAR surface from H13749 with the same resolution. The multibeam data were also examined in CARIS Subset Editor for consistency and agreement. The junctions with H13749 are generally within the NOAA allowable uncertainty in their areas of overlap. For all junctions with H13749, a negative difference indicates H13749 was shoaler, and a positive difference indicates H13749 was deeper.

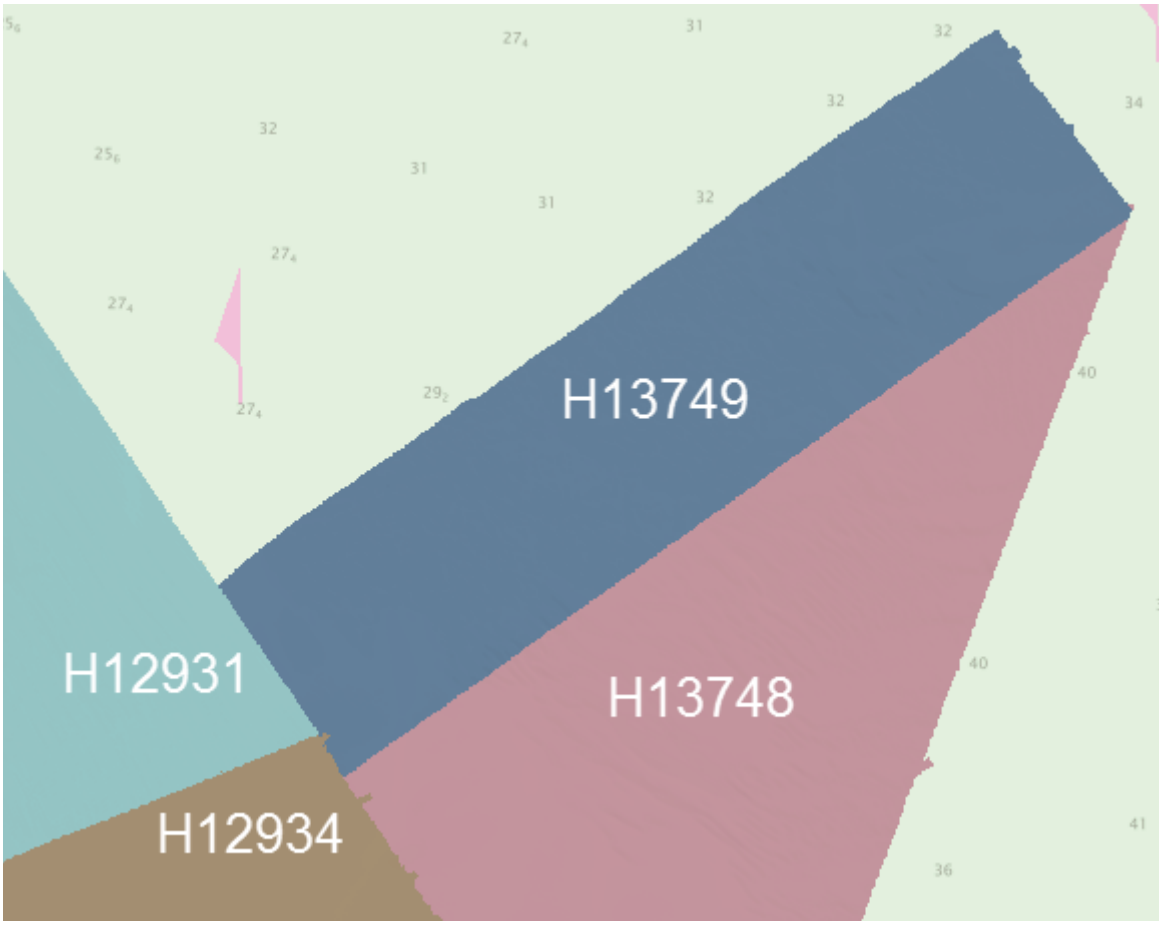


Figure 7: Overview of H13749 junction surveys.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12931	1:40000	2016	NOAA Ship Ferdinand R. Hassler	SW
H12934	1:40000	2016	NOAA Ship Ferdinand R. Hassler	S
H13748	1:40000	2023	NOAA Ship Ferdinand R. Hassler	SE

Table 9: Junctioning Surveys

H12931

Surface differencing using the Pydro Compare Surfaces tool was used to assess junction agreement between the 2 meter combined surface from H13749 and the 2 meter combined surface from H12931. A detailed graphical overview can be seen in Figure 8. The statistical analysis of the difference surface shows a mean of 0.11 meters with 95% of all nodes having a maximum deviation of +/- 0.13 meters, as seen in Figure

9. In addition, a comparison surface was created between the difference surface and the NOAA allowable uncertainty. It was found that 100% of nodes are within NOAA allowable uncertainty (Figure 10).

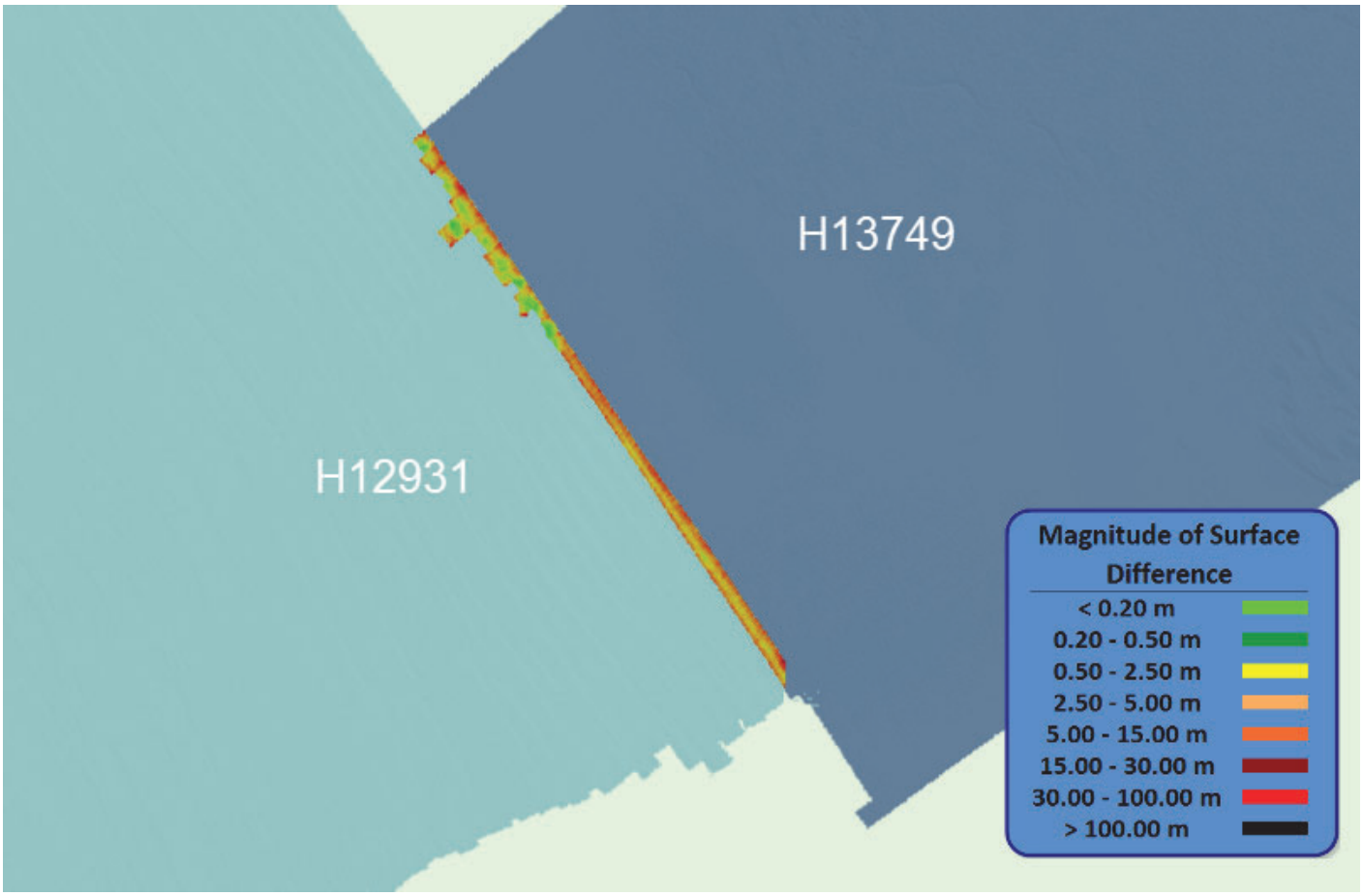
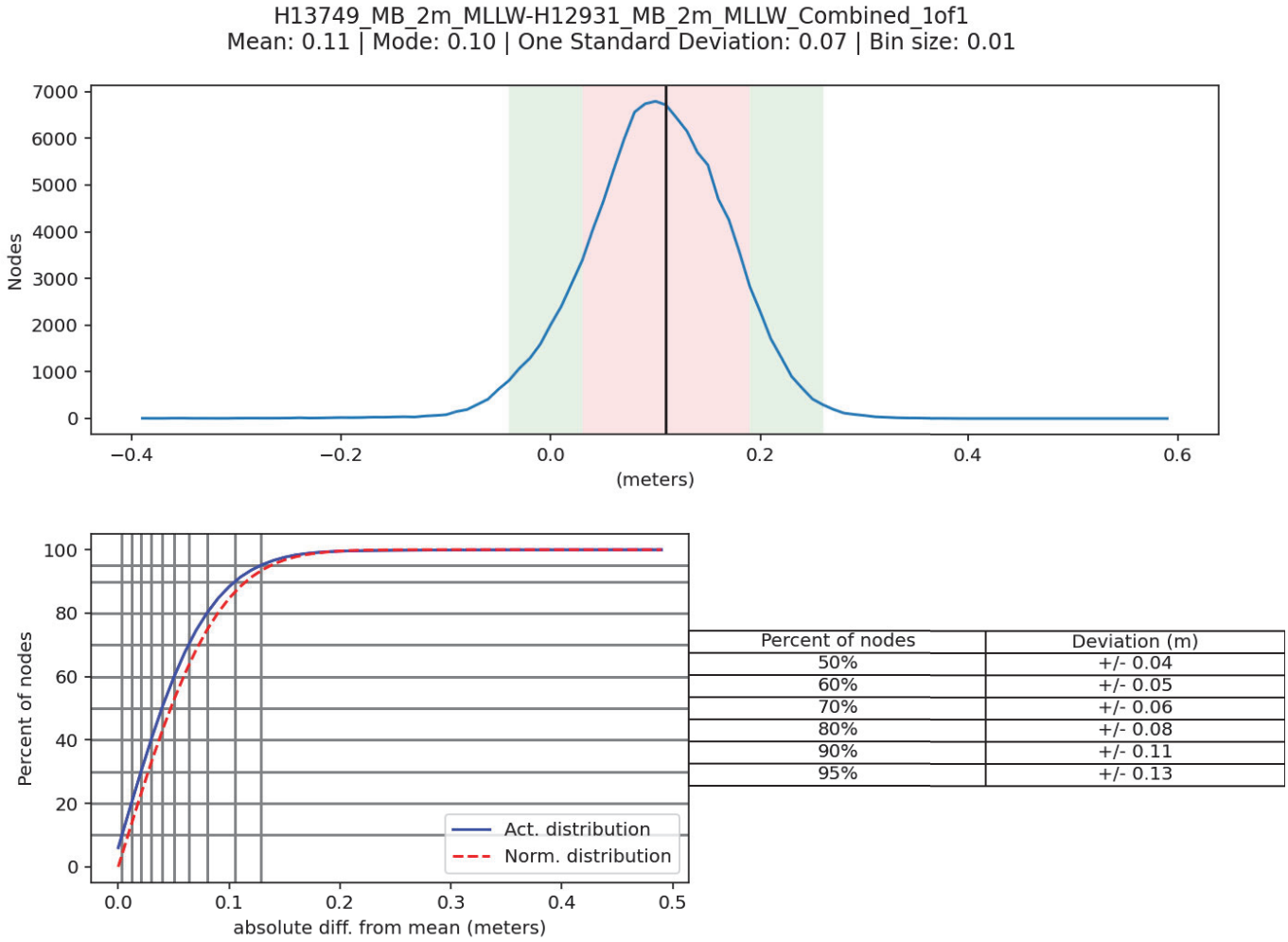


Figure 8: Difference surface between H13749 (gray) and junctioning survey H12931 (blue)



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.05
70%	+/- 0.06
80%	+/- 0.08
90%	+/- 0.11
95%	+/- 0.13

Figure 9: Difference surface statistics between H13749 and H12931 (2 meter surface)

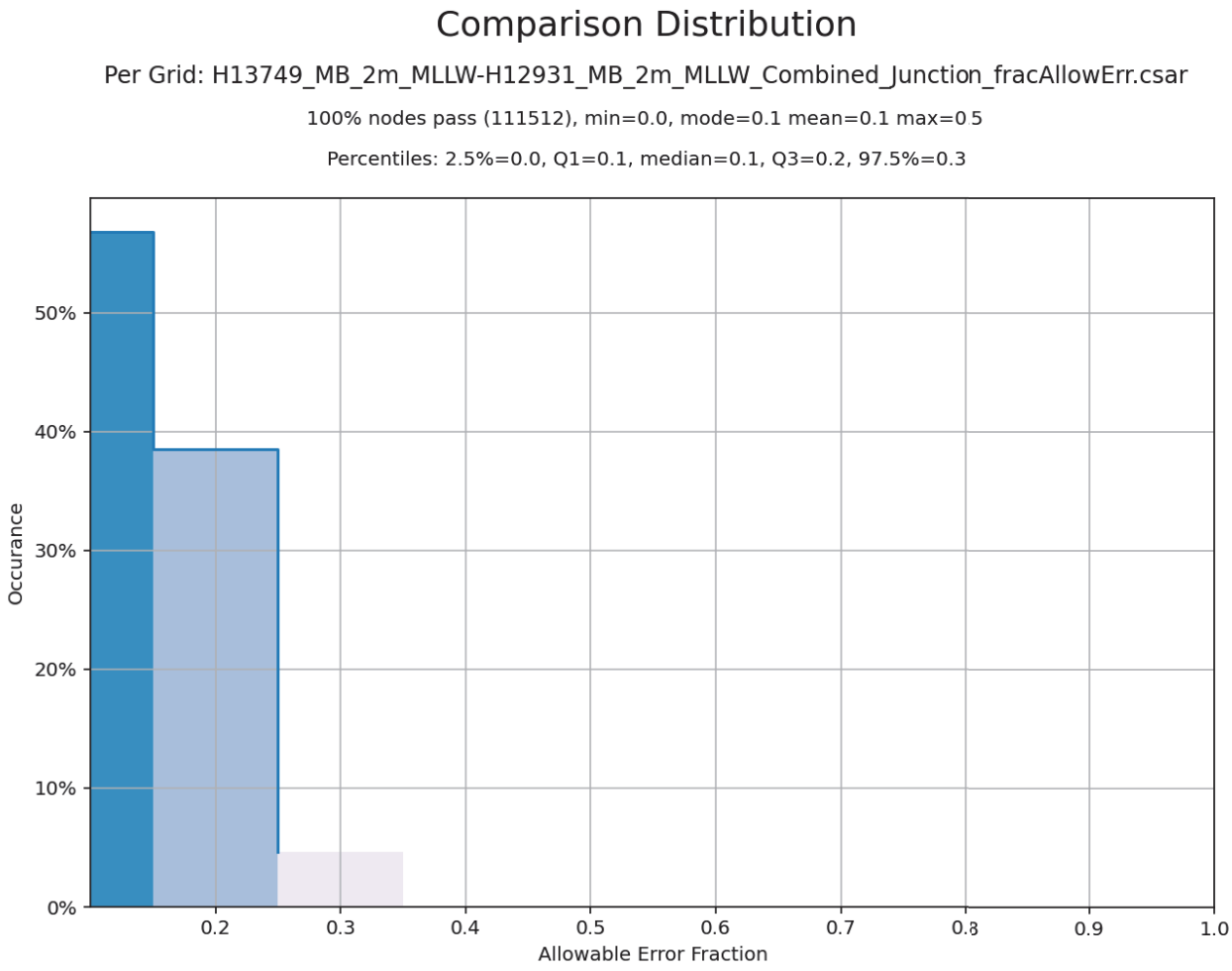


Figure 10: NOAA Allowable statistics between H13749 and H12931 (2 meter surface)

H12934

Surface differencing using the Pydro Compare Surfaces tool was used to assess junction agreement between the 2 meter combined surface from H13749 and the 2 meter combined surface from H12934. A detailed graphical overview can be seen in Figure 11. The statistical analysis of the difference surface shows a mean of 0.11 meters with 95% of all nodes having a maximum deviation of +/- 0.13 meters, as seen in Figure 12. In addition, a comparison surface was created between the difference surface and the NOAA allowable uncertainty. It was found that 100% of nodes are within NOAA allowable uncertainty (Figure 13).

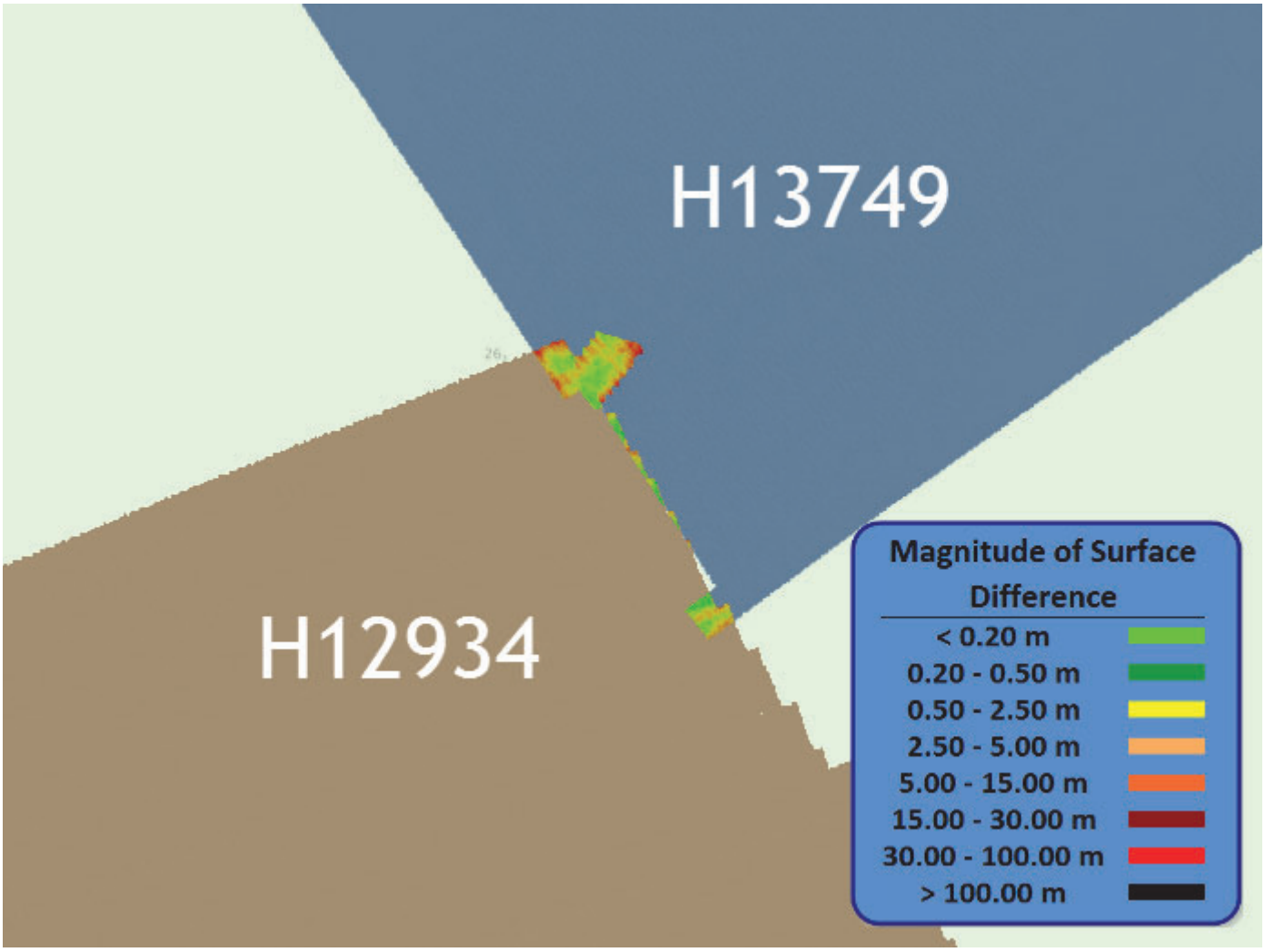
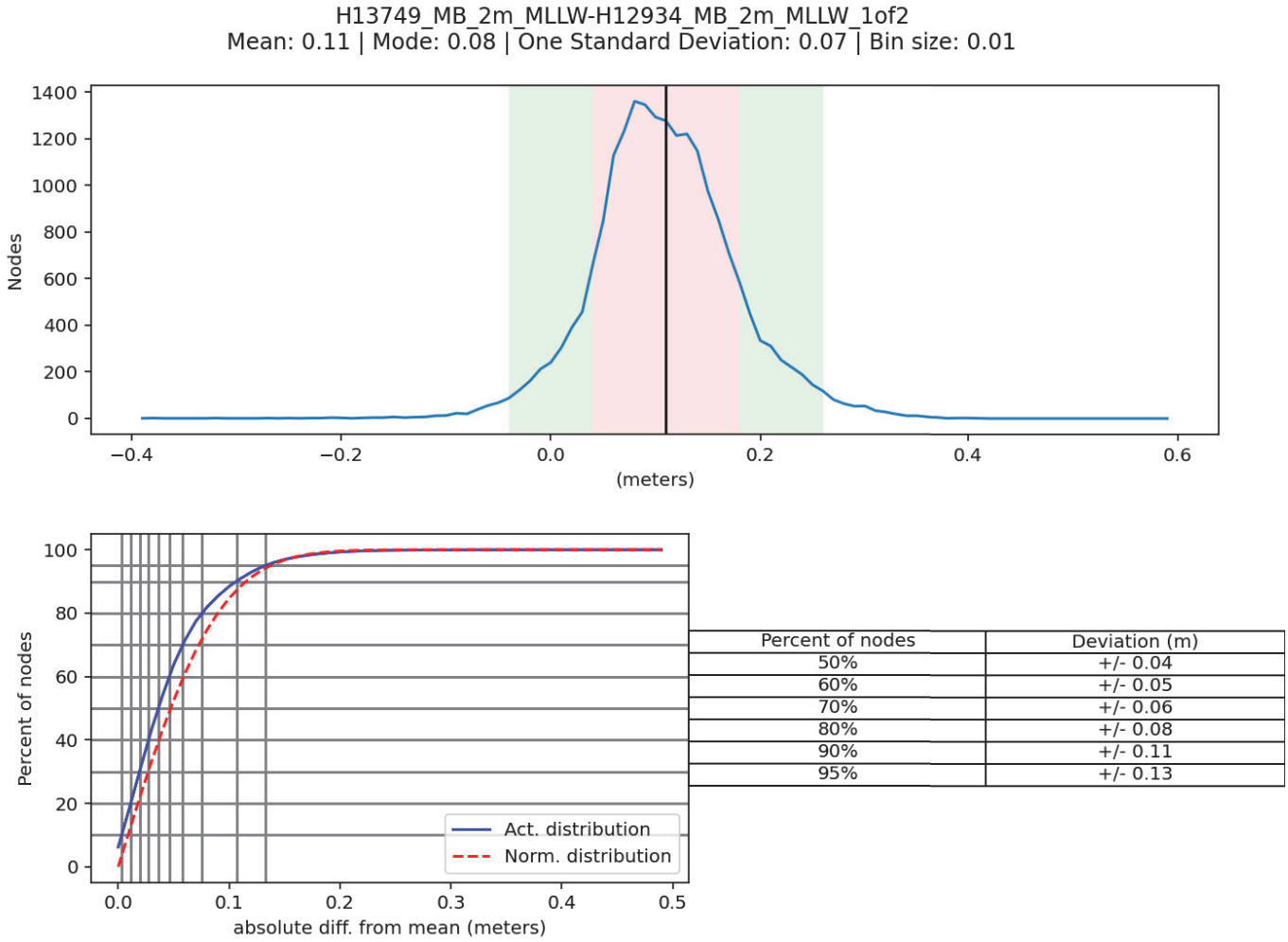


Figure 11: Difference surface between H13749 (gray) and junctioning survey H12934 (color)



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.05
70%	+/- 0.06
80%	+/- 0.08
90%	+/- 0.11
95%	+/- 0.13

Figure 12: Difference surface statistics between H13749 and H12934 (2 meter surface)

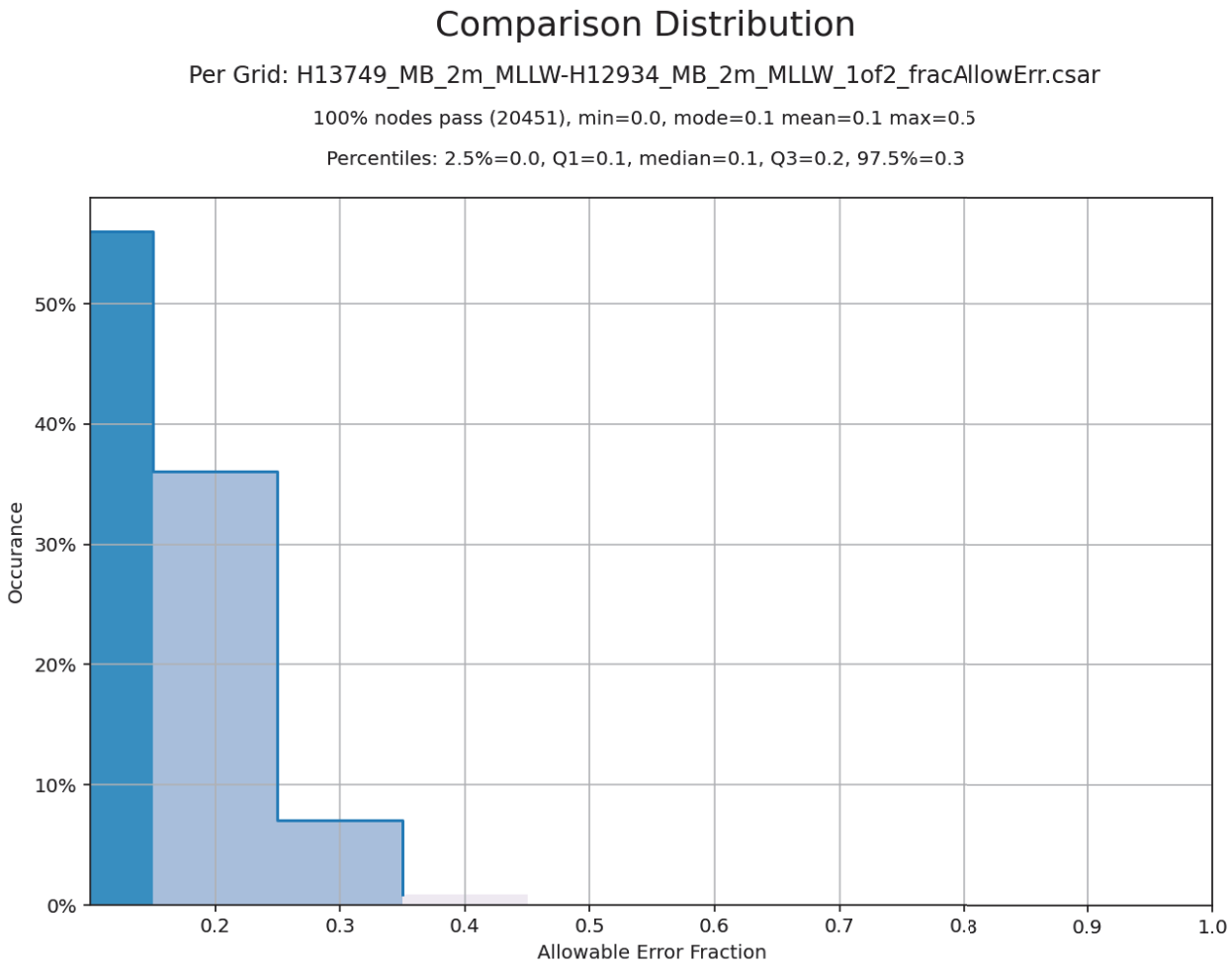


Figure 13: NOAA Allowable statistics between H13749 and H12934 (2 meter surface)

H13748

Surface differencing using the Pydro Compare Surfaces tool was used to assess junction agreement between the 2 meter combined surface from H13749 and the 2 meter combined surface from H13748. A detailed graphical overview can be seen in Figure 14. The statistical analysis of the difference surface shows a mean of 0.00 meters with 95% of all nodes having a maximum deviation of +/- 0.25 meters, as seen in Figure 15. In addition, a comparison surface was created between the difference surface and the NOAA allowable uncertainty (See Figure 16). It was found that 100% of nodes are within NOAA allowable uncertainty.

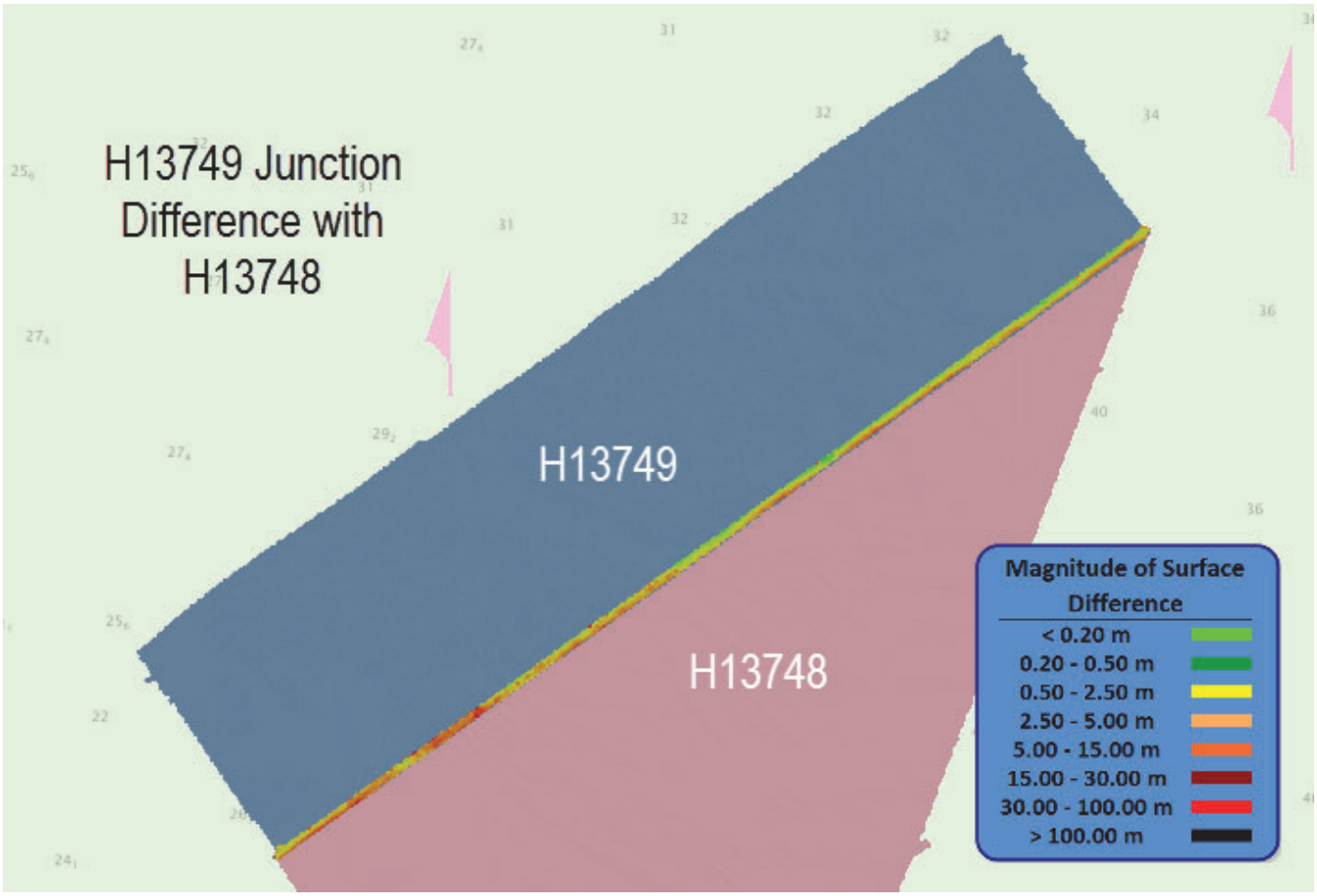
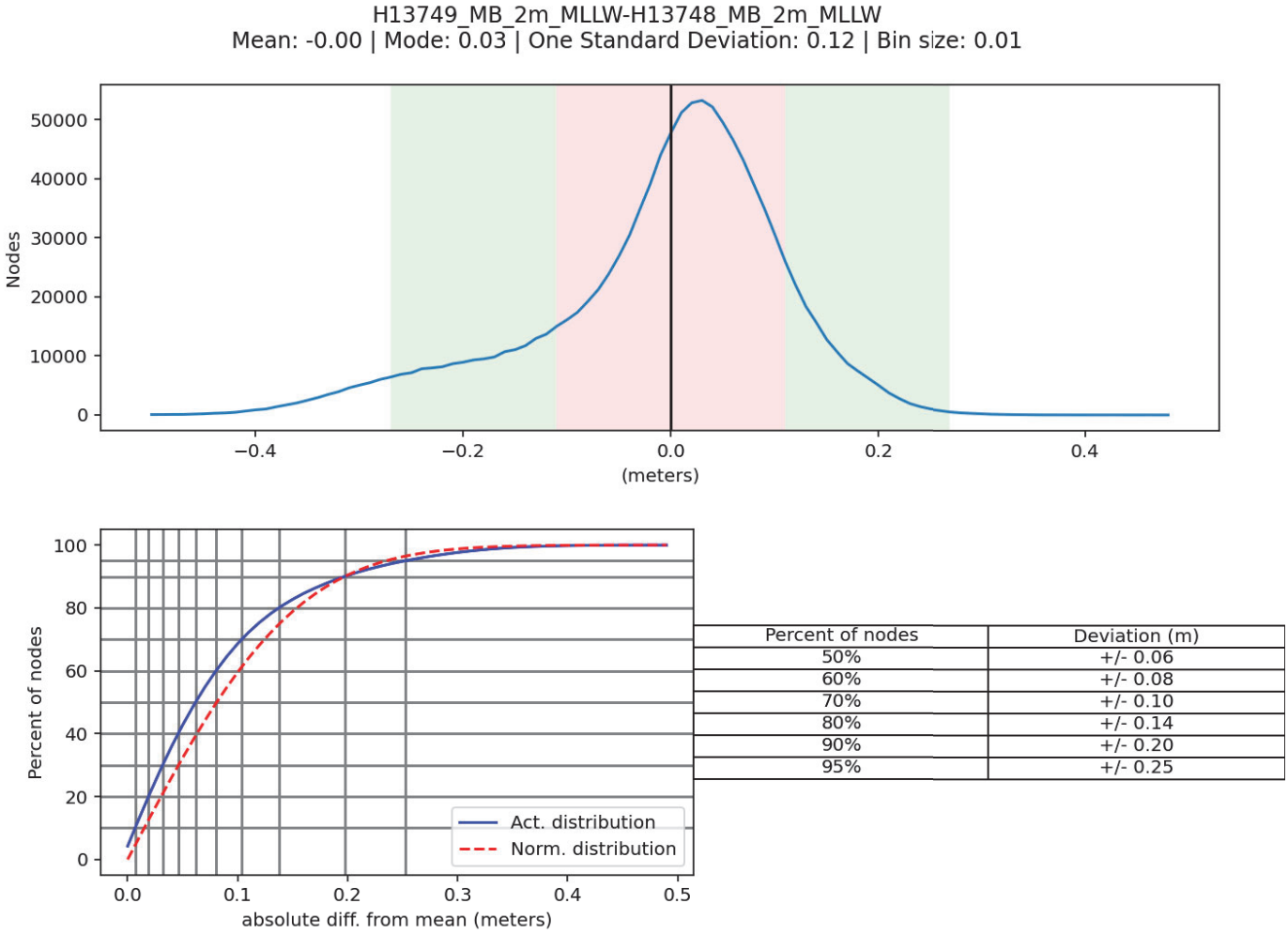


Figure 14: Difference surface between H13749 (gray) and junctioning survey H13748 (pink)



Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.08
70%	+/- 0.10
80%	+/- 0.14
90%	+/- 0.20
95%	+/- 0.25

Figure 15: Difference surface statistics between H13749 and H13748 (2 meter surface)

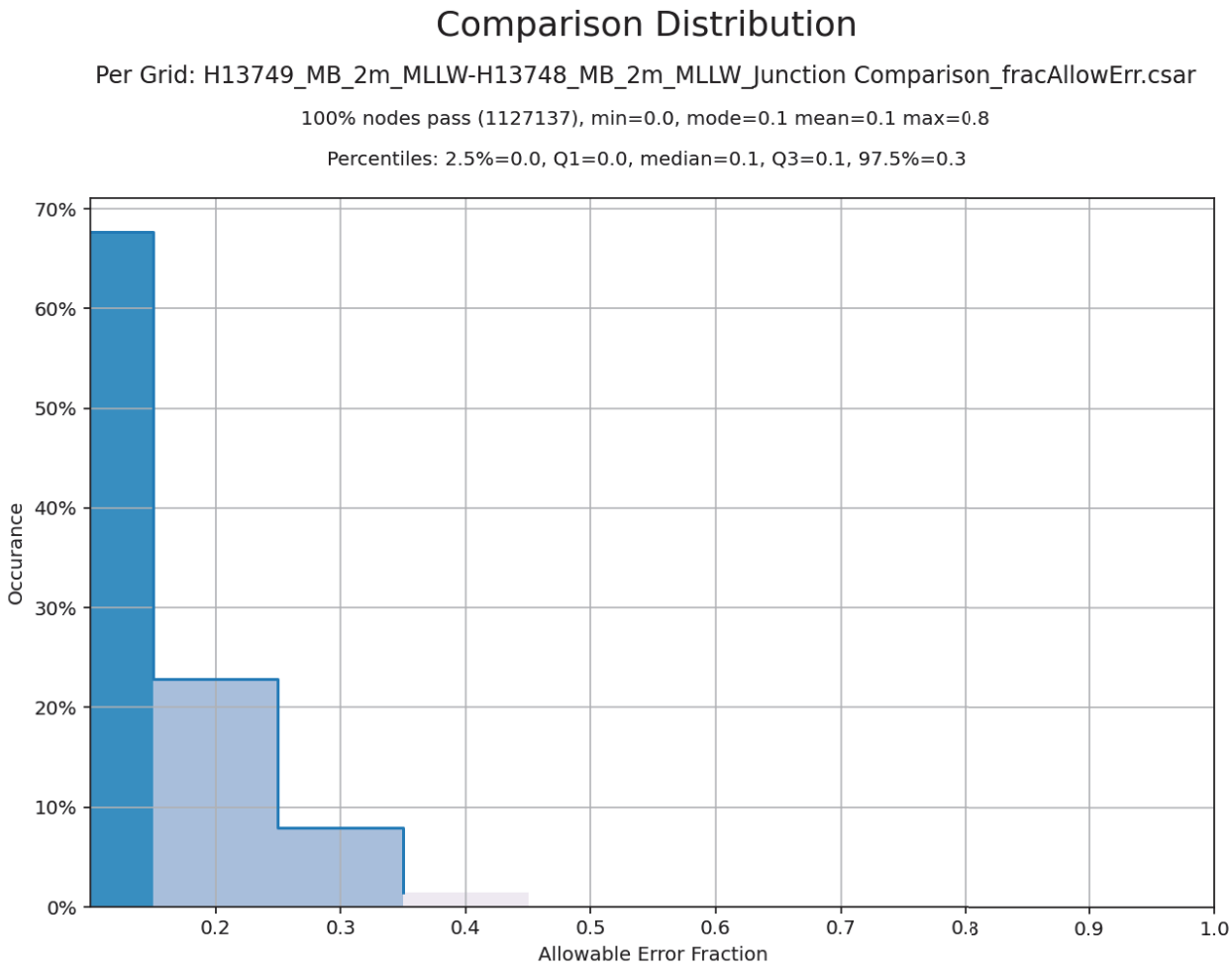


Figure 16: NOAA Allowable statistics between H13749 and H13748 (2 meter surface)

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

Attitude Network Issue

Data correction errors like those seen in Figure 17 were found throughout the survey. This error was determined to be caused by a networking issue between the POS MV and the Kongsberg EM2040 and, where the issue occurs, only affects a single ping. The errors caused by this issue and are very small and generally did not affect the gridded surface. Any erroneous soundings caused by this issue were rejected and the surface recomputed.

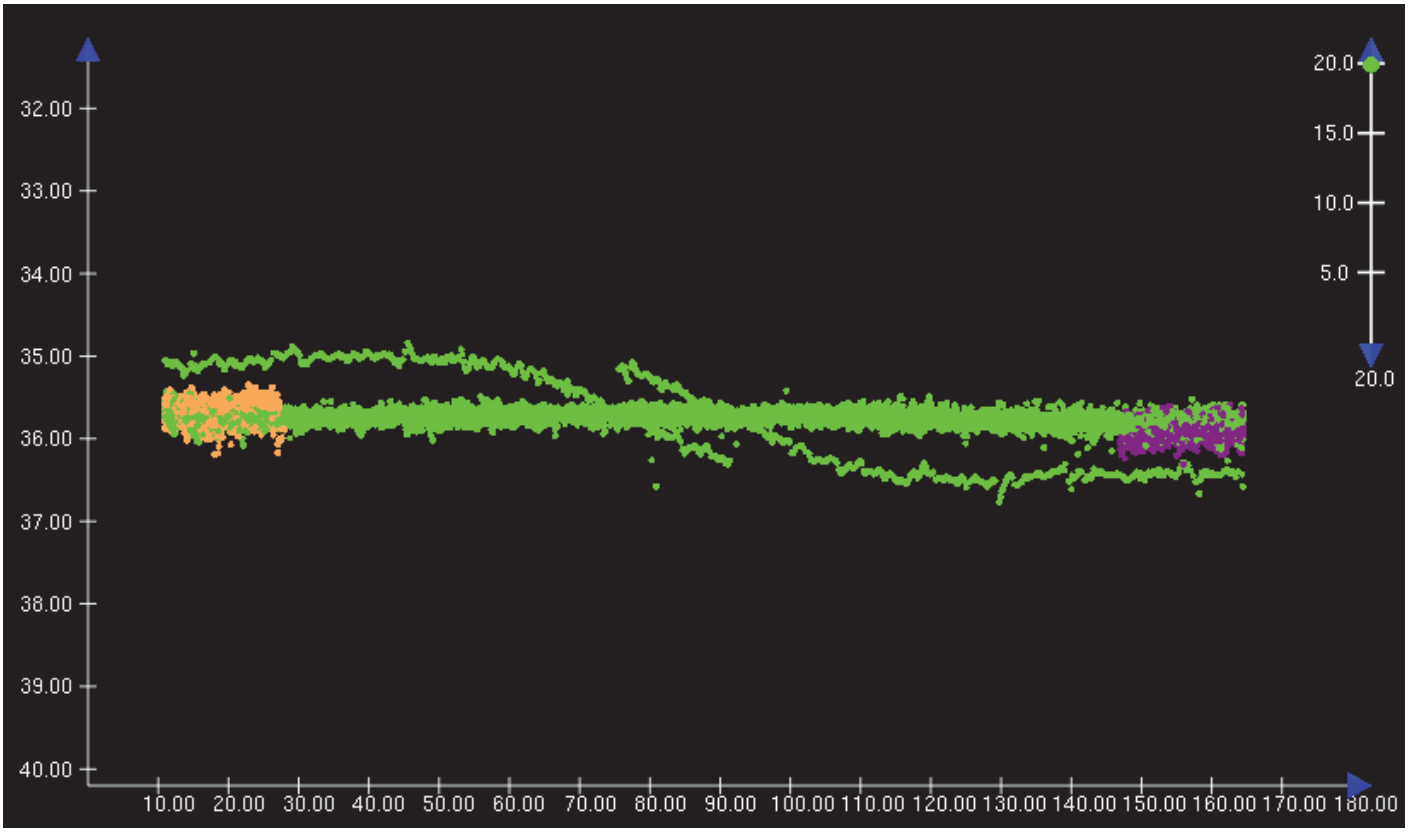


Figure 17: Example attitude network issue on H13749

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Casts were conducted at a minimum of once every 4 hours during acquisition. MVP casts on S250 were guided by observation of the surface sound speed and targeted to deeper areas. All sound speed methods were used as detailed in the DAPR.

B.2.8 Coverage Equipment and Methods

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

B.2.9 NOAA Allowable Uncertainty

The surface was analyzed using the HydrOffice QC Tools V3 Grid QA feature to determine compliance with specifications. Overall, 99.5% of nodes within the surface meet NOAA Allowable Uncertainty specifications for H13749 (Figure 18).

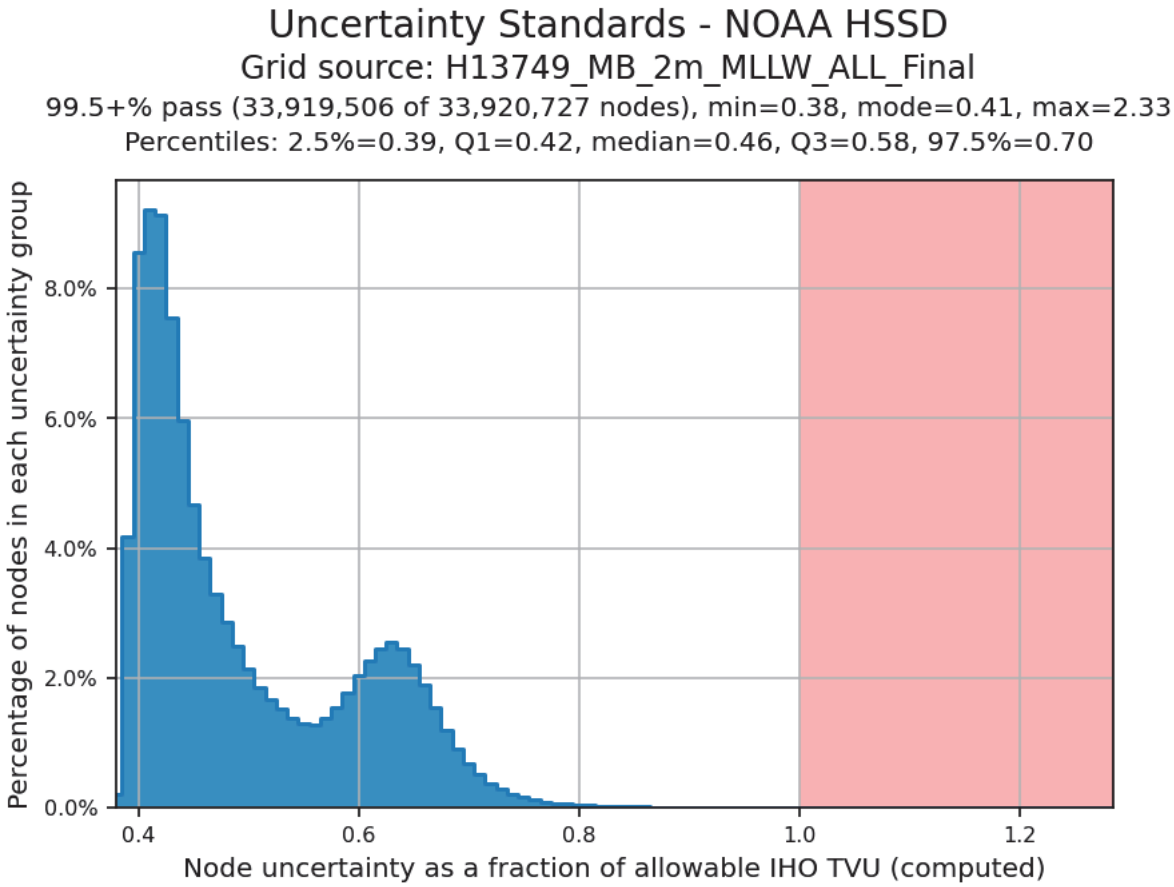


Figure 18: H13749 Allowable uncertainty statistics

B.2.10 Density

The surface was analyzed using the HydrOffice QC Tools V3 Grid QA feature to determine compliance with specifications. Density requirements for H13749 were achieved with at least 99.5% of surface nodes containing five or more soundings as required by HSSD Section 5.2.2.3 (Figure 19).

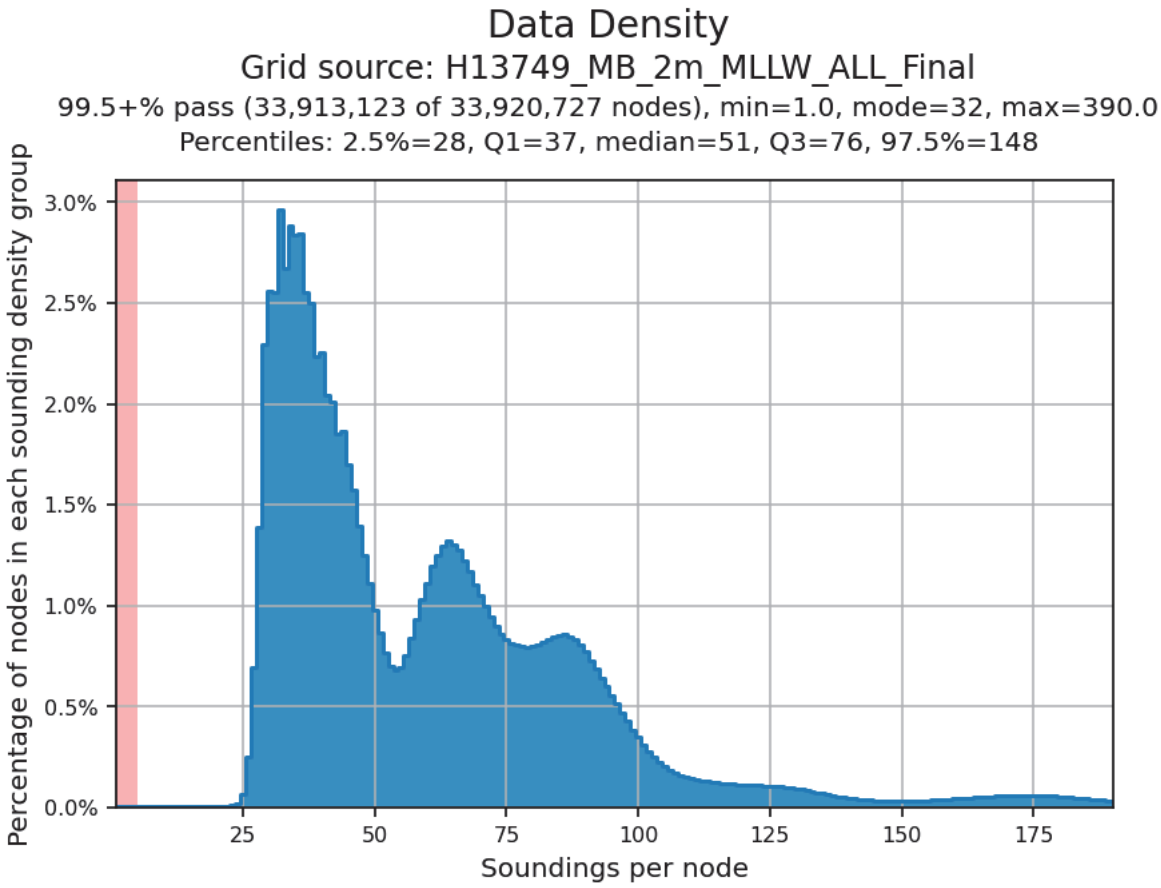


Figure 19: H13749 Data density statistics

B.2.11 Holidays

There are multiple holidays on sheet H13749. This occurred because the ship suffered a season ending mechanical failure and was unable to return to the survey grounds for clean up. These holidays are found at the edges of swaths where the subsequent line does not overlap the previous. The largest of these is 208m long and 11m wide at its widest point. For reference holidays are captured in the H13749_Holidays.000 submitted in the II_Supplemental_Records folder.

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 were stored in the .all file for Kongsberg systems. All backscatter were processed to GSF files and a floating point mosaic was created by the field unit via Fledermaus FMGT 7.9.0 . See Figure 20 for a greyscale representation of the complete mosaic.

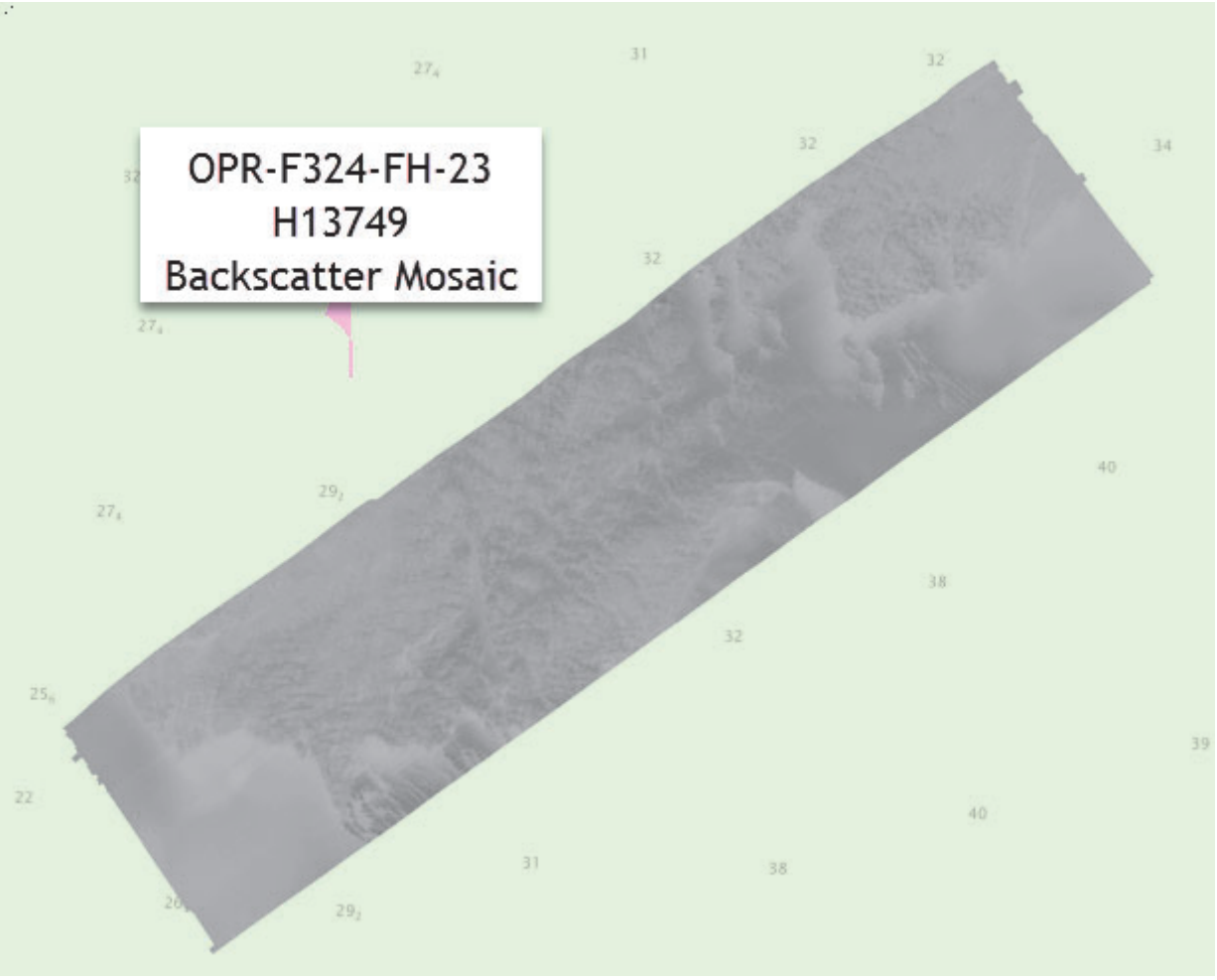


Figure 20: Backscatter mosaic for H13749

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 and SIPS	11.4.25
NOAA	Pydro	22.1

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	8.9

Table 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile Version 2023.

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
H13749_MB_2m_MLLW.csar	CARIS Raster Surface (CUBE)	2 meters	-	NOAA_2m	Complete MBES
H13749_MB_2m_MLLW_Final.csar	CARIS Raster Surface (CUBE)	2 meters	18.0 meters - 40.0 meters	NOAA_2m	Complete MBES
H13749_MBAB_2m_S250_300kHz_1of1.tiff	MB Backscatter Mosaic	2 meters	-	N/A	Complete MBES

Table 12: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the creation of all CUBE surfaces in Survey H13749. The surfaces have been reviewed where noisy data, or "fliers," are incorporated into the gridded solutions causing the surface to be shoaler or deeper than the true sea floor. Where these spurious soundings cause the gridded surface to be shoaler or deeper than the reliably measured seabed by greater than the maximum allowable Total Vertical Uncertainty at that depth, the noisy data have been rejected by the hydrographer and the surface recomputed.

Flier Finder, part of the QC Tools package within HydrOffice, was used to assist the search for spurious soundings following gross cleaning. Flier Finder was run iteratively until all remaining flagged fliers were deemed to be valid aspects of the surface. 2 fliers were highlighted by Flier Finder. These were determined by the hydrographer to be on a real feature of the bottom.

B.5.3 Data Logs

Data acquisition and processing notes are captured in field acquisition logs. Additional processing such as final tide, positioning, and sound speed application are noted a data log spreadsheet. Processed vs. raw line count comparisons are also completed in the data log. The hydrographer reviewed these documents to ensure proper correctors were applied to each line and all data issues are captured in this report.

C. Vertical and Horizontal Control

Per Section 5.2.2.1.3 of the 2020 Field Procedures Manual no Horizontal and Vertical Control Report has been generated for H13749.

C.1 Vertical Control

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

ERS Datum Transformation

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

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	OPR-F324-FH-23_NAD83_2011_VDATUM_MLLW.csar

Table 13: ERS method and SEP file

ERS methods were used as the final means of reducing H13749 to MLLW for submission.

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 18.

The following PPK methods were used for horizontal control:

- RTX

Vessel kinematic data were post-processed using Applanix POSPac processing software and RTX methods described in the DAPR. Smoothed Best Estimate of Trajectory (SBET) and associated error (RMS) data were applied to all MBES data in CARIS HIPS and SIPS.

WAAS

During real-time acquisition, S250 received correctors from the Wide Area Augmentation System (WAAS) for increased accuracies similar to USCG DGPS stations. WAAS and SBETs were the sole methods of positioning for H13749 as no DGPS stations were available for realtime horizontal control.

C.3 Additional Horizontal or Vertical Control Issues

C.3.1 DN 253 GPS Week Issue

Acquisition of POSMV data associated with MBES lines 0001 and 0002 began prior to midnight on DN253 (SEP 10). This caused a GPS week mis-match between the POS data and the MBES data for these two lines leading to the inability for Caris HIPS to process heave data manifesting as a heave artifact in the CUBE surface. To overcome this, POS delayed heave was reapplied to these lines manually in Caris HIPS setting the GPS week to SEP 03. Doing this allowed Caris to process the delayed heave for these lines. Afterwards, SBETs were reapplied and these lines re-georeferenced. The surface was recomputed confirming that the heave artifact was resolved.

D. Results and Recommendations

D.1 Chart Comparison

A comparison was performed between survey H13749 and ENC US3SC10M using CARIS HIPS and SIPS and a sounding layer derived from the 2 meter combined surface. The soundings were overlaid on the chart to assess differences between the surveyed soundings and charted depths. There were no contours to compare to on this chart.

All data from H13749 should supersede charted data. In general, surveyed soundings agree with the majority of charted depths.

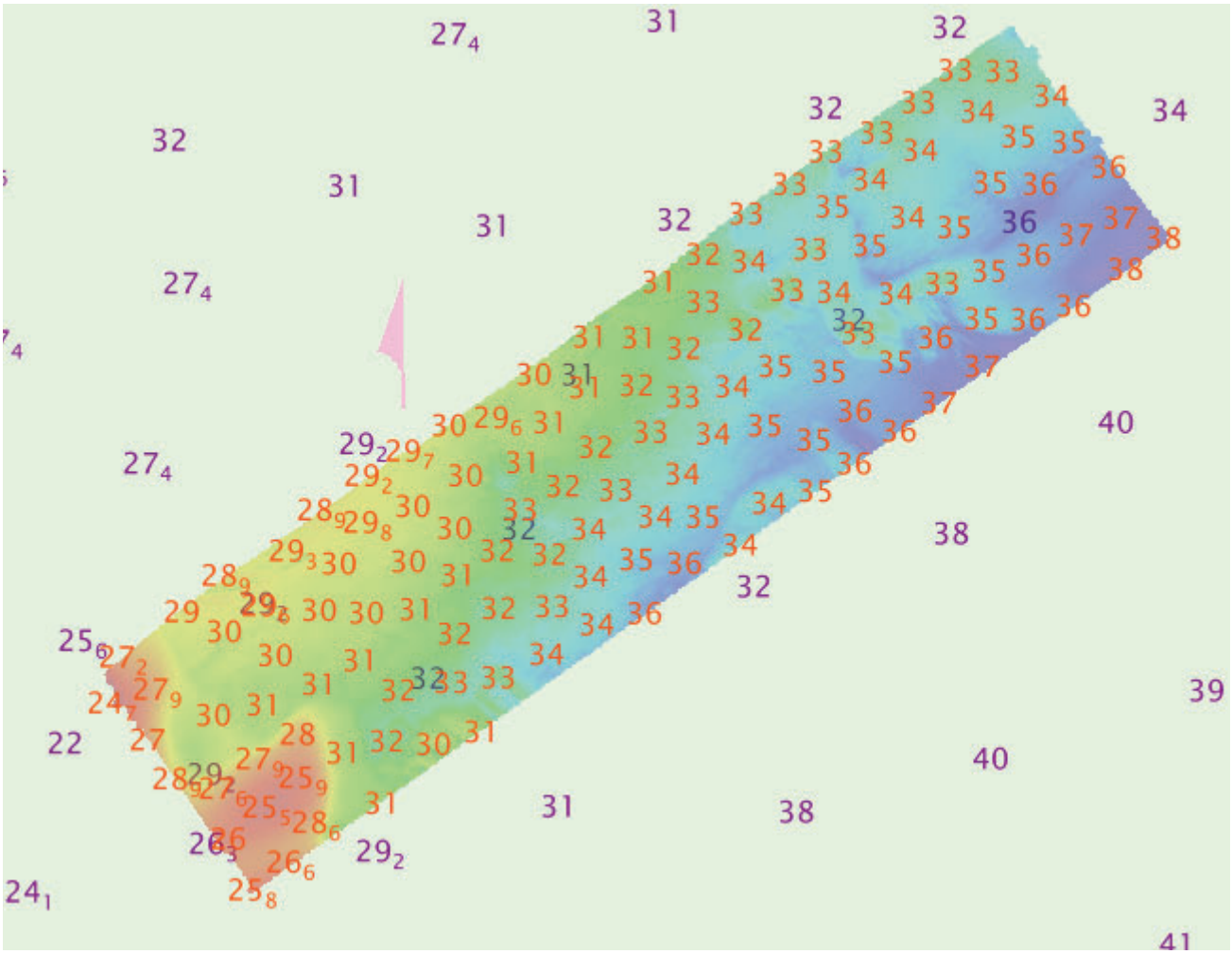


Figure 21: H13749 soundings (orange) overlaid on ENC US3SC10M (purple)

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
US3SC10M	1:432720	37	07/28/2022	08/17/2023

Table 14: 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

No uncharted features exist for this survey.

D.1.5 Channels

No channels exist 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

Bottom samples were assigned for this survey, but were not acquired due to the season ending mechanical issue.

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

While observing the data, apparent ancient river beds and potential "Carolina Bays" were present. It is believed these originate from the last glacial maximum and benefit from Frying Pan Shoals protecting them from the shifting sands observed on adjacent surveys. Further research is on going with potential publications to result. The ship is scheduled to return to the area to continue to survey and delineate these features.

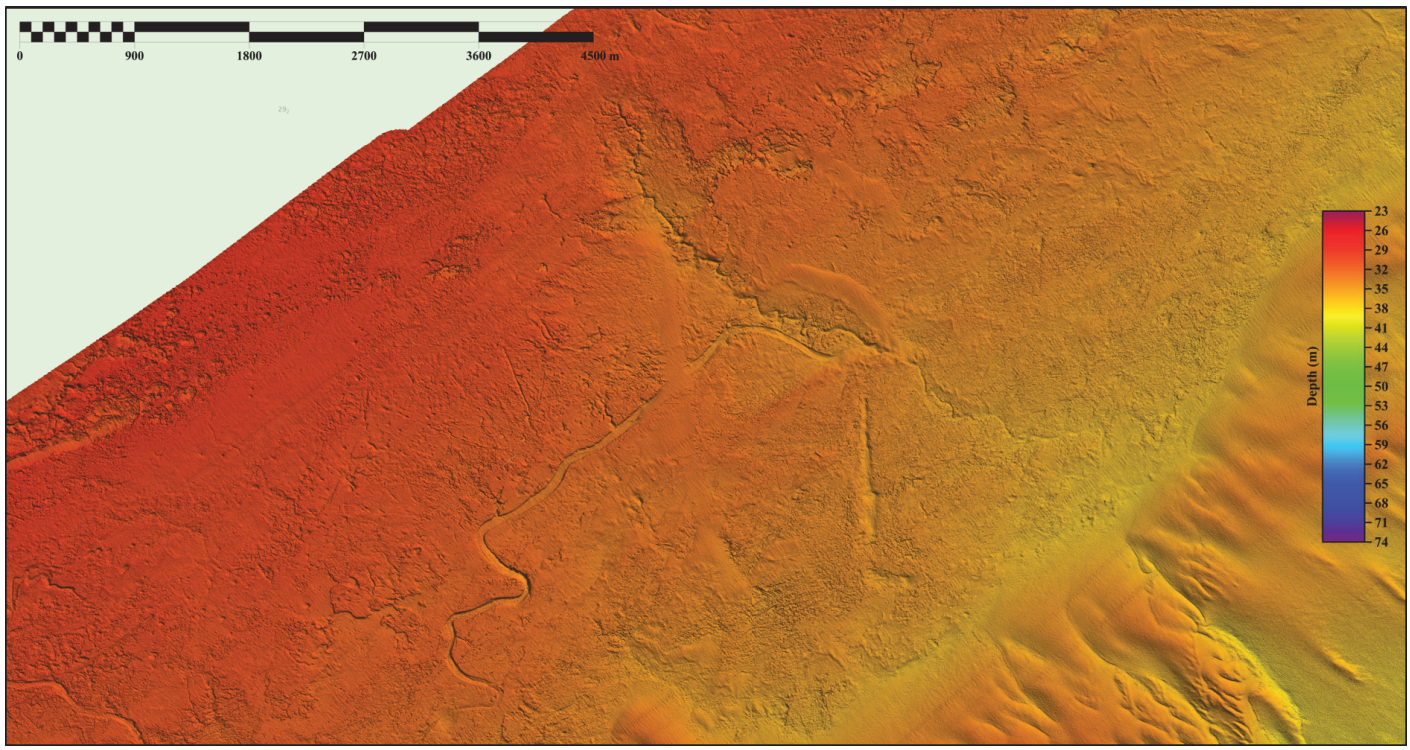


Figure 22: Example ancient rivers found on H13749

D.2.9 Construction and Dredging

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

D.2.10 New Survey Recommendations

Further surveys are recommended in the area to support the delineation of the geologic features described in D.2.8.

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
CDR William Winner	Commanding Officer	11/03/2023	Digitally signed by WINNER.WILLIAM.GORDON.1284010430 Date: 2023.11.04 10:50:47 -04'00'
LT Patrick Debroisse, CMH CAT-A	Operations Officer	11/03/2023	Digitally signed by DEBROISSE.PATRICK.JOSEPH.1501248670 Date: 2023.11.04 15:33:16 -04'00'

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	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