H13210

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13210

LOCALITY

State(s):	California
General Locality:	Channel Islands, CA
Sub-locality:	Vicinity of North-Central Santa Cruz Island

2019

CHIEF OF PARTY
CAPT Marc Moser

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Date:

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

H13210

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:	**Channel Islands, CA**
Sub-Locality:	**Vicinity of North-Central Santa Cruz Island**
Scale:	**20000**
Dates of Survey:	**10/04/2019 to 10/22/2019**
Instructions Dated:	**08/27/2019**
Project Number:	**OPR-L397-FA-19**
Field Unit:	**NOAA Ship Fairweather (S220)**
Chief of Party:	**CAPT Marc Moser**
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/.

Table of Contents

List of Tables

List of Figures

Descriptive Report to Accompany Survey H13210

Project: OPR-L397-FA-19

Locality: Channel Islands, CA

Sublocality: Vicinity of North-Central Santa Cruz Island

Scale: 1:20000

October 2019 - October 2019

NOAA Ship *Fairweather*

Chief of Party: CAPT Marc Moser

A. Area Surveyed

The survey is located in the vicinity of North-Central Santa Cruz Island, CA

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
34° 6' 28.08" N 119° 49' 42.57" W	34° 1' 10.37" N 119° 41' 11.98" W

Table 1: Survey Limits

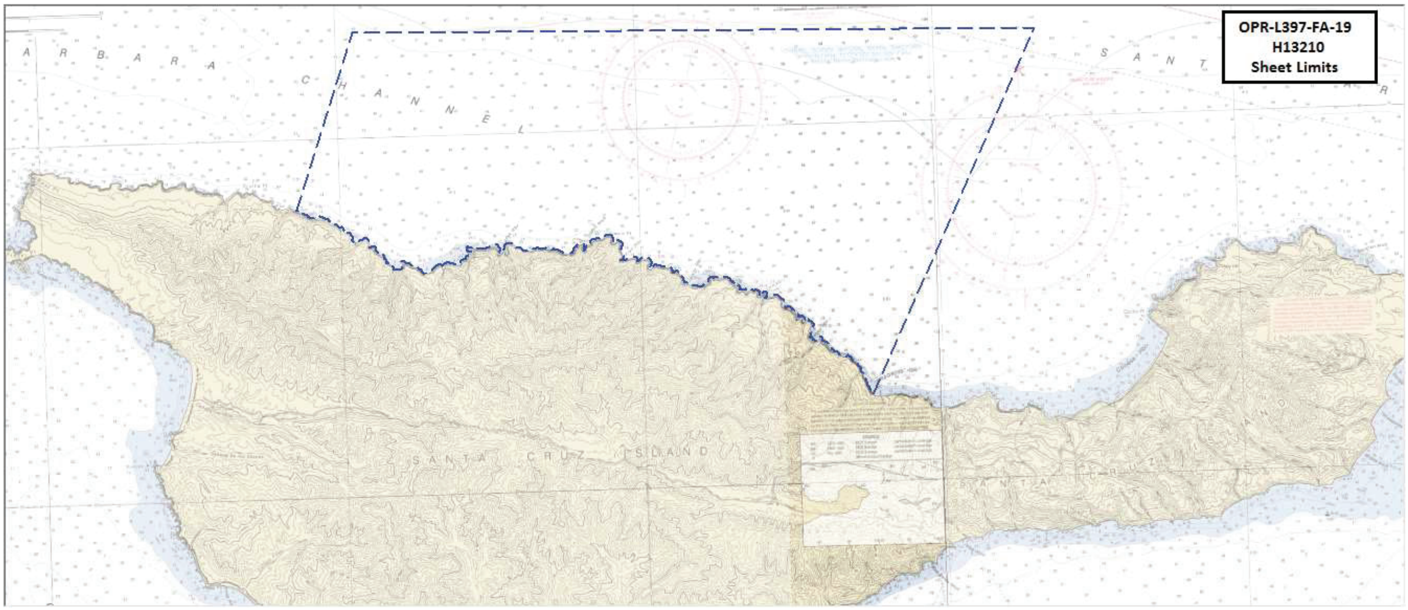


Figure 1: H13210 sheet limits (in blue) overlaid onto charts 18728 and 18729

Data were acquired to the survey limits in accordance with the requirements in the Project Instructions and the March 2019 NOS Hydrographic Survey Specifications and Deliverables (HSSD) as shown in Figure 1. In all areas where the 3.5 meter depth contour or the sheet limits were not met, the Navigable Area Limit Line (NALL) was defined as the inshore limit of bathymetry due to the risks of maneuvering the survey vessel in close proximity to areas of heavy swell and breakers. An example of such an area is shown in Figure 2.

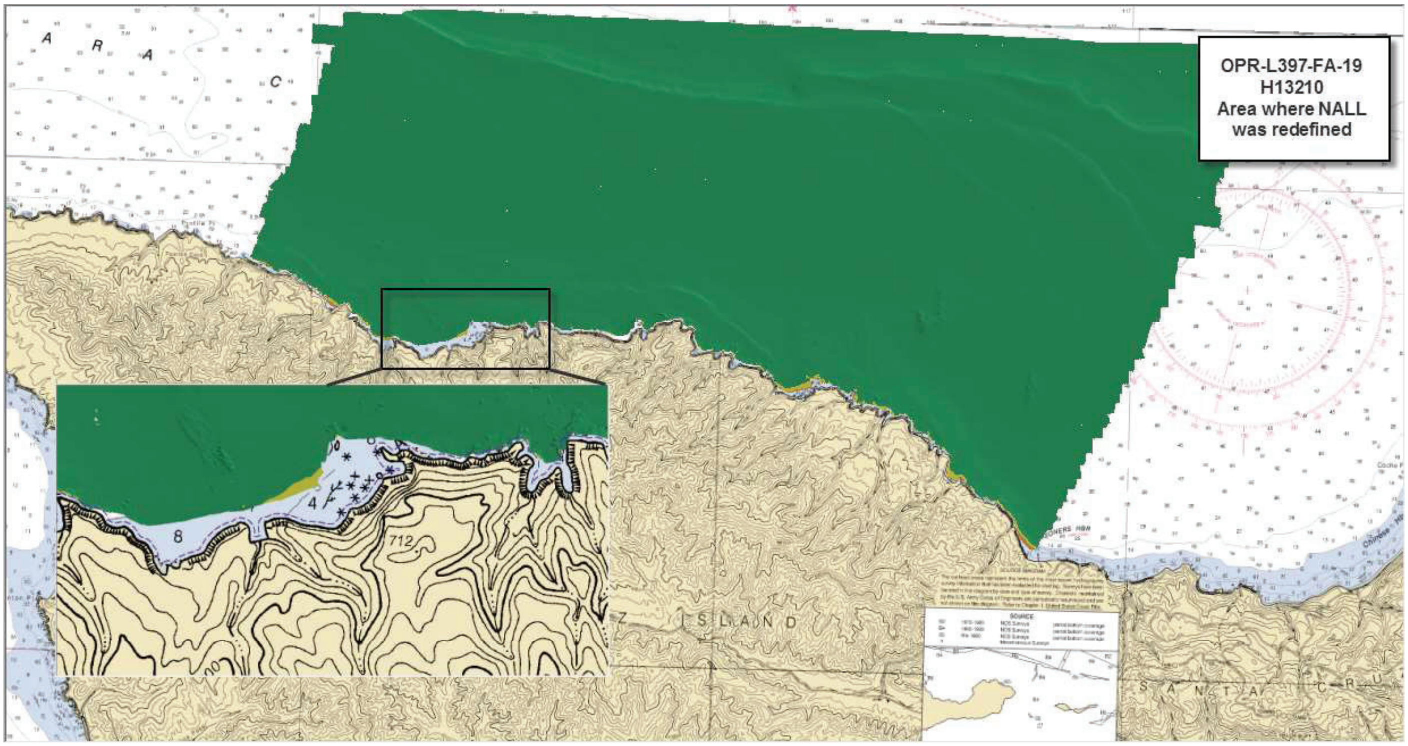


Figure 2: Area where NALL was defined by presence of heavy swell and breakers

A.2 Survey Purpose

This year the Channel Islands National Marine Sanctuary work will focus on the remaining survey area around Santa Cruz Island, the largest of the Channel Islands (about 97 sq. mi.), located about 30 miles offshore of the California mainland city of Santa Barbara. The waters surrounding CINMS are highly productive and are home to recreational and commercial fishing efforts, and regularly host kayakers, surfers, sightseers, whale watchers, researchers, and Channel Islands National Park concessionaires, who all access the sanctuary via boats. Correspondingly, the abundance of sea life and aquatic habitats drives a thriving industry of recreational and commercial fishing that brings varied vessel traffic through the waters of CINMS. The commercial fishing vessel traffic alone is responsible for the highest commercial landings value (approximately $450 million; 2005-2015) across all of California's ports. Additionally, major mainland port traffic transiting to and from Los Angeles and Long Beach, California routes large cargo and tanker vessels close to CINMS boundaries. Much of the existing nautical chart data dates back to 1930s lead line or single beam echo sounder surveys, and the areas not surveyed to modern standards are predominantly located in the shallow waters (<40m) where the vessel traffic is highest. This poses a serious risk to life, property, and the delicate ecosystem with 64 groundings since 2000. Increasing traffic is increasing the risk, with seven of those groundings in 2015 alone. Modern survey efforts, such as a 2015 survey by NOAA Ship Bell M. Shimada, have found previously undetected pinnacles within the sanctuary. This survey will continue modern mapping efforts to identify any similar threats that may exist in these waters. The CINMS hydrographic survey will be as unique as the region itself. In addition to providing data for crucial nautical chart updates, this survey will also generate backscatter data, which will be used in habitat mapping and substrate analysis. Both multibeam echo sounder and backscatter data will not only serve to enhance marine navigational safety, but will also be used by sanctuary managers, planners, and researchers, aiding them in the conservation of this most precious resource. Survey data from this project is intended to supersede all prior survey data in the common area.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13210 meet multibeam echo sounder (MBES) coverage requirements for complete coverage, as required by the HSSD. This includes crosslines (see Section B.2.1), NOAA allowable uncertainty (see Section B.2.10), and density requirements (see Section B.2.11).

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

Table 2: Survey Coverage

The entirety of H13210 was acquired with complete coverage, meeting the requirements listed above and in the HSSD. See Figure 3 for an overview of coverage.

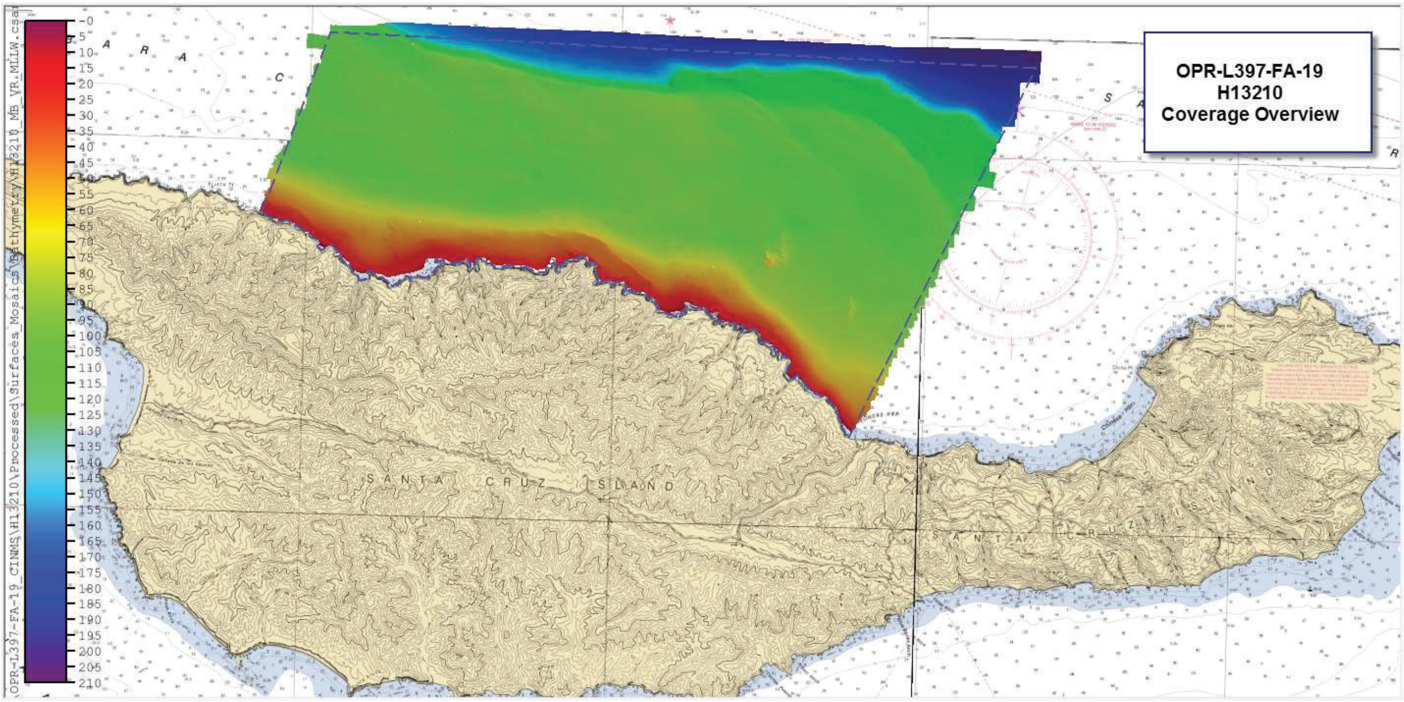


Figure 3: H13210 survey coverage overlaid onto charts 18728 and 18729

A.6 Survey Statistics

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

	HULL ID	*S220*	*2805*	*2806*	*2807*	*2808*	*Total*
LNM	SBES Mainscheme	0	0	0	0	0	0
	MBES Mainscheme	112.84	44.34	32.90	47.33	43.95	281.36
	Lidar Mainscheme	0	0	0	0	0	0
	SSS Mainscheme	0	0	0	0	0	0
	SBES/SSS Mainscheme	0	0	0	0	0	0
	MBES/SSS Mainscheme	0	0	0	0	0	0
	SBES/MBES Crosslines	0	0	0	15.74	0	15.74
	Lidar Crosslines	0	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							33.41

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
10/04/2019	277
10/05/2019	278

Survey Dates	Day of the Year
10/06/2019	279
10/15/2019	288
10/16/2019	289
10/22/2019	295

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the OPR-L397-FA-19 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	***S220***	***2805***	***2806***	***2807***	***2808***
LOA	70.4 meters	8.6 meters	8.6 meters	8.6 meters	8.6 meters
Draft	4.8 meters	1.1 meters	1.1 meters	1.1 meters	1.1 meters

Table 5: Vessels Used

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg Maritime	EM 710	MBES
Kongsberg Maritime	EM 2040	MBES
Teledyne RESON	SVP 70	Sound Speed System
Teledyne RESON	SVP 71	Sound Speed System
Lockheed Martin	Deep Blue	Expendable Bathythermograph (XBT)
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
Applanix	POS MV 320 v5	Positioning and Attitude System

Table 6: Major Systems Used

The equipment was installed on the survey platform as follows: S220 utilizes the Kongsberg EM 710 MBES, a POS MV v5 system for position and attitude, SVP 70 surface sound speed, and Lockheed Martin Deep Blue Expendendable Bathythermograph (XBT) for temperature and depth casts. All launches utilize Kongsberg EM2040 MBES, Teledyne Reson SVP 71 surface sound speed sensors, and Sea-Bird Scientific 19plus CTD casts.

B.2 Quality Control

B.2.1 Crosslines

Multibeam crosslines acquired for this survey totaled 5.59% of mainscheme acquisition.

Crosslines were collected, processed, and compared in accordance with section 5.2.4.2 of the HSSD. To evaluate crosslines, a surface generated via data strictly from mainscheme lines and a surface generated via data strictly from crosslines were created. From these two surfaces, a difference surface (mainscheme - crosslines = difference surface) was generated (Figure 4), and is submitted in the Separates II Digital Data folder. Statistics show the mean difference between depths derived from mainscheme data and crossline data was 0.05 meters with mainscheme being deeper and 95% of nodes falling within +/- 0.41 meters (Figure 5). For the respective depths, the difference surface was compared to the allowable NOAA uncertainty standards. In total, 99.5% of the depth differences between H13210 mainscheme and crossline data were within allowable NOAA uncertainties.

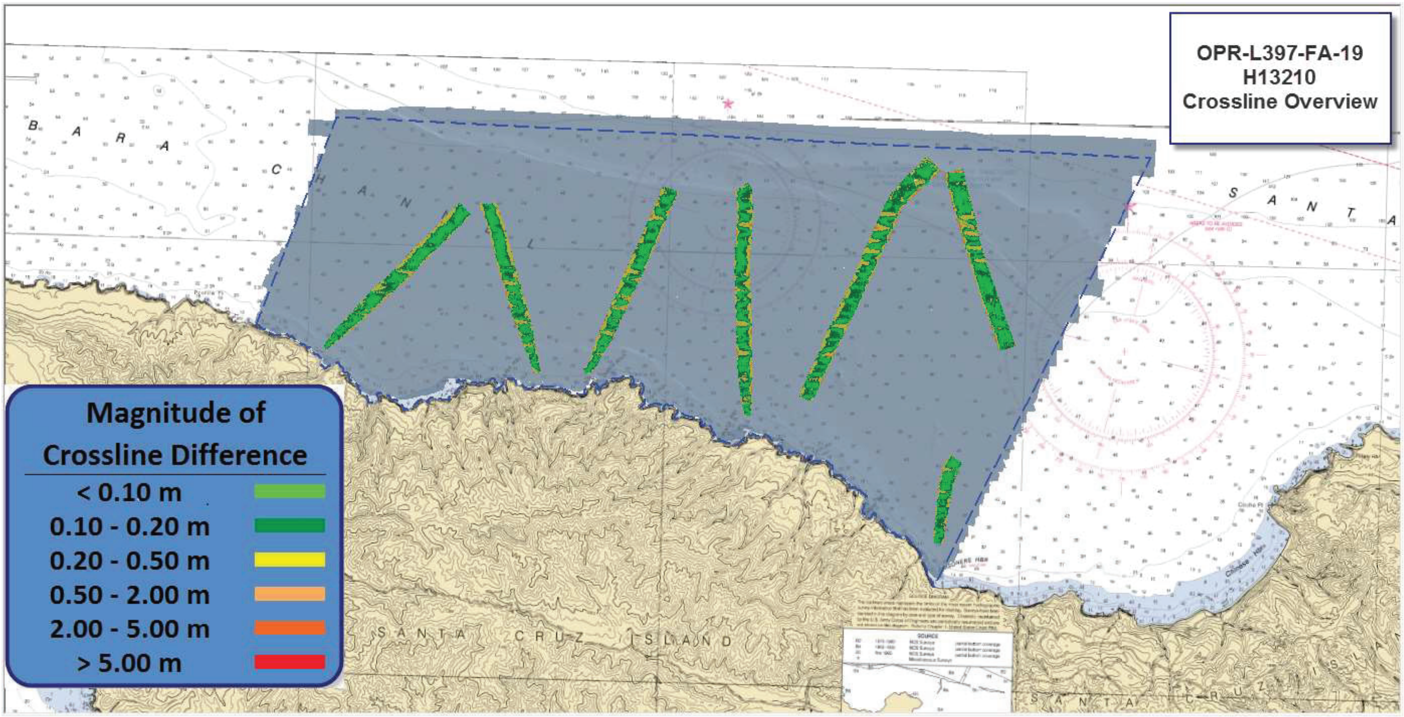


Figure 4: Overview of H13210 Crosslines

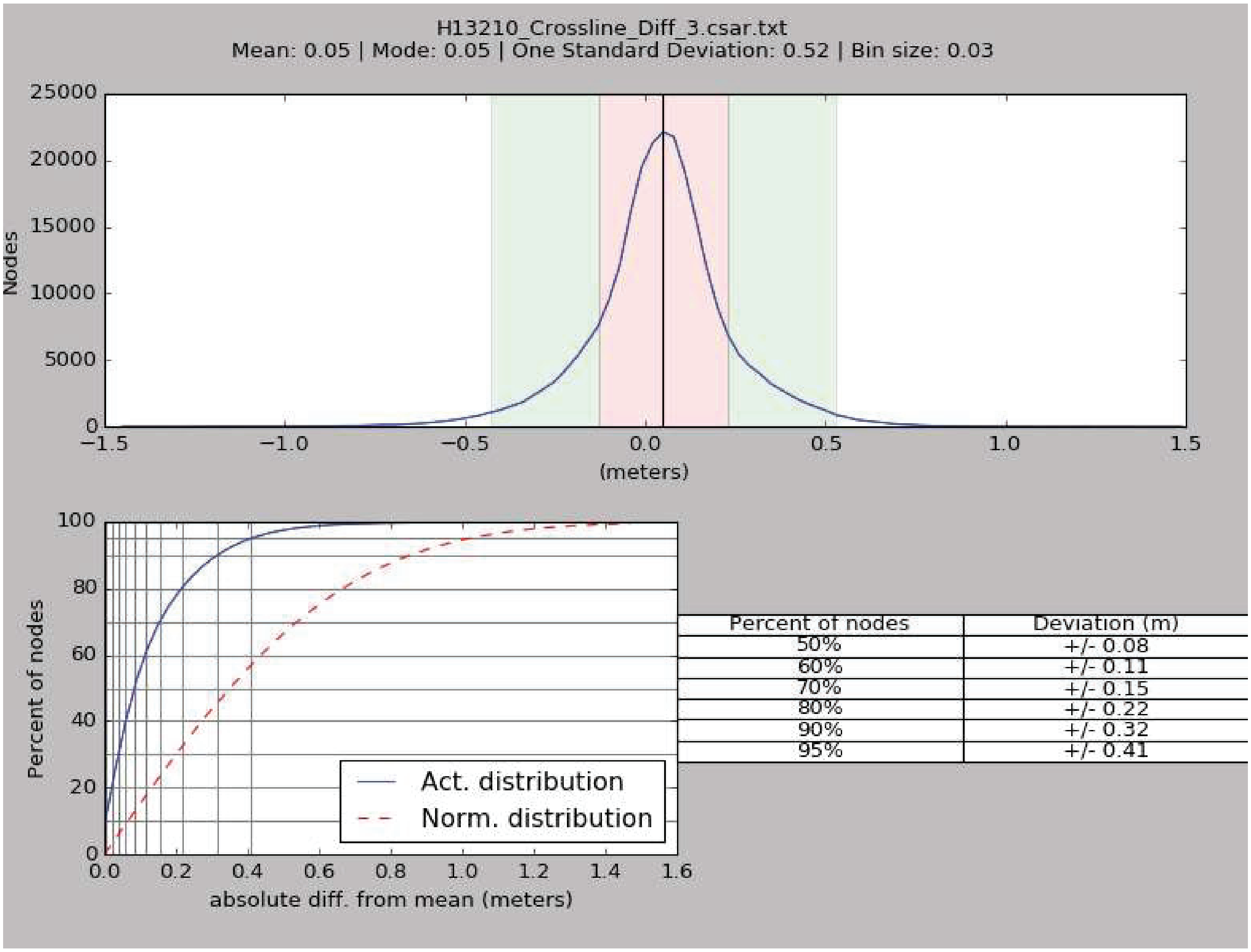


Figure 5: H13210 crosslines and mainscheme difference statistics

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	N/A	0.078 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Expendable Bathythermograph (XBT)	Surface
S220	N/A	4 meters /second	0.5 meters/second
280x (all launches)	2 meters/second	N/A	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

In addition to the usual a priori estimates of uncertainty via device models for vessel motion and VDATUM, real time and post-processed uncertainty sources were also incorporated into the depth estimates of survey H13210. Real-time uncertainties were provided via EM 710 and EM 2040 MBES and 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 Trajectory (SBET) RMS file generated in Applanix POSPac.

B.2.3 Junctions

H13210 junctions with two adjacent surveys from this project, H13209 and H13322 as shown in Figure 6. Data overlap between H13210 and each adjacent survey was achieved. These areas of overlap between surveys were reviewed in CARIS HIPS and SIPS by surface differencing (at equal resolutions) to assess surface agreement. The junctions with H13210 are generally within the NOAA allowable uncertainty in their areas of overlap. For all junctions with H13210, a negative difference indicates H13210 was shoaler and a positive difference indicates H13210 was deeper.

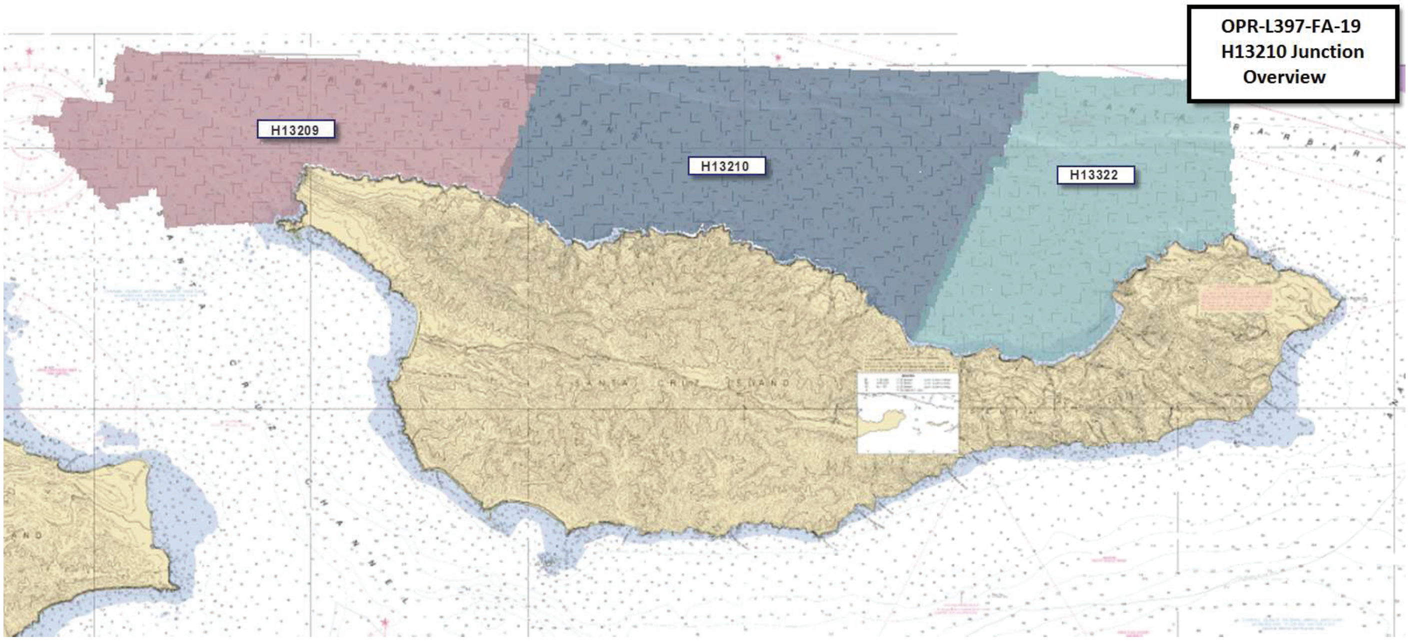


Figure 6: Overview of H13210 junction surveys

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13209	1:20000	2019	NOAA Ship FAIRWEATHER	W
H13322	1:20000	2019	NOAA Ship FAIRWEATHER	E

Table 9: Junctioning Surveys

<u>H13209</u>

Compare Grids in HydrOffice was used to assess junction agreement between the surface from H13210 and the surface from H13209 as shown in Figure 7. The statistical analysis of the difference surface in Figure 8 shows a mean of - 0.01meters with 95% of all nodes having a maximum deviation of +/-0.33 meters. It was found that 99.5% of all nodes are within NOAA allowable uncertainty.

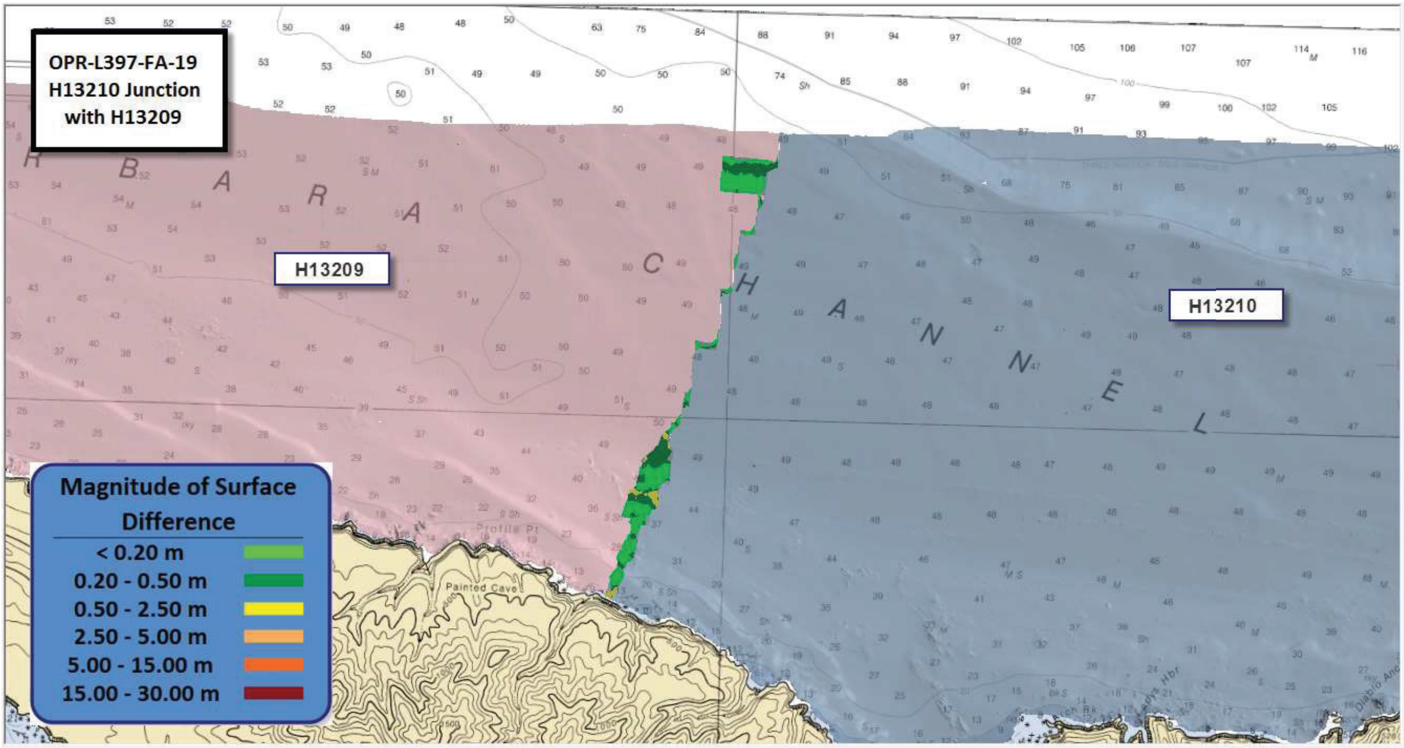
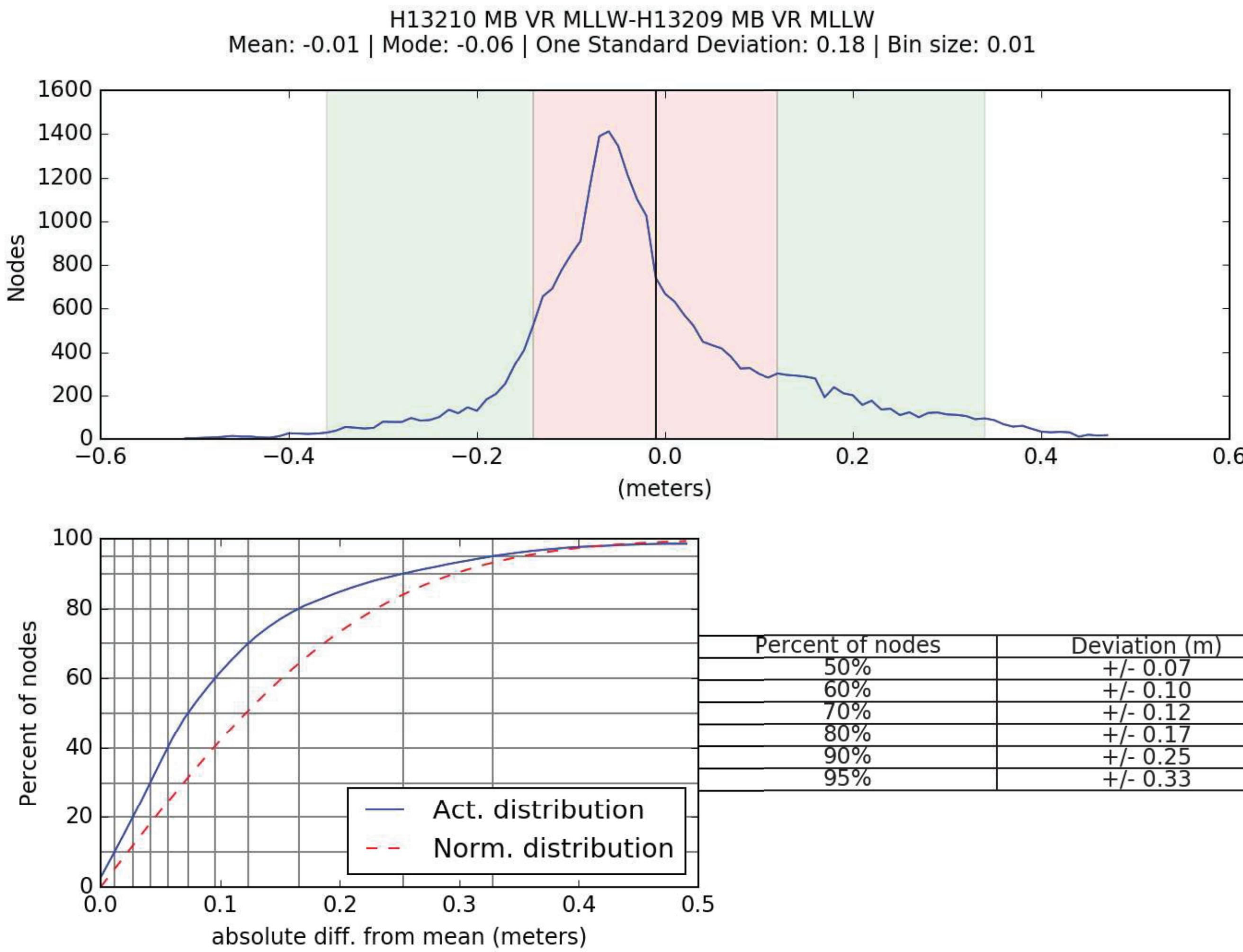


Figure 7: Difference surface between H13210 (gray) and junctioning survey H13209 (pink)



Percent of nodes	Deviation (m)
50%	+/- 0.07
60%	+/- 0.10
70%	+/- 0.12
80%	+/- 0.17
90%	+/- 0.25
95%	+/- 0.33

Figure 8: Difference surface statistics between H13210 and H13209 (VR Surface)

<u>H13322</u>

Compare Grids in HydrOffice was used to assess junction agreement between the surface from H13210 and the surface from H13322 as shown in Figure 9. The statistical analysis of the difference surface in Figure 10 shows a mean of - 0.03 meters with 95% of all nodes having a maximum deviation of +/- 0.29 meters. It was found that 99.5% of all nodes are within NOAA allowable uncertainty.

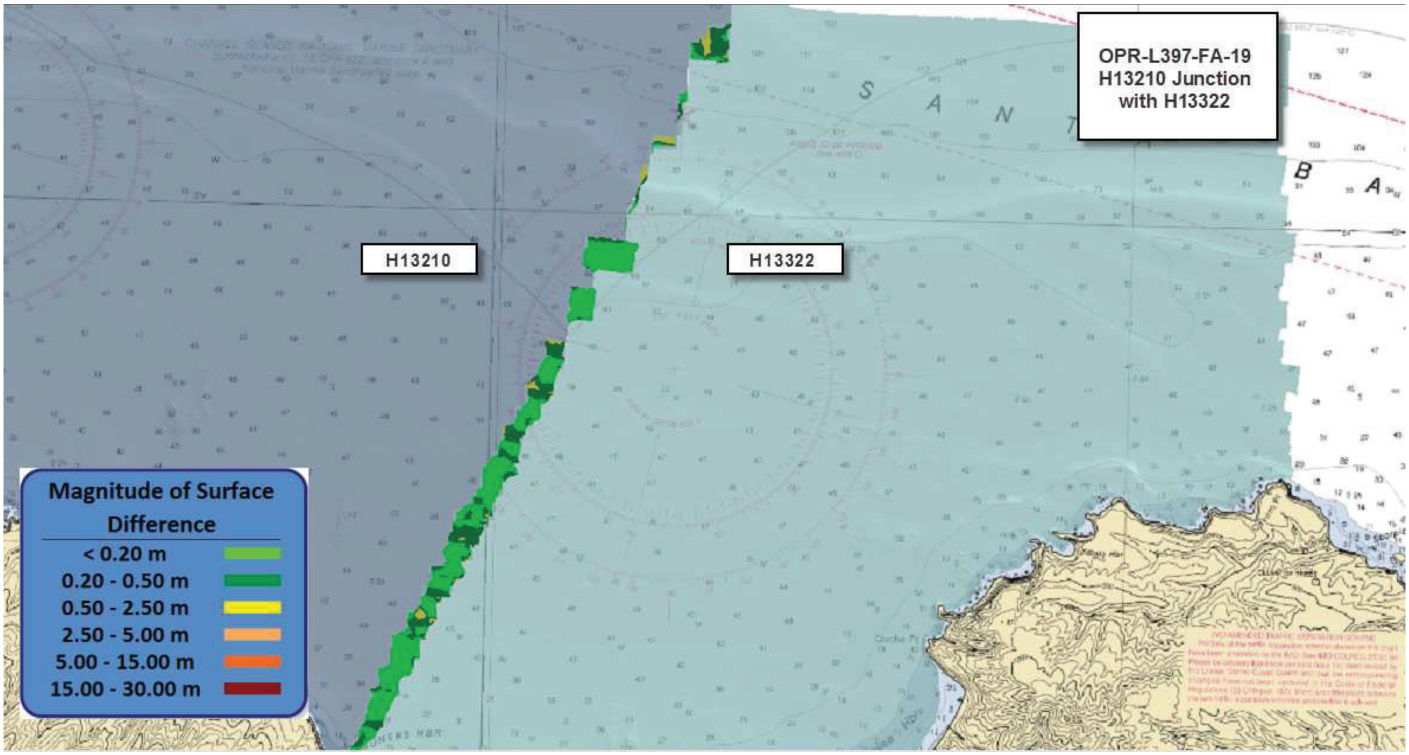
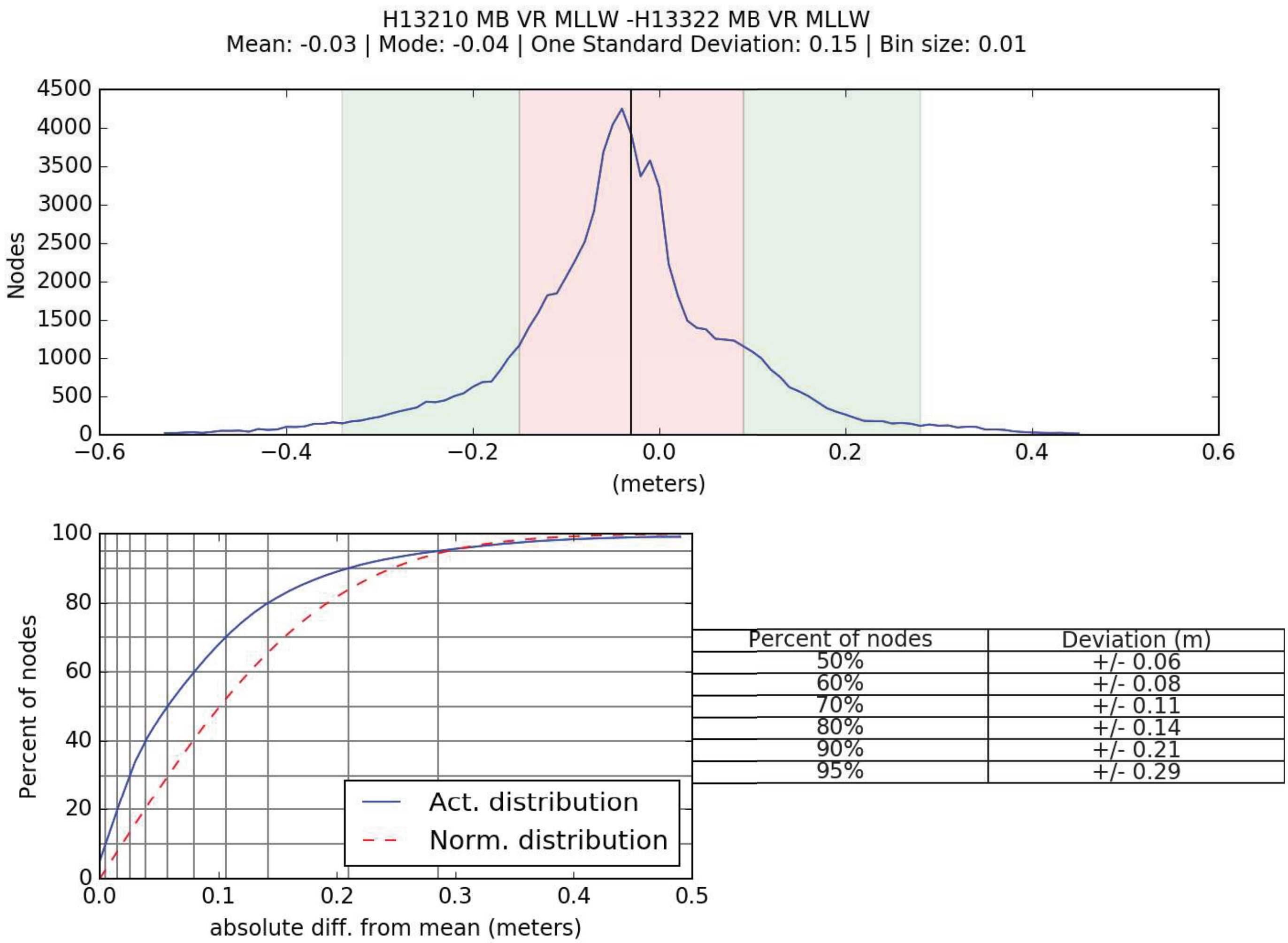


Figure 9: Difference surface between H13210 (gray) and junctioning survey H13322 (blue)



Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.08
70%	+/- 0.11
80%	+/- 0.14
90%	+/- 0.21
95%	+/- 0.29

Figure 10: Difference surface statistics between H13210 and H13322 (VR 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

Sound Speed Issues

In certain areas, particularly off the western portion of H13210, sound speed issues were apparent, visible primarily as "smiles" (Figure 11). Given the location of the issues, the most probable cause is the use of historical data for the salinity profile rather than an actual representation of salinity in the water column. XBTs were used to determine sound speed for this area where data was acquired by S220 due to a repair that was needed for AML Oceanographic MVP 200. Surfaces were not significantly impacted and the data still meet NOAA allowable uncertainty parameters from HSSD Section 5.1.3. As such, the data remain sufficient to supersede all previous data.

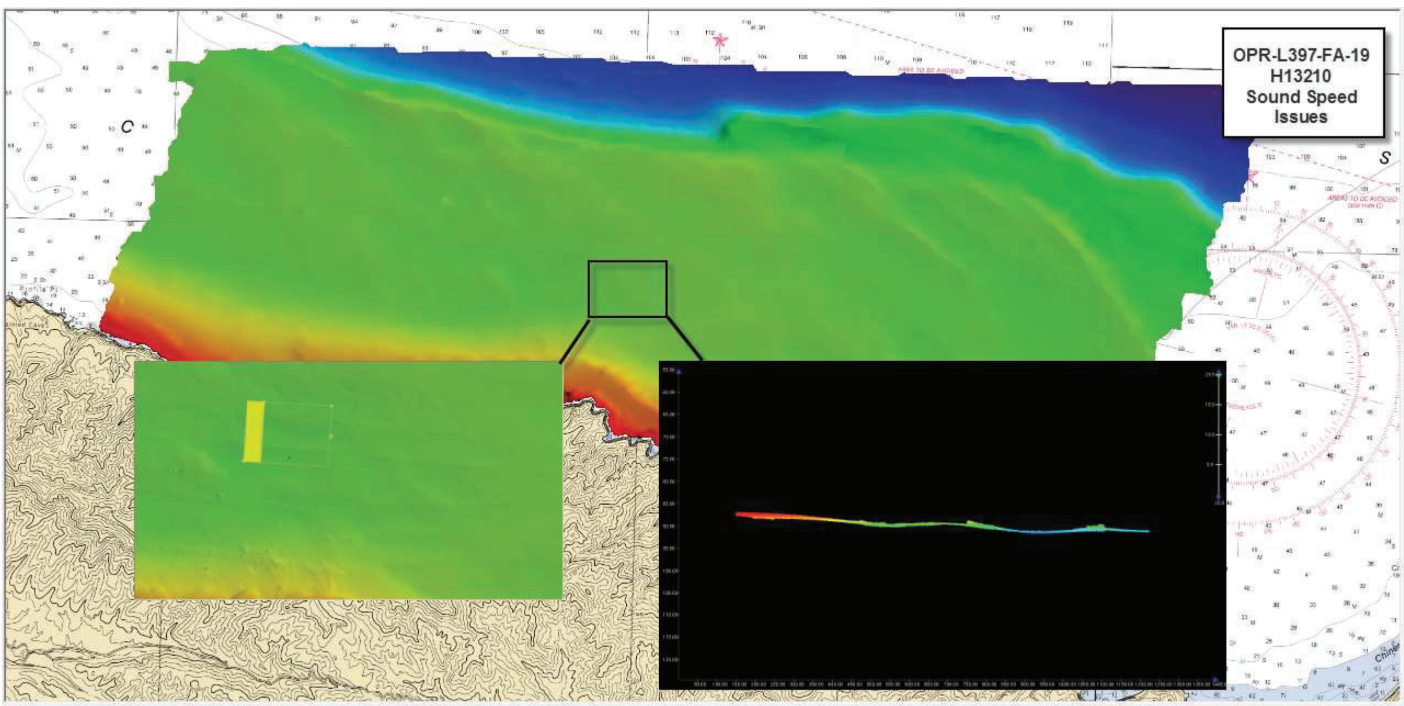


Figure 11: Example of sound speed issues visible in data

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Casts were conducted at a minimum of one every four hours during launch acquisition. Casts were conducted more frequently in areas where the influx of fresh water had an effect on the speed of sound in the water column and when there was a change in surface sound speed greater than two meters per second. XBT casts on S220 were conducted at an average interval of 172 minutes, 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 Holidays

H13210 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. Two holidays which meet the definition described in the HSSD for complete coverage were identified via HydrOffice QC tools Holiday Finder Tool. This tool automatically scans the surface for holidays as defined in the HSSD and was run in conjunction with a visual inspection of the surface by the hydrographer. Reasonable attempts were made to ensure full coverage of the area but these areas were not able to be acquired due to sea state conditions that were not conducive to the retrieval of holiday data. The holiday to the southeast in Figure 12 is the result of insufficient overlap between lines and the holiday in the southwest was caused by acoustic shadowing due to the rocky nature of the seabed. The holiday in the southwest (Figure 13) was examined in subset editor and the hydrographer is confident that all least depths of the rock were acquired.

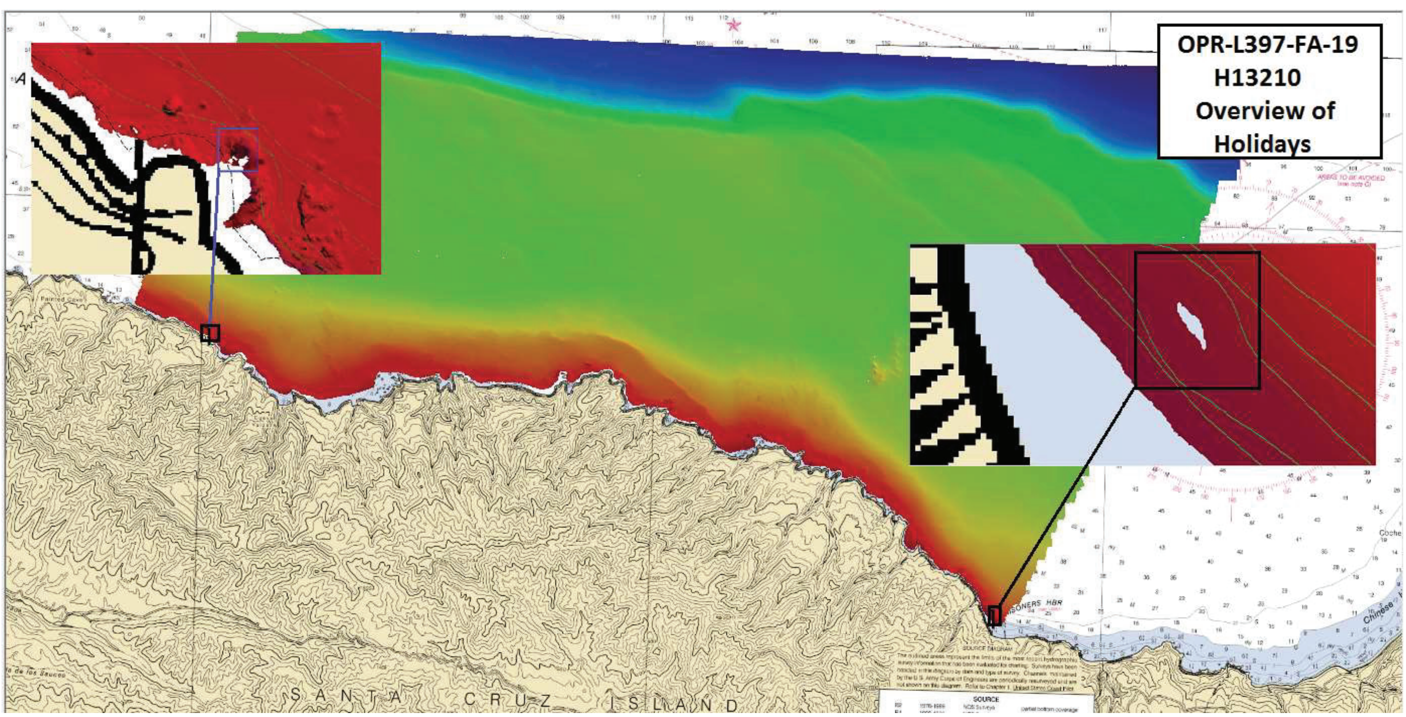


Figure 12: Overview of holidays in H13210

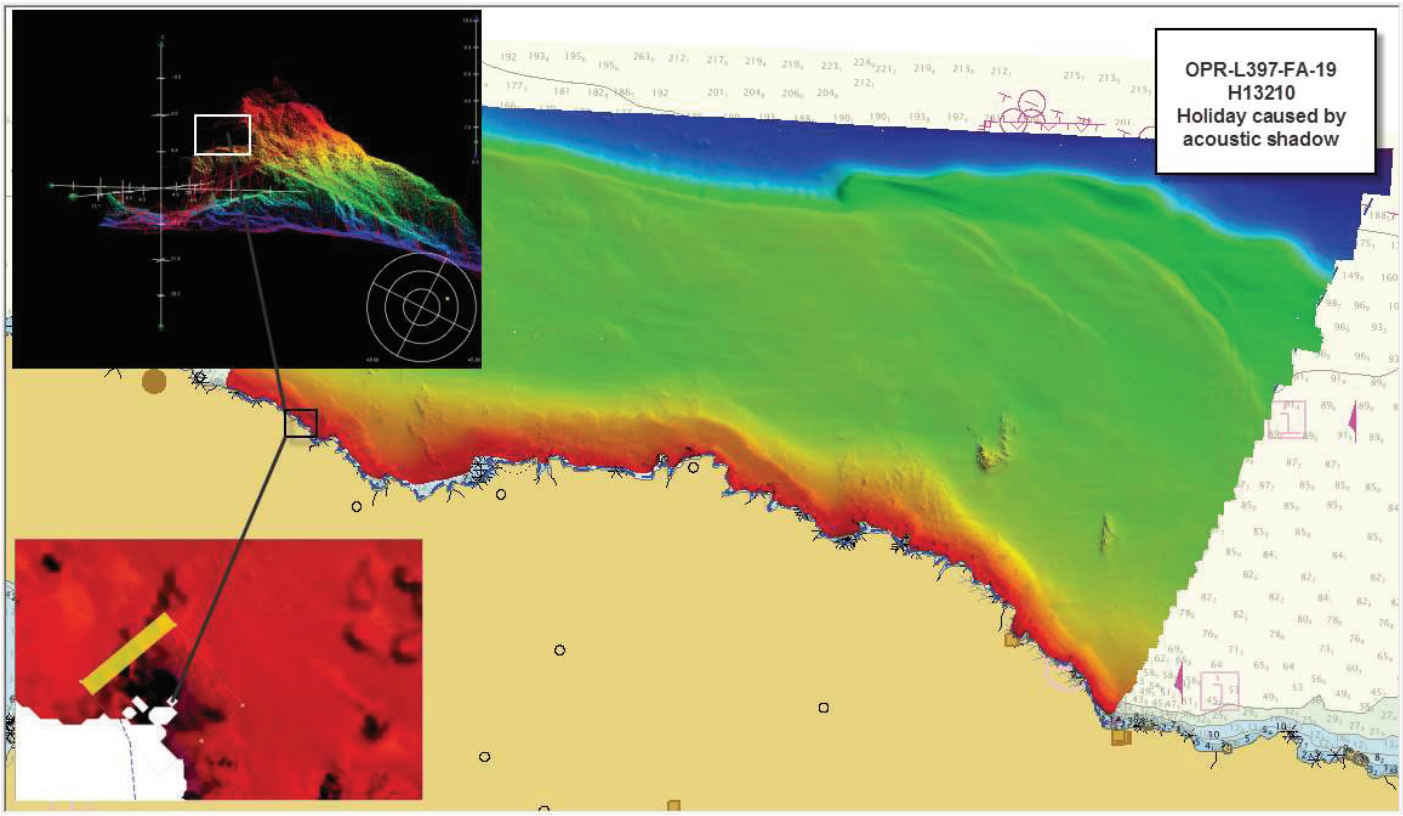


Figure 13: H13210 holiday caused by acoustic shadow

B.2.10 NOAA Allowable Uncertainty

The surface was analyzed using HydrOffice QC Tools Grid QA feature to determine compliance with specifications. Overall 99.5% of nodes within the surface meet NOAA uncertainty specifications for H13210 as shown in Figure 13 below.

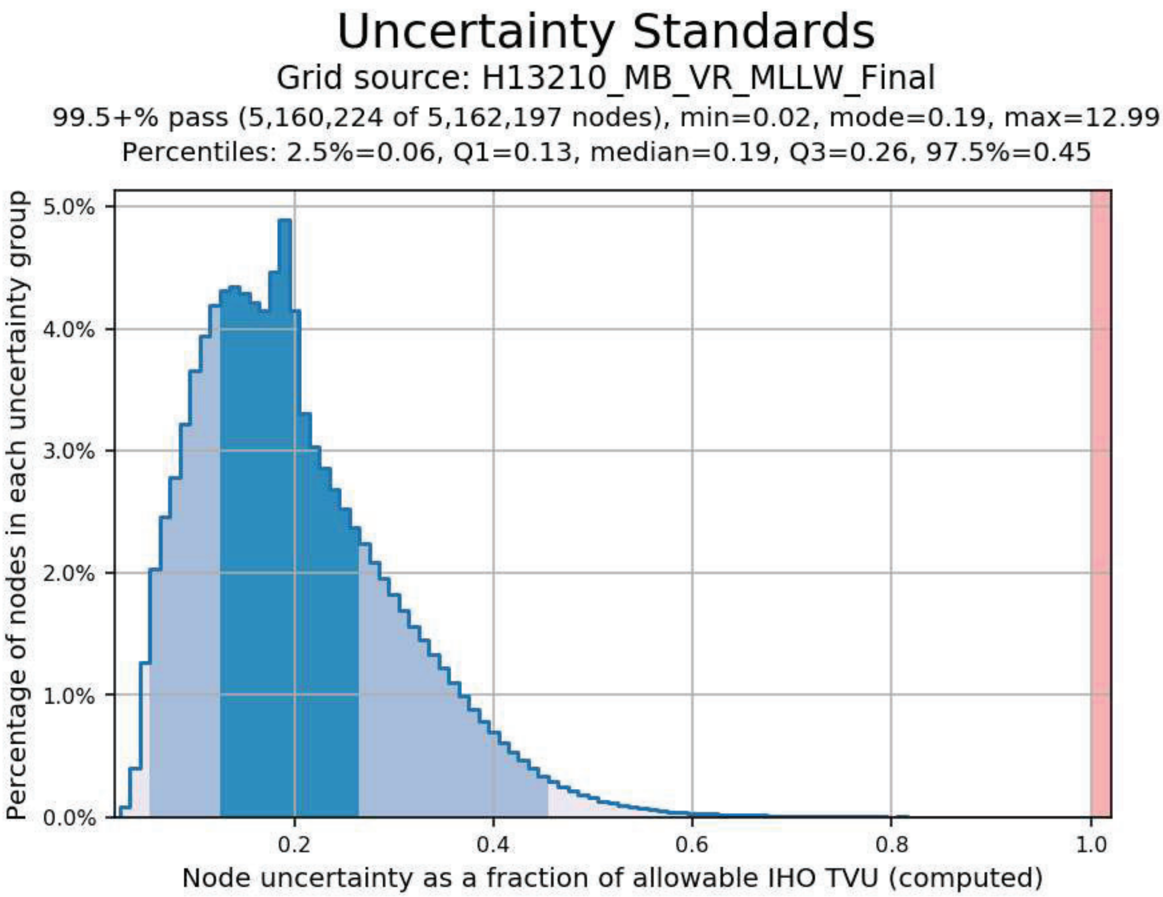


Figure 14: H13210 Allowable uncertainty statistics

B.2.11 Density

The surface was analyzed using the HydrOffice QC Tools Grid QA feature to determine compliance with specifications. Density requirements for H13210 were achieved with at least 99.5% of surface nodes containing five or more soundings as required by HSSD Section 5.2.2.3 and shown in Figure 14 below.

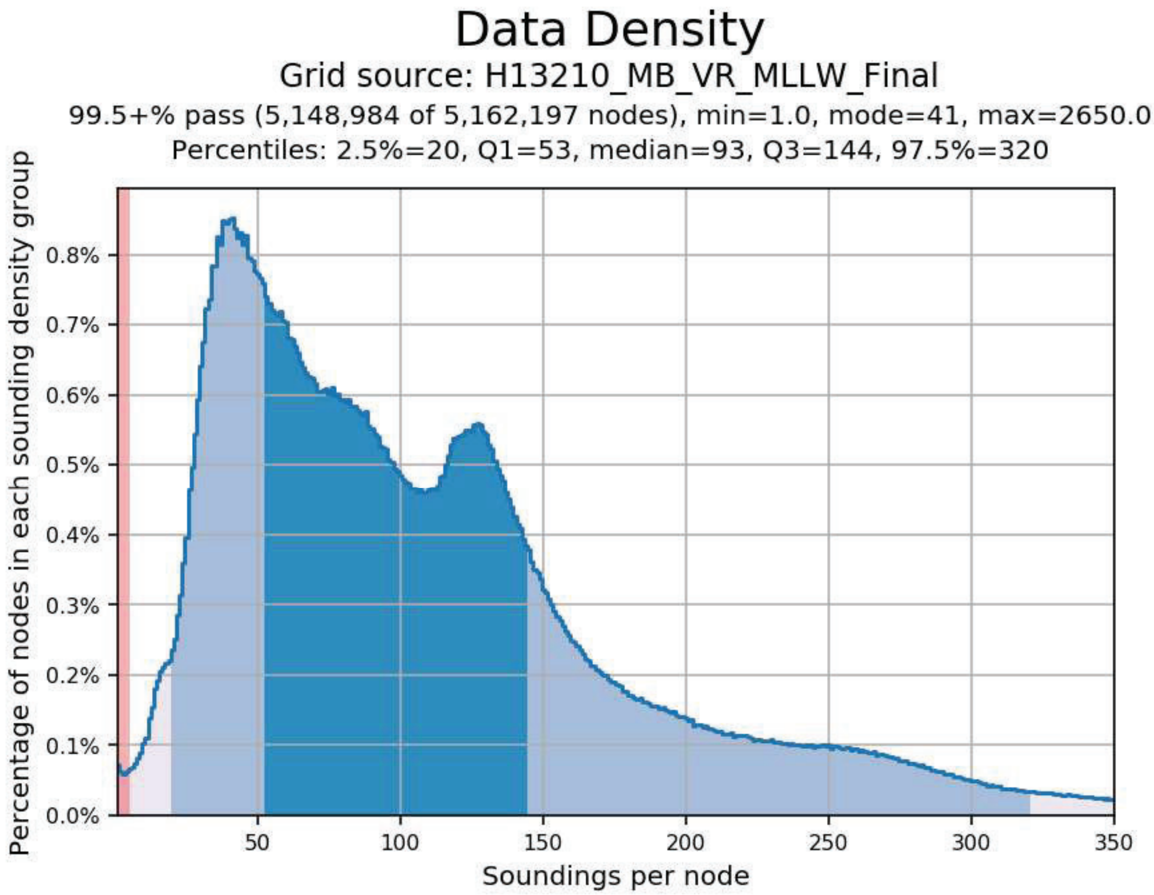


Figure 15: H13210 Data density statistics

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 per vessel was created by the field unit via Fledermaus FMGT 7.8.10. See Figure 16 for a greyscale representation of the complete mosaics. A relative backscatter calibration was performed by HSTB via a patch test in order to bring the survey systems on each of the launches into alignment. The offsets between the launch sonar systems identified by the patch test were entered into the processing settings within FMGT to increase continuity in the backscatter imagery collected by each vessel. See Figure 17 for a table of the entered calibration values.

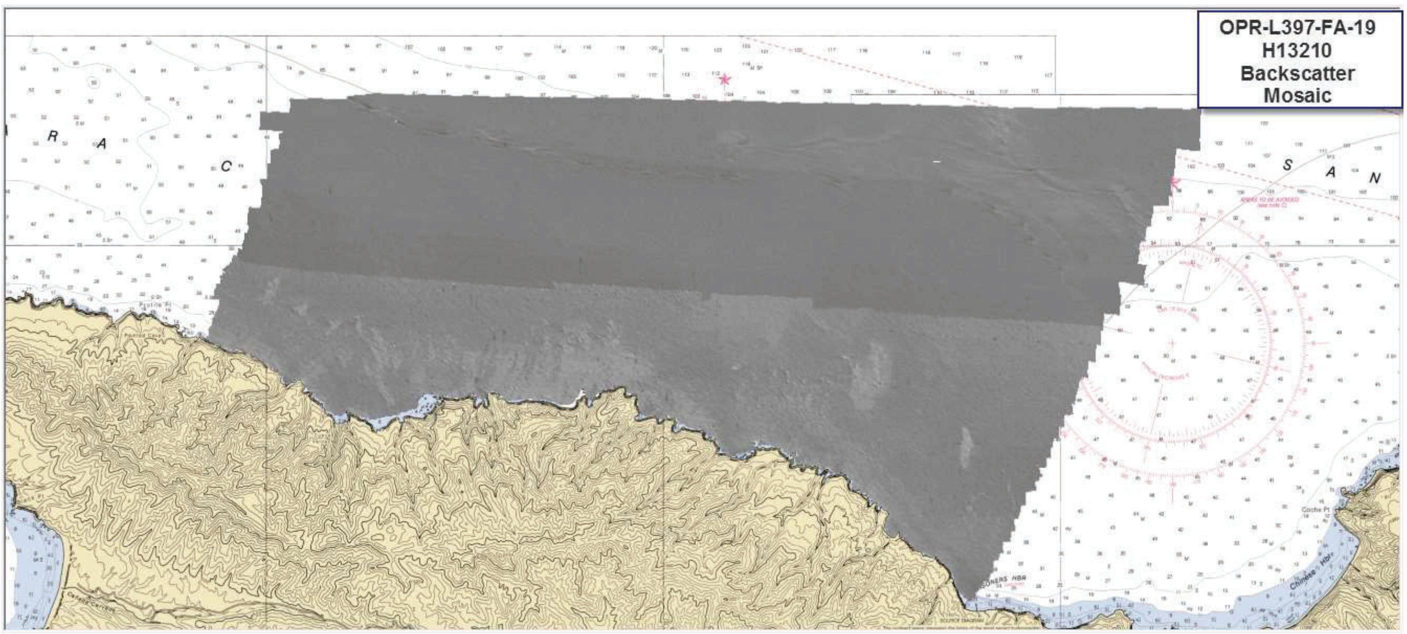


Figure 16: Backscatter mosaic for H13210

	200				300				400		
	Short CW	Med CW	Long CW	FM (Both)	Short CW	Med CW	Long CW	FM (Both)	Short CW	Med CW	Long CW
2805	-1.1	-1.4	-1.8	2.7	**-0.7**	**-0.9**	**-1.0**	**-1.4**	3	3.9	4.8
2806	1.8	1.8	1.8	2.4	**-0.1**	**-0.3**	**-0.4**	**-0.8**	3.6	4.65	5.7
2807	-0.3	-0.15	0	0	**0**	**-0.2**	**-0.3**	**-0.7**	3.3	4.2	5.1
2808	0	0.6	1.2	1.6	**-0.3**	**-0.5**	**-0.6**	**-1.0**	1.8	2.7	3.6

Figure 17: Backscatter calibration values

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	11.1.3

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	7.8.10

Table 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile Version 2019.

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
H13210_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	1.6 meters - 209.6 meters	NOAA_VR	Complete MBES
H13210_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	1.6 meters - 209.6 meters	NOAA_VR	Complete MBES

Table 12: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the creation of all CUBE surfaces for H13210. 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 vary from 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.

B.5.3 Data Logs

Data acquisition and processing notes are included in the acquisition and processing logs, and additional processing such as final separation model reduction and sound speed application are noted in the H13210 Data Log spreadsheet. All data logs are submitted digitally in the Separates I folder.

C. Vertical and Horizontal Control

Per section 5.1.2.3 of the 2014 Field Procedures Manual, no Horizontal and Vertical Control Report has been generated for H13210.

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-L397-FA-19_100m_NAD83-MLLW_geoid12a

Table 13: ERS method and SEP file

ERS methods were used as a final means of reducing H13210 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 11.

The following PPK methods were used for horizontal control:

- RTX

Vessel kinematic data were post-processed using Applanix POSPac processing software and RTX positioning 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, all platforms 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 H13210 as no DGPS stations were available for real-time horizontal control.

D. Results and Recommendations

D.1 Chart Comparison

A comparison was performed between survey H13210 and ENCs US5CA66M and US5CA67M using Caris HIPS and SIPS. Sounding and contour layers were overlaid on the ENC to assess differences between the surveyed soundings and charted depths. The ENC was compared to the surface by extracting all soundings from the chart and creating an interpolated TIN surface which could be differenced with the surface from H13210 as shown in Figure 18; statistics from the differencing analysis are shown in Figures 19 and 20.

All data from H13210 should supersede charted data. In general, surveyed soundings agree with the majority charted depths. A full discussion follows below.

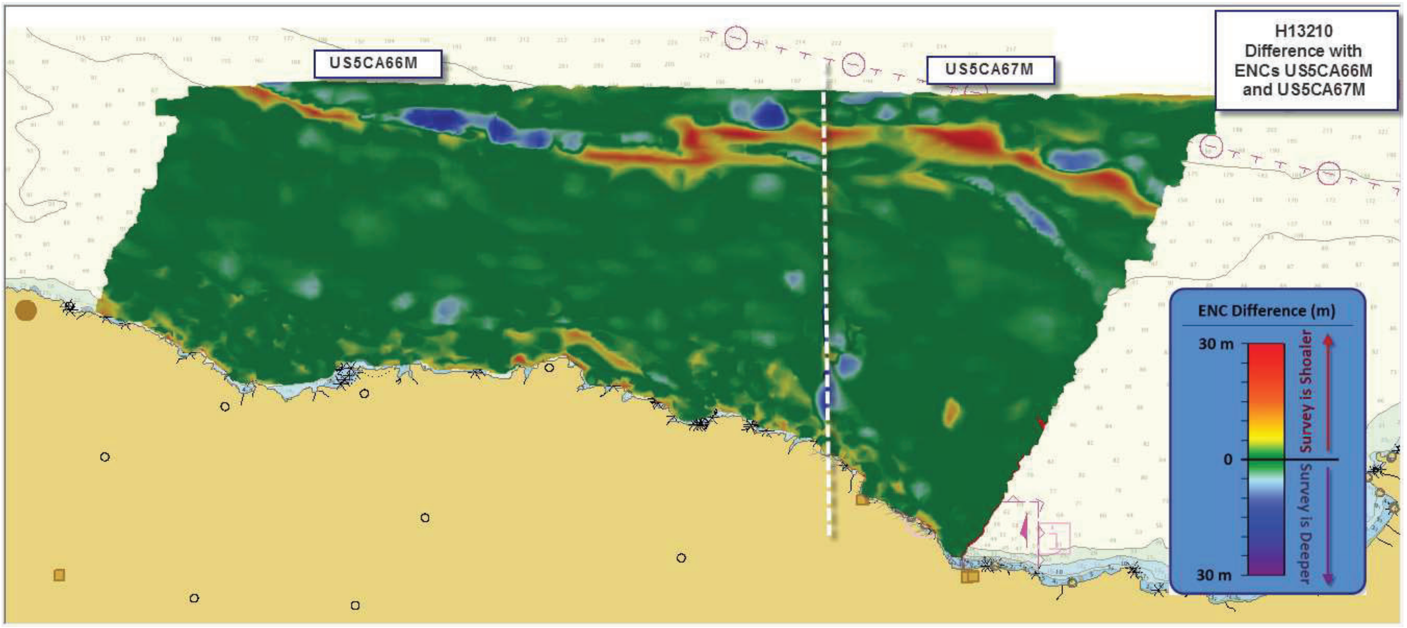
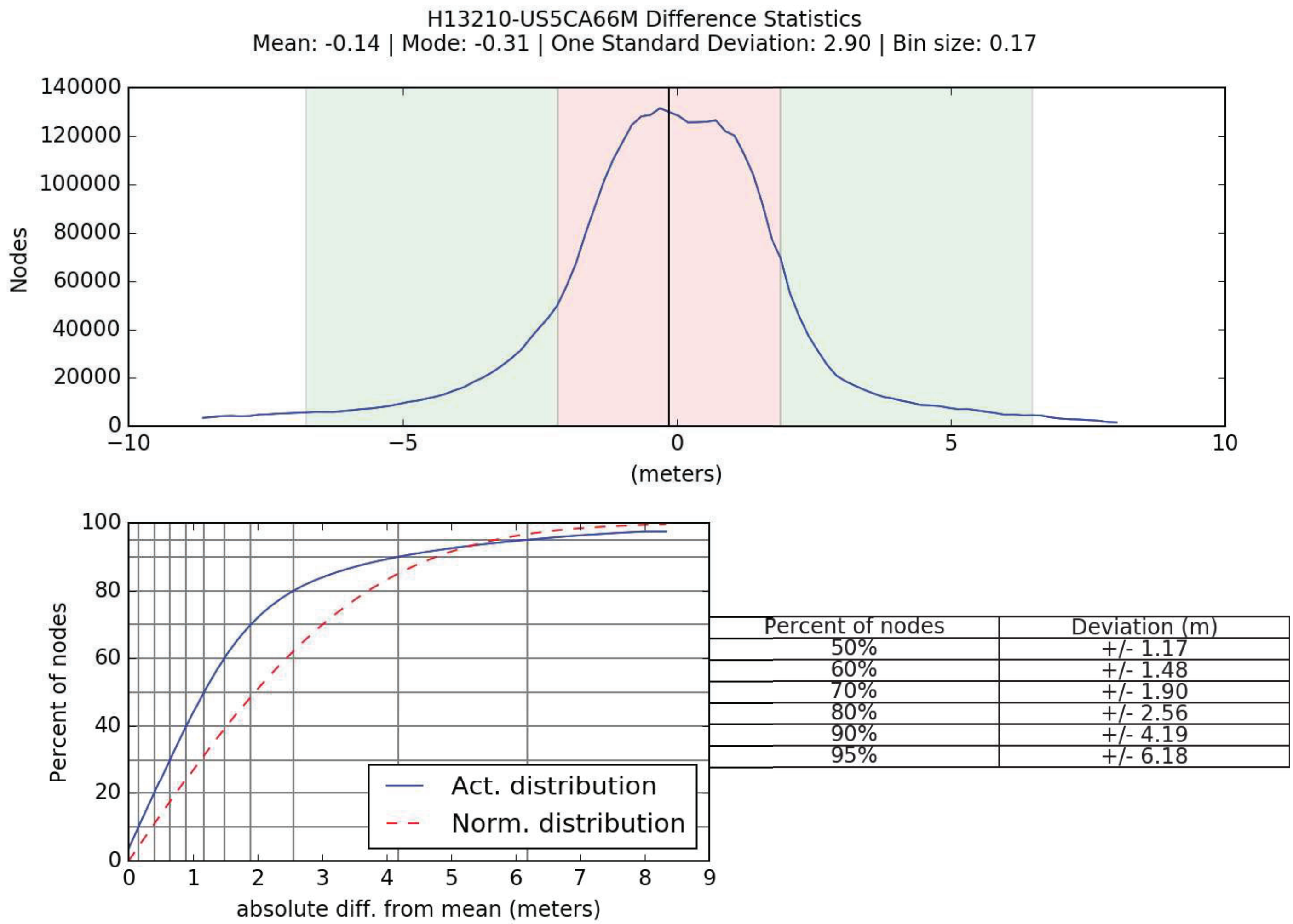


Figure 18: Difference surface between H13210 and interpolated TIN surface from ENC US5CA66M and US5CA67M



Percent of nodes	Deviation (m)
50%	+/- 1.17
60%	+/- 1.48
70%	+/- 1.90
80%	+/- 2.56
90%	+/- 4.19
95%	+/- 6.18

Figure 19: Difference surface statistics between H13210 and interpolated TIN surface from US5CA66M

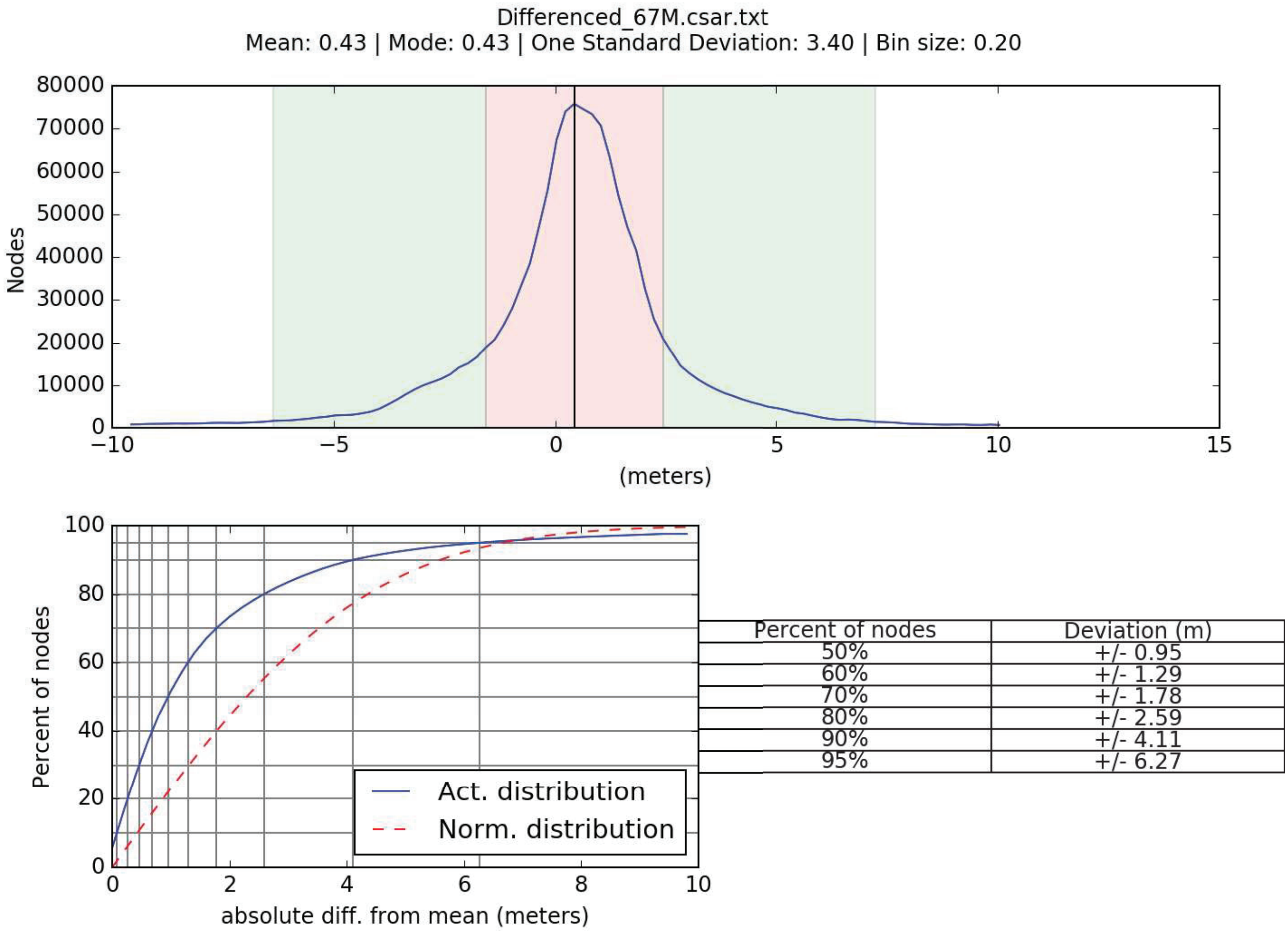


Figure 20: Difference surface statistics between H13210 and interpolated TIN surface US5CA67M

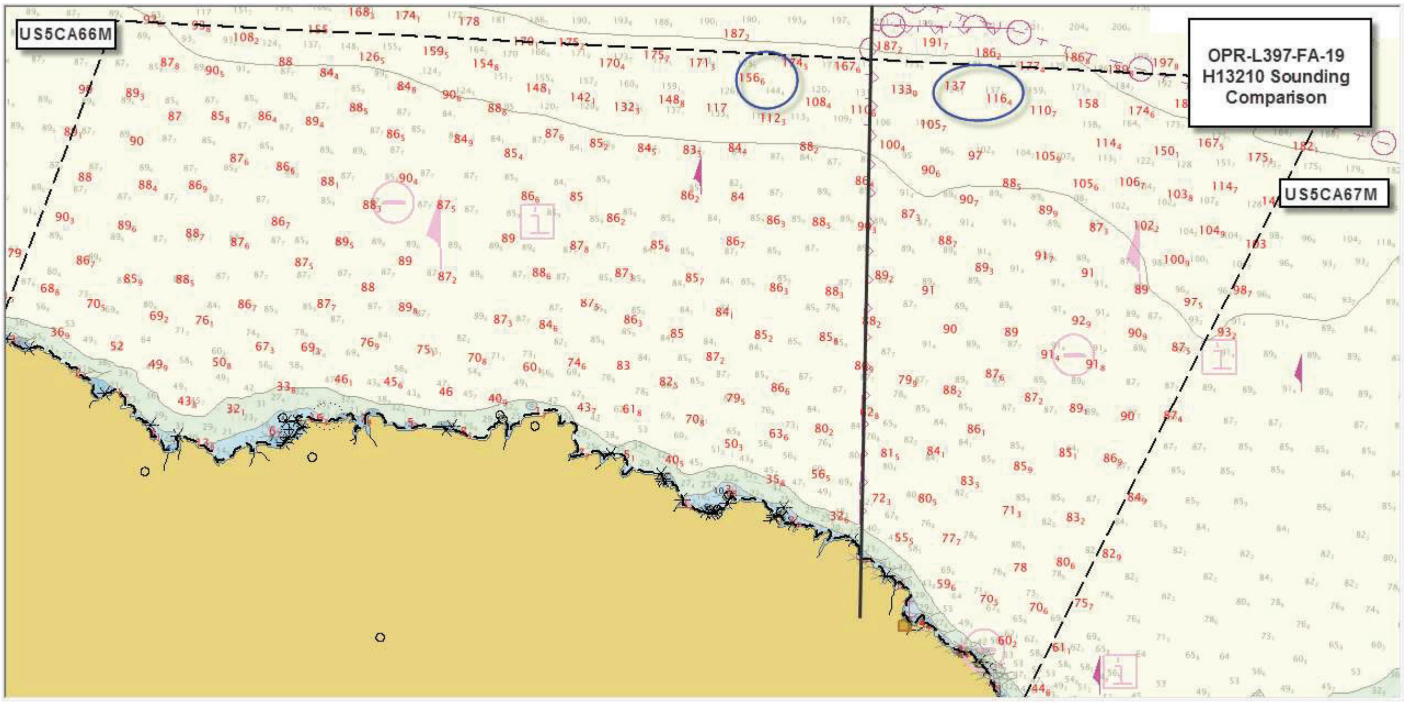


Figure 21: Overview of H13210 soundings in meters (red) overlaid on ENCs US5CA66M and US5CA67M

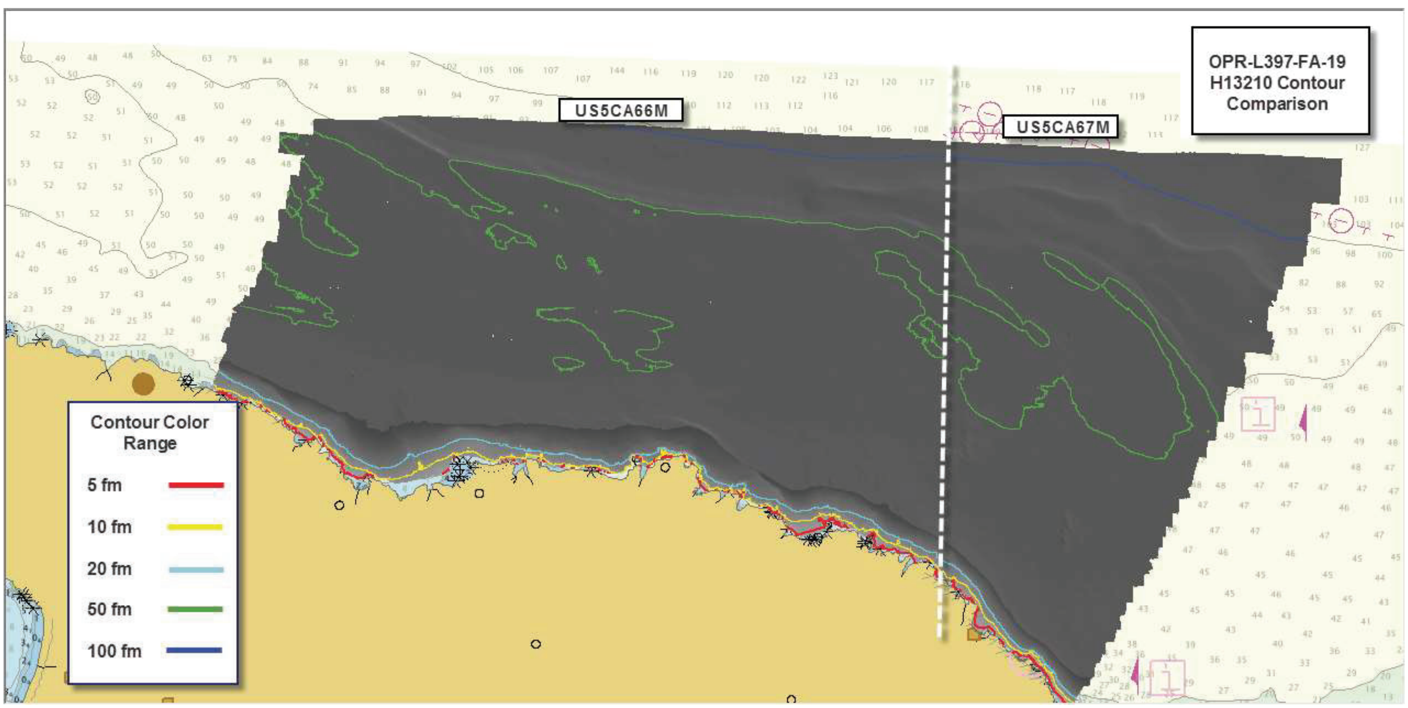


Figure 22: Overview of H13210 contours overlaid on ENCs US5CA66M and US5CA67M

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?
US5CA66M	1:40000	6	05/24/2019	10/04/2019	NO
US5CA67M	1:40000	5	06/27/2019	10/04/2019	NO

Table 14: Largest Scale ENCs

<u>US5CA66M</u>

Soundings from H13210 are in general agreement with charted depths on ENC US5CA66M with most depths agreeing to 2 meters. The largest differences are seen toward the east end of the chart where differences range to 10 meters as seen in Figure 21 .

Contours from H13210 are in general agreement with charted contours on ENC US5CA66M as shown in Figure 22. The hydrographer recommends the addition of a 30 fathom contour line due to the natural ledge that occurs at this depth as can be observed in Figure 22.

<u>US5CA67M</u>

Soundings from H13210 are in general agreement with charted depths on ENC US5CA67M with most depths agreeing to 2 meters. The largest differences are seen in the central west area of the chart where differences range to 20 meters as seen in Figure 21.

Contours from H13210 are in general agreement with charted contours on ENC US5CA67M as shown in Figure 22. The hydrographer recommends the addition of a 30 fathom contour line due to the natural ledge that occurs at this depth as can be observed in Figure 22.

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

No charted features exist for this survey.

D.1.4 Uncharted Features

Survey H13210 has 22 new features that are addressed in the Final Feature File. Of these features, there are 11 new land areas and 11 new land elevations.

D.1.5 Shoal and Hazardous Features

One hazardous feature exists for this survey. An underwater rock for which the least depth was found by multibeam is located in the south central portion of the survey and was measured to have a minimum depth of 1.6m in an area that is otherwise at least 7m deep. This rock was not submitted as a DTON as it is very close to shore but could be hazardous to the many fishing vessels that approach within feet of the shoreline.

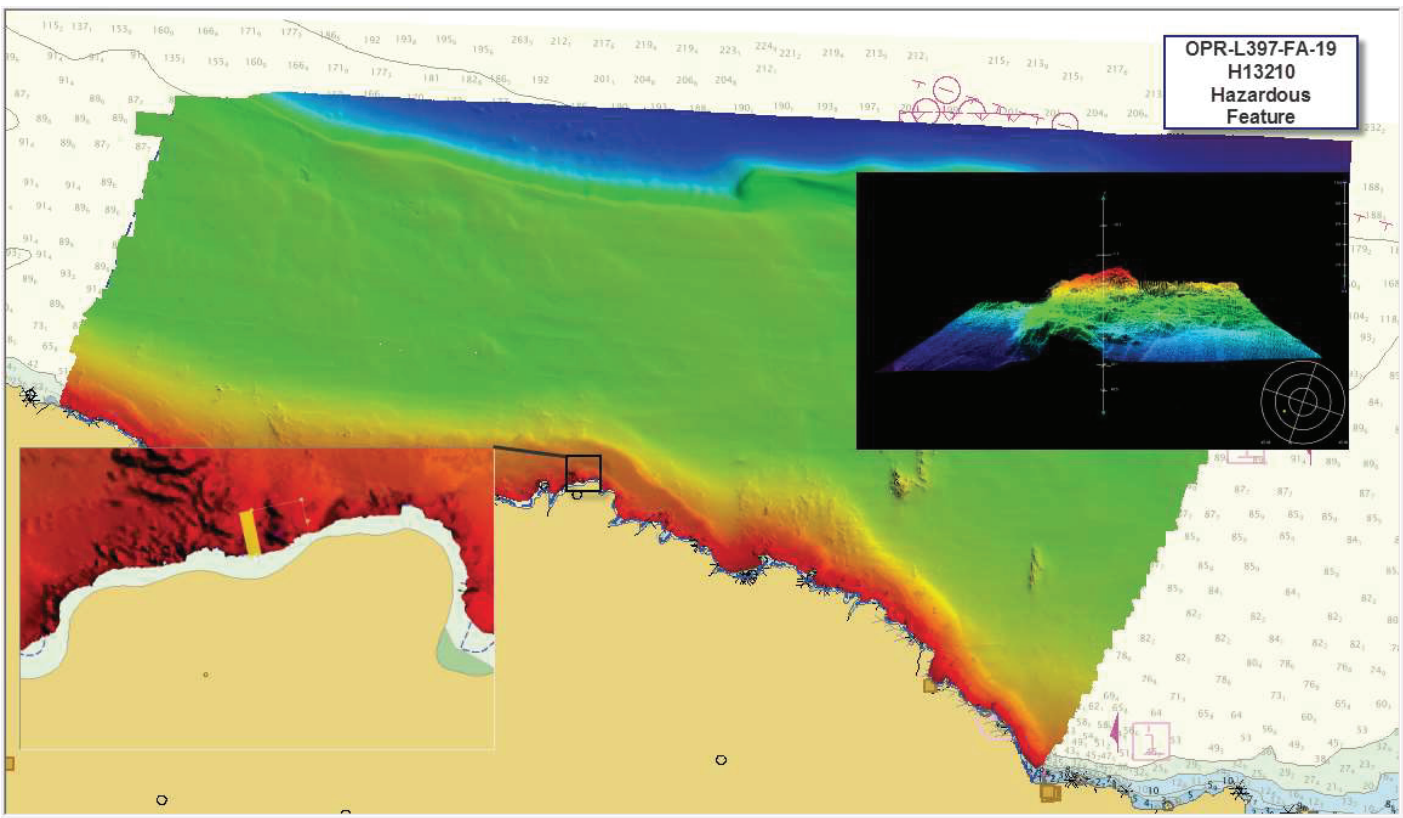


Figure 23: H13210 Hazardous Feature

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

Fairweather personnel conducted limited shoreline verification and reconnaissance, utilizing traditional shoreline methods. In areas where traditional shoreline verification was not possible, H13210 survey limits extended to the NALL and all features within these limits were addressed and attributed in the H13210 Final Feature File. All features inshore of the NALL were attributed in the Final Feature File with a description of "Not Addressed" and remarks of "Retain as charted, not investigated due to being inshore of NALL" as per HSSD section 7.3.1.

D.2.2 Aids to Navigation

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

D.2.3 Overhead Features

No overhead features exist for this survey.

D.2.4 Submarine Features

No submarine features exist for this survey.

D.2.5 Platforms

No platforms exist for this survey.

D.2.6 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.7 Abnormal Seafloor and/or Environmental Conditions

No abnormal seafloor and/or environmental conditions exist for this survey.

D.2.8 Construction and Dredging

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

D.2.9 New Survey Recommendation

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

D.2.10 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
CAPT Marc Moser	Chief of Party	02/21/2020	MOSER.MARC.STANTON.1163193902 MOSER.MARC.STANTON.1163193902 2020.02.24 09:05:38 -08'00'
LT Stephen Moulton	Operations Officer	02/21/2020	MOULTON.STEPHEN.F.1282116835 Digitally signed by MOULTON.STEPHEN.F.1282116835 Date: 2020.02.21 15:23:04 -08'00'
CHST Alissa Johnson	Chief Survey Technician	02/21/2020	JOHNSON.ALISSA.JEAN.1537531165 Digitally signed by JOHNSON.ALISSA.JEAN.1537531165 Date: 2020.02.21 13:43:57 -08'00'
HST Michelle Wiegert	Sheet Manager	02/21/2020	WIEGERT.MICHELLE.LYNN.1548600975 Digitally signed by WIEGERT.MICHELLE.LYNN.1548600975 Date: 2020.02.24 08:12:08 -08'00'

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

APPROVAL PAGE

H13210

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.

Digitally signed by HOLMBERG.PETER.SCOTT.1365886101
Date: 2021.07.28 12:55:01 -07'00'

Approved:____

Peter Holmberg

Products Team Lead, Pacific Hydrographic Branch