H13982

13NM SE of Charleston Entrance

OPR-G380-TJ-24
Approaches to Charleston
South Carolina

Responsible Party
DOC/NOAA/NOS/OCS -- Office of Coast Survey
Contact Information
hsd.chief@noaa.gov
Field Unit
NOAA Ship Thomas Jefferson (S222)
Survey Dates
August 14, 2024 - October 08, 2024
License Information
CC0-1.0
Approver
CDR Megan R. Guberski

Platform and Sonar Equipment

S222 (369958000)

Kongsberg Maritime EM 2040

Bathymetry Grid

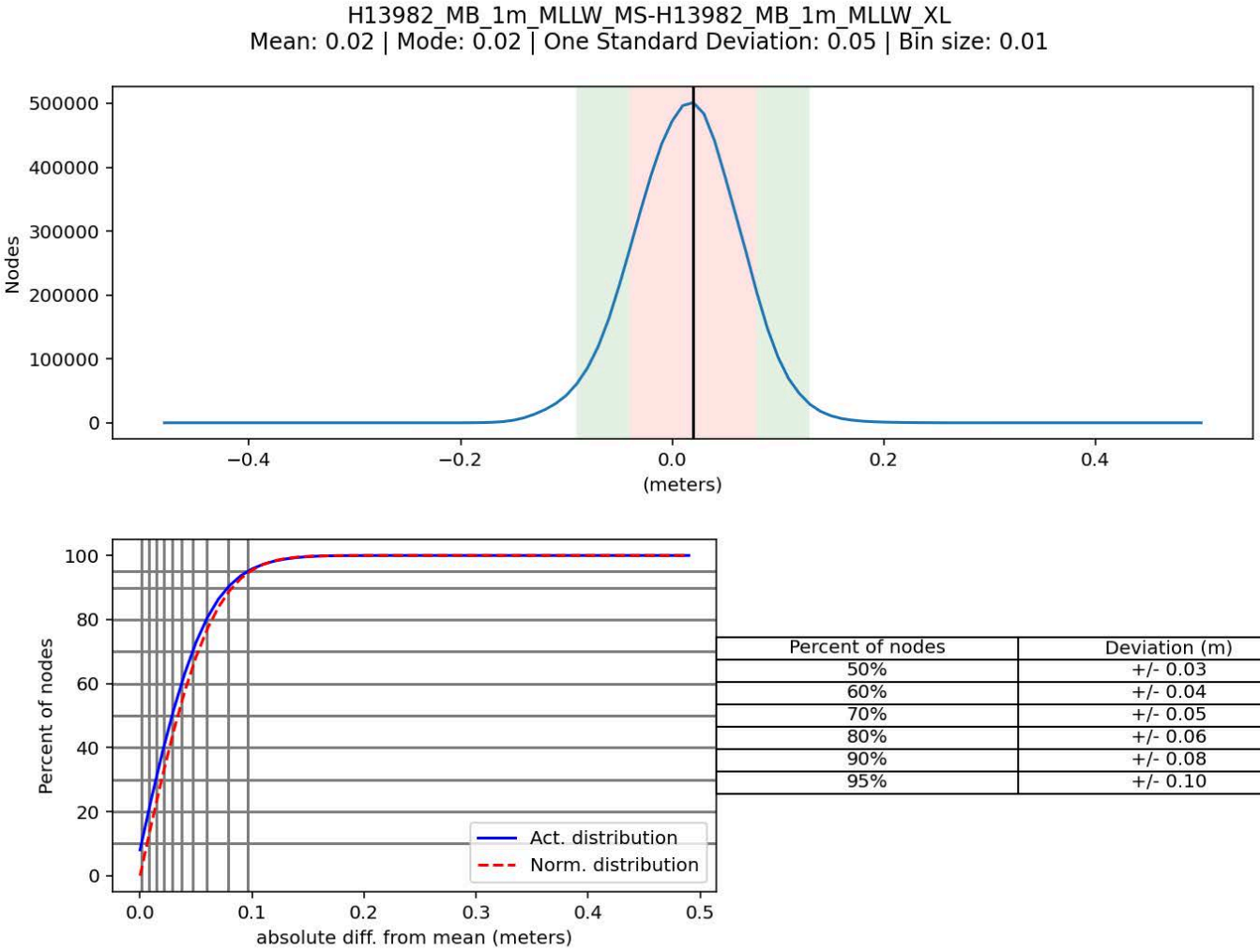
H13982_MB_1m_MLLW_1of1 *North American Datum 1983 (2011) Projected UTM 17, Mean Lower Low Water*

						Fixed	Variable
Sounding Technique:	***Multibeam***	Full Seafloor Coverage:	***Yes***	Feature Detection Size:		***2.0m***	***10%***
Features Detected:	***Yes***	Bathymetric Coverage:	***Yes***	Uncertainty Horizontal:		***1m***	***N/A***
Least Depth Detected:	***Yes***	Interpolated:	***No***	Uncertainty Vertical:		***0.25m***	***0.75%***

Quality Control Procedure

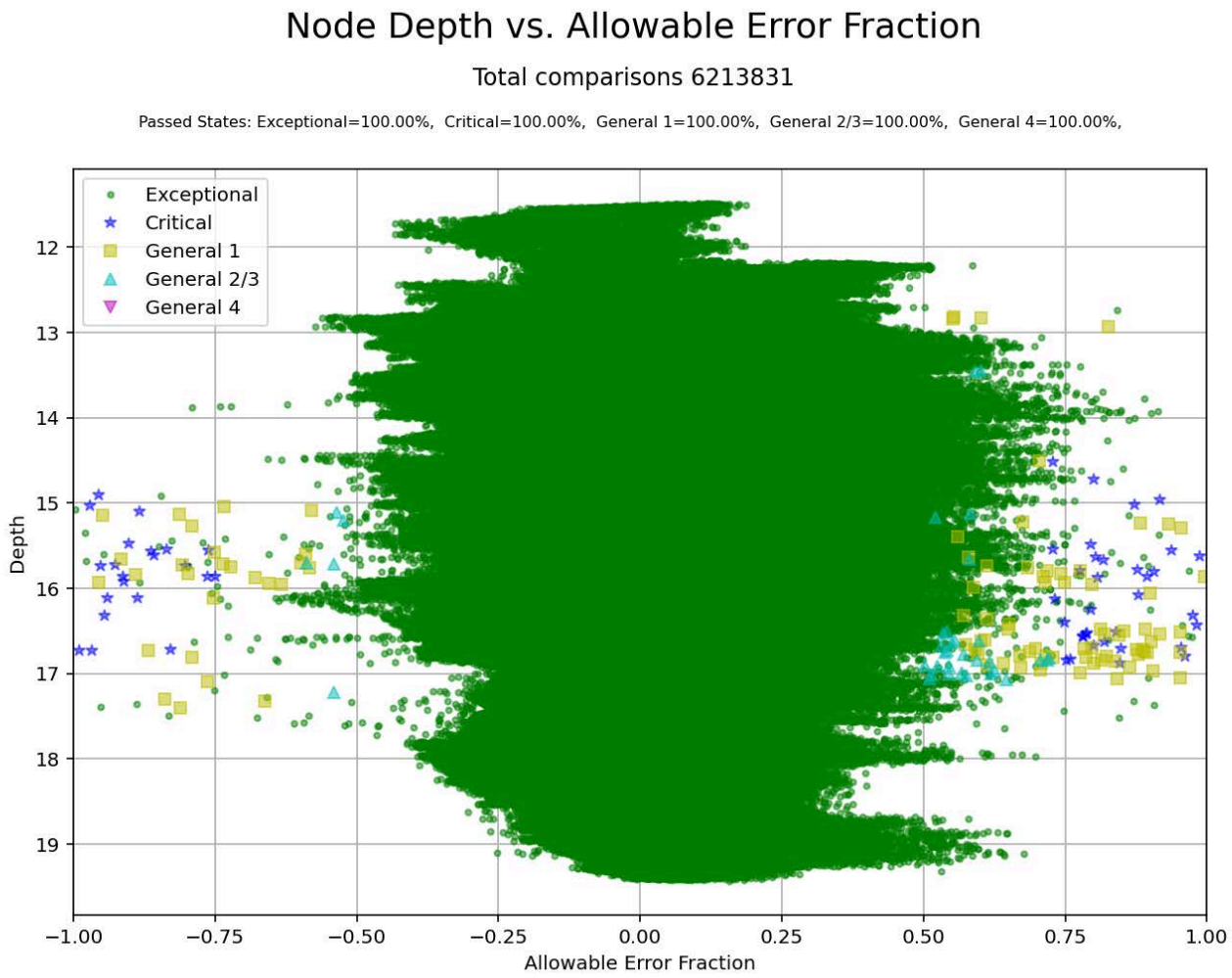
Crosslines

Pydro 24, a suite of software maintained by NOAA's Hydrographic Systems and Technology Branch (HSTB), contains various tools that aid in the analysis and quality control of hydrographic data. A Single Resolution (SR) 1m Combined Uncertainty and Bathymetry Estimator (CUBE) surface of this survey's mainscheme data and a SR 1m CUBE surface of this survey's crossline data were differenced with the Pydro 24 tool "Compare Grids." The results of this comparison indicate that 100% of grid-node comparisons between the two surfaces are within the Fraction of Allowable Error for depth/height, exceeding the specification of 95% stipulated by NOAA's 2024 Hydrographic Surveys Specifications and Deliverables (HSSD). The resulting mean of this comparison was a 0.02m difference, with a standard deviation of 0.05m, verifying the consistency of the data. Vessel S222 collected a total of approximately 71.69 linear nautical miles of MBES crosslines, a figure which constitutes about 6.75% of mainscheme mileage.



Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.04
70%	+/- 0.05
80%	+/- 0.06
90%	+/- 0.08
95%	+/- 0.10

A statistical summary of the comparison between H13982 crossline and maincheme data.



A statistical summary of the comparison between H13982 crossline and maincheme data.

Junction Overlap

Survey H13982 junctions with prior surveys H12805, H13766 and H13779. The Pydro 24 tool "Compare Grids" was utilized to assess the overlap of each junction.

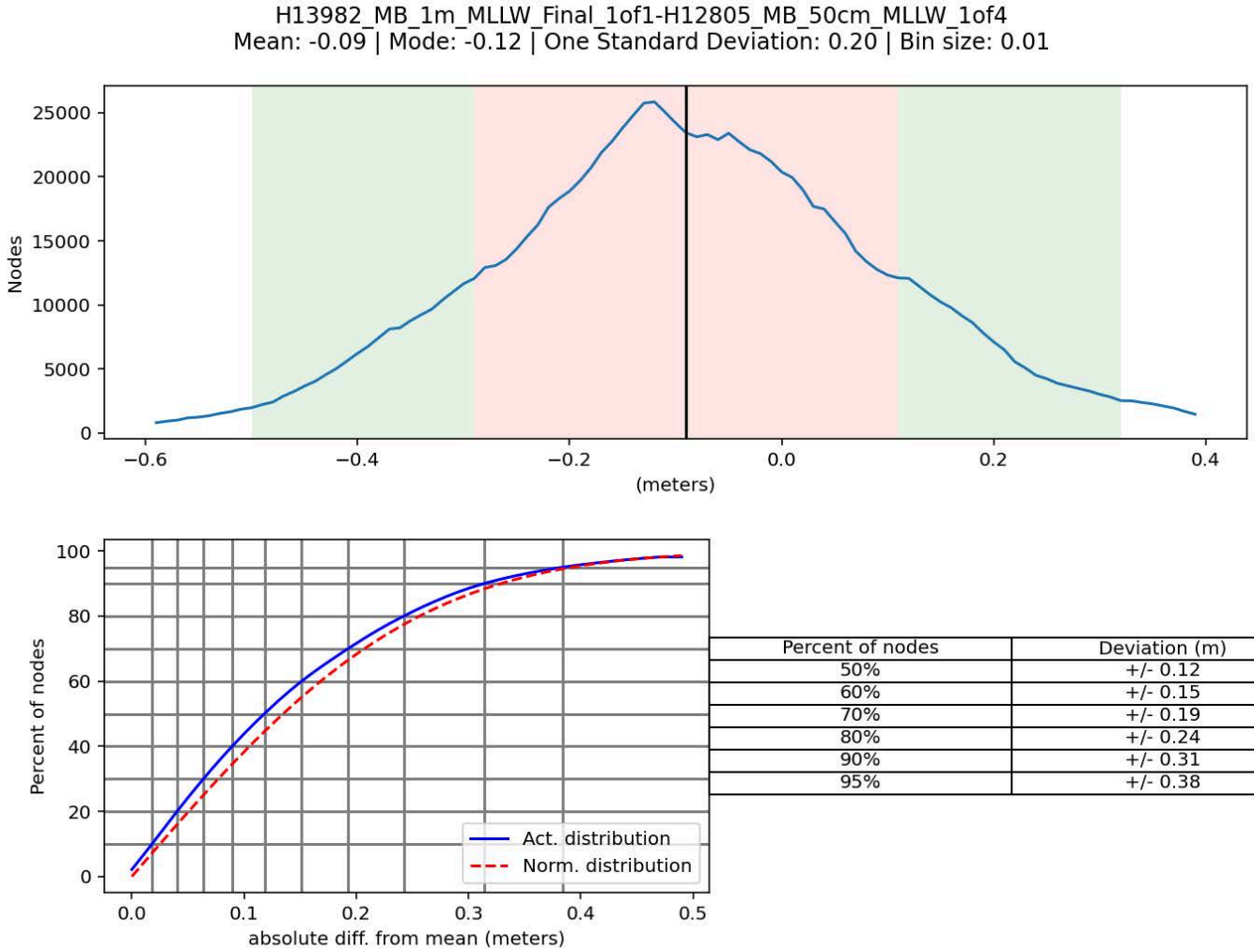
The results of a comparison between a 1m SR surface of survey H13982 and surface H12805 (1 of 4) indicate that 99.92% of grid-node comparisons between these surfaces are within Fraction of Allowable Error standards for depth/height for the assigned quality metric of "General 1," exceeding the specification of 95% stipulated by NOAA's 2024 HSSD. The resulting mean of this comparison was a -0.09m difference, with a standard deviation of 0.20m which is within allowable TVU for the area.

The results of a comparison between a 1m SR surface of survey H13982 and surface H12805 (2 of 4) indicate that 99.90% of grid-node comparisons between these surfaces are within Fraction of Allowable Error standards for depth/height for the assigned quality metric of "General 1," exceeding the specification of 95% stipulated by NOAA's 2024 HSSD. The resulting mean of this comparison was a 0.06m difference, with a standard deviation of 0.20m which is within allowable TVU for the area.

The results of a comparison between a 1m SR surface of survey H13982 and surface H12805 (3 of 4) indicate that 99.97% of grid-node comparisons between these surfaces are within Fraction of Allowable

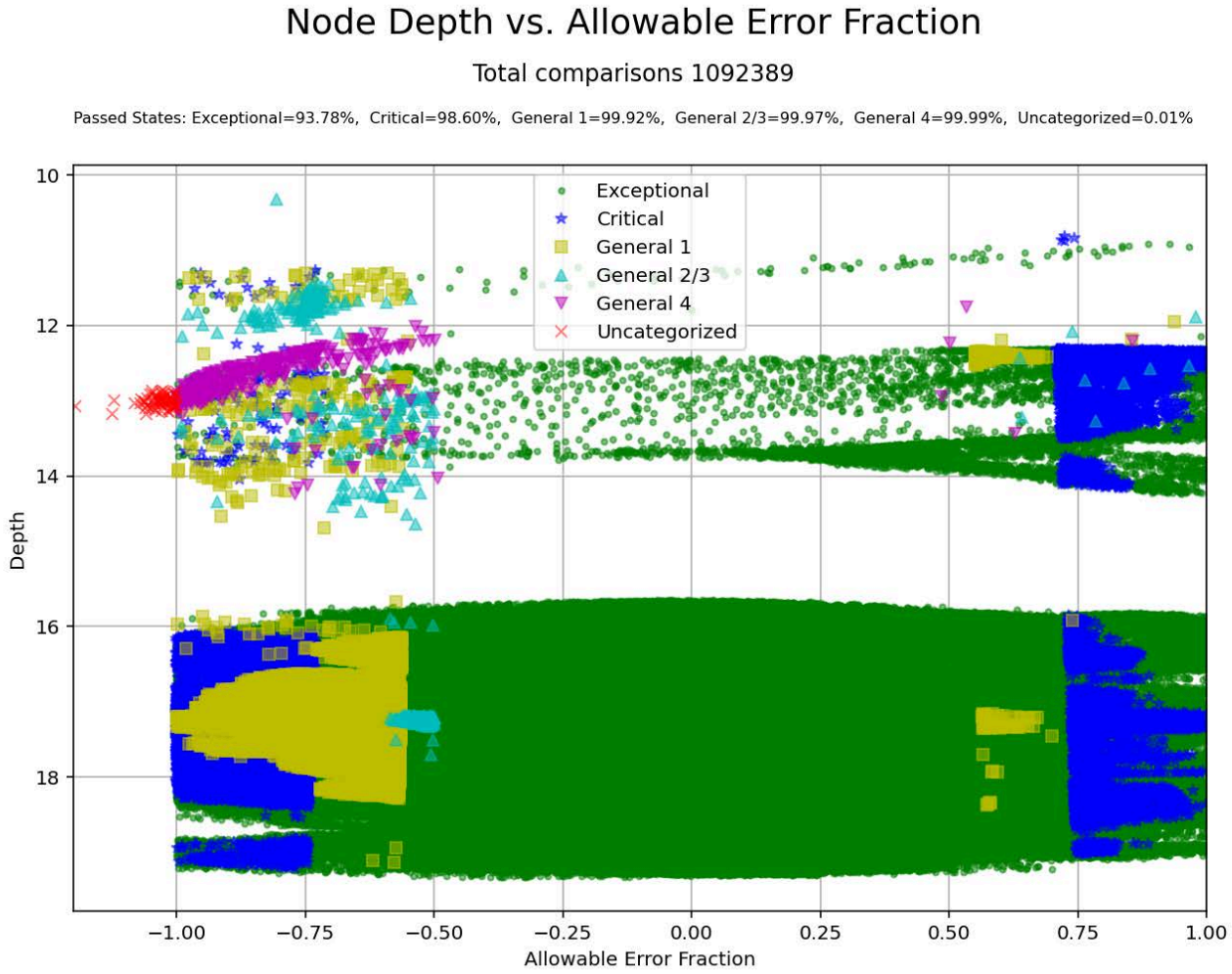
Error standards for depth/height for the assigned quality metric of "General 1," exceeding the specification of 95% stipulated by NOAA's 2024 HSSD. The resulting mean of this comparison was a -0.06m difference, with a standard deviation of 0.20m which is within allowable TVU for the area.

The results of a comparison between a 1m SR surface of survey H13982 and surface H12805 (4 of 4) indicate that 99.99% of grid-node comparisons between these surfaces are within Fraction of Allowable Error standards for depth/height for the assigned quality metric of "General 1," exceeding the specification of 95% stipulated by NOAA's 2024 HSSD. The resulting mean of this comparison was a 0.01m difference, with a standard deviation of 0.17m which is within allowable TVU for the area.

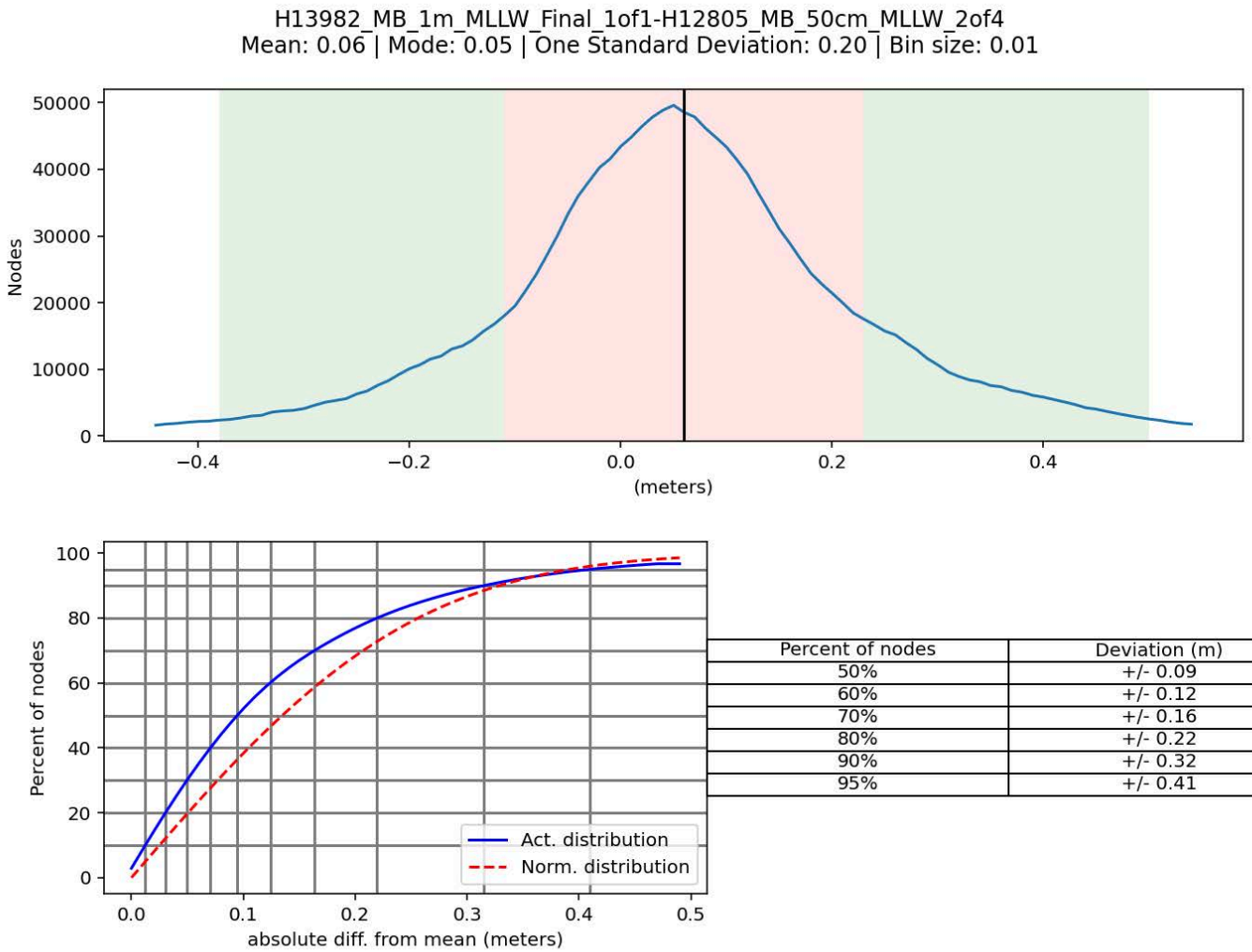


Percent of nodes	Deviation (m)
50%	+/- 0.12
60%	+/- 0.15
70%	+/- 0.19
80%	+/- 0.24
90%	+/- 0.31
95%	+/- 0.38

A stats/distribution summary plot between H13982 and H12805 (1 of 4) mainscheme.

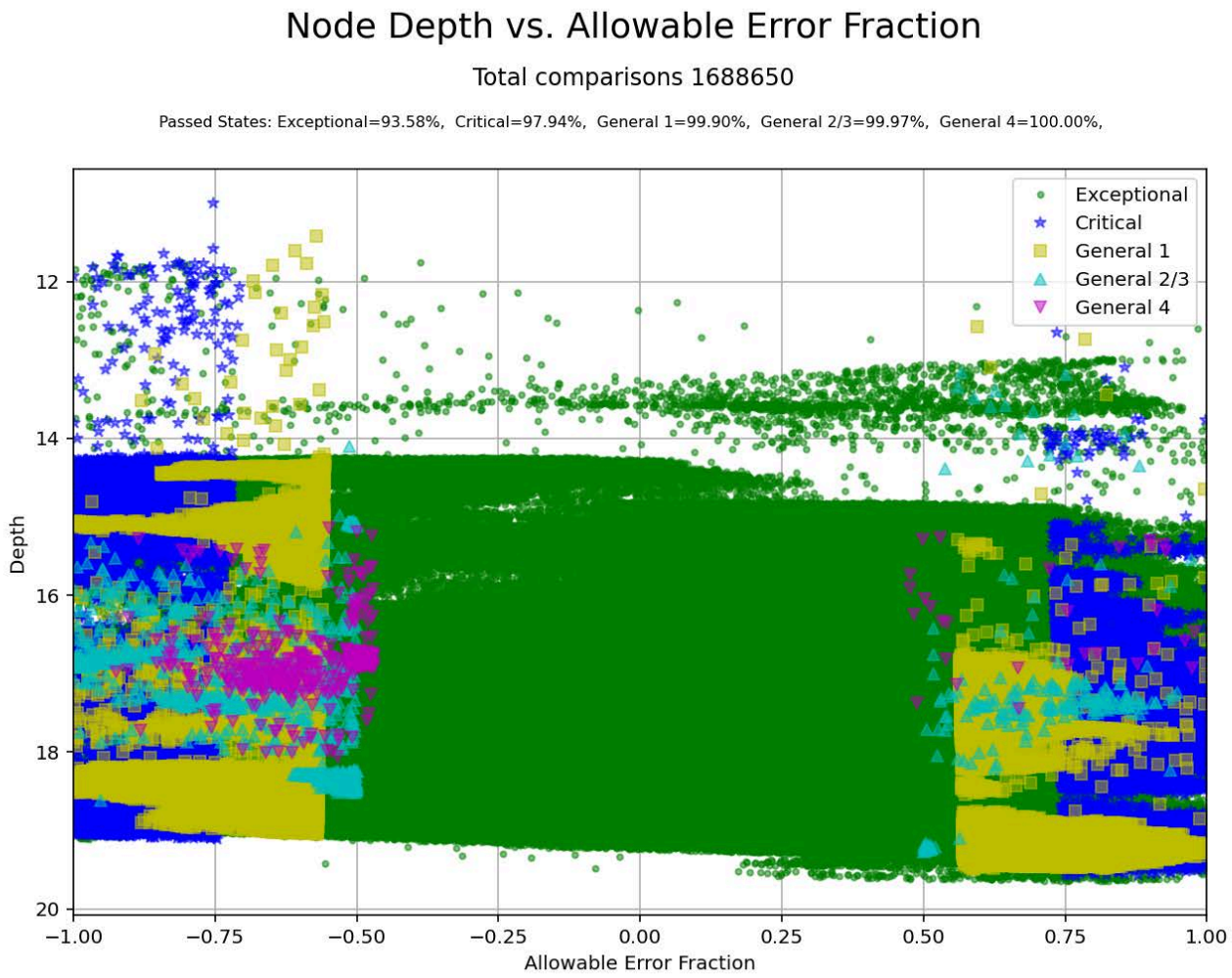


A plot of Node Depth vs. Allowable Error Fraction for the comparison between H13982 and H12805 (1 of 4) mainscheme.

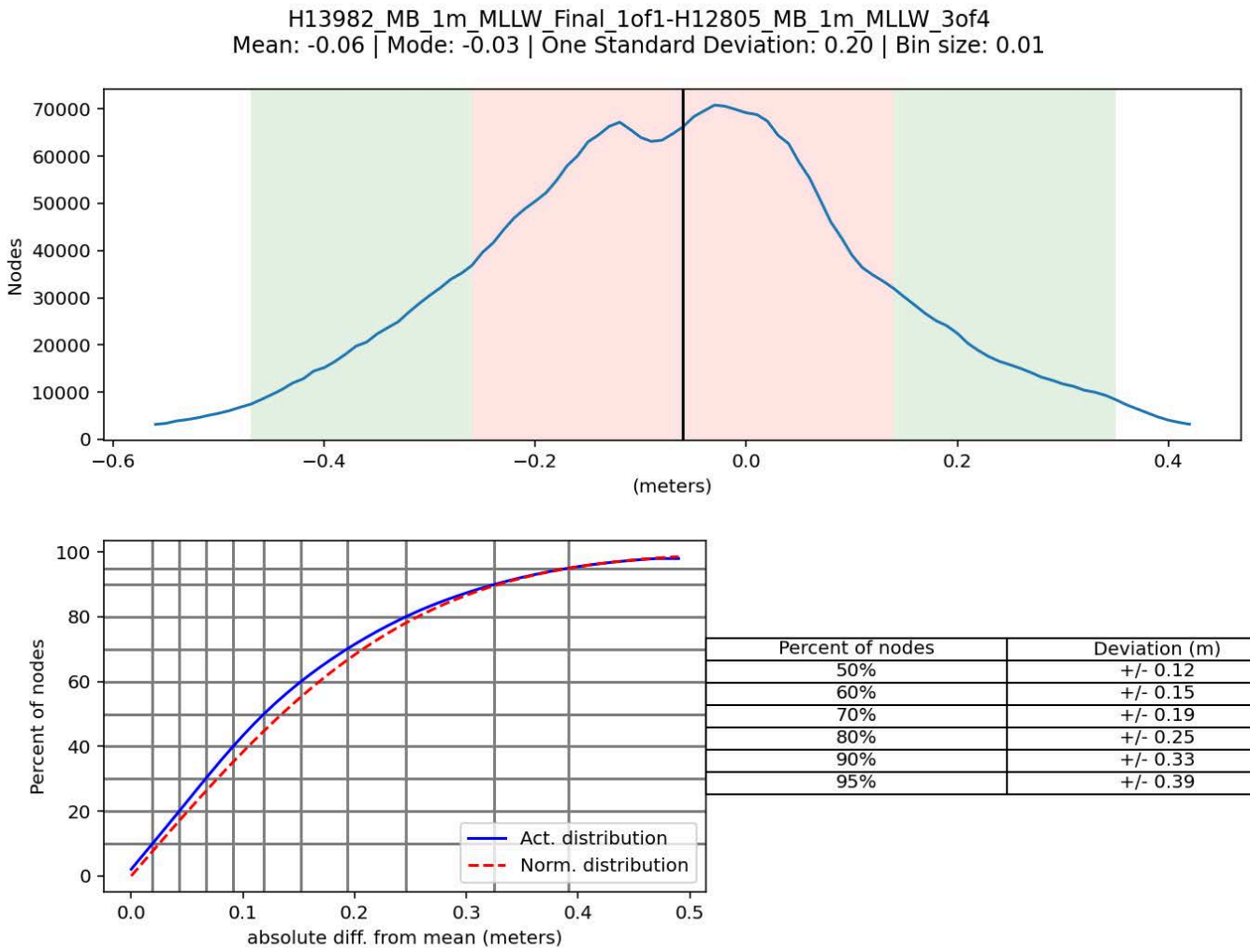


Percent of nodes	Deviation (m)
50%	+/- 0.09
60%	+/- 0.12
70%	+/- 0.16
80%	+/- 0.22
90%	+/- 0.32
95%	+/- 0.41

A stats/distribution summary plot between H13982 and H12805 (2 of 4) mainscheme.

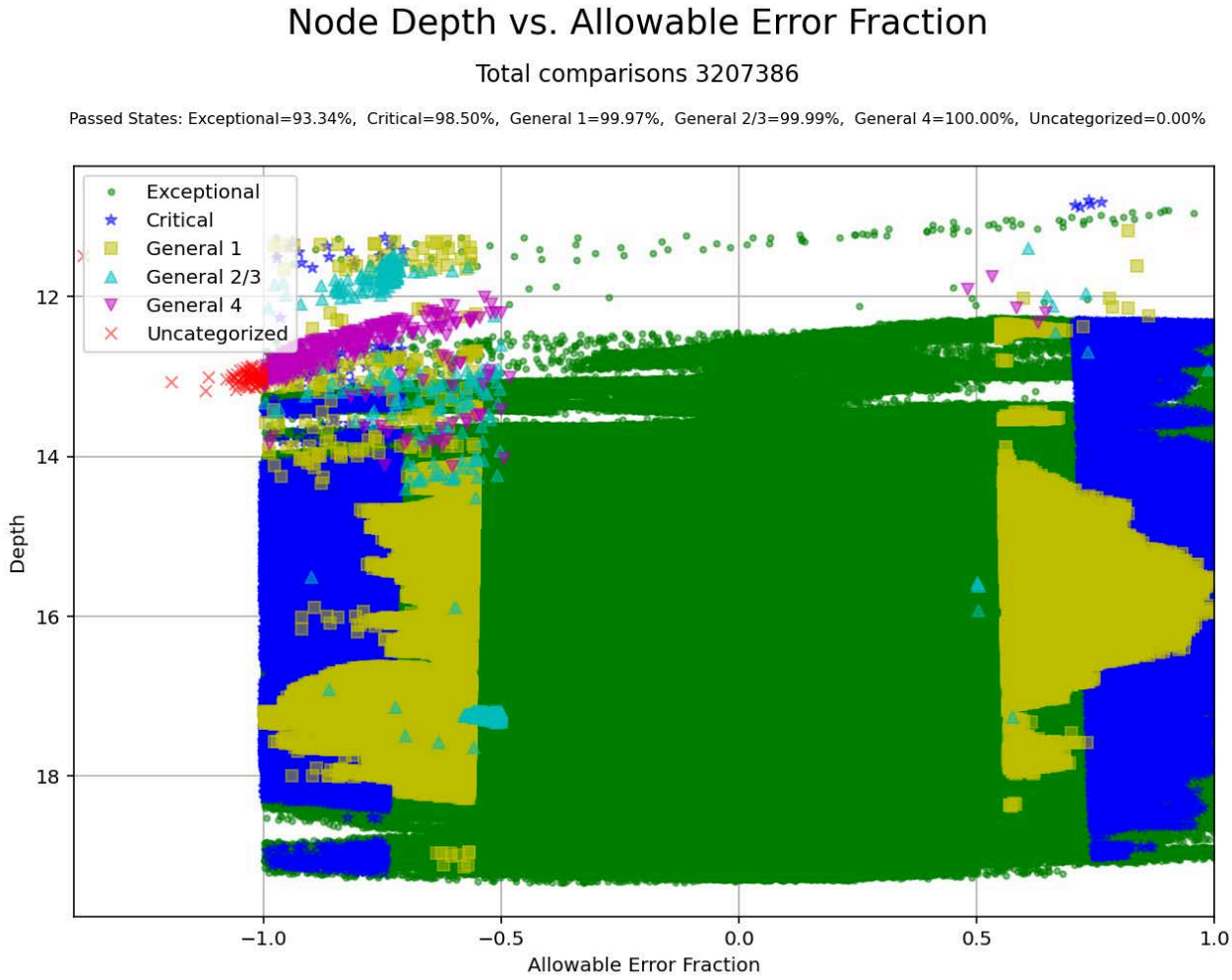


A plot of Node Depth vs. Allowable Error Fraction for the comparison between H13982 and H12805 (2 of 4) mainscheme.

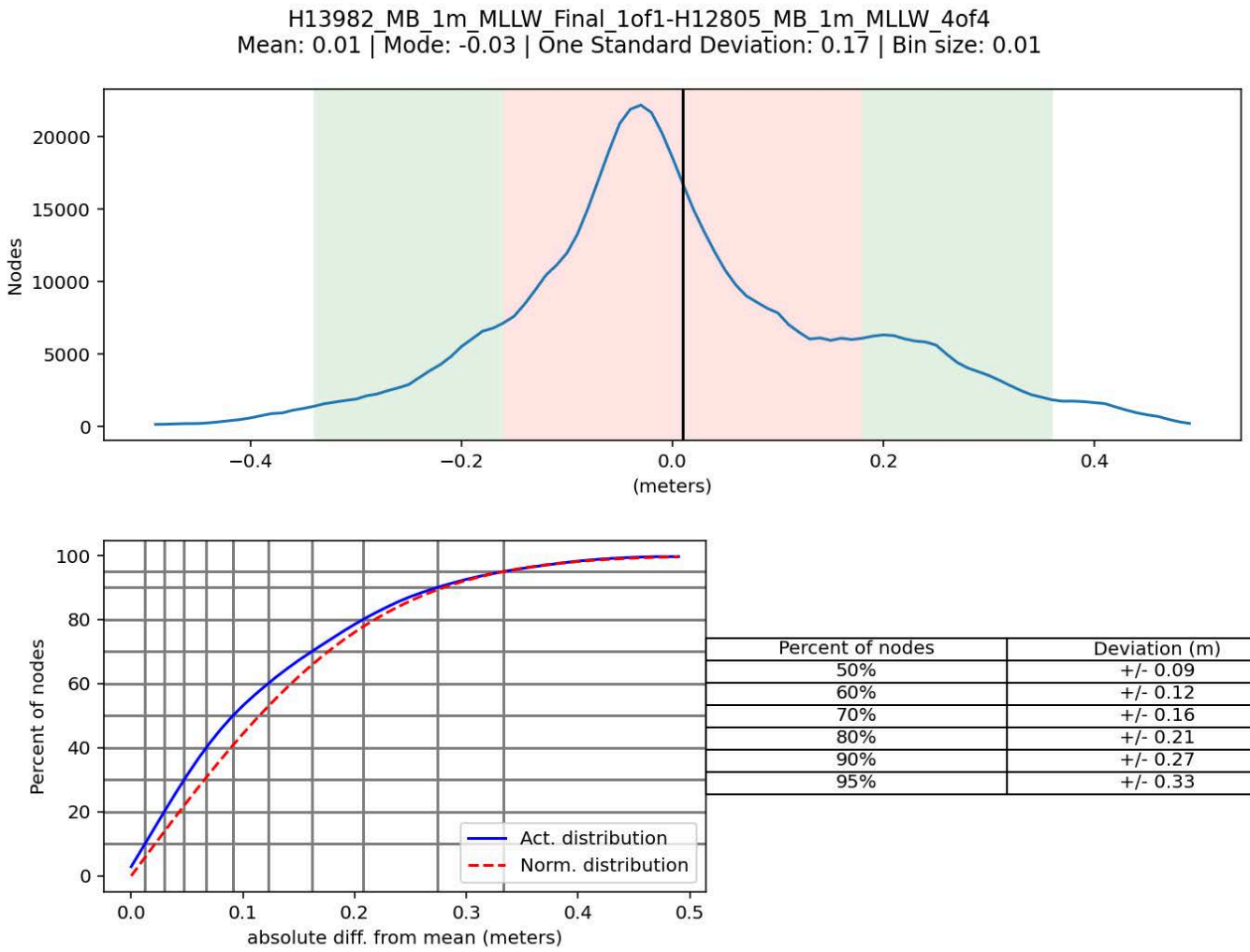


Percent of nodes	Deviation (m)
50%	+/- 0.12
60%	+/- 0.15
70%	+/- 0.19
80%	+/- 0.25
90%	+/- 0.33
95%	+/- 0.39

A stats/distribution summary plot between H13982 and H12805 (3 of 4) mainscheme.

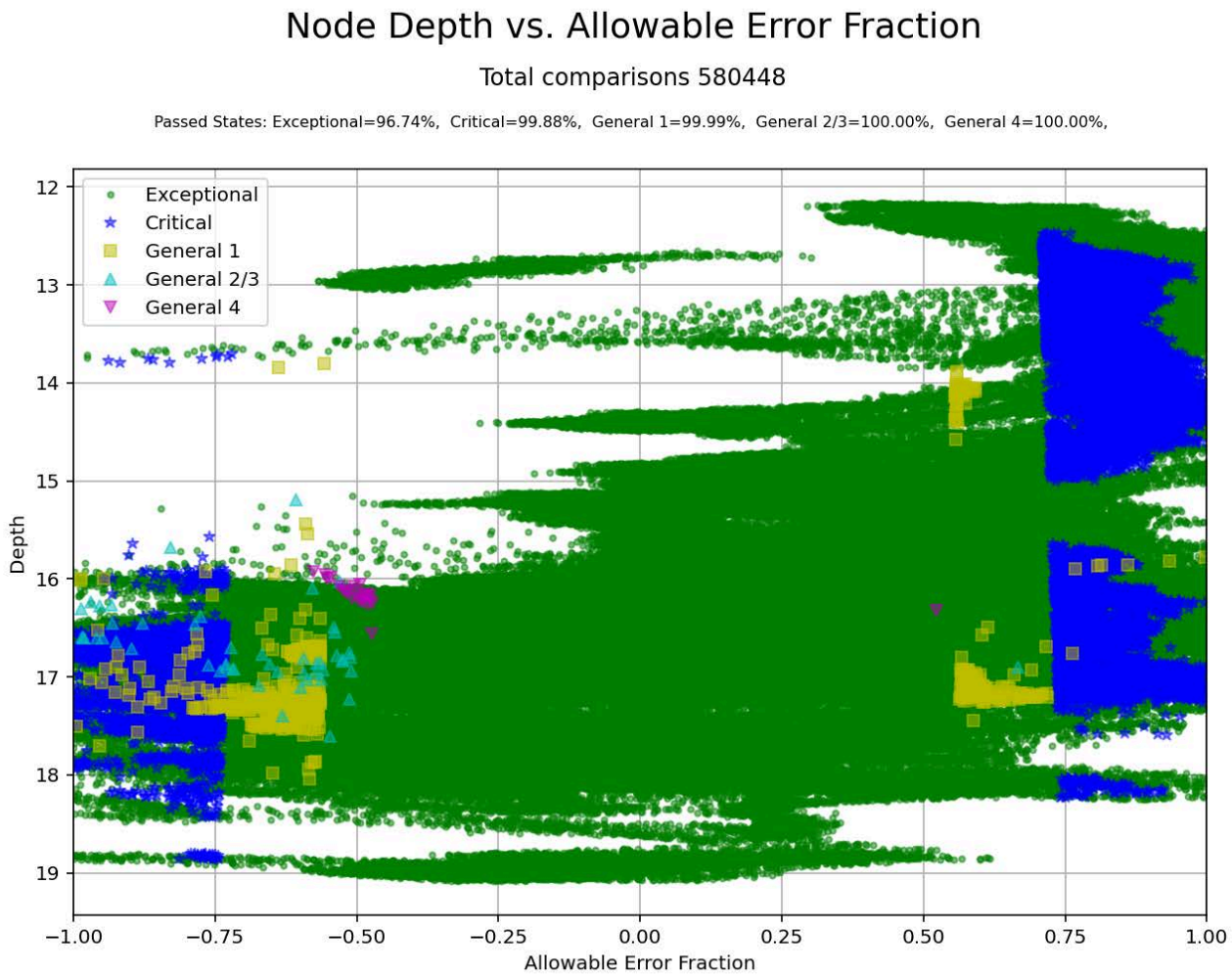


A plot of Node Depth vs. Allowable Error Fraction for the comparison between H13982 and H12805 (3 of 4) mainscheme.



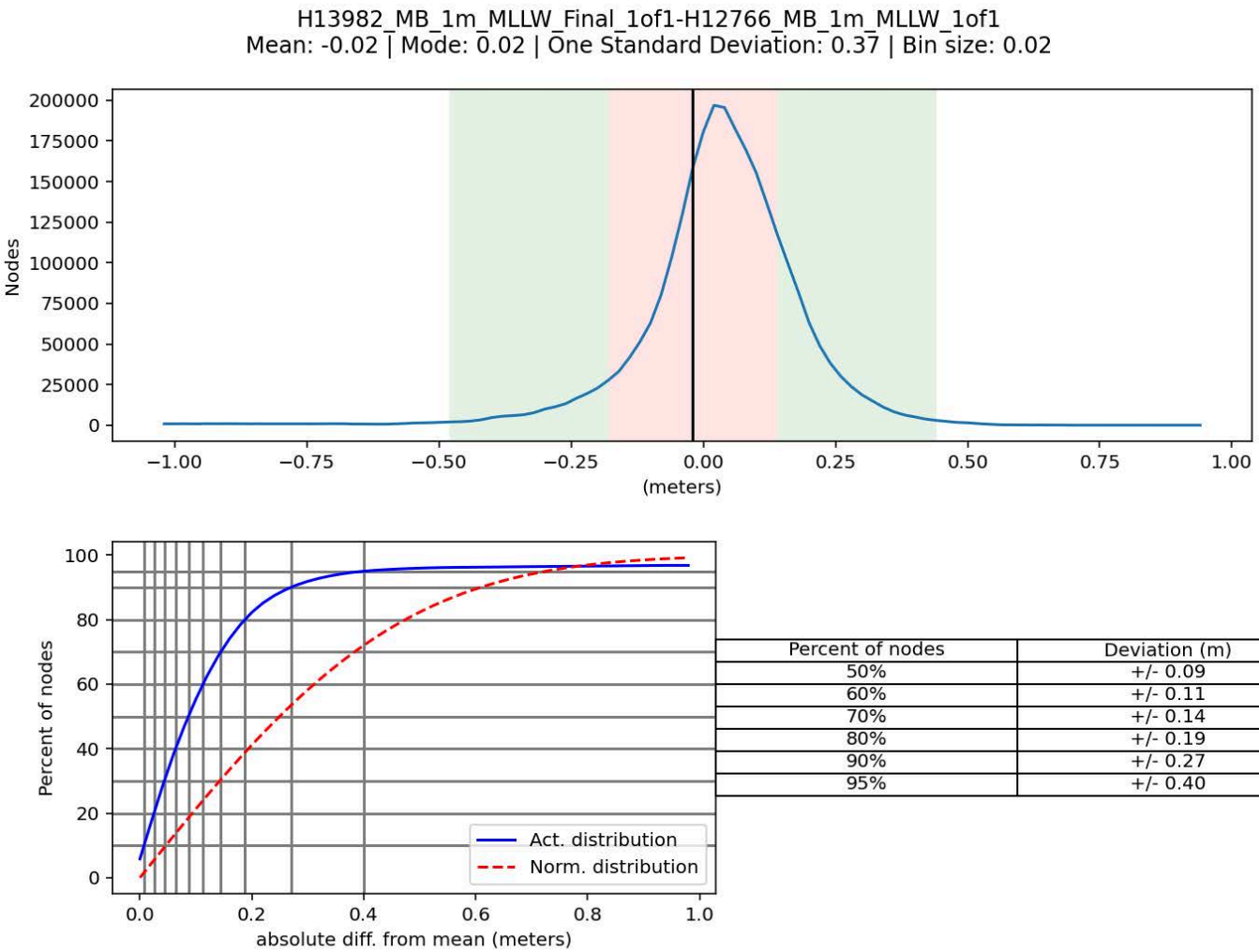
Percent of nodes	Deviation (m)
50%	+/- 0.09
60%	+/- 0.12
70%	+/- 0.16
80%	+/- 0.21
90%	+/- 0.27
95%	+/- 0.33

A stats/distribution summary plot between H13982 and H12805 (4 of 4) mainscheme.



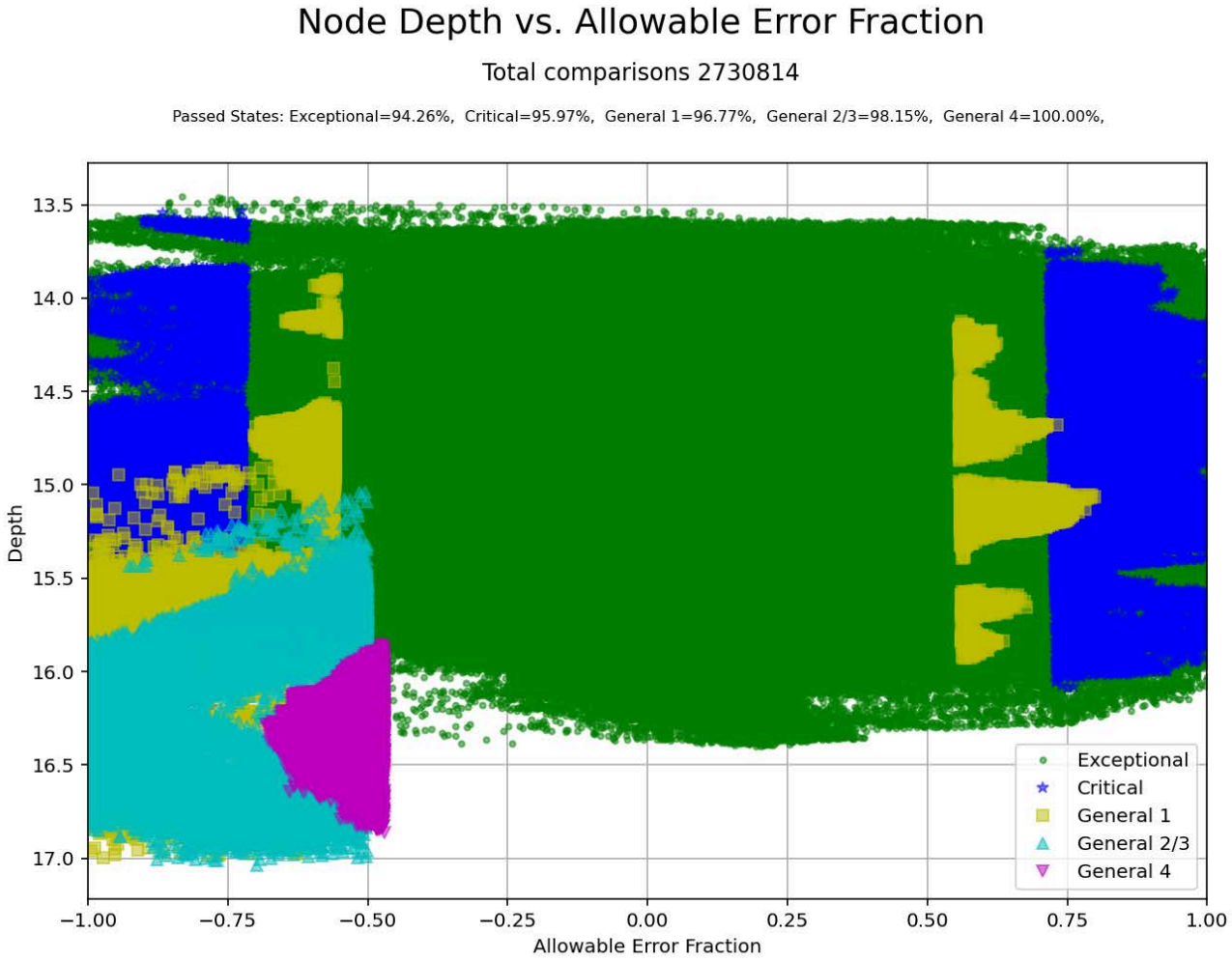
A plot of Node Depth vs. Allowable Error Fraction for the comparison between H13982 and H12805 (4 of 4) mainscheme.

The results of a comparison between a 1m SR surface of survey H13982 and surface H12766 indicate that 96.77% of grid-node comparisons between these surfaces are within Fraction of Allowable Error standards for depth/height for the assigned quality metric of "General 1," exceeding the specification of 95% stipulated by NOAA's 2024 HSSD. The resulting mean of this comparison was a -0.02m difference, with a standard deviation of 0.37m which is within allowable TVU for the area.



Percent of nodes	Deviation (m)
50%	+/- 0.09
60%	+/- 0.11
70%	+/- 0.14
80%	+/- 0.19
90%	+/- 0.27
95%	+/- 0.40

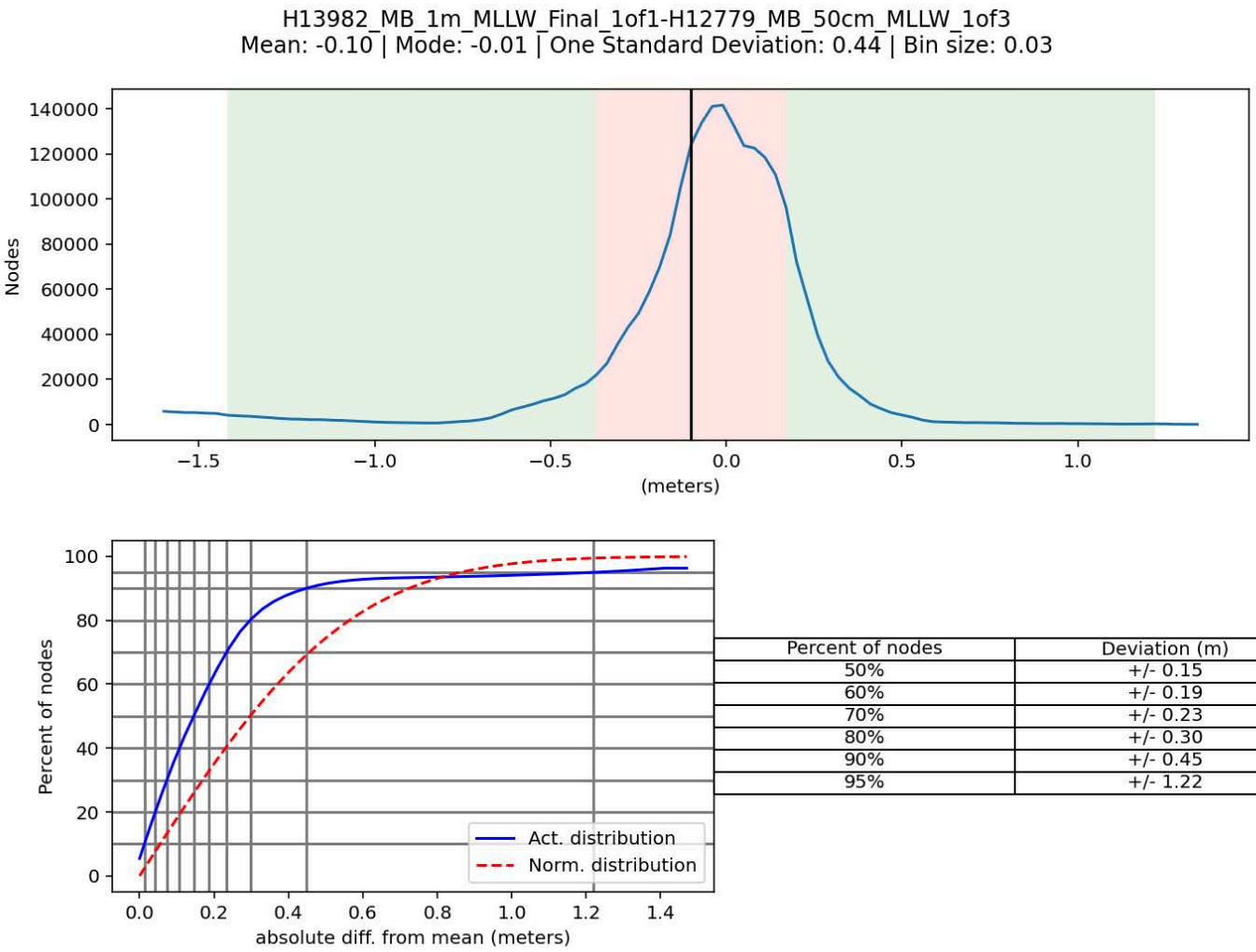
A stats/distribution summary plot between H13982 and H12766 mainscheme.



A plot of Node Depth vs. Allowable Error Fraction for the comparison between H13982 and H12766 mainscheme.

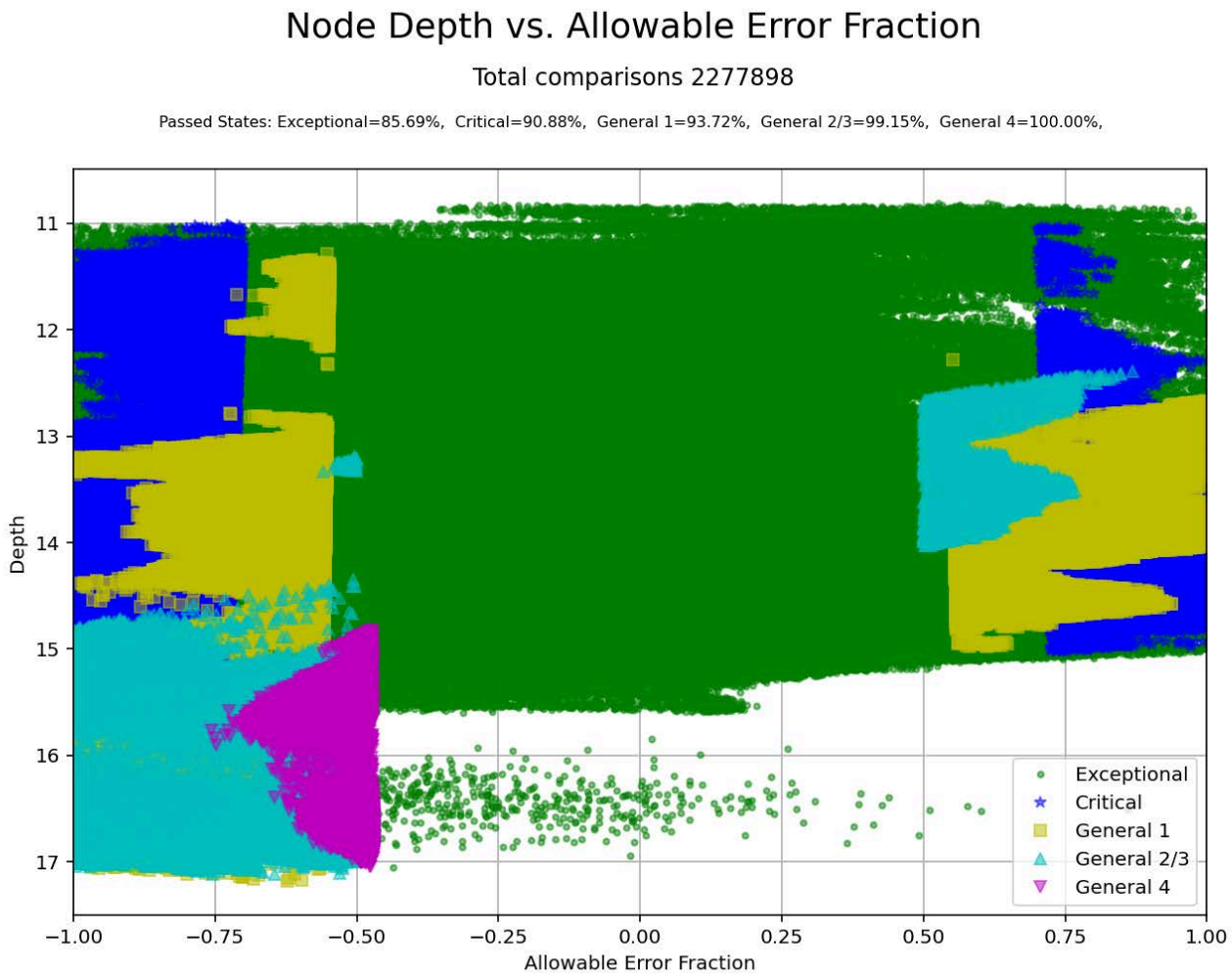
The results of a comparison between a 1m SR surface of survey H13982 and surface H12779 (1 of 3) indicate that 93.72% of grid-node comparisons between these surfaces are within Fraction of Allowable Error standards for depth/height for the assigned quality metric of "General 1," not exceeding the specification of 95% stipulated by NOAA's 2024 HSSD. The resulting mean of this comparison was a -0.10m difference, with a standard deviation of 0.44m.

The results of a comparison between a 1m SR surface of survey H13982 and surface H12779 (3 of 3) indicate that 93.80% of grid-node comparisons between these surfaces are within Fraction of Allowable Error standards for depth/height for the assigned quality metric of "General 1," not exceeding the specification of 95% stipulated by NOAA's 2024 HSSD. The resulting mean of this comparison was a -0.07m difference, with a standard deviation of 0.38m.

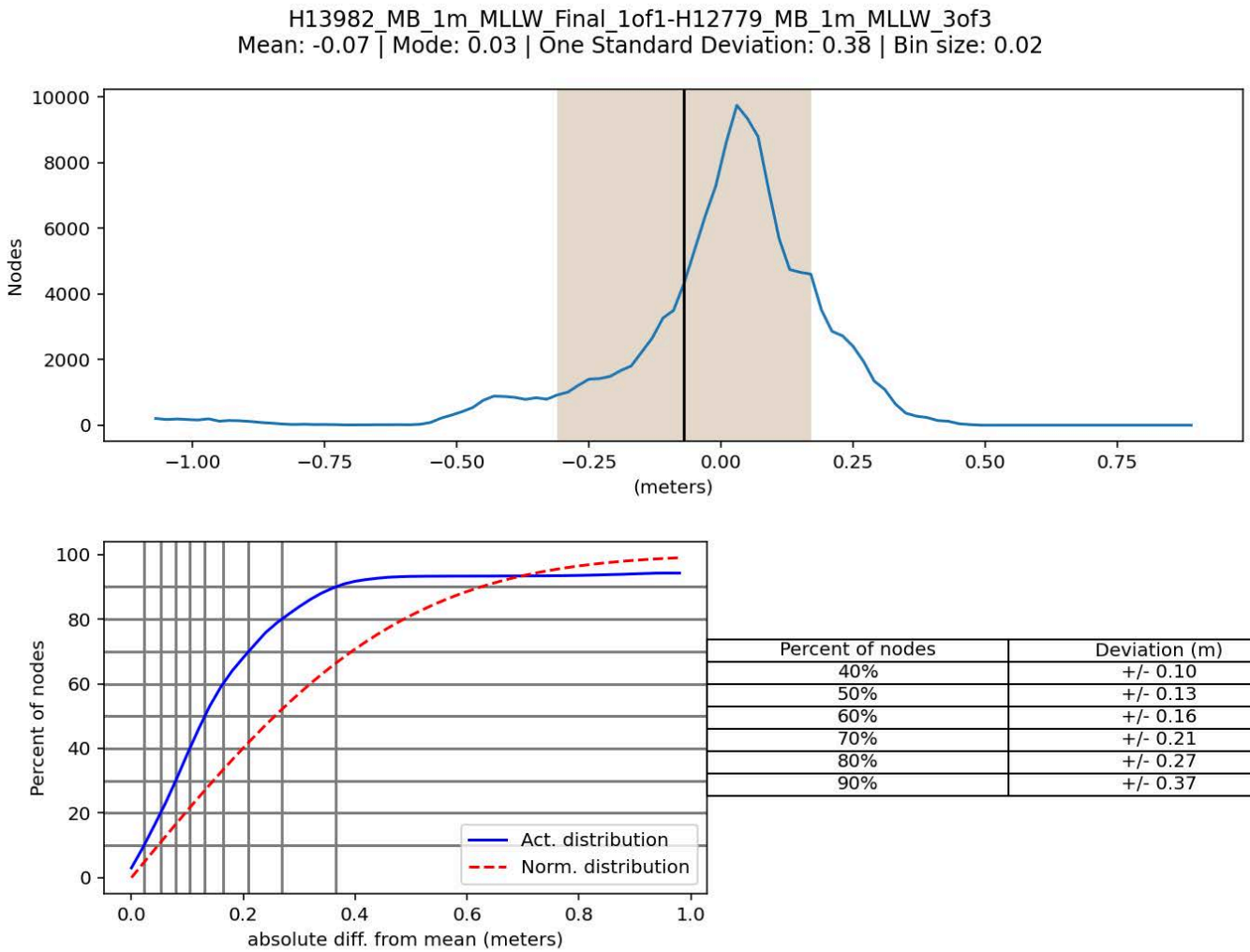


Percent of nodes	Deviation (m)
50%	+/- 0.15
60%	+/- 0.19
70%	+/- 0.23
80%	+/- 0.30
90%	+/- 0.45
95%	+/- 1.22

A stats/distribution summary plot between H13982 and H12779 (1 of 3) mainscheme.

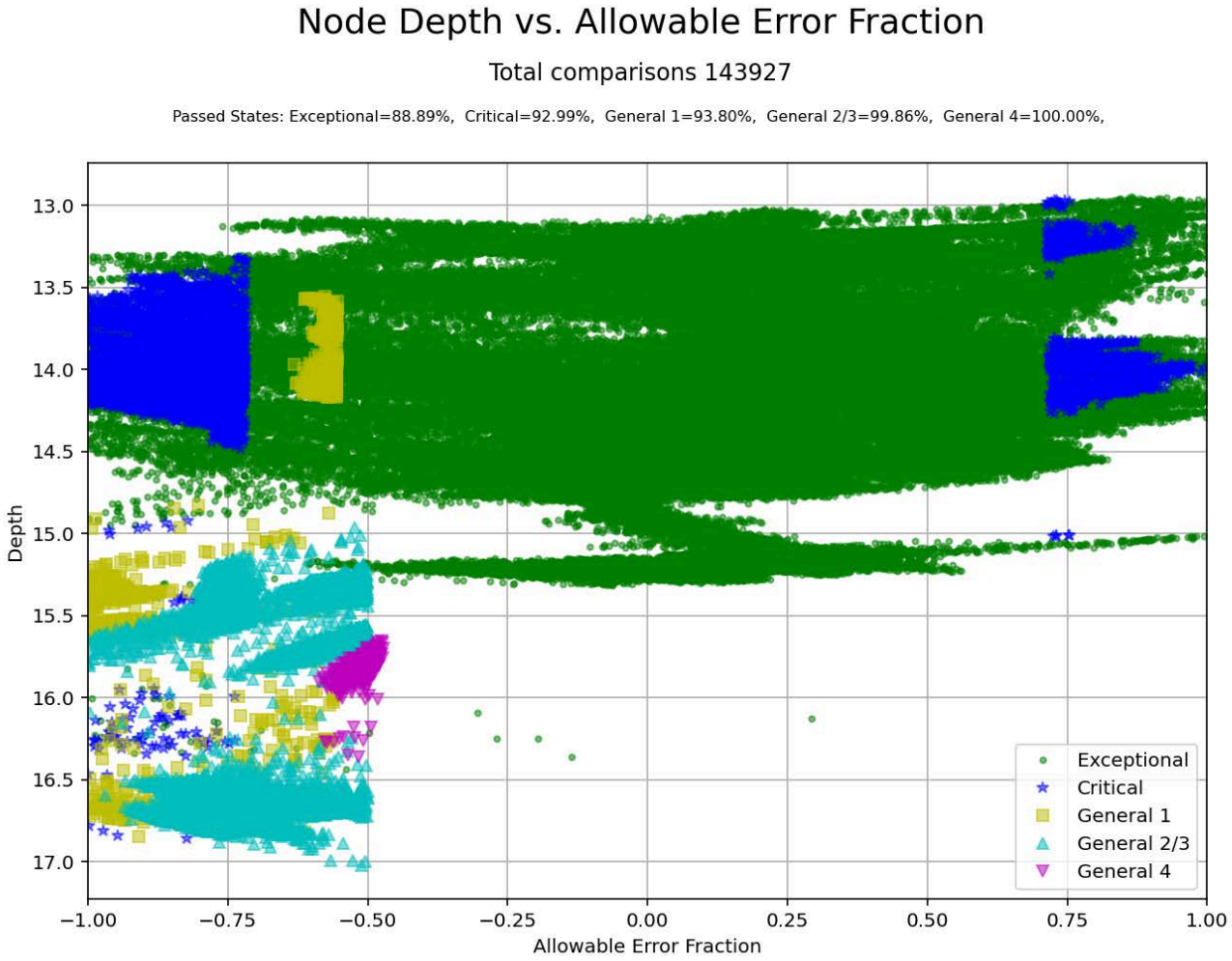


A plot of Node Depth vs. Allowable Error Fraction for the comparison between H13982 and H12779 (1 of 3) mainscheme.



Percent of nodes	Deviation (m)
40%	+/- 0.10
50%	+/- 0.13
60%	+/- 0.16
70%	+/- 0.21
80%	+/- 0.27
90%	+/- 0.37

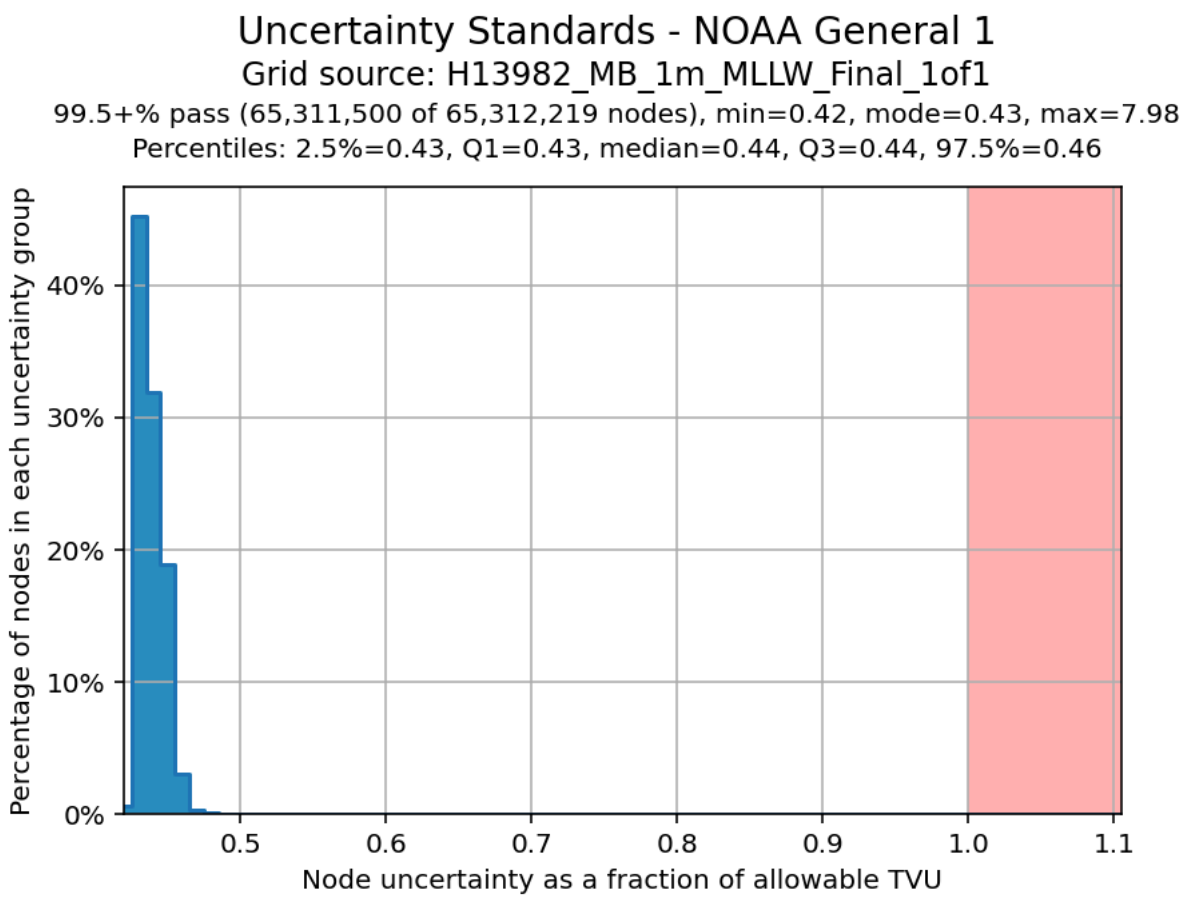
A stats/distribution summary plot between H13982 and H12779 (3 of 3) mainscheme.



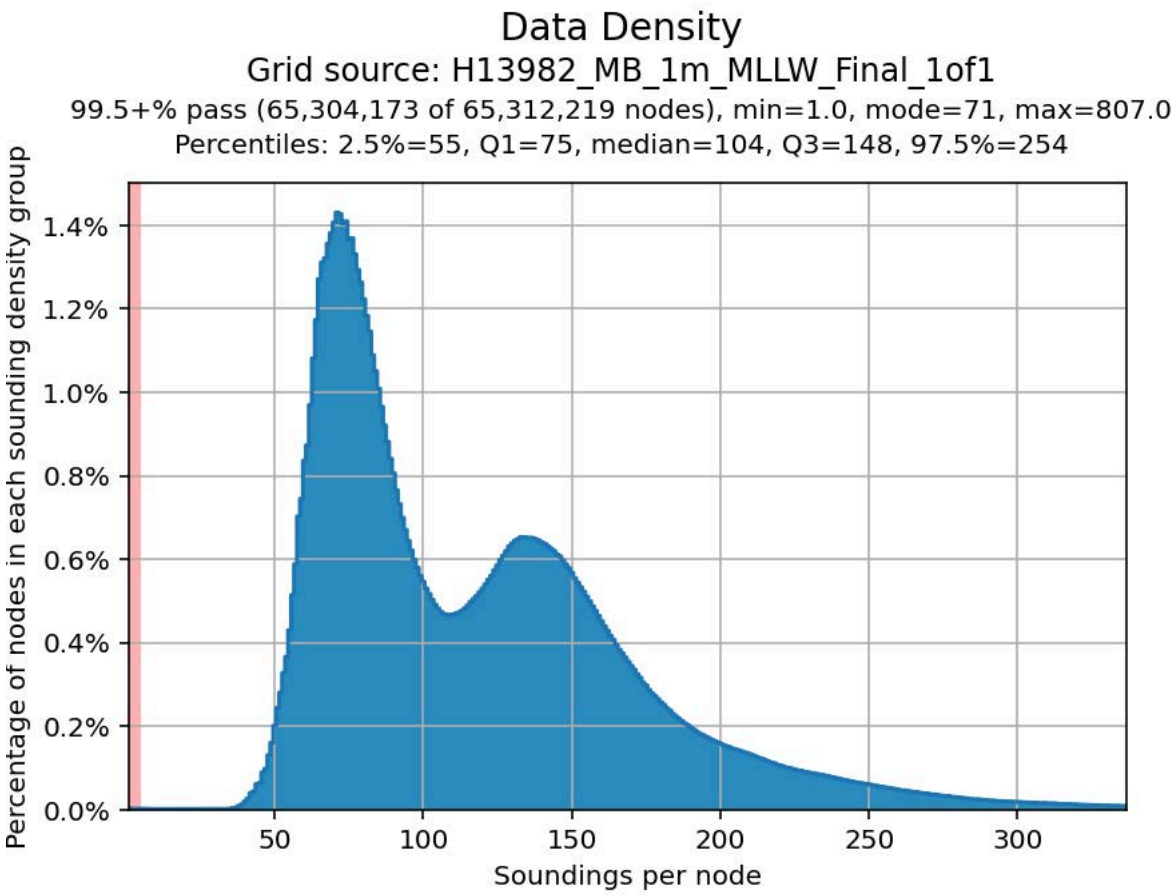
A plot of Node Depth vs. Allowable Error Fraction for the comparison between H13982 and H12779 (3 of 3) mainscheme.

Statistical Analysis

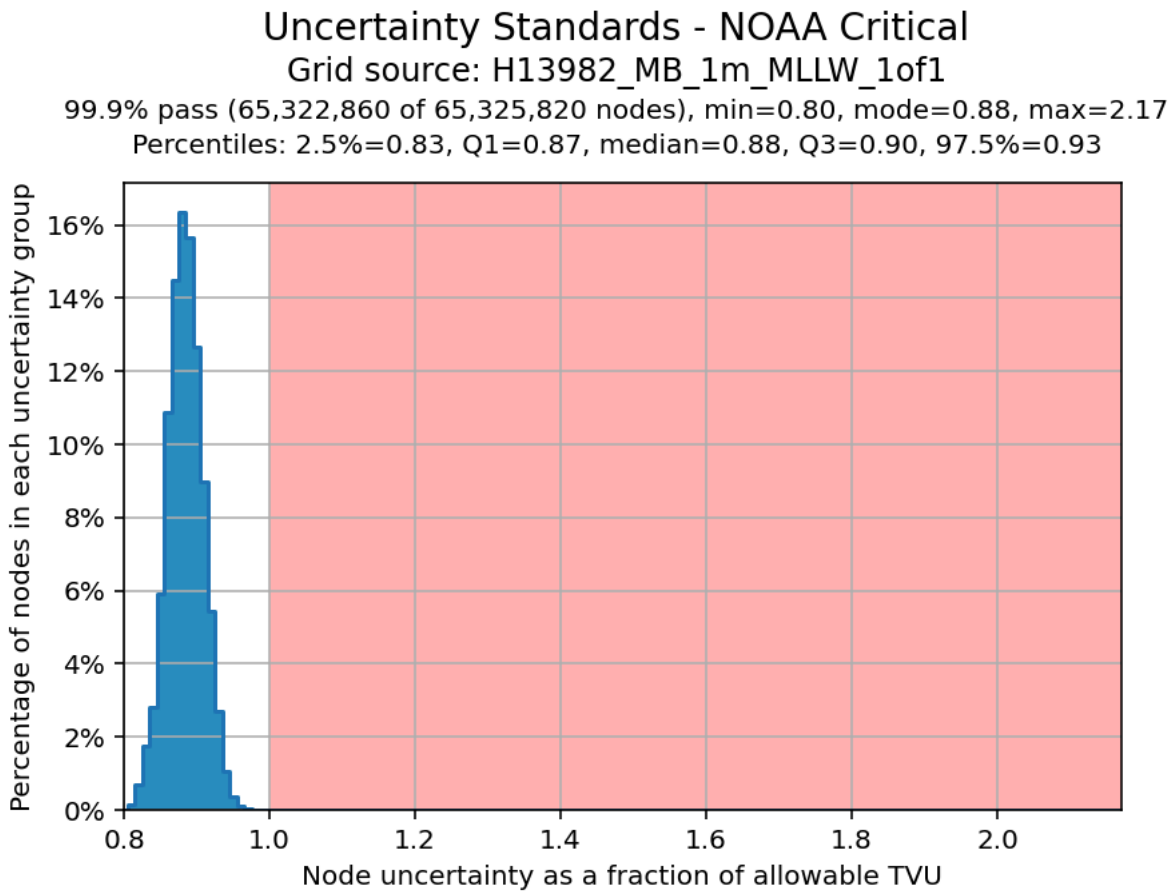
Statistical analysis of grid layers was conducted to assess the quality of the bathymetry. The "Grid QC" program contained within NOAA's Pydro 24 QC Tools was used to asses grid density and uncertainty against allowable standards specified in the most recent edition of the HSSD. This survey was assigned quality metrics of "General 1," and the delivered grids exceed the specified standards up to "Critical"quality metrics. Information about uncertainty values used for data processing can be found within the Caris HIPS & SIPS processing project and in the associated Hydrographic Vessel Files (HVFs) for each survey platform.



H13982 Uncertainty Statistics - Gemeral-1



H13982 Density Statistics



H13982 Uncertainty Statistics - Critical

Directed Editing

After initial collection, MBES data underwent a thorough process of editing and inspection to clean gridded surfaces of erroneous fliers that inaccurately affected seabed measurements, and to ensure that no systematic errors were present. Teledyne's CARIS software was used to generate and examine a 1m CUBE surface as well as its uncertainty, and standard deviation layers, which guided visual inspection for flyers. In addition, the Pydro 24 tool "Flier Finder" analyzes the grids for anomalous data and was utilized to guide editing.

Holiday Identification

Survey coverage was assessed daily by the field unit as part of night processing to identify data gaps to be addressed. Gaps in coverage that are larger than HSSD specifications are known as holidays. Various methods were utilized to aid in holiday identification including visual inspection and NOAA's Pydro 24 QC Tools program "Holiday Finder". "Holiday Finder" is most commonly used for holiday identification in areas of 100% bathymetric (MBES) coverage. The hydrographer inputs a CUBE surface and the tool returns a number of files which can be used in Caris HIPS & SIPS for holiday analysis and acquisition planning. There is one holiday present in the mainscheme coverage of sheet H13982, which the field unit was unable to address due to the location being in close proximity of a buoy.

Survey Adequacy

This survey is adequate to supersede previous data; however, there exists a gap in data due to a holiday as described above. The data in this survey was acquired in accordance with requirements set forth in the 2024 HSSD.

Imagery Coverage

Imagery coverage assessment was not performed for this survey

Data Interpolation

Data interpolation was not performed for this survey

Backscatter

Calibration Method

N/A

Dynamic Range

The system echo sounders have the dynamic range to accommodate the relatively homogeneous survey area. The frequency was held constant at 300 kHz while the system automatically controlled pulse type.

Acquisition Configuration

No special techniques were used outside of normal considerations for quality data acquisition for a bathymetric survey.

Environmental Variable

Sound speed profiles were collected at the start of acquisition each day and at a minimum of once every four hours in order to apply appropriate absorption coefficients during acquisition.

Acquisition Output

Please refer to Section 4.3.2.1.2 Acoustic Backscatter Imagery of the Field Procedures Manual for the backscatter post processing workflow.

Report of Survey

Uncertainty Source

Information about uncertainty values used for data processing can be found within the Caris HIPS & SIPS processing project and in the associated Hydrographic Vessel Files (HVFs) for each survey platform. Uncertainty results for H13982 can be found in the Statistical Analysis section of Quality Control Procedures in this document.

Unusual Condition

Unusual IMU dropouts and vertical offset issues were encountered on this survey. In an effort to troubleshoot, the POS computer system (PCS POS MC320 v5) was replaced (DN261 – 09/17/24) and a subsequent patch test was conducted to update the HIPS Vessel File (hvf). As S222 continued to encounter issues, the POS Inertial Measurement Unit (IMU) was replaced (DN272 - 09/28/24) alongside a

new patch test and updated hvf. Any affected lines were either updated or reacquired and processed with the newest hvf - and no significant offsets persist.

Supplementals

- Coast Pilot Report *(Nov 06, 2024)*
- Trained Marine Mammal Observers list *(Mar 05, 2024)*
- NCEI Sound Speed Data *(Nov 04, 2024)*
- Final Survey Outline *(Oct 09, 2024)*
- Potentially Sensitive Data Findings *(Oct 09, 2024)*

Approval Statement

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 and approved all data and metadata. The survey meets or exceeds requirements as set forth in the Project Instructions and NOS Hydrographic Surveys Specifications and Deliverables. The survey is complete and no additional work is required with the exception of any deficiencies noted in the Report of Survey.

Approver Name	Approver Title	Approver Certification
CDR Megan R. Guberski	Chief of Party	

Personnel

Name	Title	Certification
Benjamin M. Bryan	Senior Survey Technician	

Full Equipment List

Equipment Type	Manufacturer and System	Model Number	Serial Number	Calibration Date	Frequency	Accuracy Check Date
S222 (369958000)						
Positioning and Attitude System	Applanix POS MV 320 v5	POS MV	6497	2024-06-05	NA	NA
Positioning and Attitude System	Applanix POS MV 320 v5	POS MV	8959	2024-04-01	NA	NA
Multibeam	Kongsberg Maritime EM 2040	EM 2040	40122	2024-03-27	kHz	2024-04-04
CTD	AML Oceanographic MVP200	M12981	NA	2024-04-01	NA	
CTD	AML Oceanographic MVP-X	MVP-X CTD	9006	2024-02-08	NA	2024-04-01
Sound Speed System	Teledyne RESON SVP 70	SVP 70	1013077	2024-01-09	NA	
Sound Speed System	Teledyne RESON SVP 70	SVP 70	0614179	2023-10-23	NA	