

# **Topobathy Lidar and VDatum in the Coastal Mapping Program**

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**NOAA**

**National Geodetic Survey/Remote Sensing Division**



National Oceanic and Atmospheric Administration

# National Geodetic Survey

**Mission:** Define, maintain and provide access to the National Spatial Reference System.

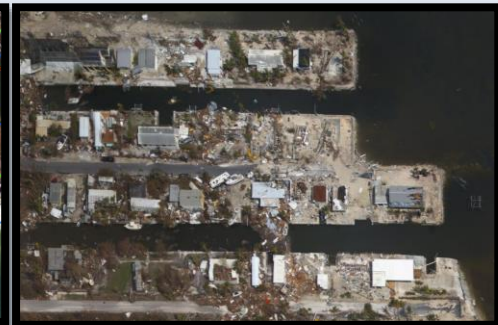
## RSD Primary Programs:



**Aeronautical Survey  
Program**



**Coastal Mapping  
Program**



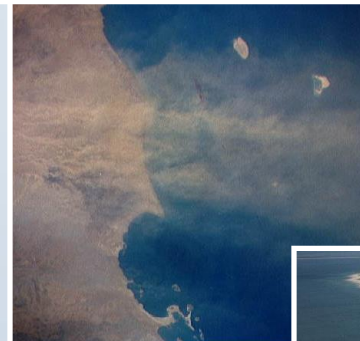
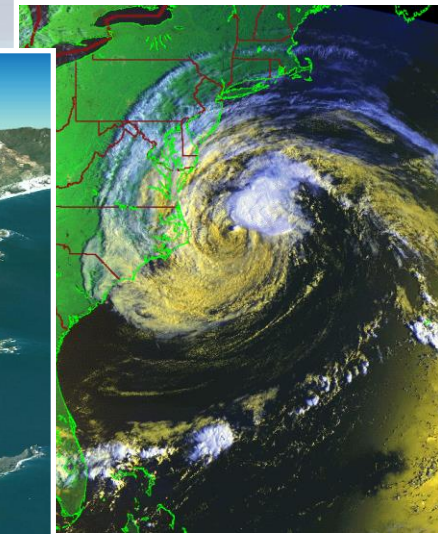
**Emergency Response**



# The Issue: Delineating a Consistent Shoreline

**The Coastal Environment: a margin of continuous change.**

- **Shorelines vary due to:**
  - wave energy
  - tidal cycles
  - atmospheric conditions
  - anthropogenic influences
  
- **Shoreline change can vary dramatically or negligibly and in no uniform pattern, at temporal scales of daily, seasonally, and decadal.**



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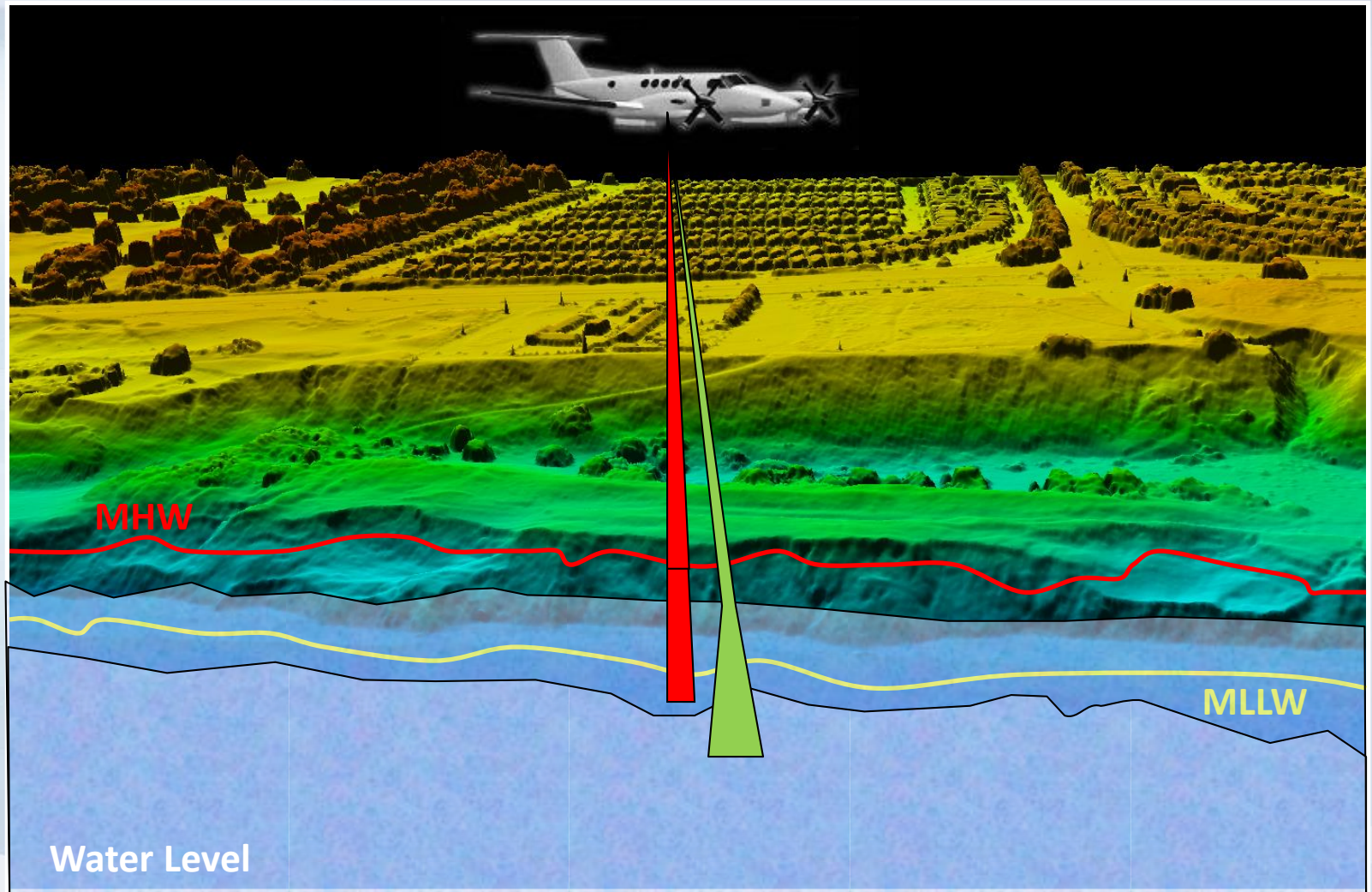
# The Issue: Delineating a Consistent Shoreline:

There are numerous proxies utilized to establish the shoreline



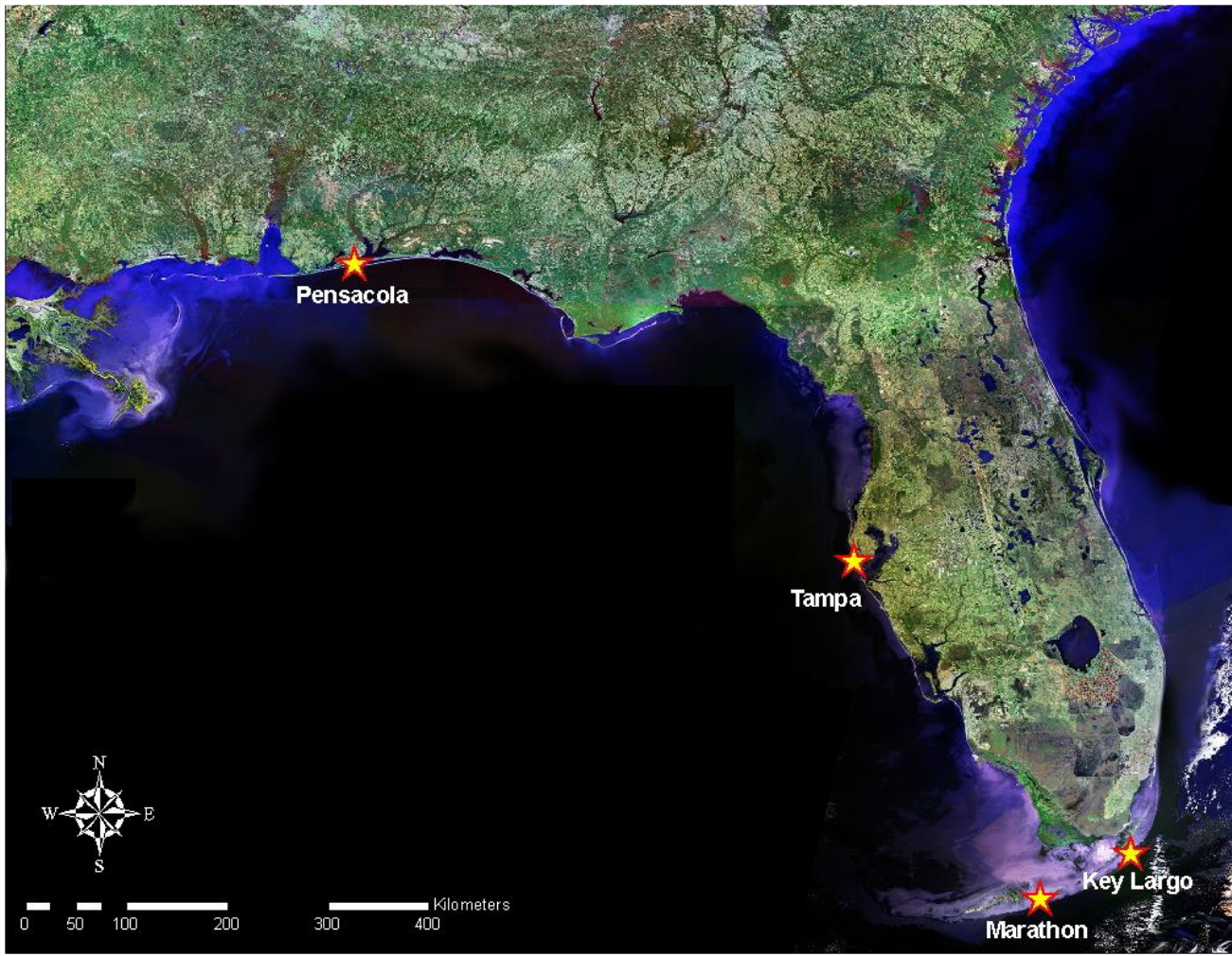
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# The Issue: Extracting multiple tidal datum based shorelines from one lidar dataset



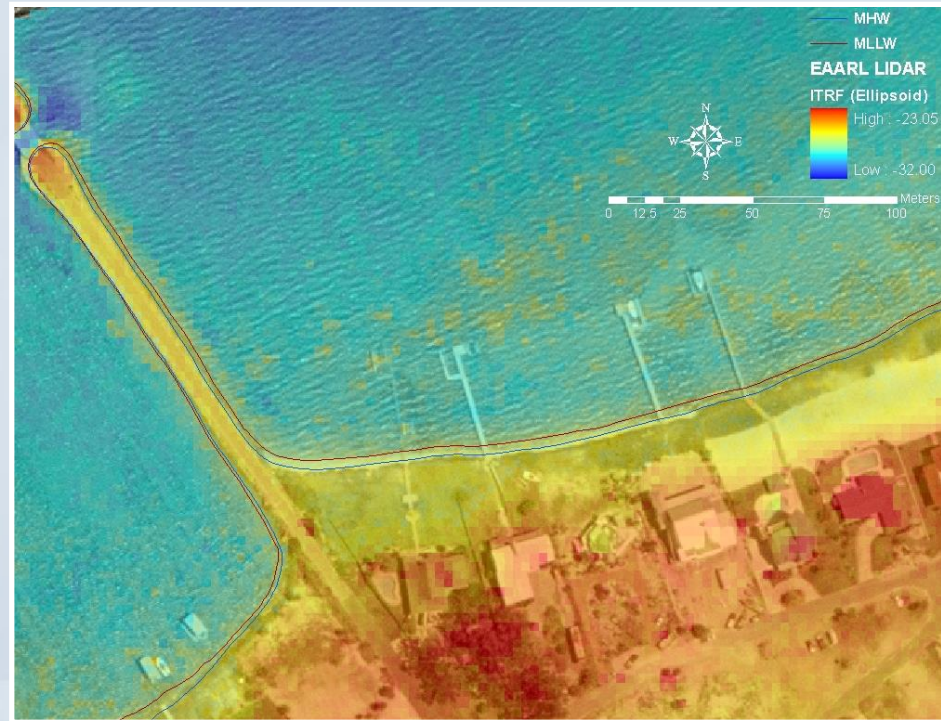
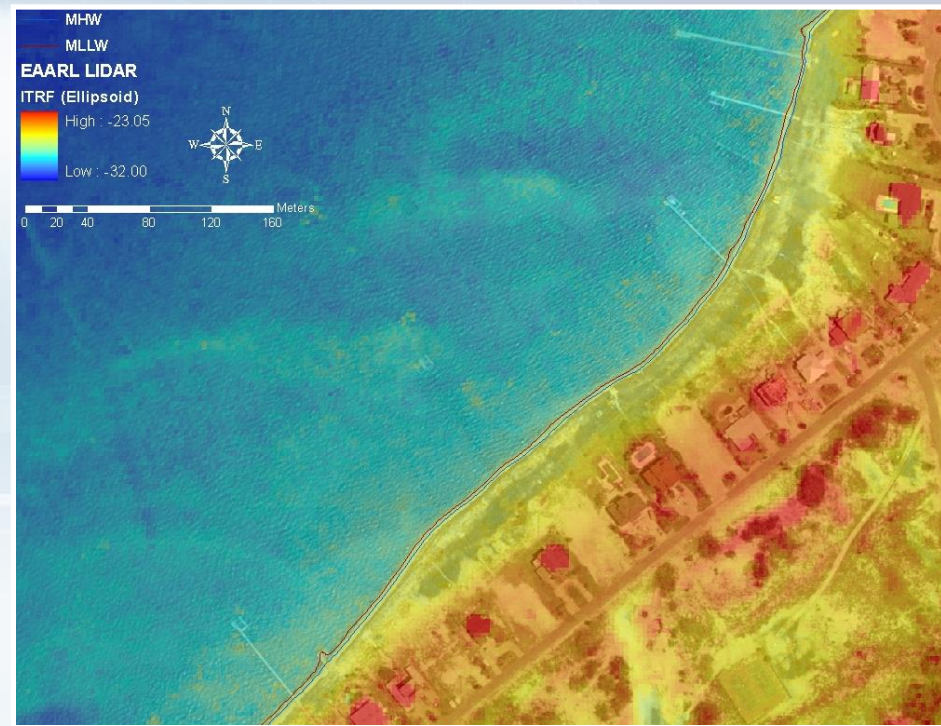
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# Experimental Advance Airborne Research Lidar (EAARL): 2006



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# The EAARL Project: Shoreline Extraction (Pensacola)



# The EAARL Project: Florida Keys

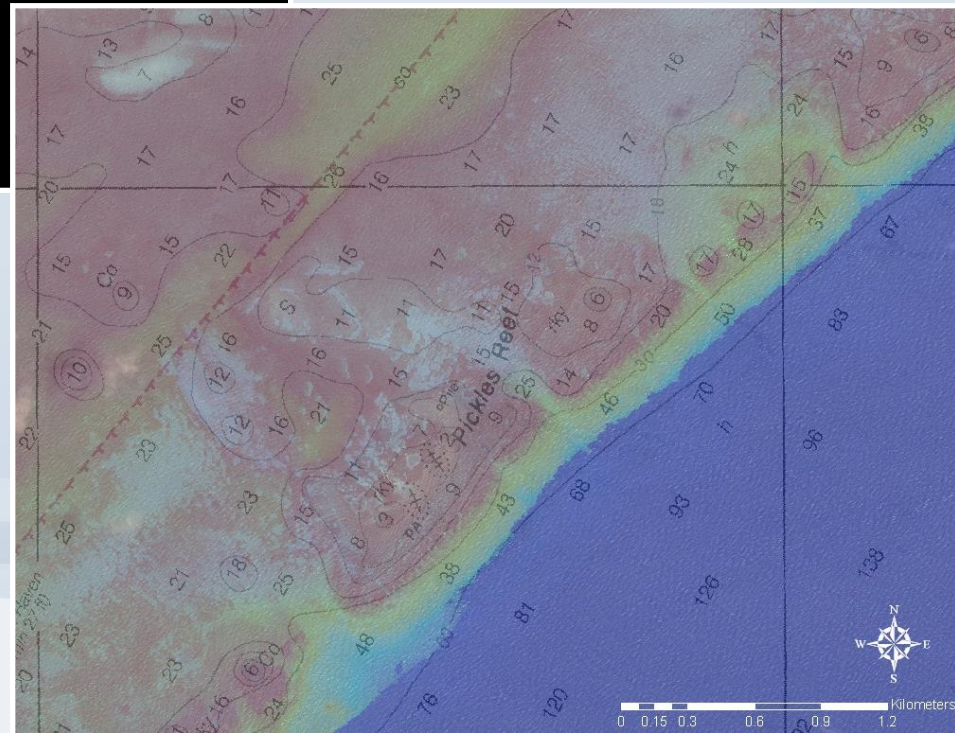
- Nautical Charting
- Rugosity Measurements

Habitat Structure and Cover

Ecosystem Management



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# Acquisition: Aerial Platform

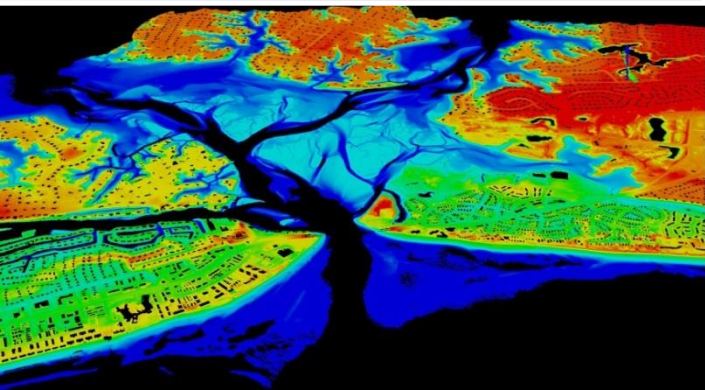
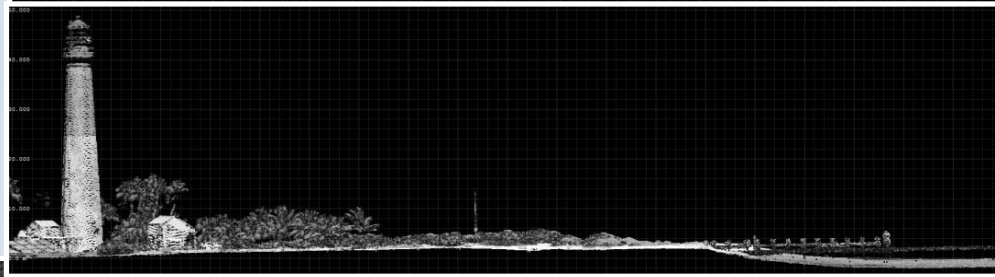


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# Topobathy Lidar

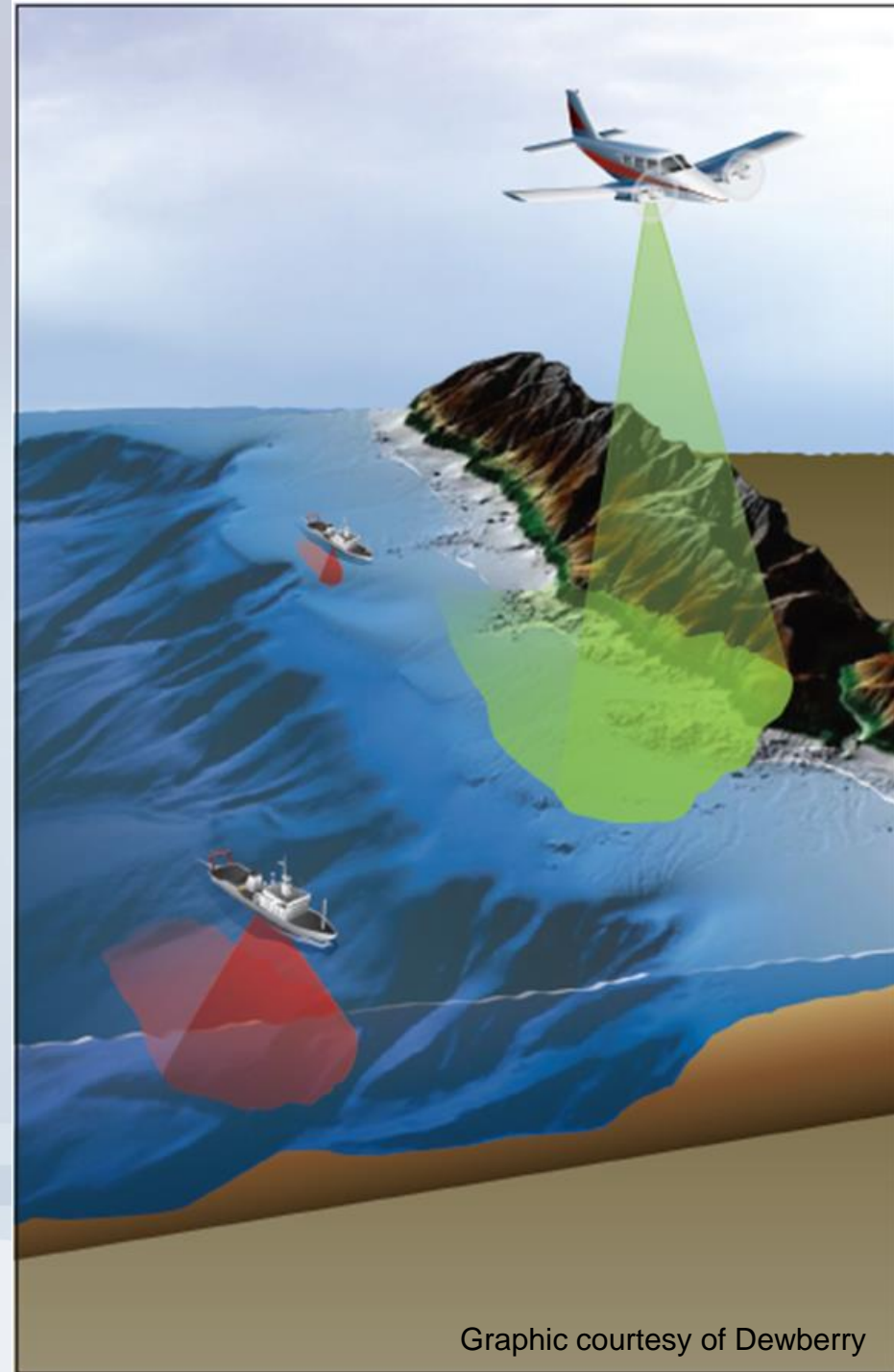
Occupies middle ground between conventional topographic and bathymetric systems:

- Narrow Beam,
- Low Power,
- Small FOV,
- Very High Sampling Rates
- Focus is on shallow water and environmental applications
- **Uniquely suited for shoreline mapping**  
Seamless, high-resolution data across backshore, intertidal, and nearshore marine zones
- **Fill in shallow water gap**  
(shoreward of NALL line)



# Support of Hydrographic Surveys

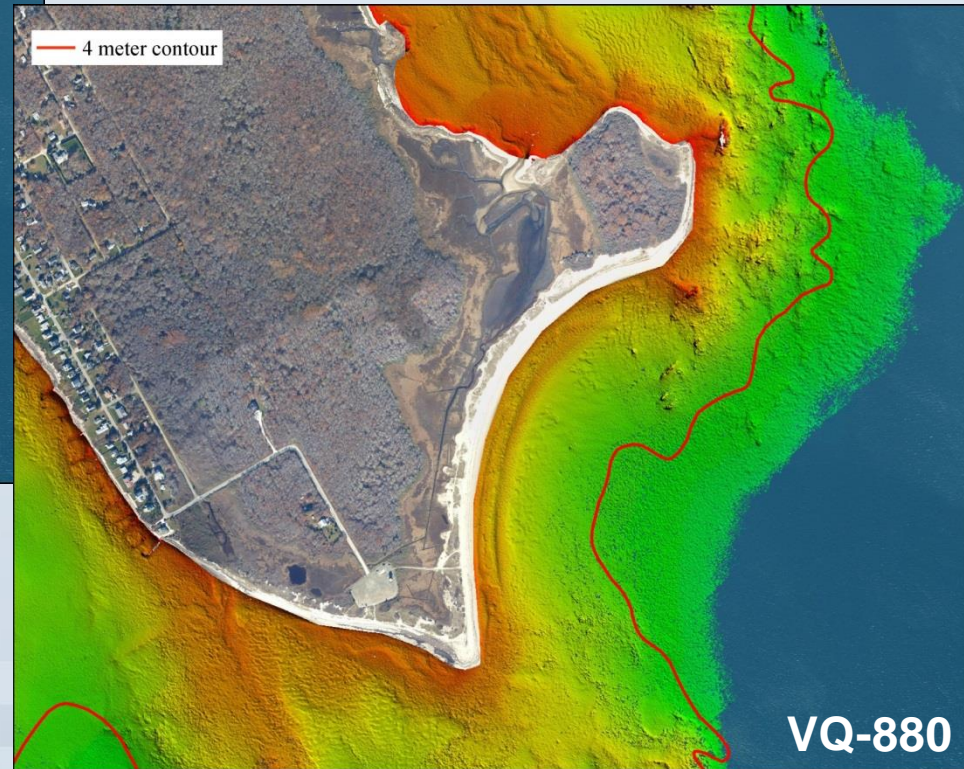
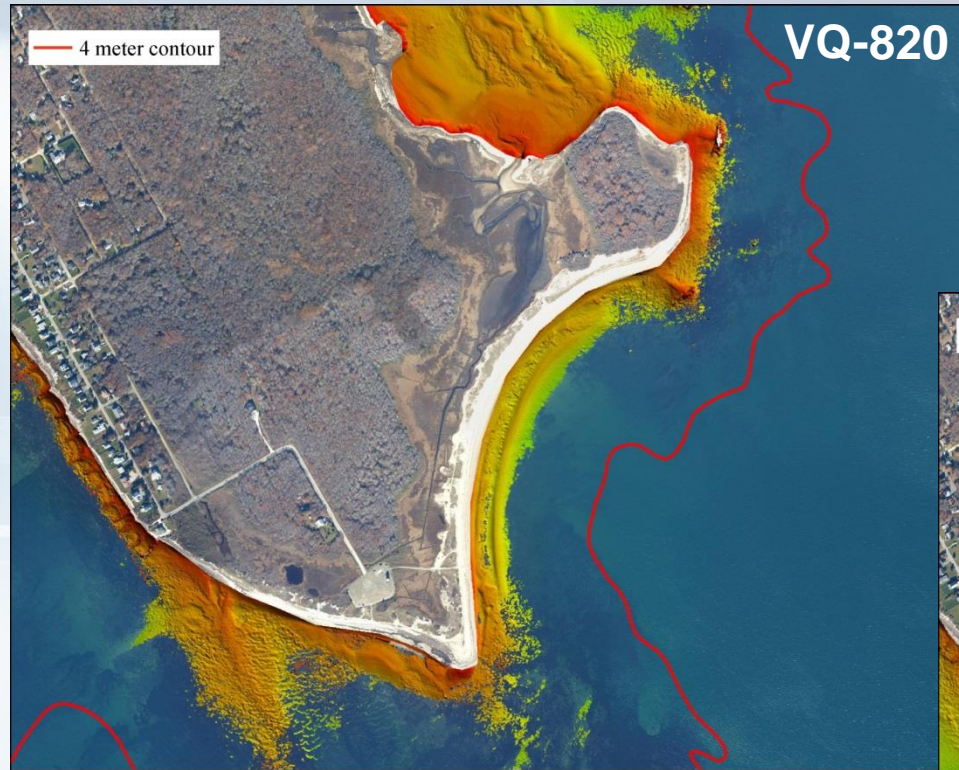
- RSD collects nearshore topobathy lidar to the 4m NALL in the year prior to ship ops
- RSD will provide both shoreline and nearshore bathymetry
- Hydro operations will use this data to plan operations and overall situational awareness
- Increases efficiency and safety of launch and ship operations



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Graphic courtesy of Dewberry

# Buzzards Bay



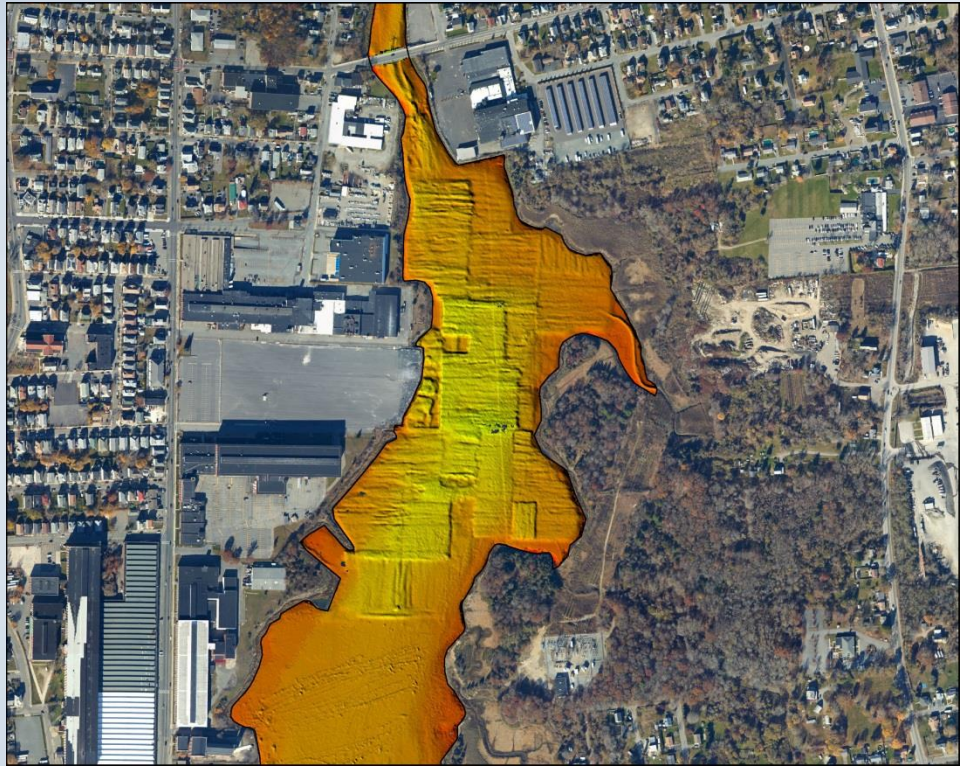
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# Buzzards Bay: New Bedford Harbor

VQ-820



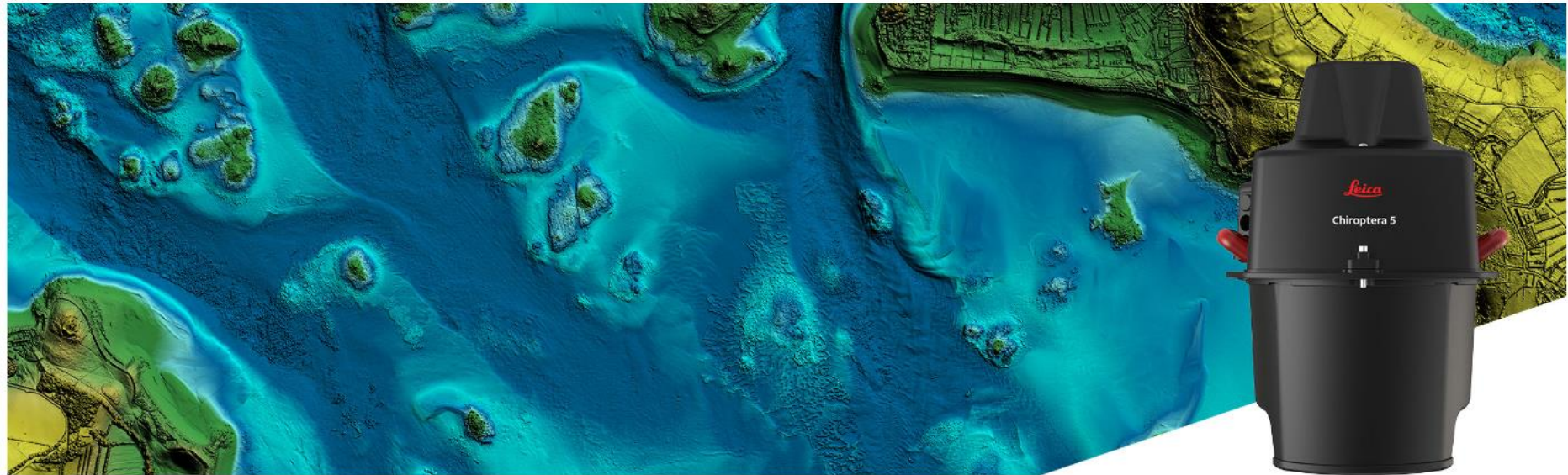
VQ-880



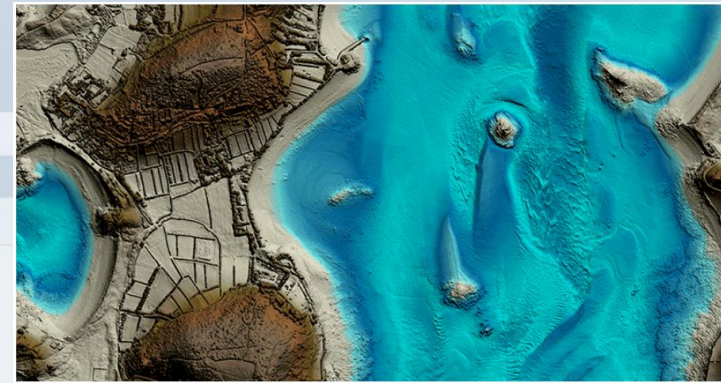
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# Leica Chiroptera-5 Bathymetric & Topographic LiDAR

Superior point density and depth penetration for coastal and inland water surveys



Leica Chiroptera-5, the high-performance airborne sensor, combines topographic and bathymetric LiDAR channels with a 4-band camera to deliver seamless data from water to land. The system provides 40% higher point density, a 20% increase in water depth penetration and improved topographic sensitivity compared to previous generations. The sensor delivers detailed LiDAR data of submerged terrain and objects and supports numerous applications such as nautical charting, erosion risk assessment, environmental monitoring and seabed classification.



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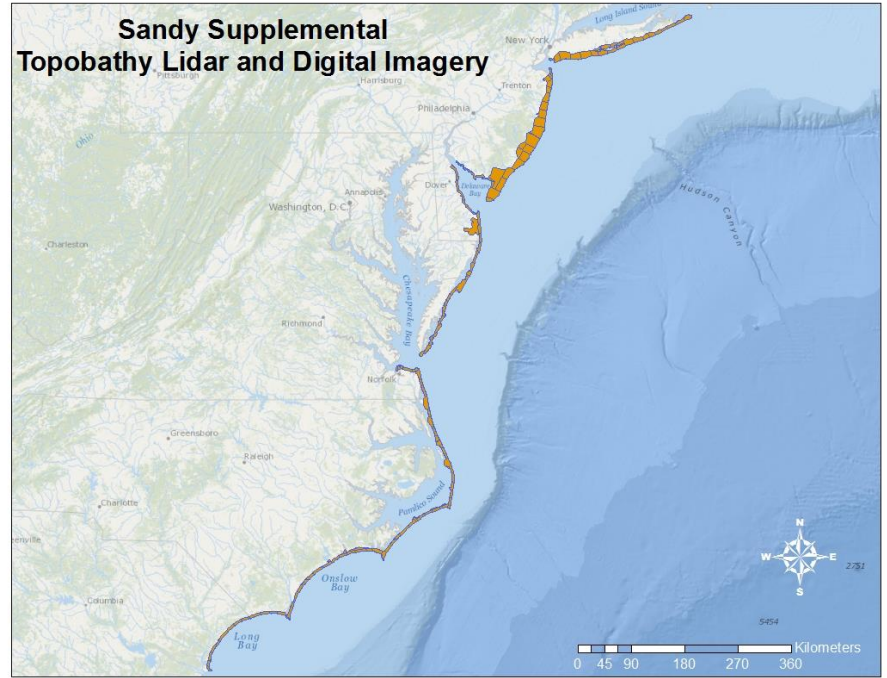
# Sandy Supplemental Topobathy Lidar

Light Detection and Ranging (LIDAR) and  
Digital Camera Imagery Requirements

SCOPE OF WORK FOR SHORELINE MAPPING  
IN SUPPORT OF  
Public Law No: 113-002,  
Disaster Relief Appropriations Act 2013

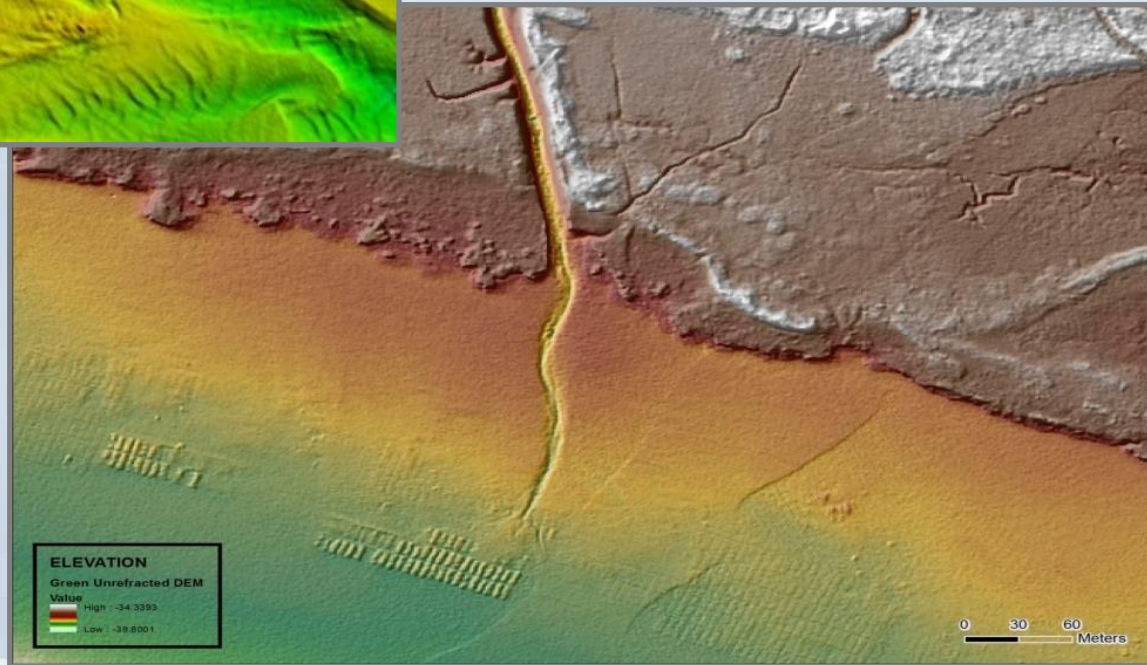
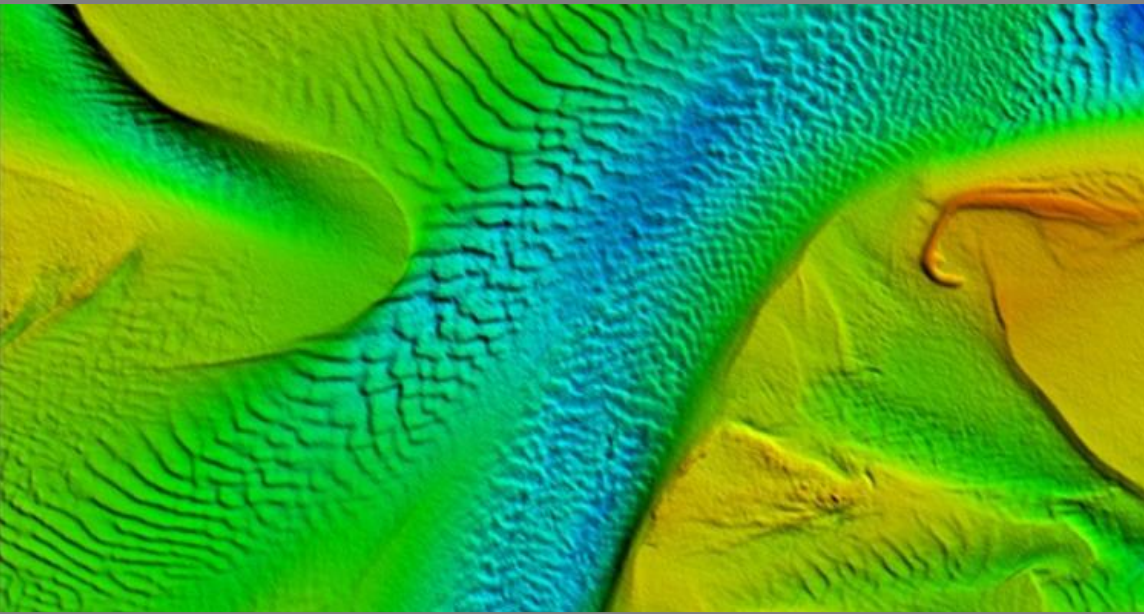
REMOTE SENSING DIVISION  
NATIONAL GEODETIC SURVEY  
NATIONAL OCEAN SERVICE  
NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION  
U.S. DEPARTMENT OF COMMERCE

## Sandy Supplemental Topobathy Lidar and Digital Imagery



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# Sandy Supplemental Topobathy Lidar

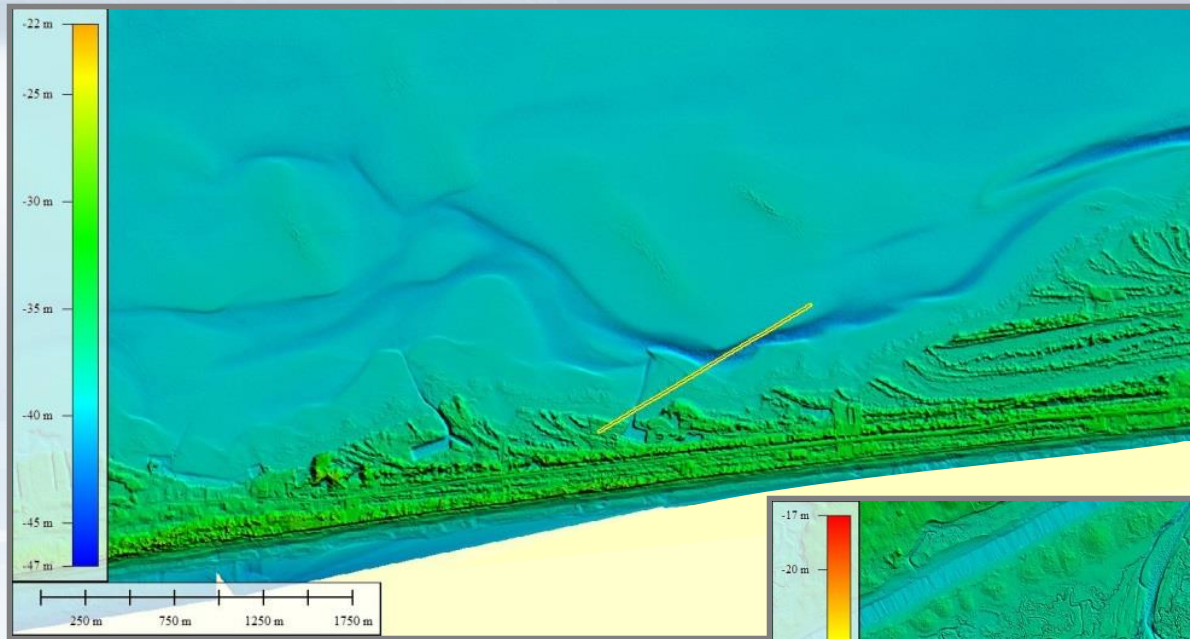


National Oceanic and Atmospheric Administration

Courtesy of Dewberry/Quantum Spatial



# Sandy Supplemental Topobathy Lidar

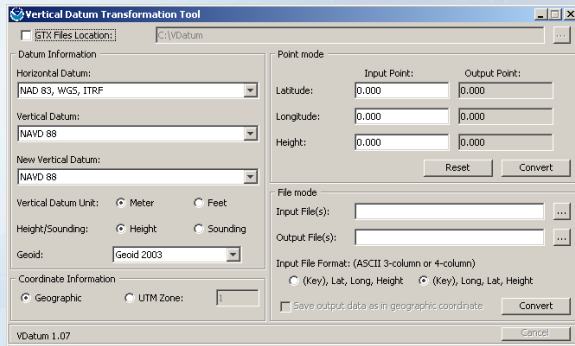
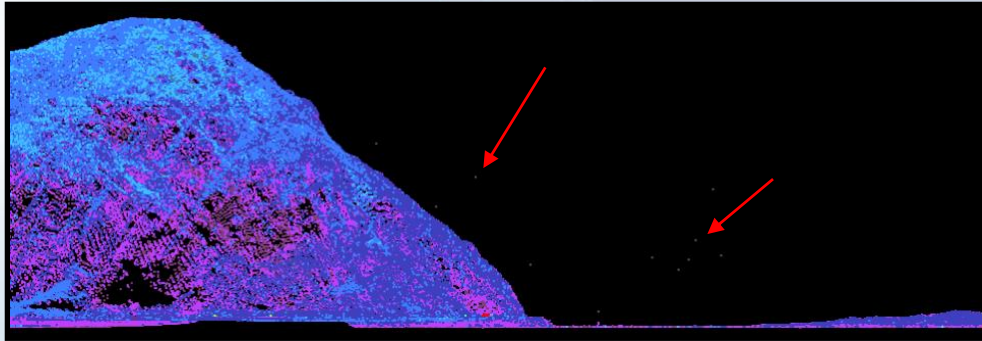


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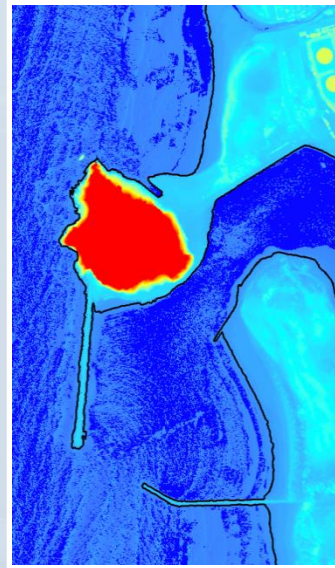
Courtesy of Dewberry/Quantum Spatial

# Lidar Shoreline Extraction

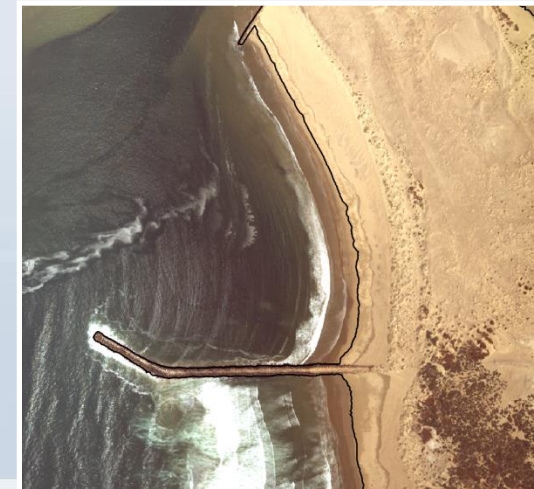
## Edit Lidar Point Cloud



VDatum



Contour Shoreline from DEM



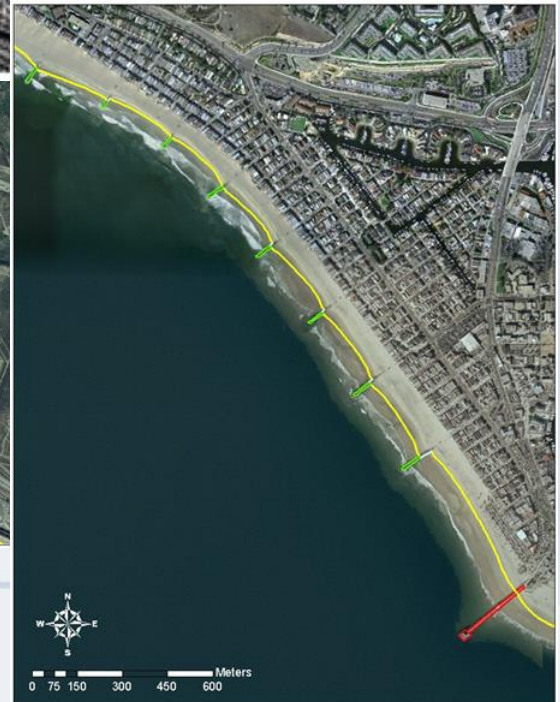
Quality Control & Feature Attribution



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# Imagery

The screenshot shows the ArcGIS desktop environment. The main map window displays a satellite-style aerial image of a coastal area. A yellow line traces the coastline, and a red line is drawn across it. The 'Layers' panel on the left shows a list of data layers, including 'Natural Mean High Water'. The 'Toolbox' on the right contains various GIS tools. A 'Select Class' dialog box is open, showing options for selecting features based on class, attribute, or extension.



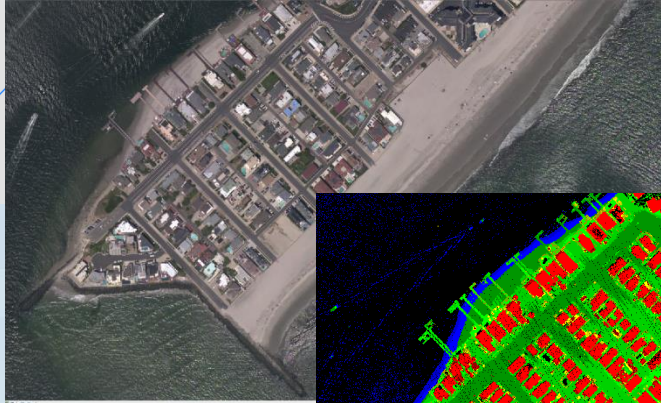
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# IOCM Products/Deliverables

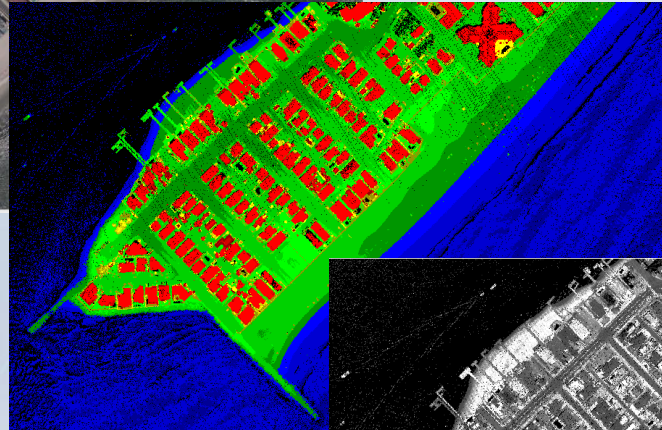
Shoreline



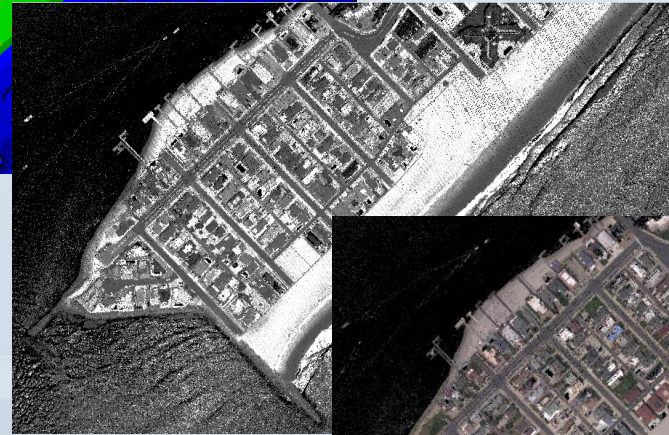
Ortho Mosaic Imagery



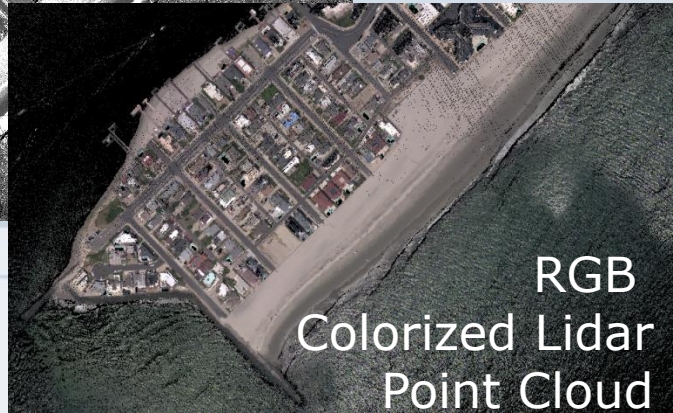
Lidar Point Cloud (elevation)



Lidar Point Cloud (intensity)

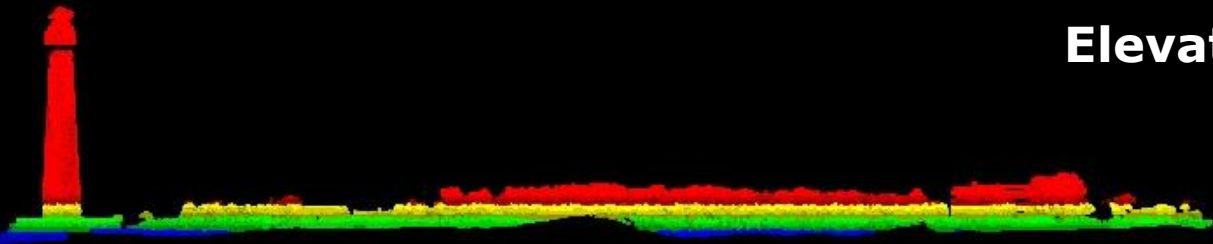


RGB  
Colorized Lidar  
Point Cloud



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**Elevation**



**Classified Point Cloud**



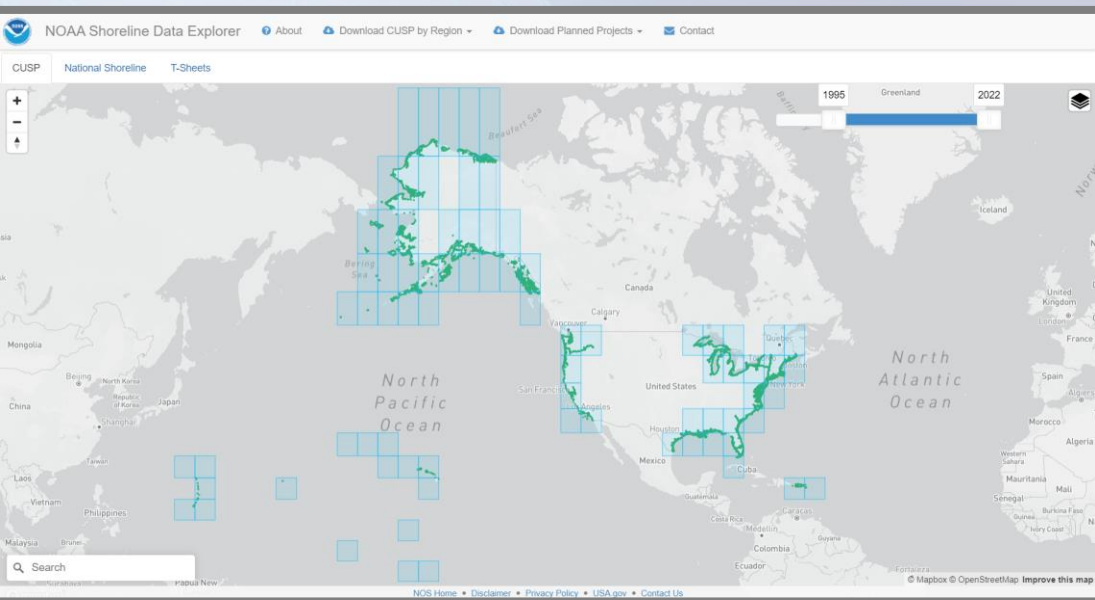
**RGB Encoded**



**Topobathy Bare Earth**



# Distribution of Data



**Shoreline:**

<https://nsde.ngs.noaa.gov/>



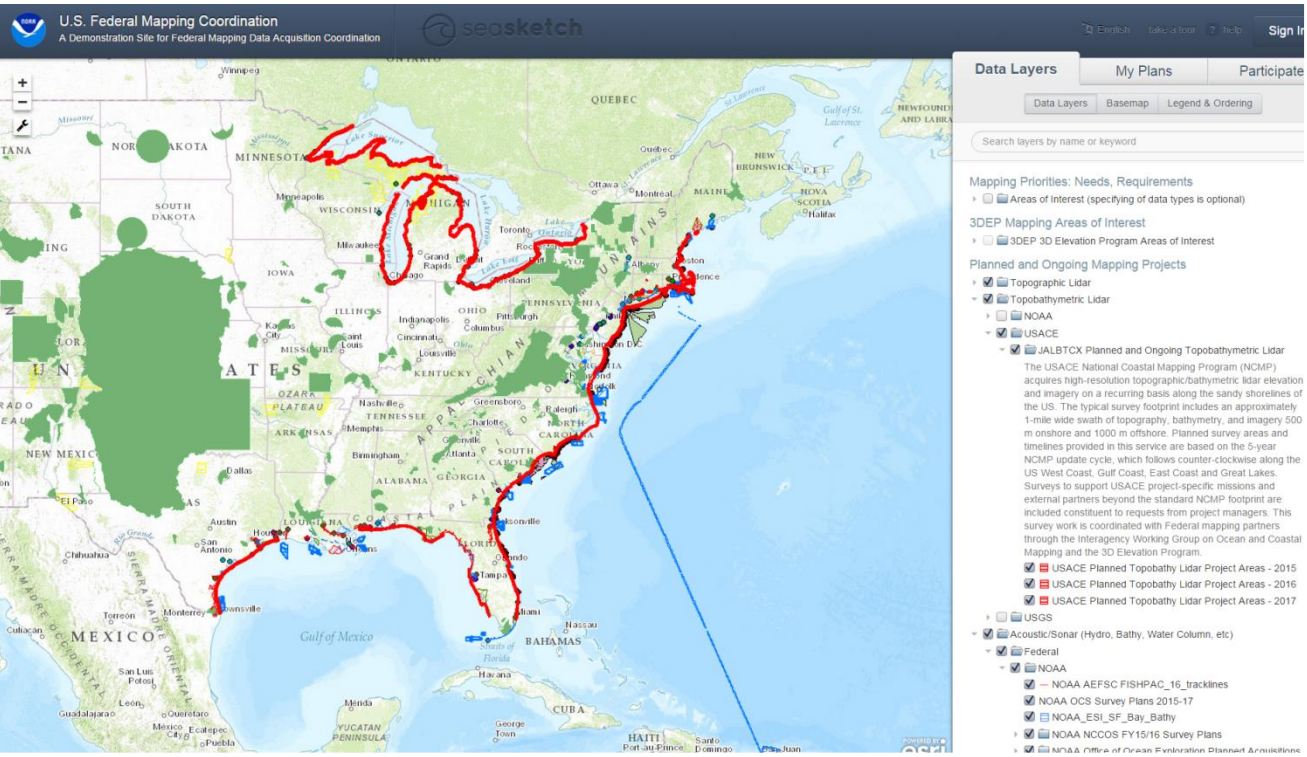
**Lidar and Imagery:**

<https://www.coast.noaa.gov/digitalcoast/>



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# U.S. Federal Mapping Coordination Site



<http://www.seasketch.org/#projecthomepage/5272840f6ec5f42d210016e4>

- IWG-OCM and 3DEP agencies are using Seasketch tool to share info on acquisition plans, data needs, coordination
- Additional tools available for use – forums, sketching

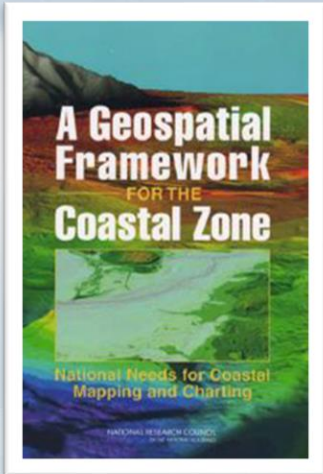
- Identifies mapped areas
- Improves planning
- Enables cross-agency collaboration

- Avoid costly duplication of effort
- Maximize survey time
- Meet science & mission requirements



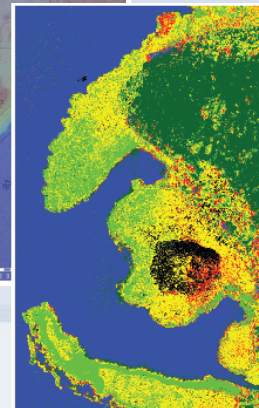
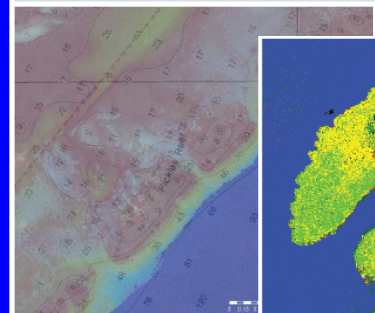
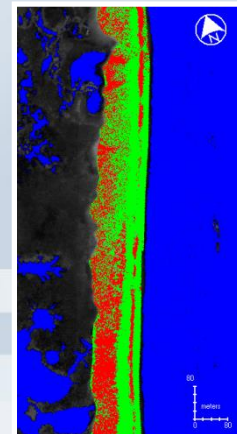
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# Integrated Ocean and Coastal Mapping (IOCM)



The practice of acquiring, managing, integrating and disseminating ocean and coastal geospatial mapping data in such a manner that permits these data and their derivative products to be easily accessed and used by and for the greatest range of users and purposes.

IOCM requires intra- and inter-agency coordination with a focus on streamlining operations, reducing redundancies, improving efficiencies, developing common standards, and stimulating innovation and technological development.



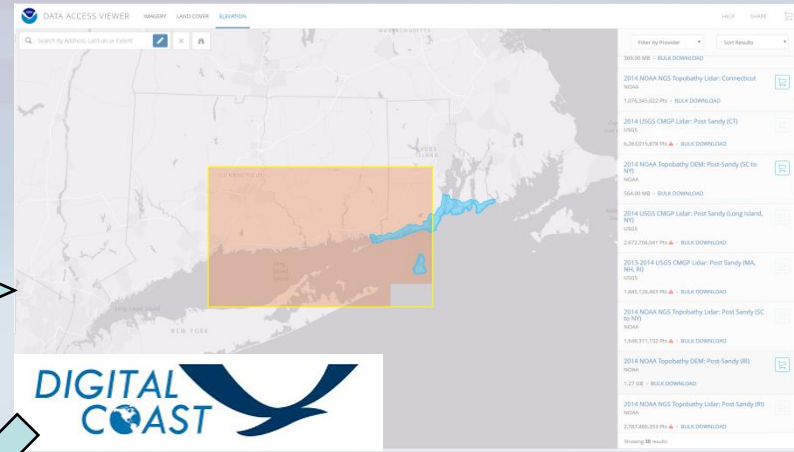
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# National Centers for Environmental Information (NCEI):



Acquisition & Processing



Discovery & Dissemination



Long Term Archiving & Stewardship



Topo-Bathy DEM Development

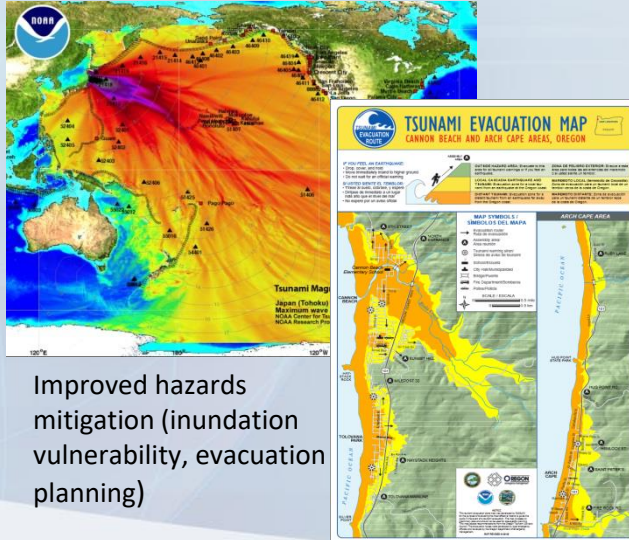


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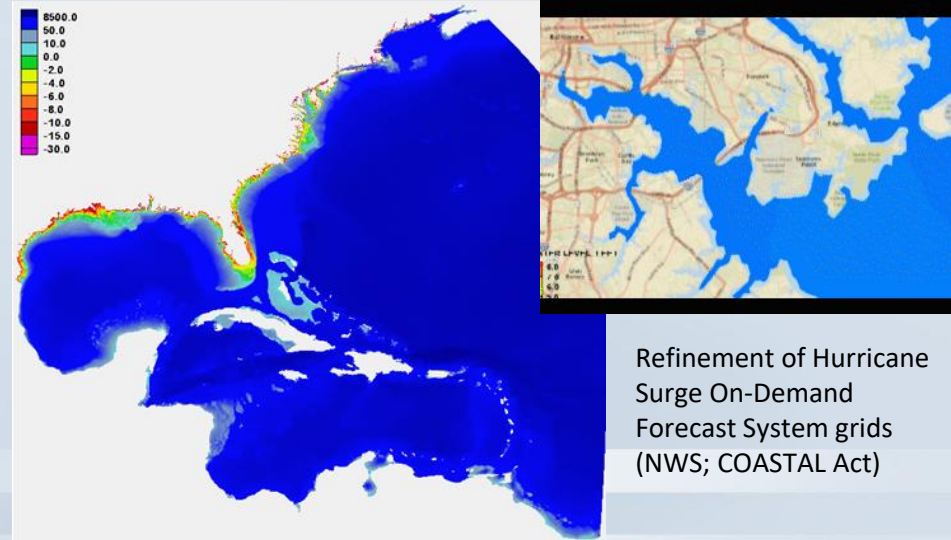
# National Centers for Environmental Information-Boulder (NCEI): DEMs developed at the NOAA support improved tsunami and storm surge inundation modeling and mapping

*Integrated topo-bathy DEM along RI/CT border developed in the wake of Hurricane Sandy (utilizes 2014 post-storm data)*

Modeling tsunami generation, propagation, and inundation (NOAA Tsunami Program And National Tsunami Hazard Mitigation Program)



Improved hazards mitigation (inundation vulnerability, evacuation planning)

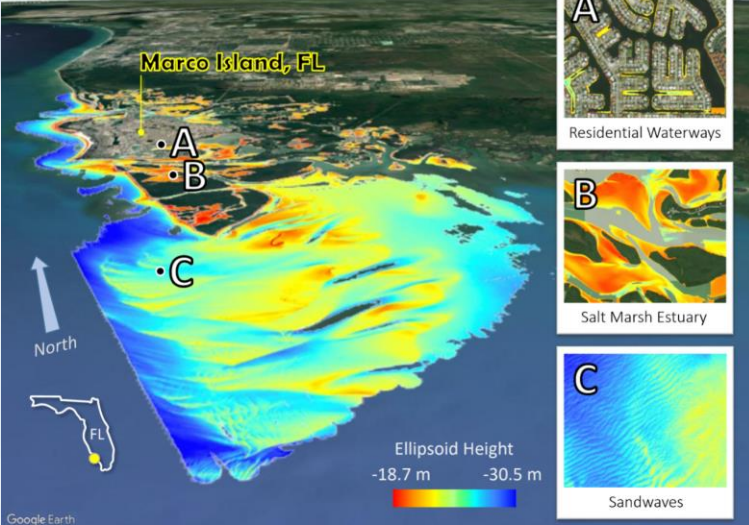


Refinement of Hurricane Surge On-Demand Forecast System grids (NWS; COASTAL Act)

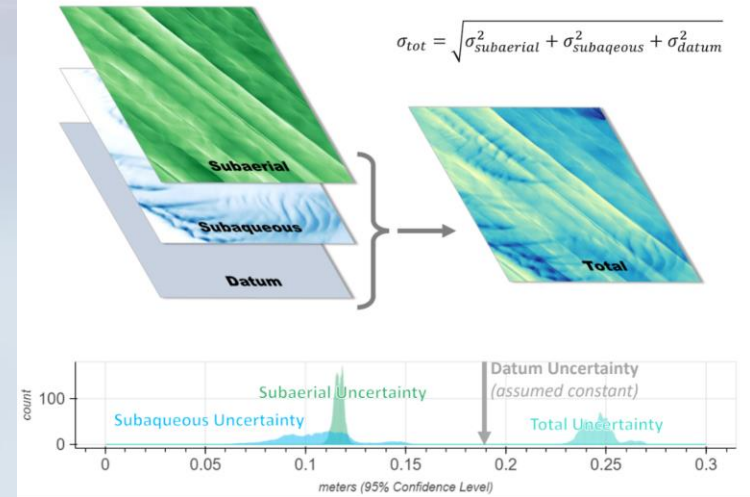


# Total Propagated Uncertainty for Topobathy Lidar

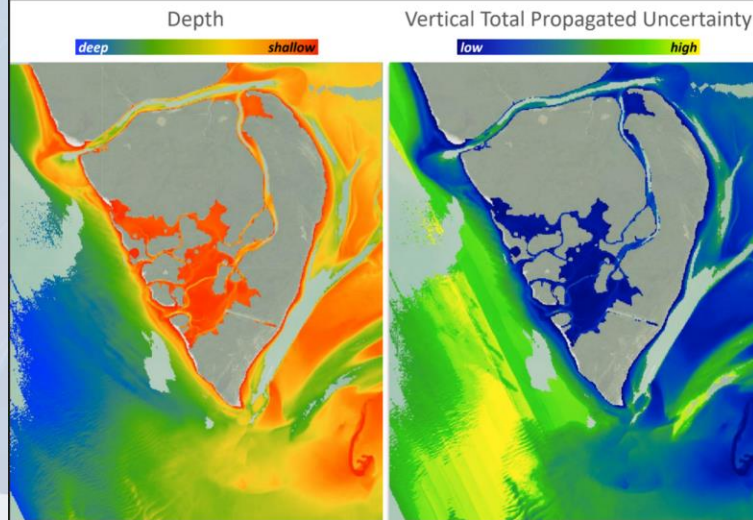
PROJECT FL-1604-TB-N



## Combining Uncertainty Components



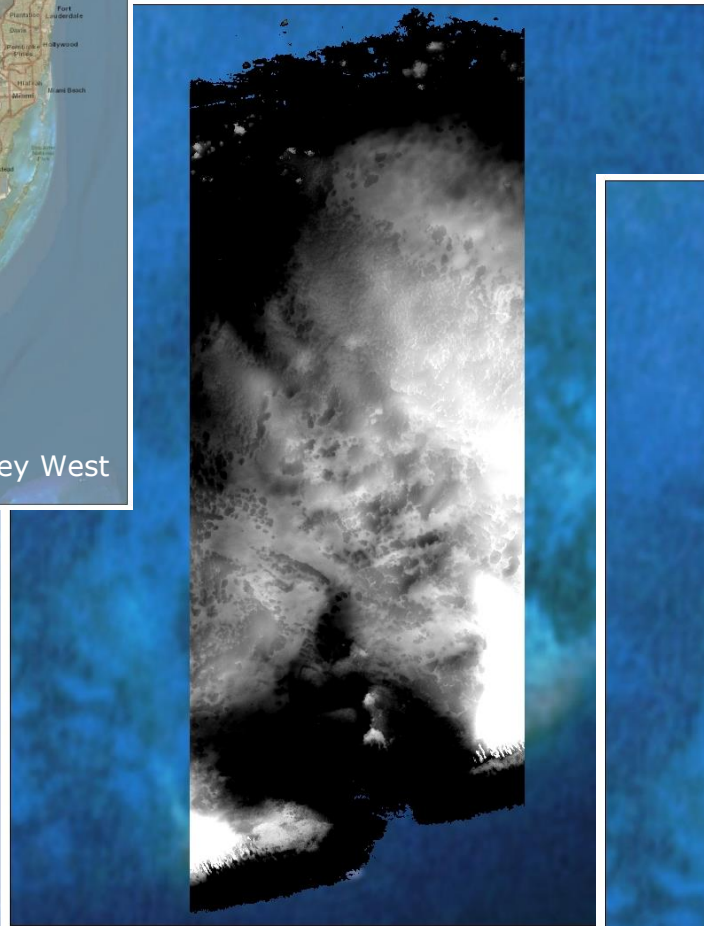
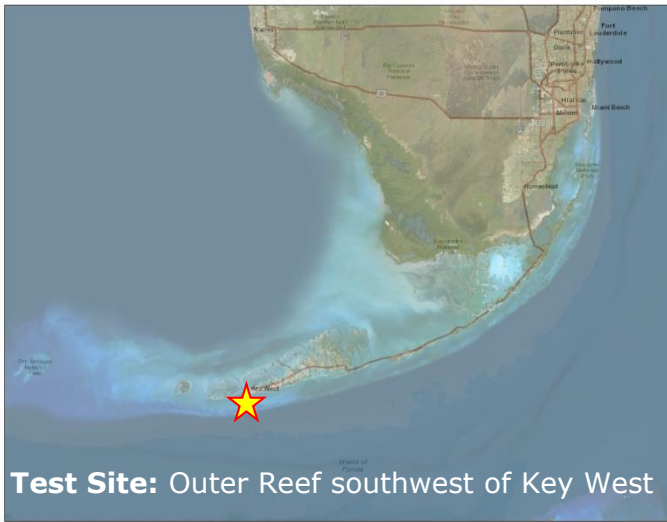
## Marco Island Test Site



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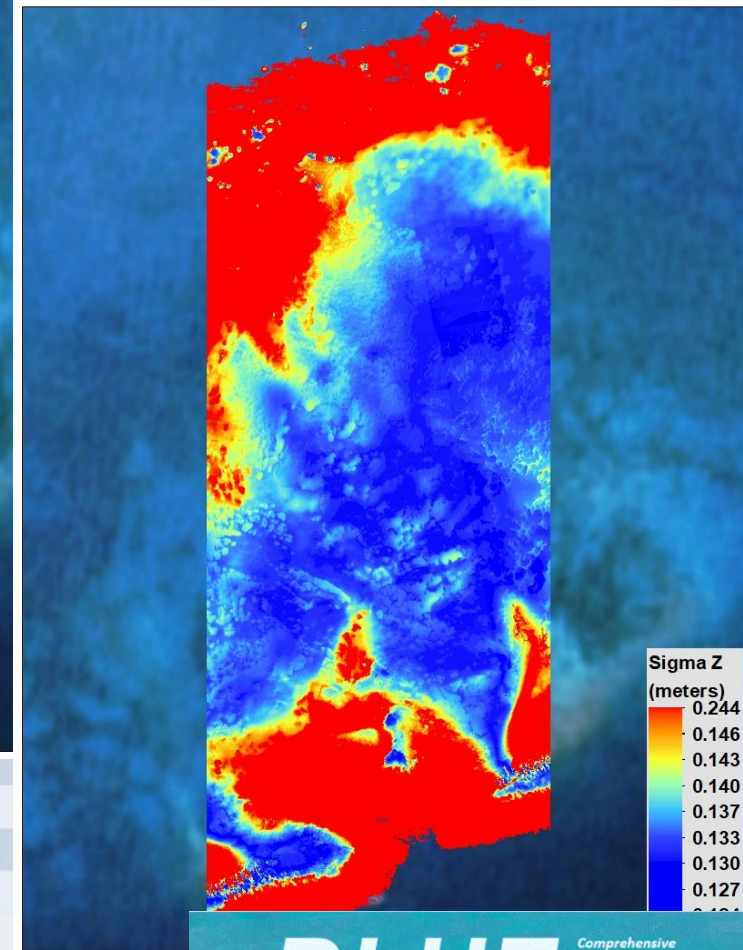
**cBLUE** Comprehensive  
Bathymetric  
Lidar  
Uncertainty  
Estimator

# Total Propagated Uncertainty for Topobathy Lidar



Digital Elevation Model

TPU Result



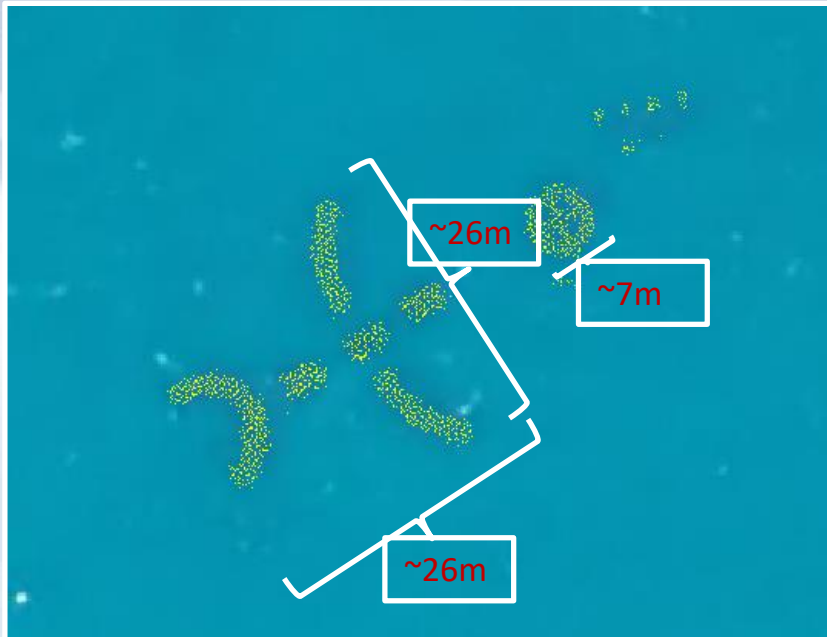
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**cBLUE** Comprehensive Bathymetric Lidar Uncertainty Estimator

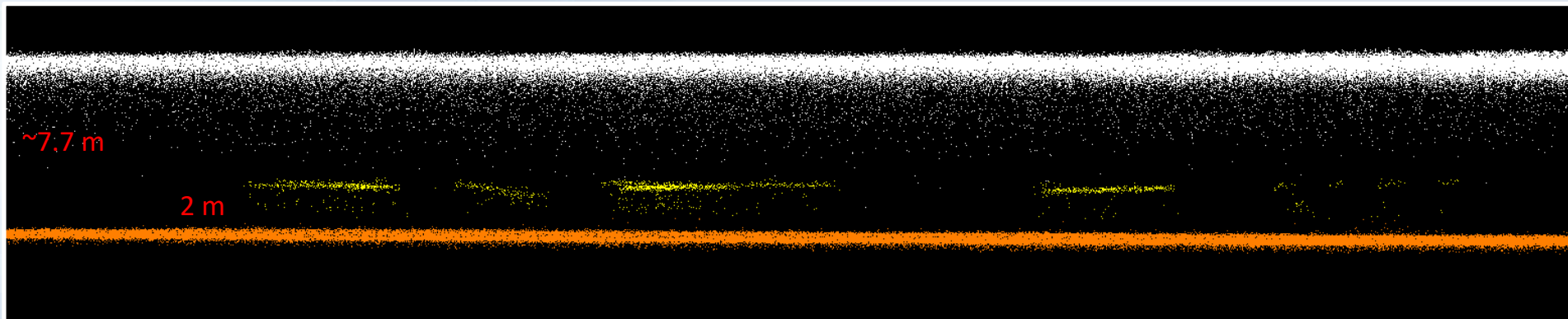
# Submerged Object – Outer Reef, Florida



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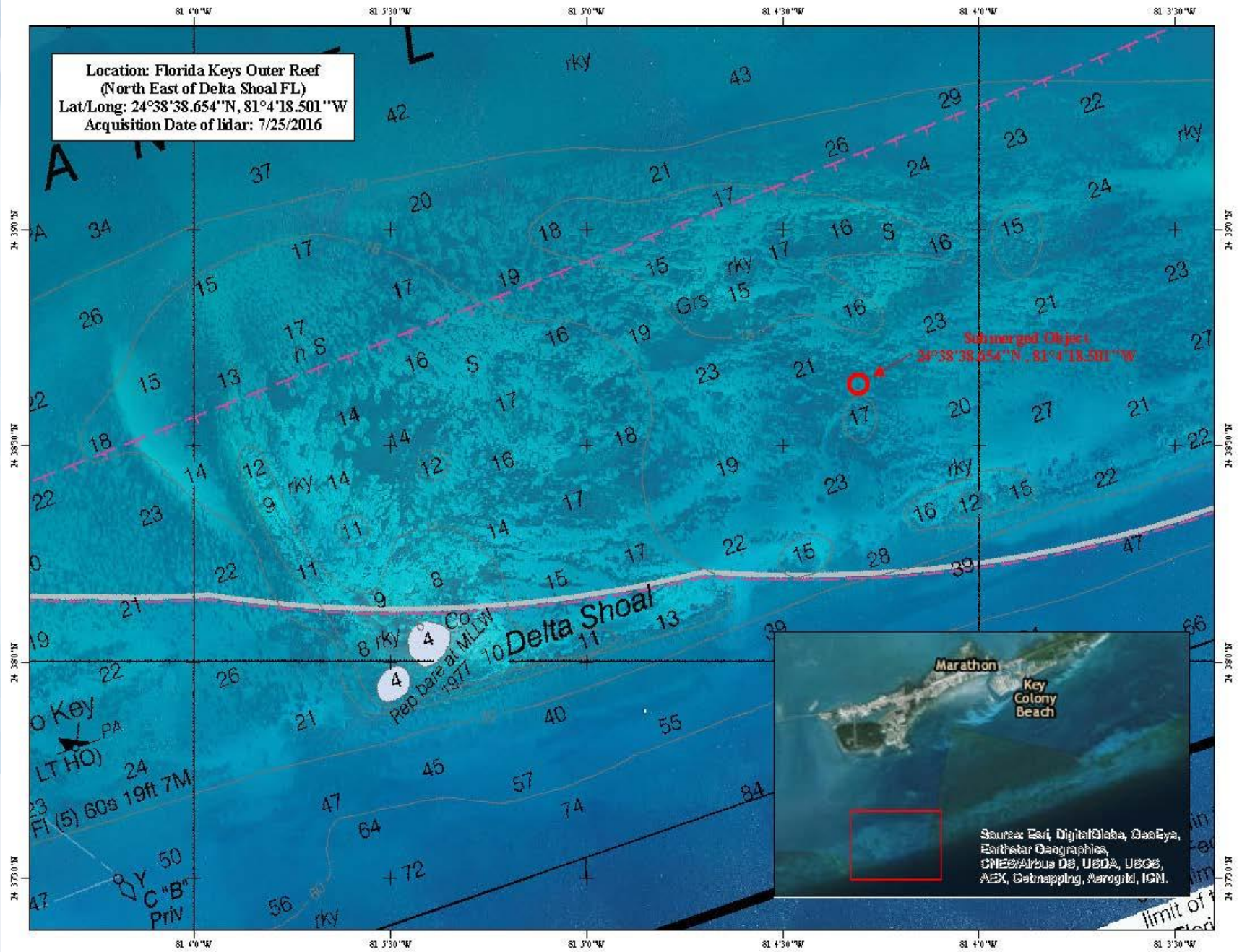


- Point density of the object ranged from ~12 to 13 pts per  $m^2$
- Water depth: ~7.7m
- Object height: 2m

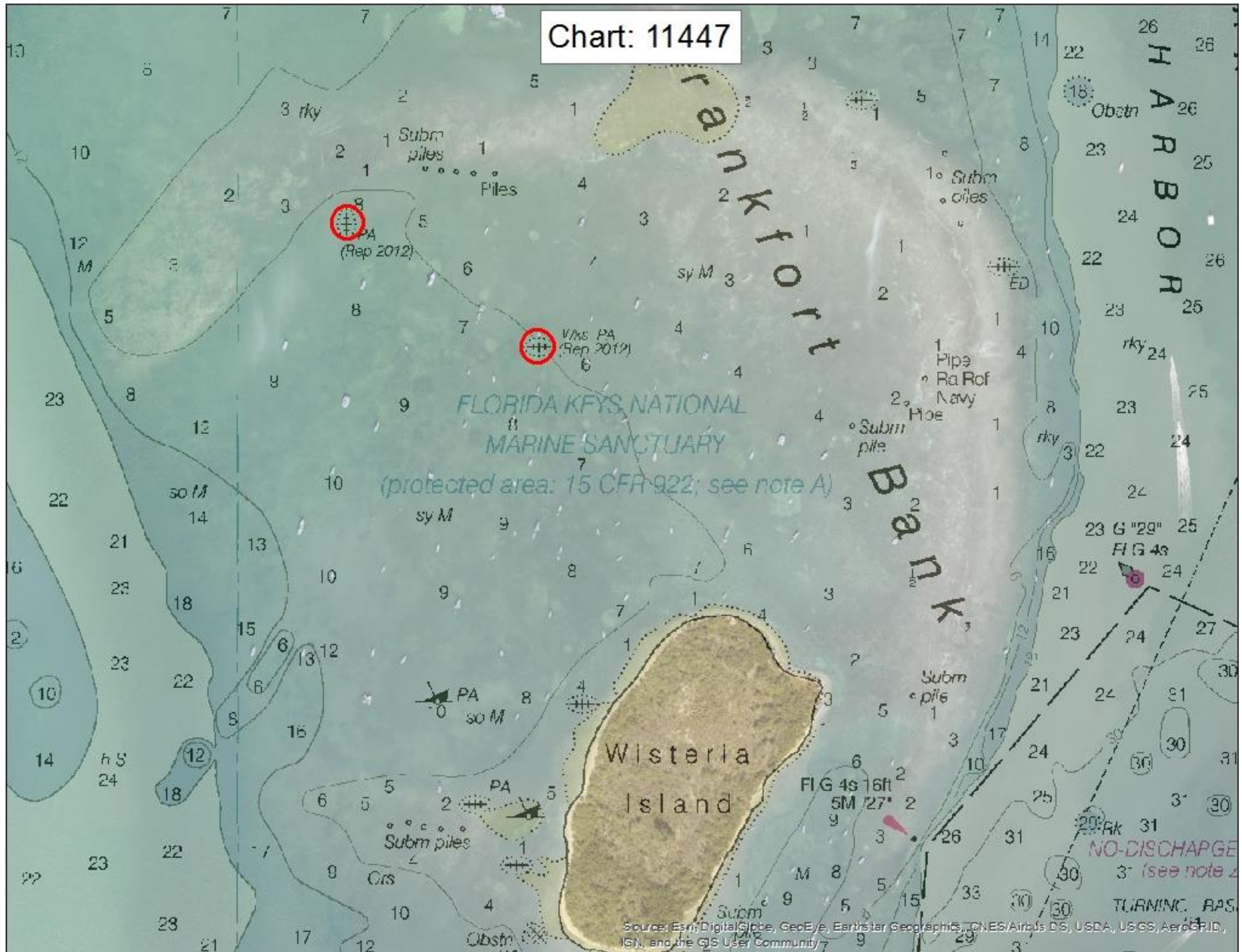


# Detection of Unknown Submerged Objects

Location: Florida Keys Outer Reef  
(North East of Delta Shoal FL)  
Lat/Long: 24°38'38.654"N, 81°4'18.501"W  
Acquisition Date of lidar: 7/25/2016

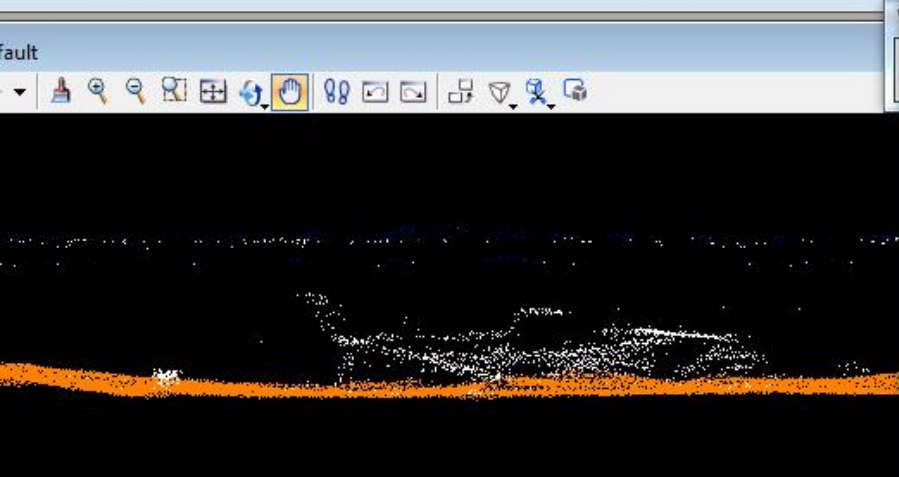
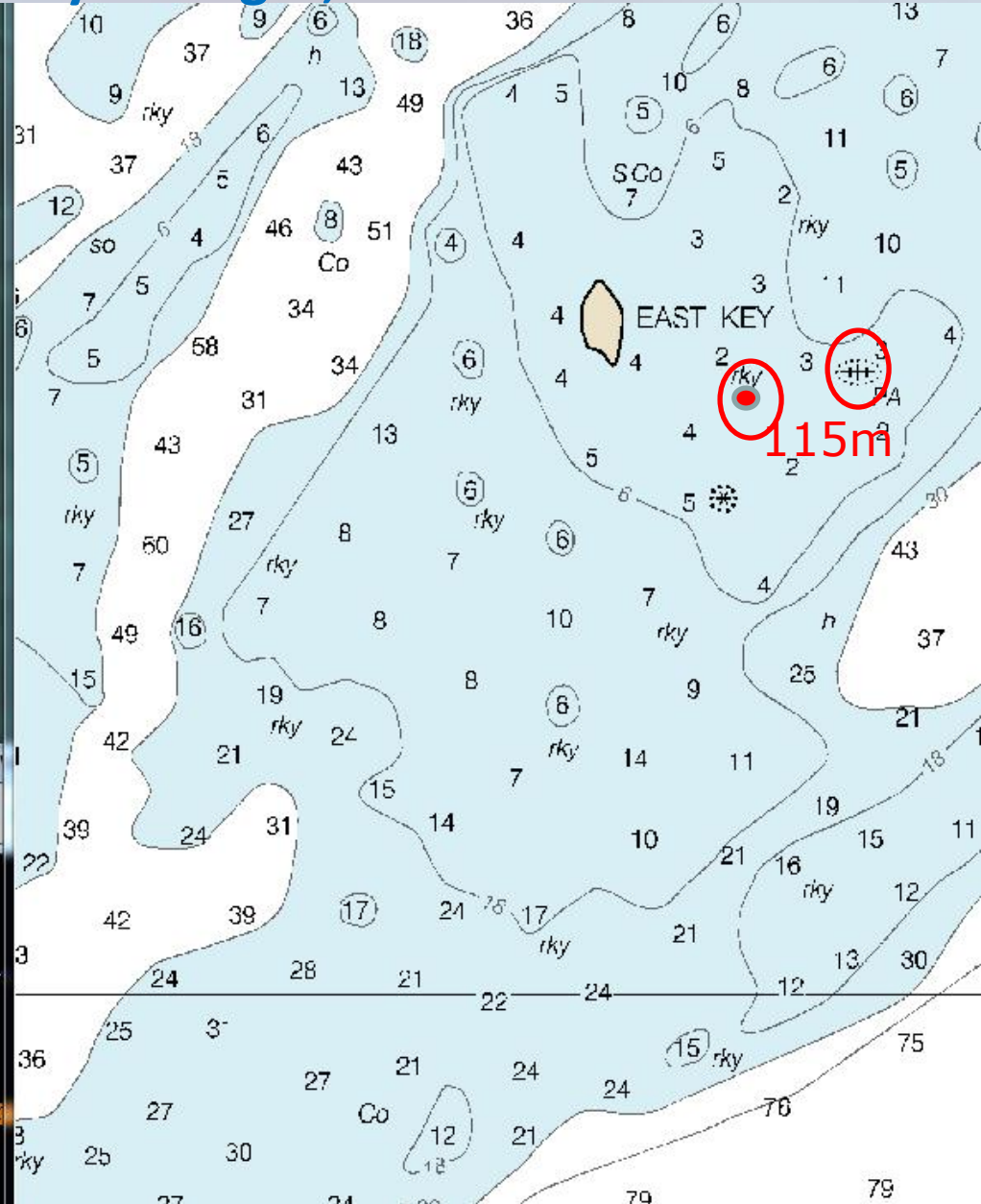
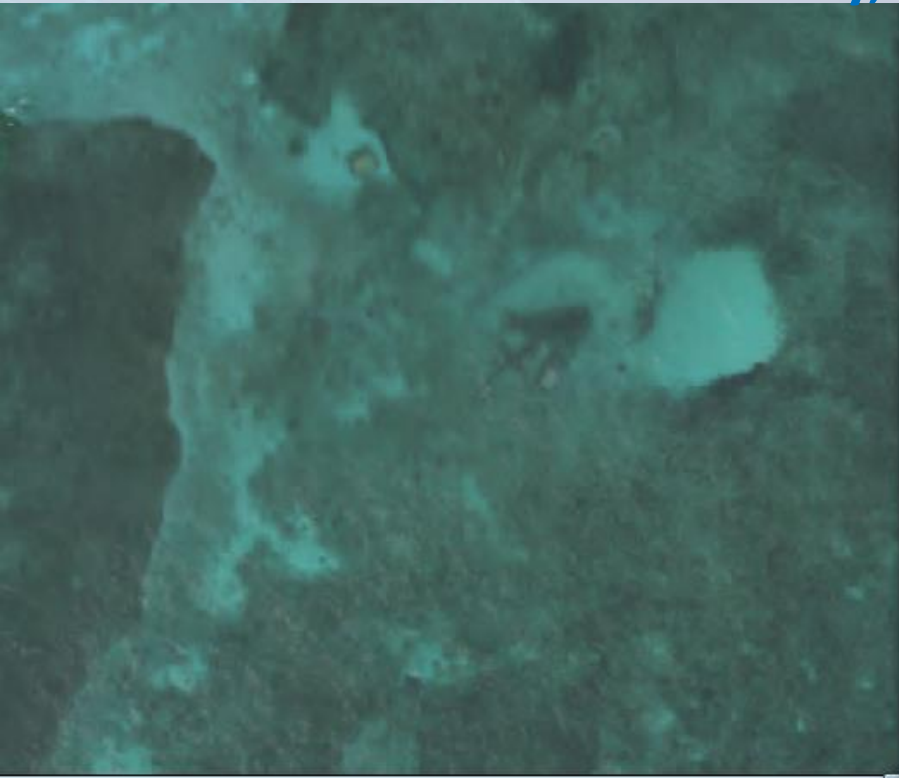


# Confirmation of Submerged Objects

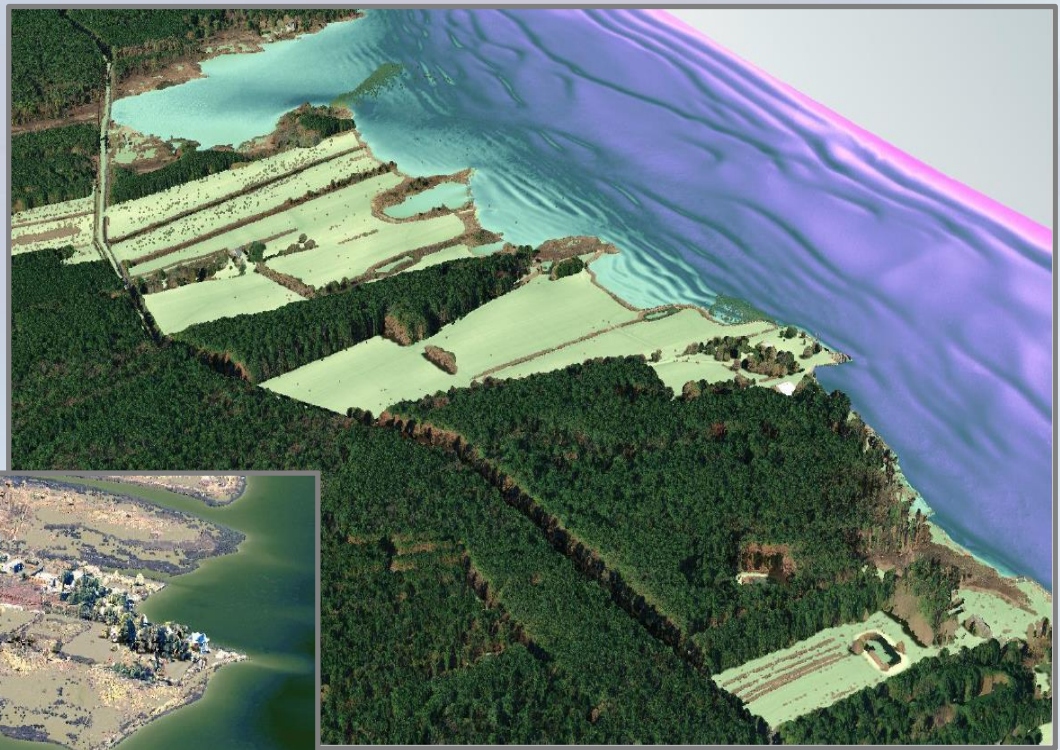




# Wreck with Position Approximate (PA) updated near East Key, Dry Tortugas, FL

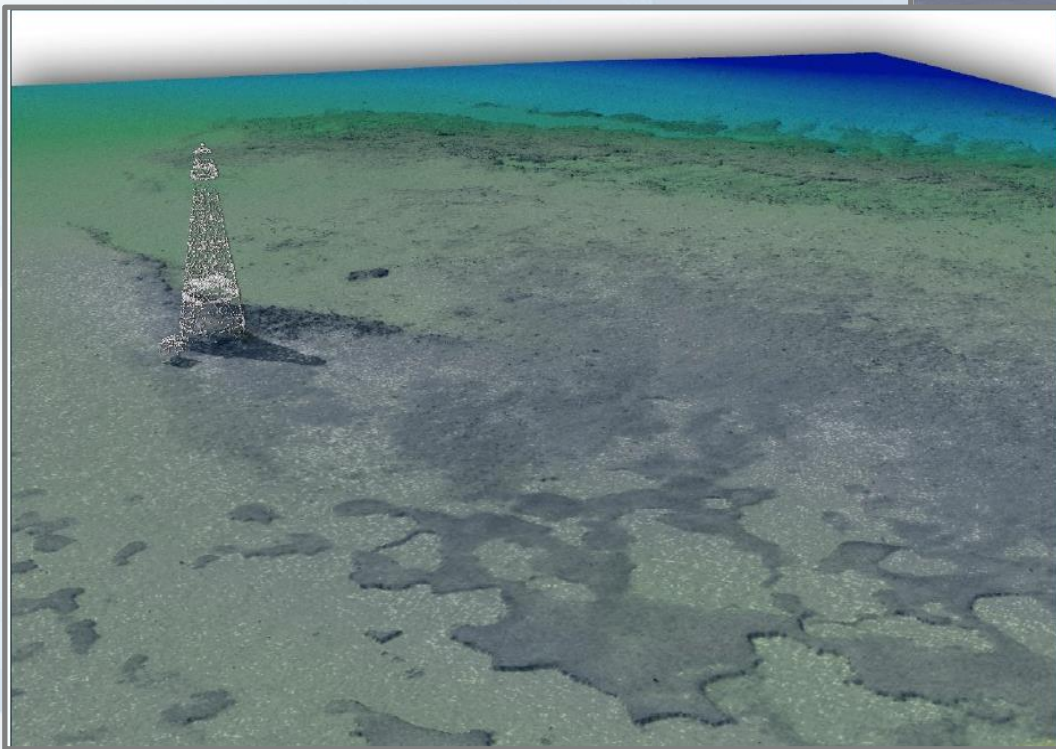


# Chesapeake Bay



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# Florida Keys

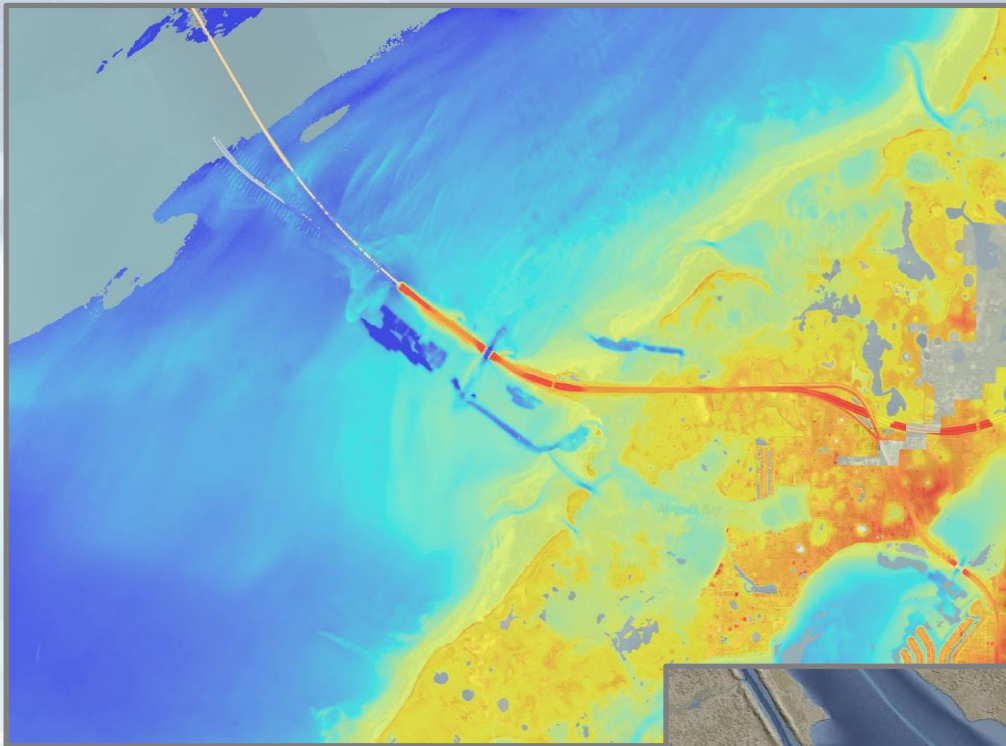


*(Courtesy of NV5)*

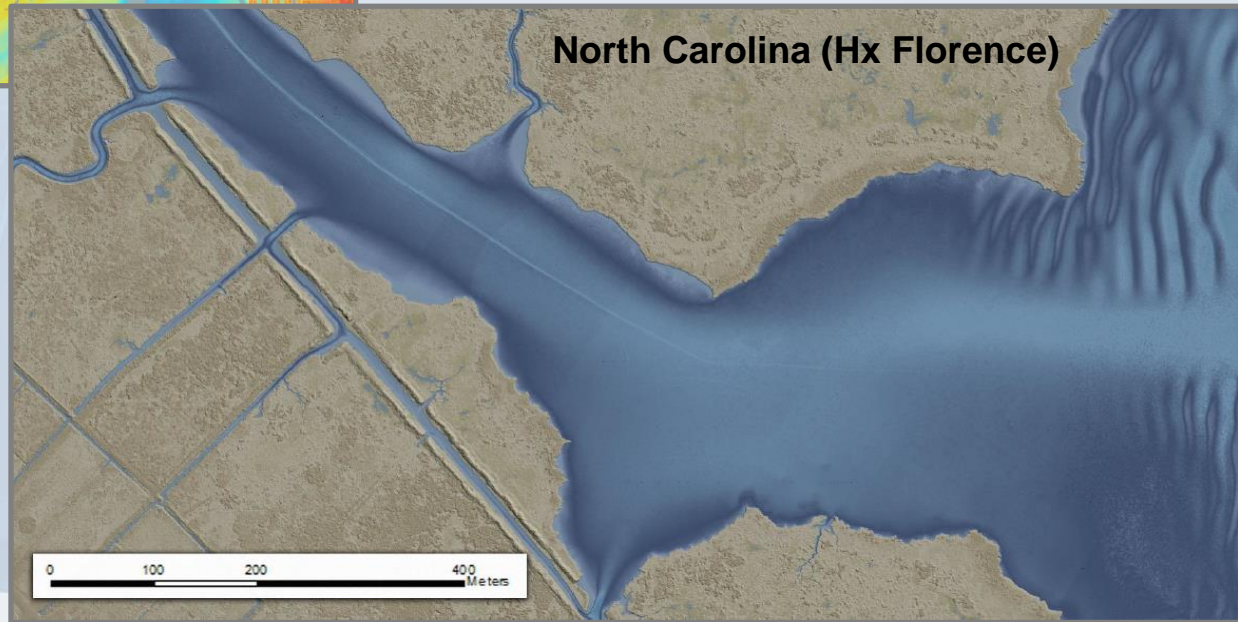


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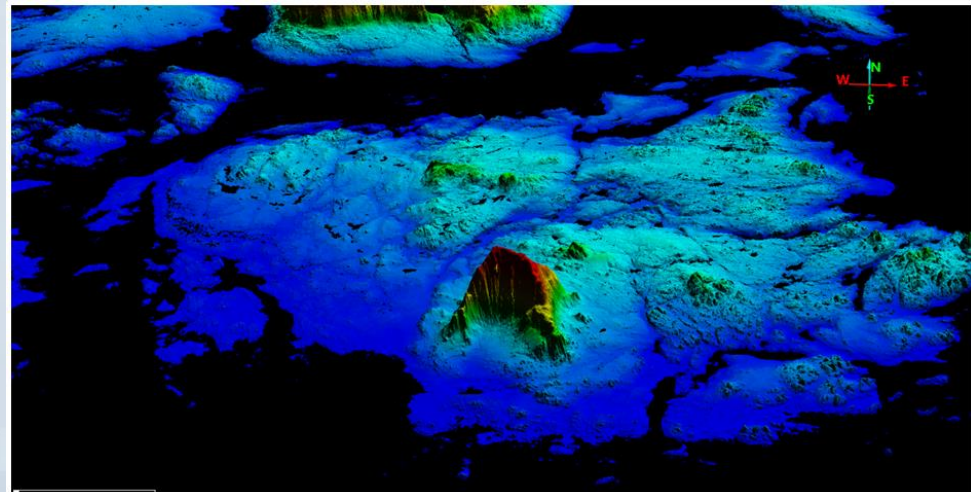
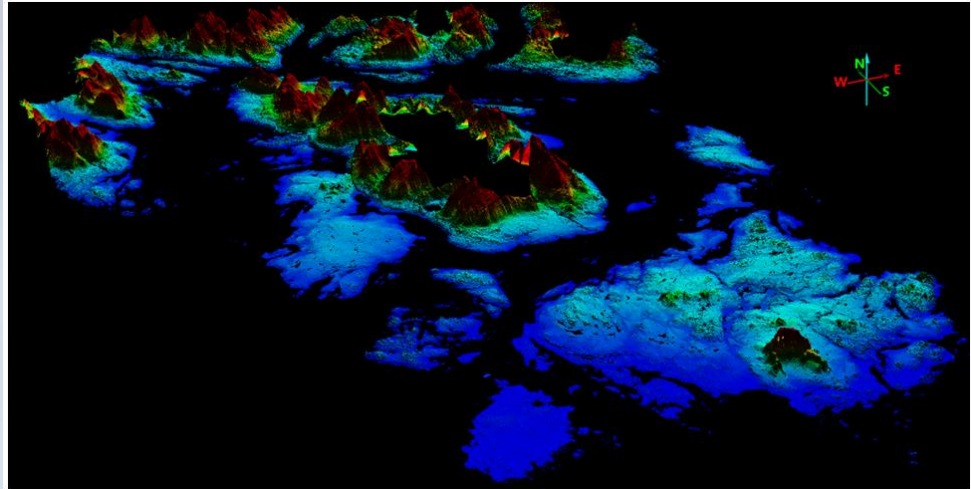
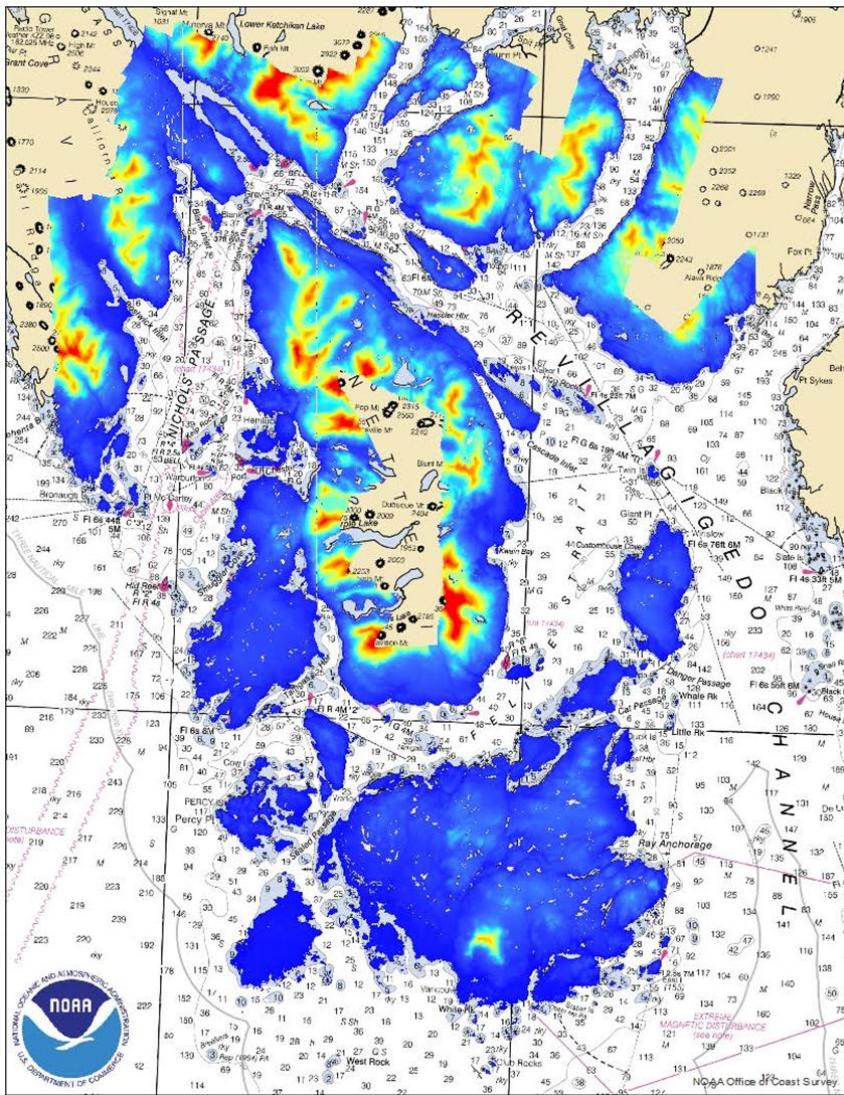
**South Tampa Bay  
(Sunshine Skyway Bridge)**



**North Carolina (Hx Florence)**

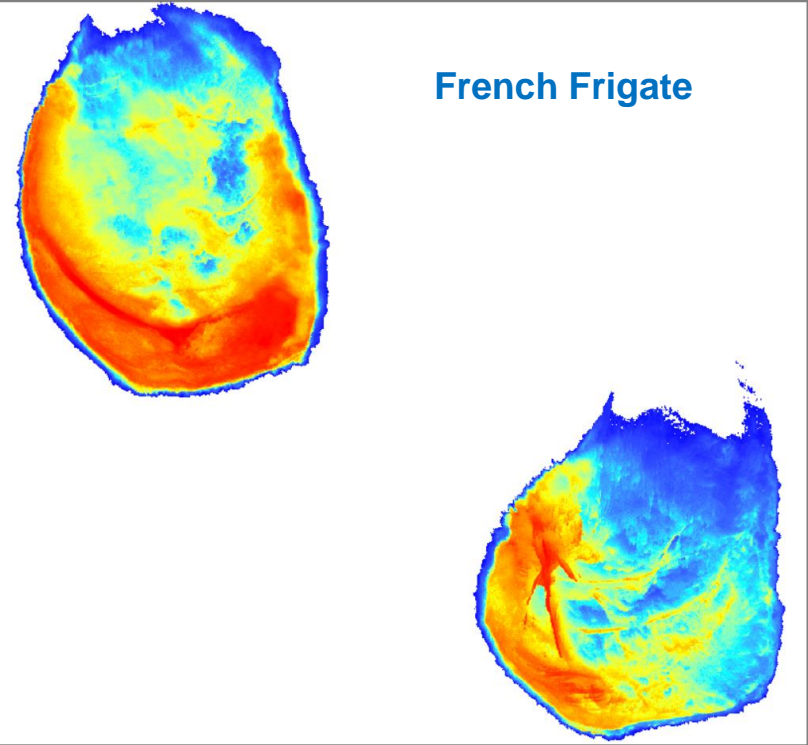
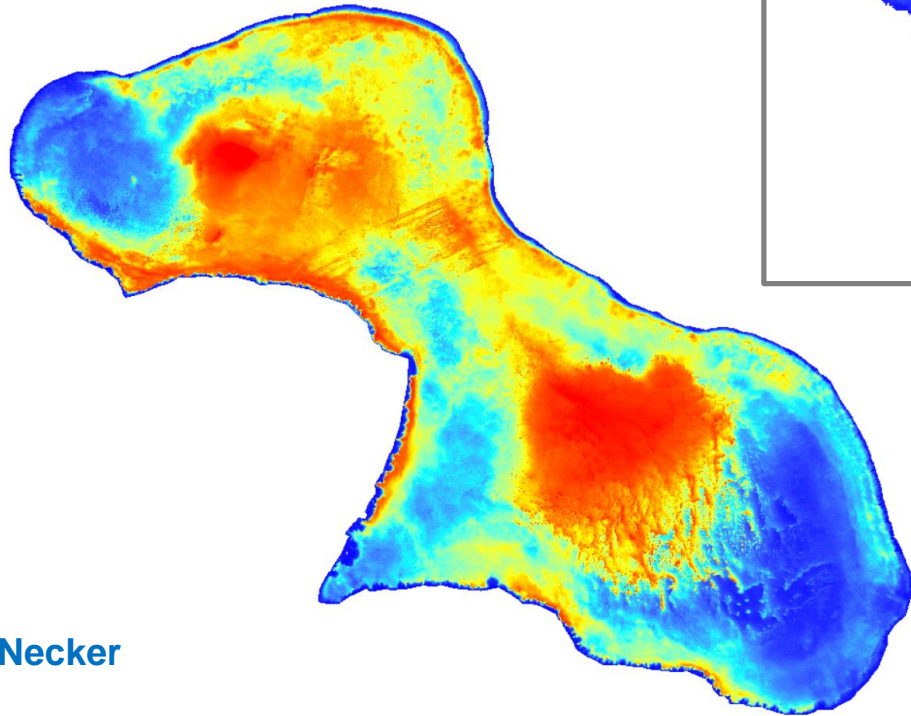
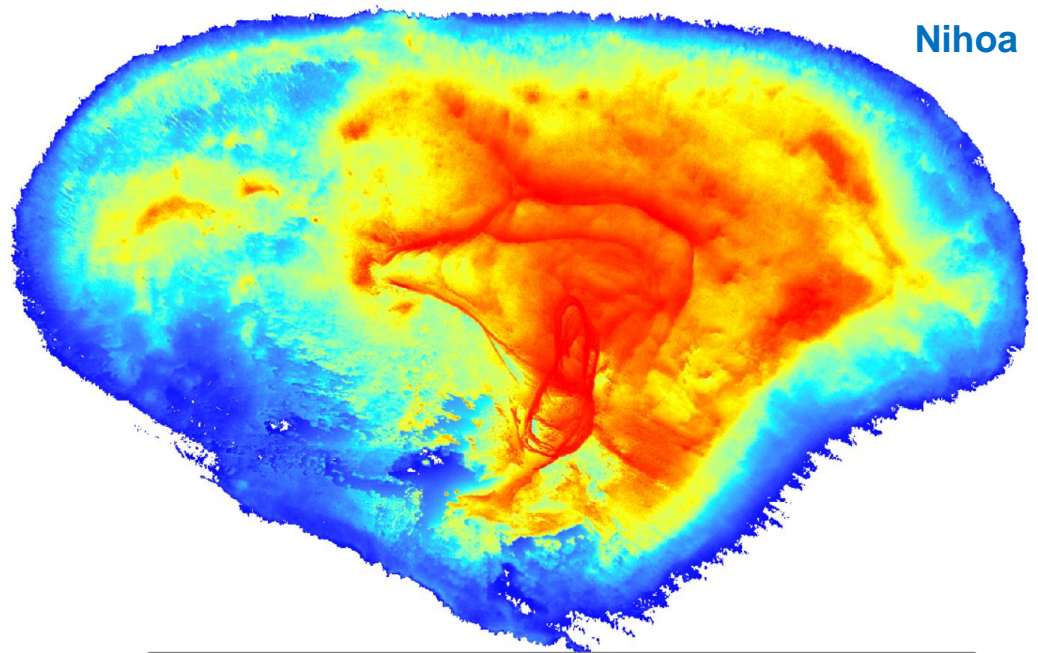


# Revillagigedo, SE AK



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# Eastern Northwestern Hawaiian Islands

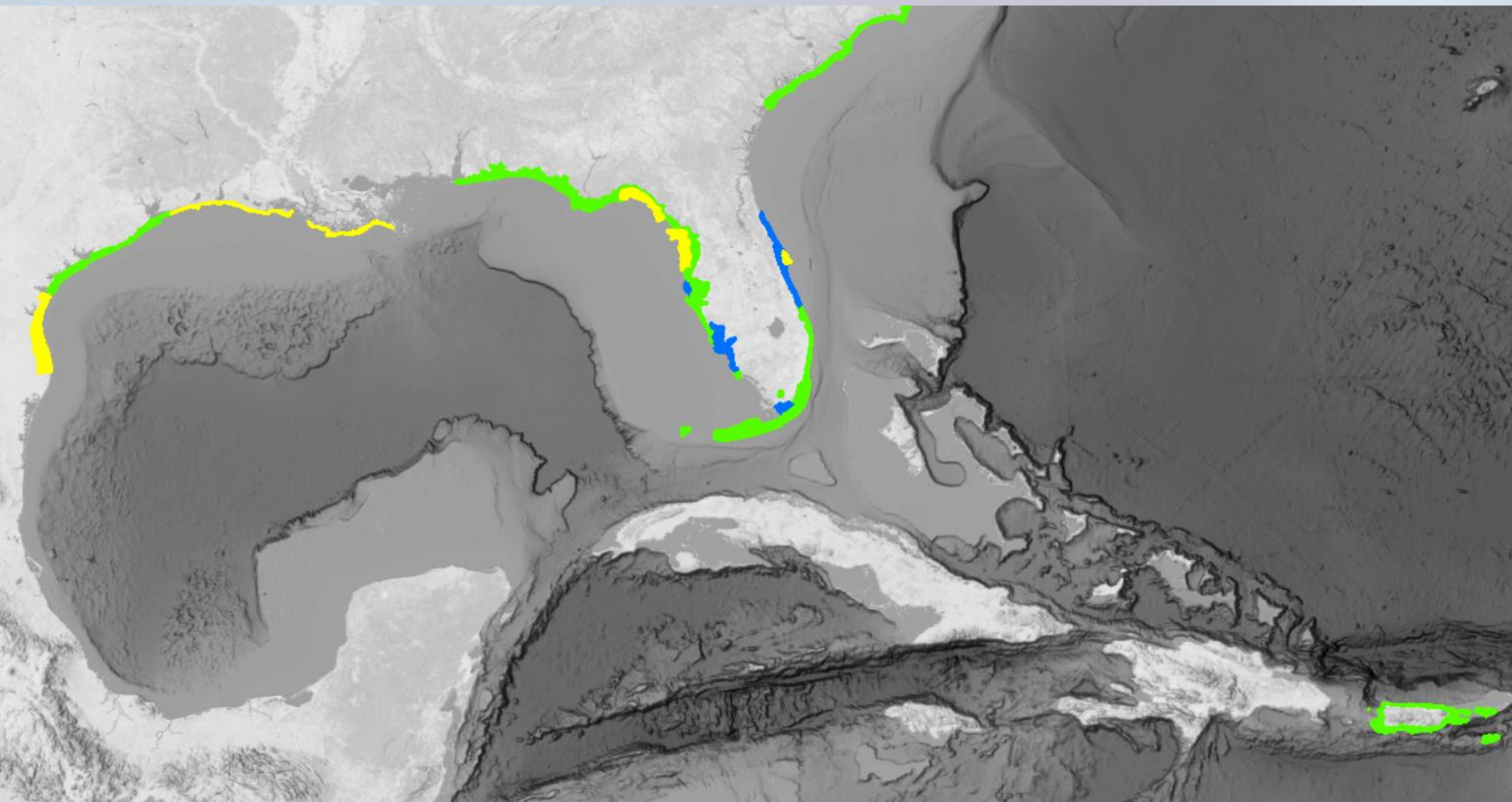







**Indian River Lagoon:  
Sebastian Inlet  
(Courtesy of Dewberry)**



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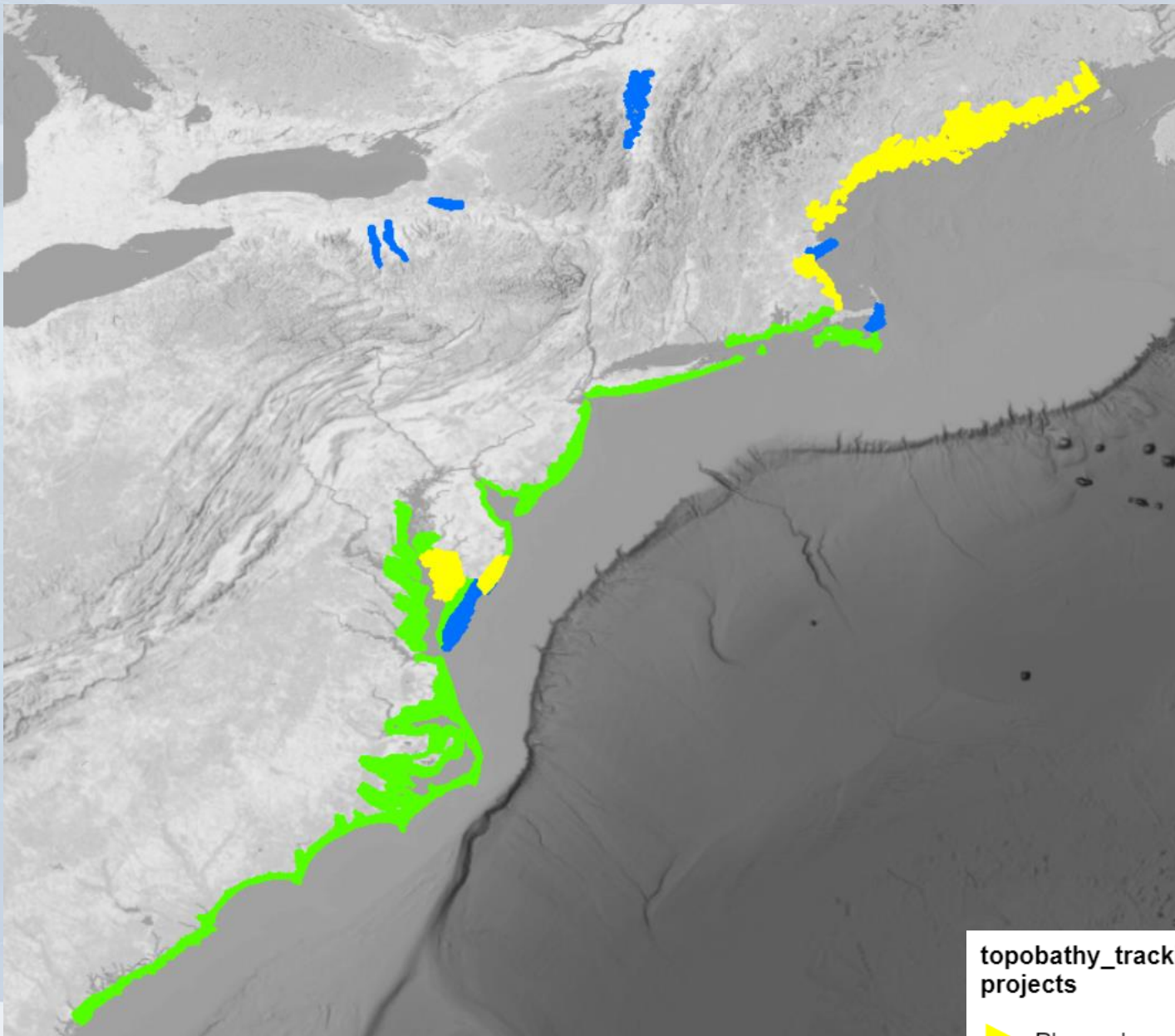
**topobathy\_tracking\_inhouse  
projects**

-  Planned
-  Acquired
-  Completed






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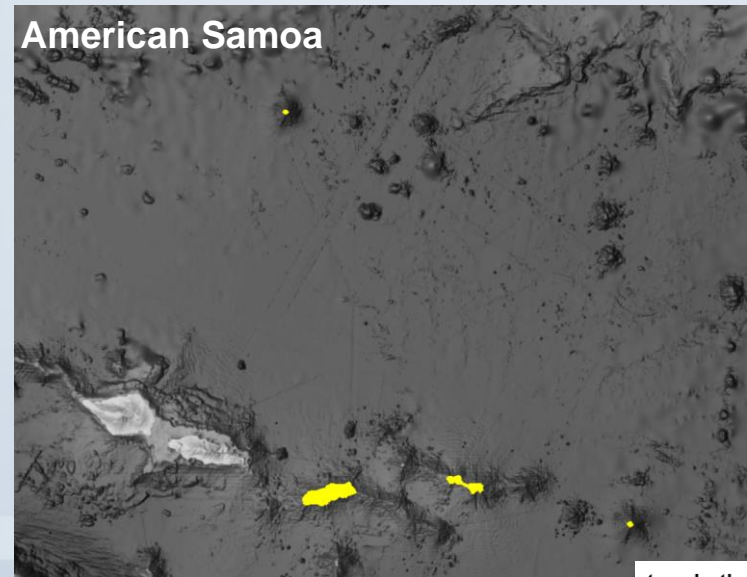
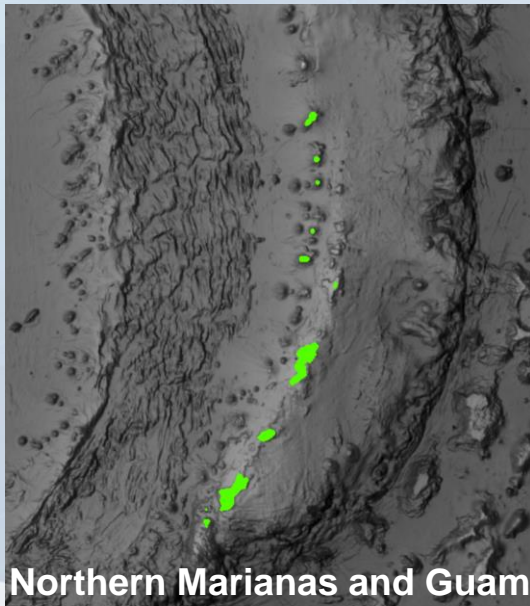
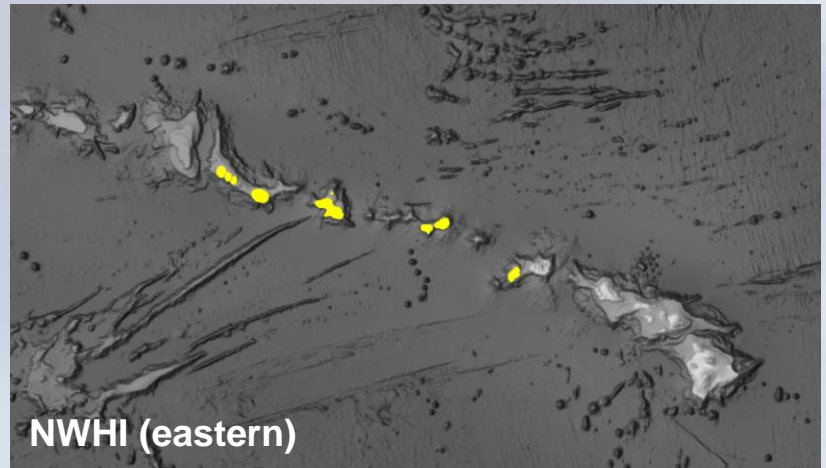


**topobathy\_tracking\_inhouse  
projects**

-  Planned
-  Acquired
-  Completed



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topobathy\_tracking\_inhouse projects

- Planned
- Acquired
- Completed

# VDatum

## Vertical Datum Transformation Tool

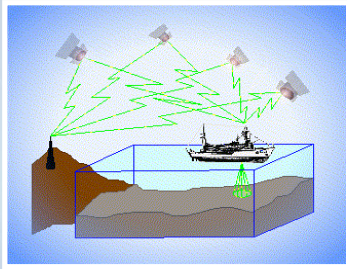


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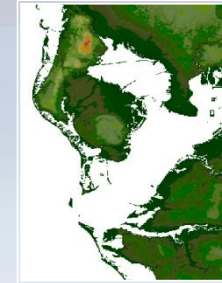
# What Vertical Datum is My Data in?

## Ellipsoidal Datums

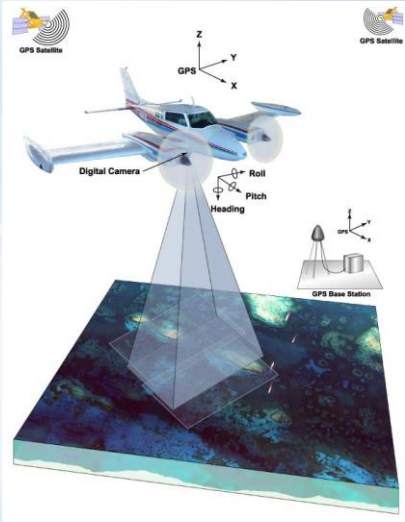
## Orthometric Datums



RTK-GPS vertical  
referencing  
Hydrographic Surveys



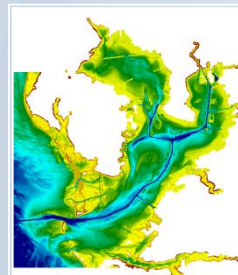
USGS  
Topography



Lidar



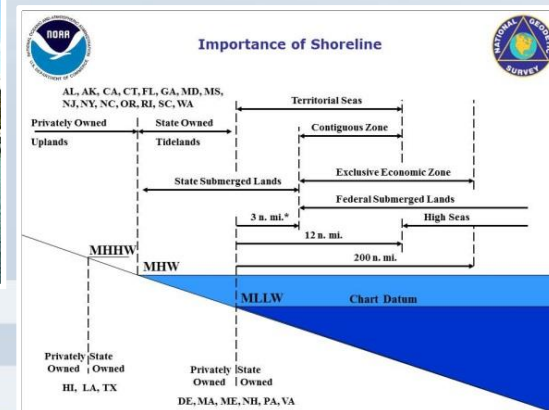
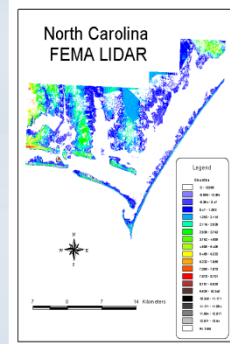
GPS



NOAA Bathymetry  
(MLLW)



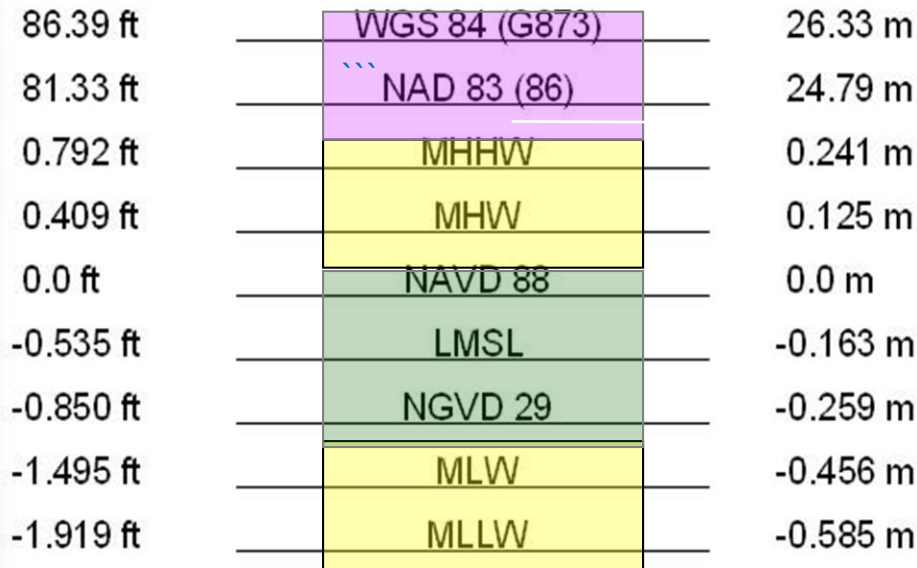
Tidal Datums



# All elevation data is referenced to a vertical datum.

**BUT** there are a many different vertical datums in use around the nation

Relationship of vertical datums for Tampa Bay:



ITRF,  
WGS 84,  
NAD 83 (NSRS)



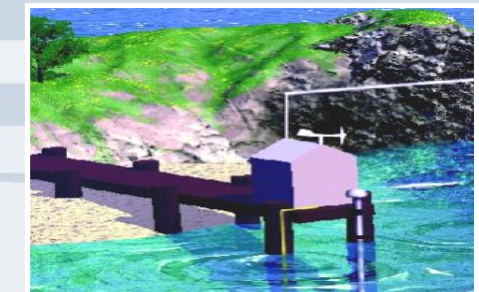
Ellipsoid Datums

NAVD 88,  
NGVD 29



Orthometric Datums

MHHW, MHW,  
MTL, DTL,  
LMSL,  
MLW, MLLW



Tidal Datums

For elevation data sets to be blended together they must be referenced to same vertical datum.

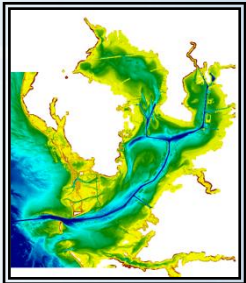


# Development and Use of VDatum

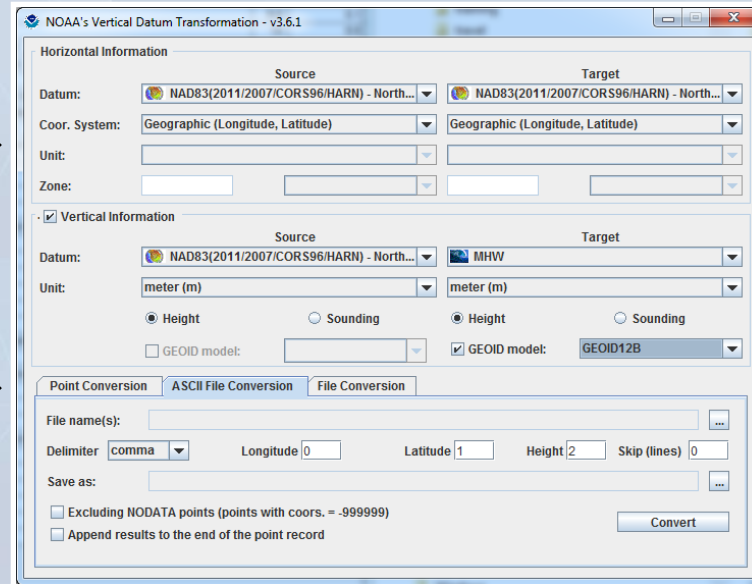
*Mapping the Land-Sea Interface:* VDatum converts elevation data (heights and soundings) among different vertical datums



USGS Topography

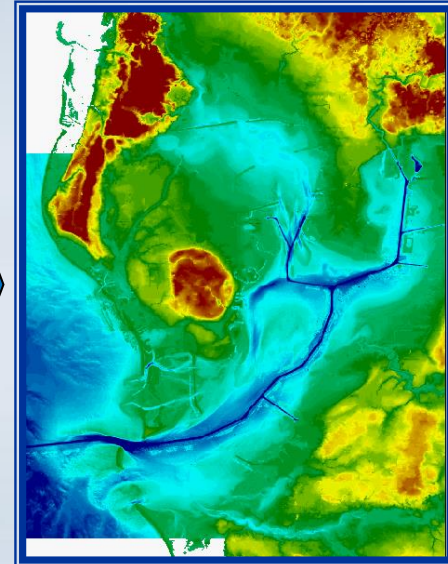


NOAA Bathymetry



The screenshot shows the NOAA's Vertical Datum Transformation - v3.6.1 application window. It is divided into several sections:

- Horizontal Information:** Source and Target Datum are both set to NAD83(2011/2007/CORS96/HARN) - North...; Coor. System is Geographic (Longitude, Latitude); Unit is empty; Zone is empty.
- Vertical Information:** Source Datum is NAD83(2011/2007/CORS96/HARN) - North...; Target Datum is MHW; Unit is meter (m); Height is selected for both Source and Target; GEOID model is set to GEOID12B.
- Point Conversion:** File name(s) is empty; Delimiter is comma; Longitude is 0; Latitude is 1; Height is 2; Skip (lines) is 0; Save as is empty.
- Options:** Excluding NODATA points and Append results to the end of the point record are unchecked.
- Buttons:** A Convert button is located at the bottom right.



*VDatum is a Java application developed jointly by :*

- National Geodetic Survey (NGS)
- Office of Coast Survey (OCS)
- Center for Operational Oceanographic Products & Services (CO-OPS)



Foundational Data  
Observations  
(Geodetic and Tidal)

**VDatum**

Modeling  
(Hydrodynamic and  
TSS)  
and Uncertainty  
Development

Software Development  
and Outreach/  
Training/  
Coordination

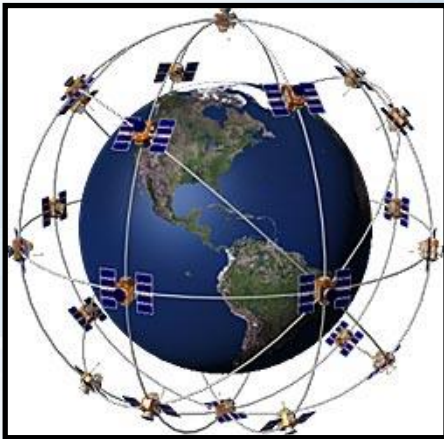


National Oceanic and Atmospheric Administration

# 3 Categories of Vertical Datums:

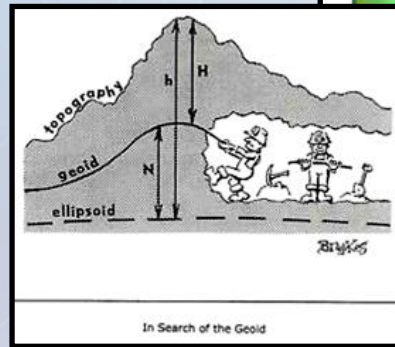
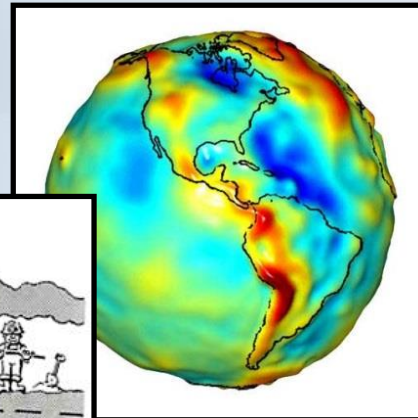
## 3D/Ellipsoid

realized through space-based systems, such as GPS



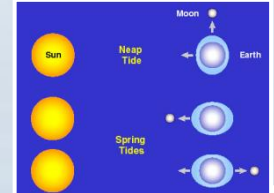
## Orthometric (GEOID)

based on a form of global mean sea level

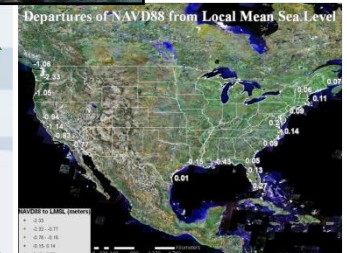
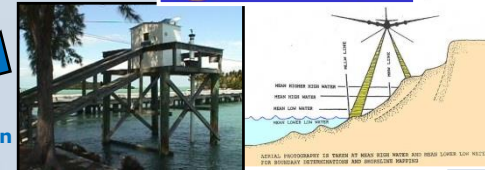


## Tidal Datums

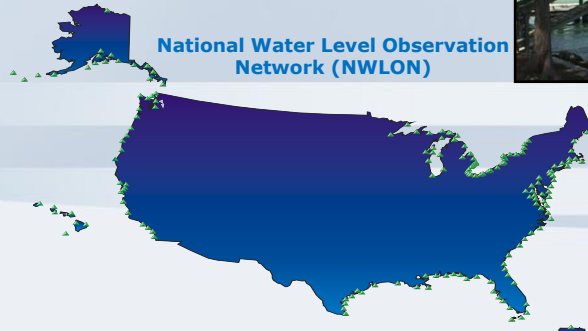
based on tidally-derived surfaces such as high or low water



National Water Level Observation Network (NWLON)

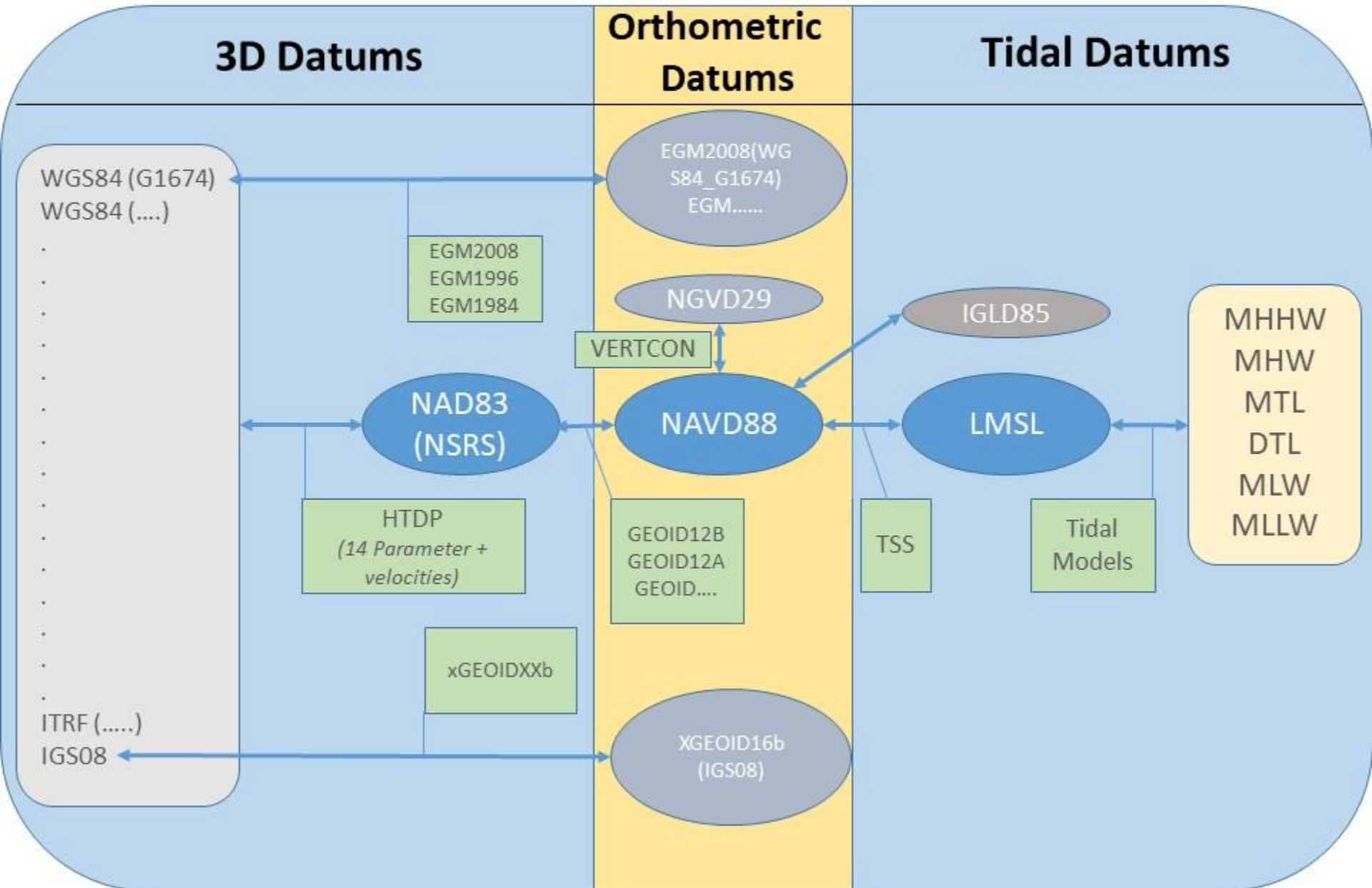


National Oceanic and Atmospheric Administration



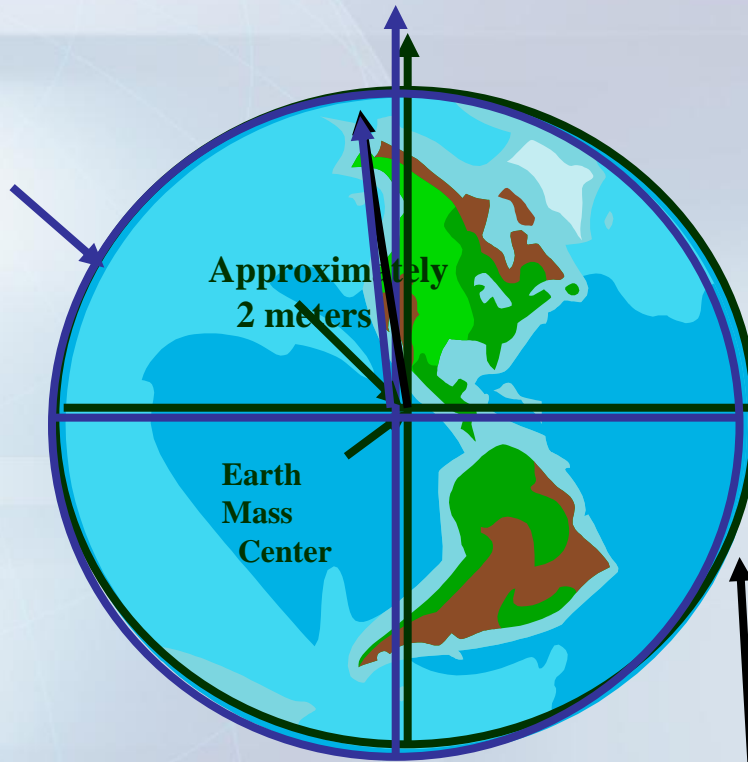


# Vertical Datum Transformation “Roadmap”



# 3D/Ellipsoid Datums

NAD83  
(GRS 1980)



- Calculation of geographic position on this irregular surface is very complex. A simpler model is needed.
- This simplified mathematical surface is the *ellipsoid*.
- An ellipsoid approximates the shape of the earth, a datum defines the position of the ellipsoid relative to the center of the earth. A datum provides a frame of reference for measuring locations on the surface of the earth.

The GRS80 ellipsoid's origin is approximately 2m from WGS84 ellipsoid's. The Clarke 1866 ellipsoid's origin is approximately 236 m from WGS84 ellipsoid's



National Oceanic and Atmospheric Administration

*14-parameter transformation*

# Orthometric Datums and the GEOID

## Ellipsoid to Orthometric

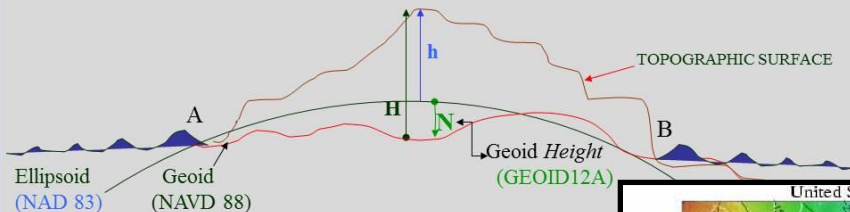
### + Ellipsoid, Geoid, and Orthometric Heights

H = Orthometric Height (NAVD 88)

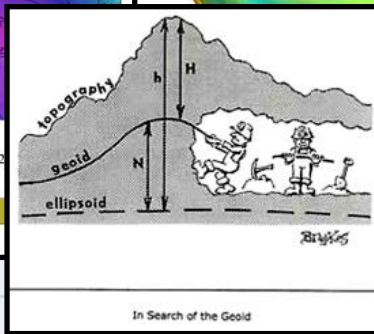
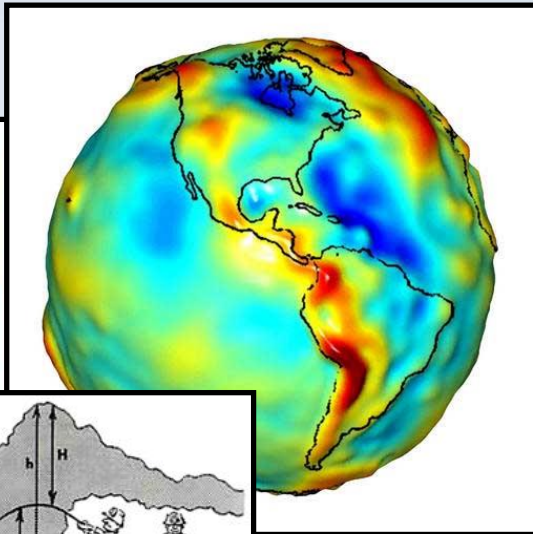
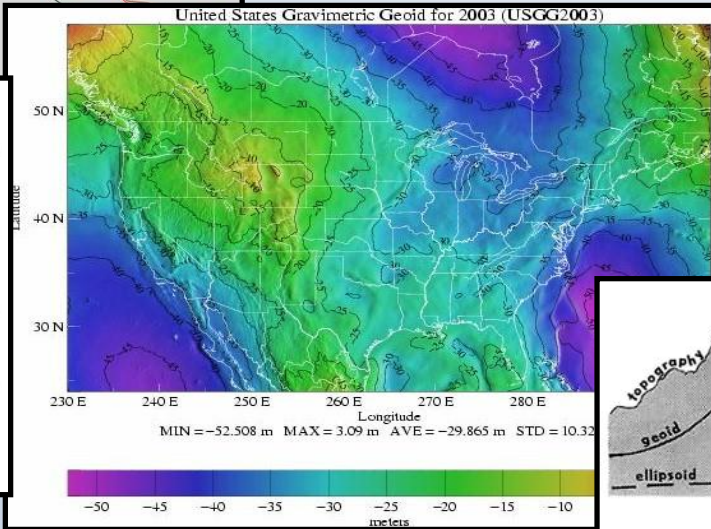
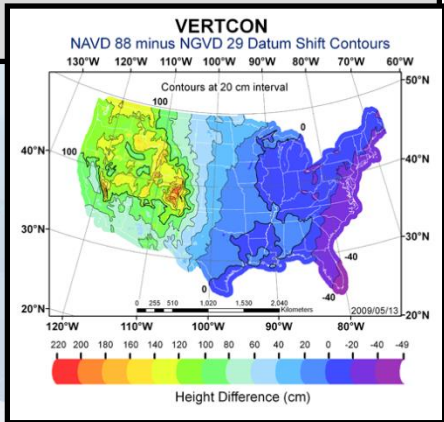
h = Ellipsoidal Height (NAD 83)

N = Geoid Height (GEOID 12A)

$$H = h - N$$



- NAVD88 is based on an adopted elevation at Point Rimouski (Father's Point). It uses Helmert orthometric heights as an approximation to true orthometric heights.
- GEOID: "The *equipotential surface* of the Earth's gravity field which best fits, in the least squares sense, (global) mean sea level."
- Can't see the surface or measure it directly.
- Can be modeled from gravity data as they are mathematically related.

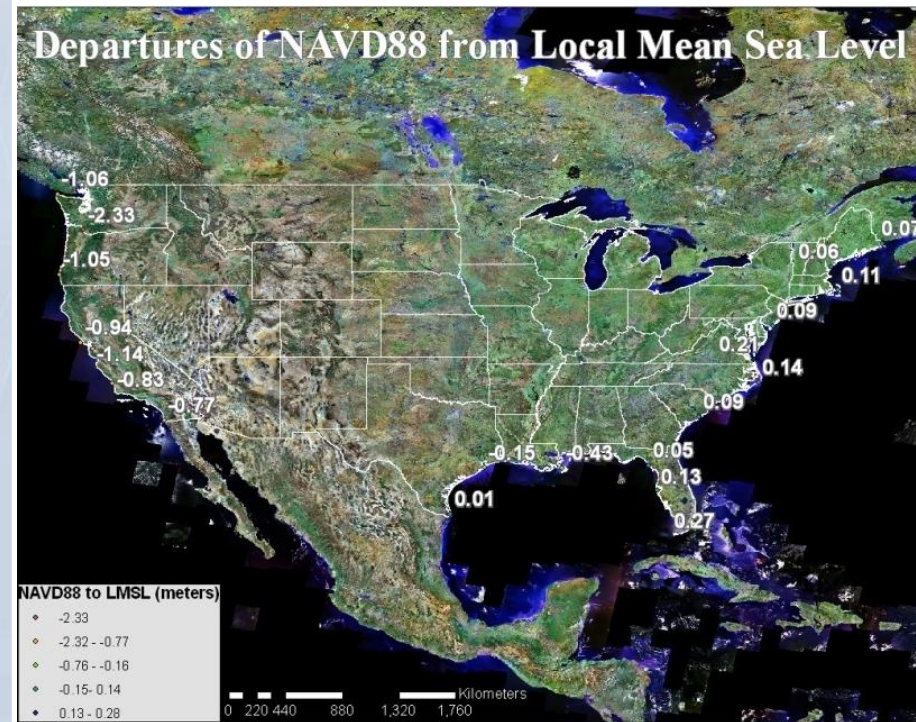


National Oceanic and Atmospheric Administration

*biquadratic interpolation*

# Topography of the Sea Surface

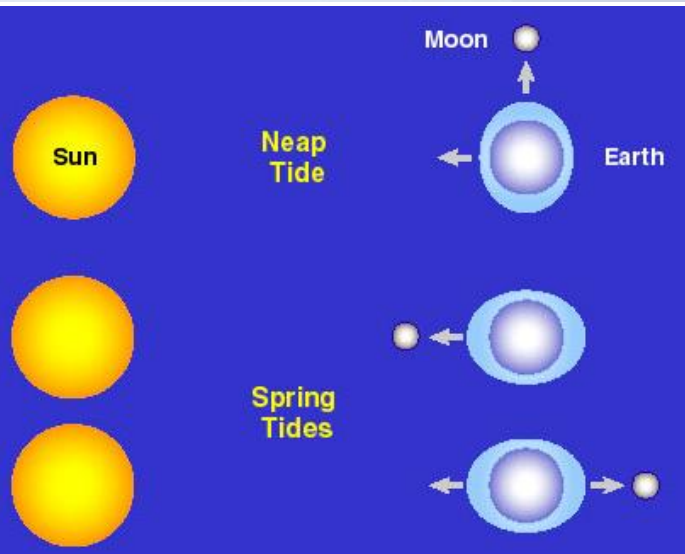
The **Topography of the Sea Surface (TSS)** is defined as the elevation of the North American Vertical Datum of 1988 (NAVD88) relative to local mean sea level (LMSL).



National Oceanic and Atmospheric Administration

bilinear interpolation

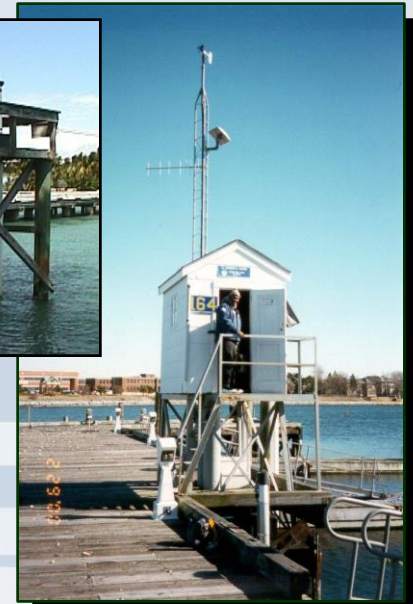
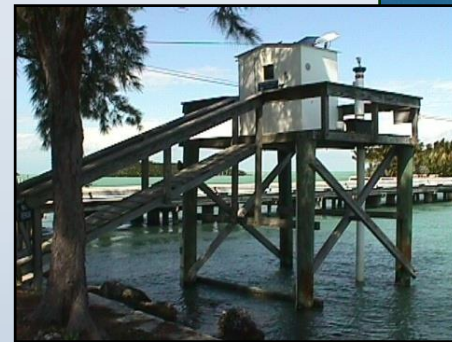
# Tidal Datums



- A vertical datum is called a tidal datum when it is defined by a certain phase of the tide.
- National Tidal Datum Epoch (NTDE): is a specific 19-year period that spans the longest periodic tidal variations resulting from astronomical tide-producing forces.
- The fundamental base from which most coastal and marine boundaries are determined.
- Also important for referencing soundings and depicting shorelines on nautical charts.



National Water Level Observation Network (NWLON)

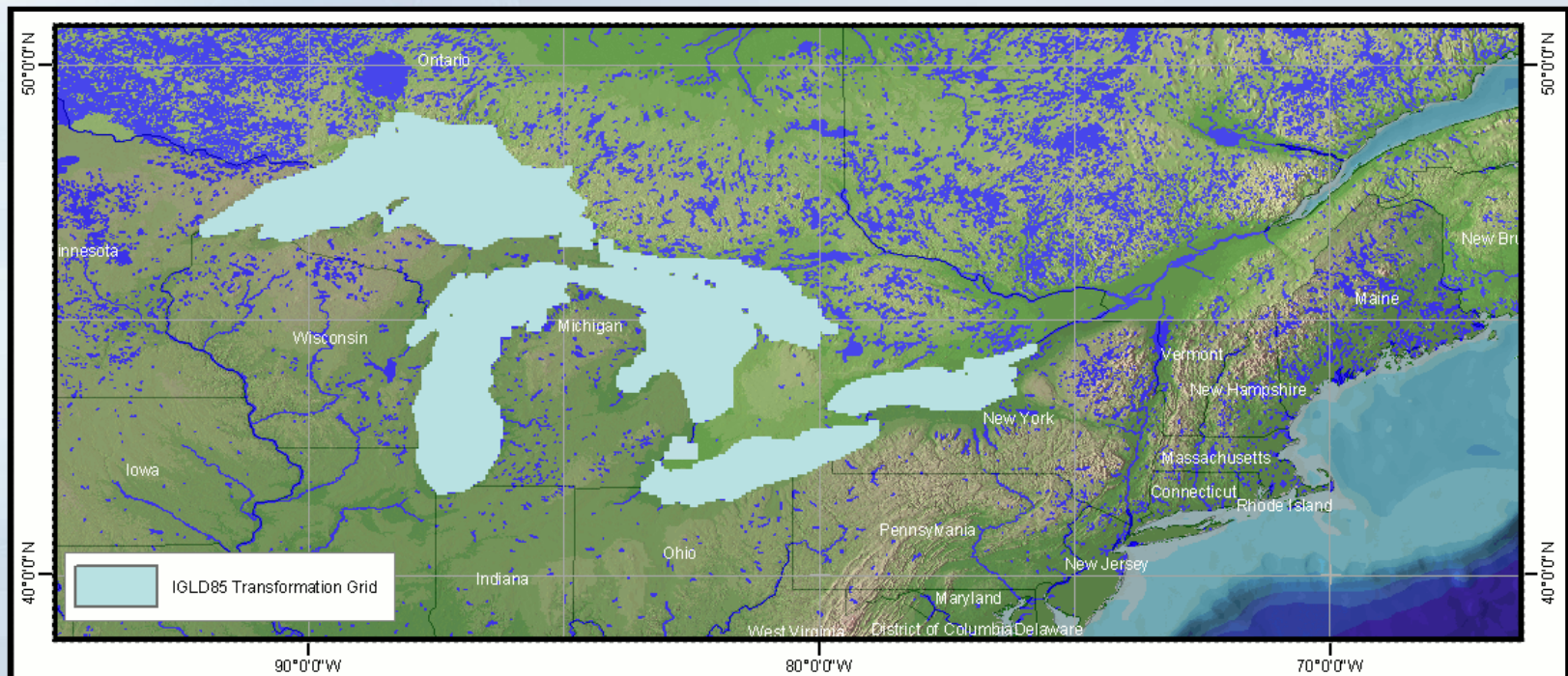


National Oceanic and Atmospheric Administration

bilinear interpolation

# VDatum: IGLD85

- Conversions between IGLD 85 and NAVD 88 are provided based on the NAVD 88 gravity model (<http://www.ngs.noaa.gov/TOOLS/Navdgrav/navdgrav.html>) and the hydraulic corrector model.



# VDatum Applications

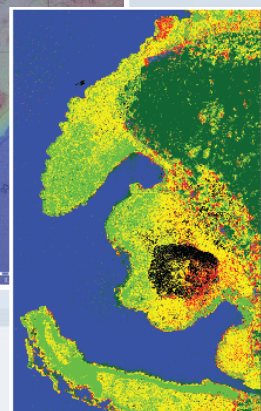
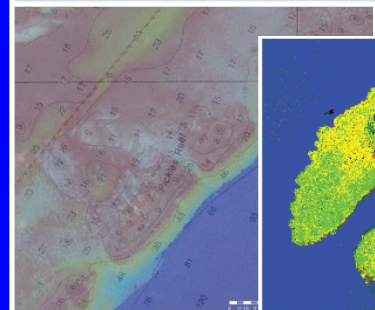
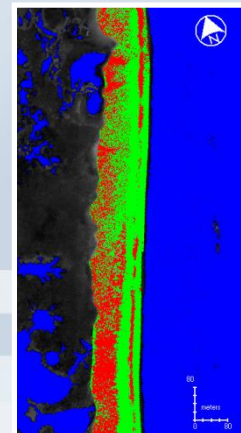
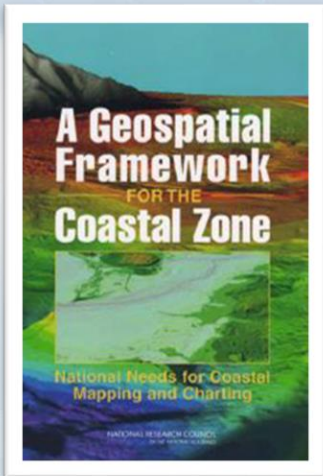


National Oceanic and Atmospheric Administration

# Integrated Ocean and Coastal Mapping (IOCM)

The practice of acquiring, managing, integrating and disseminating ocean and coastal geospatial mapping data in such a manner that permits these data and their derivative products to be easily accessed and used by and for the greatest range of users and purposes.

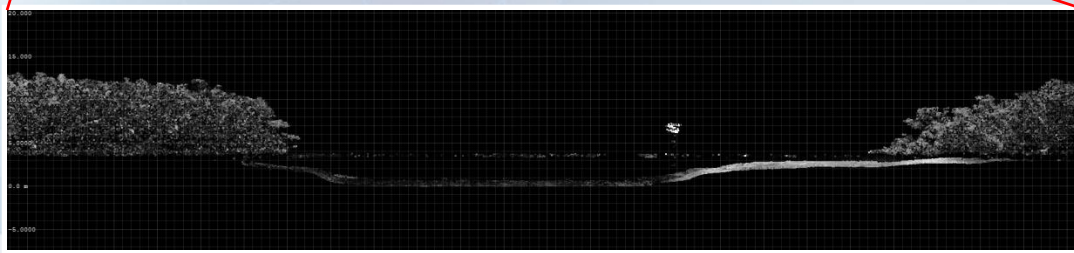
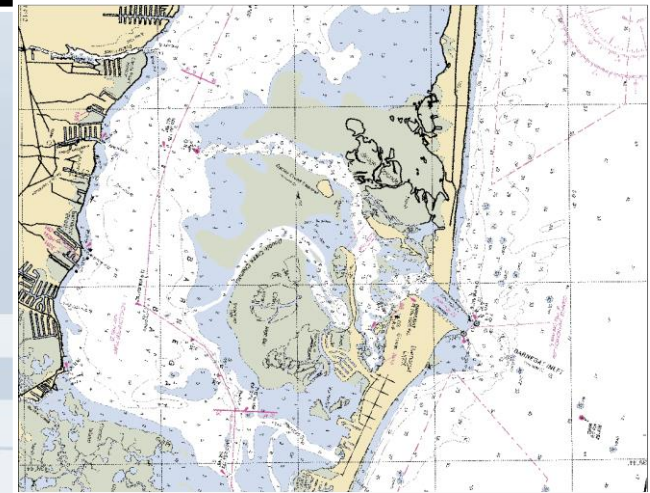
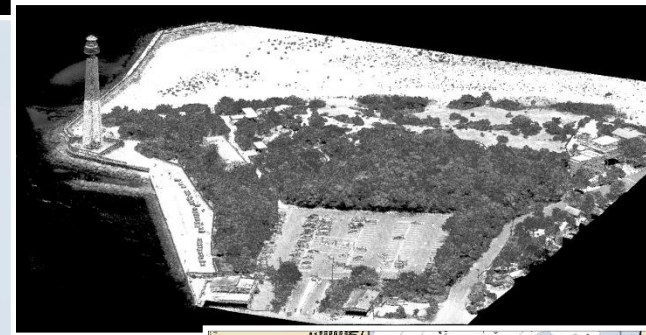
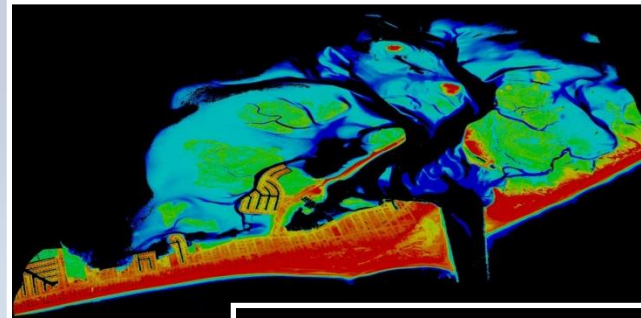
IOCM requires intra- and inter-agency coordination with a focus on streamlining operations, reducing redundancies, improving efficiencies, developing common standards, and stimulating innovation and technological development.



National Oceanic and Atmospheric Administration

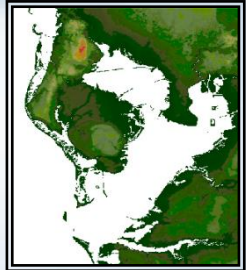


# TopoBathy Lidar

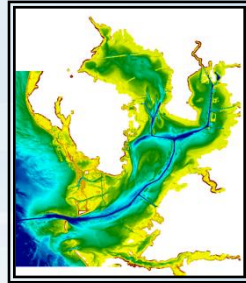
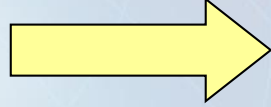


National Oceanic and Atmospheric Administration

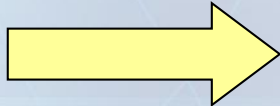
# VDatum: Used to Create Digital Elevation Models



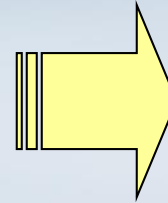
Topography



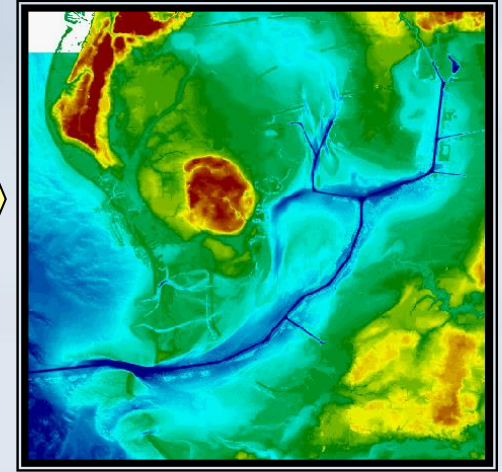
Bathymetry



## VDatum



## Topo/ Bathy Digital Elevation Model



## Applications for Seamless Bathy/Topo Datasets:

- Inundation modeling from storm surge, tsunamis, and sea level rise.
- Erosion, accretion, renourishment
- Analyzing storm impacts
- Determining setback lines
- Determining local, state, and national boundaries
- Navigation products and services
- Habitat restoration
- Shoreline Change Analysis
- Analyzing environmental and natural resources
- Permitting



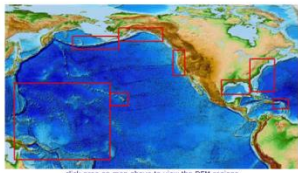
# Utilizing VDatum for Digital Elevation Model Creation: Tsunami Inundation

**NOAA NATIONAL GEOPHYSICAL DATA CENTER**  
U.S. DEPARTMENT OF COMMERCE

NOAA > NESDIS > NGDC > MGDD > Bathymetry & Relief

All Bathym/Topo Coastal DEM Portal Fishing Global Lakes Multibeam NOS surveys

### NOAA Tsunami Inundation Digital Elevation Models (DEMs)



Click area on map above to view the DEM regions

**Project contact:**  
 Lisa A. Taylor@noaa.gov  
 phone: 303-497-6767

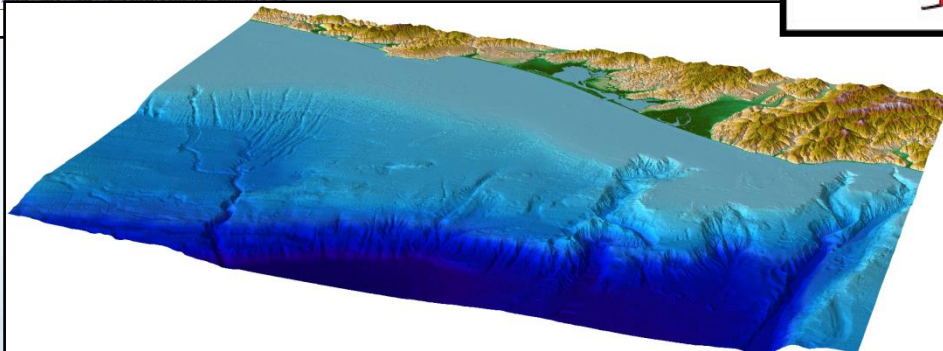
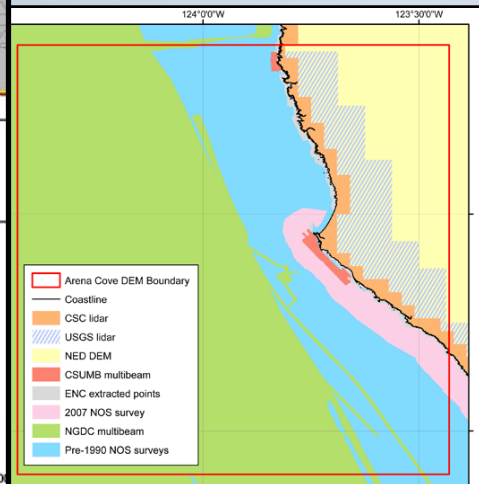
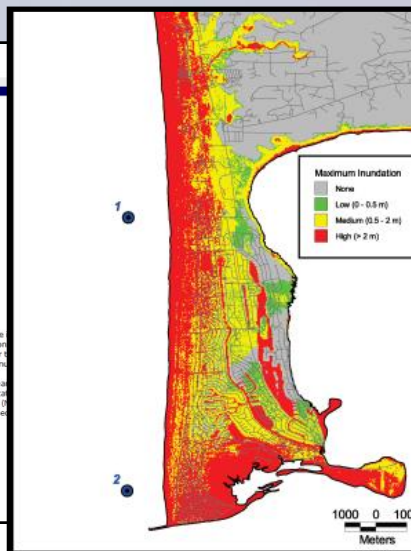
**Technical contact:**  
 Barry Eskins@noaa.gov  
 phone: 303-497-6505

NOAA's National Geophysical Data Center (NGDC) is building high-resolution digital elevation models (DEMs) of select U.S. coastal regions. These topographic DEMs are used to support tsunami forecasting and modeling efforts at the NOAA Center for Tsunami Research, Pacific Marine Environment. The DEMs are part of the tsunami forecast system SIFT (Short-term Inundation Forecasting for Tsunamis) currently being developed by PMEL for the Centers, and are used in the MOST (Method of Splitting Tsunami) model developed by PMEL to simulate tsunami generation, propagation, and impact.

Bathymetric, topographic, and shoreline data used in DEM compilation are obtained from various sources, including NGDC, the U.S. National Oceanic and Atmospheric Administration (NOAA), the U.S. Army Corps of Engineers (USACE), the Federal Emergency Management Agency (FEMA), and other federal, state agencies, academic institutions, and private companies. DEMs are referenced to a vertical tidal datum of North American Vertical Datum of 1988 (NAVD 88) and horizontal datum of World Geodetic System of 1984 (WGS 84). Cell size ranges from 1/3 arc-second (~10 meters) to 36 arc-seconds (~1000 meters).

**NEW!** DEMs built by the PMEL's NOAA Center for Tsunami Research are now available for download from this web site.

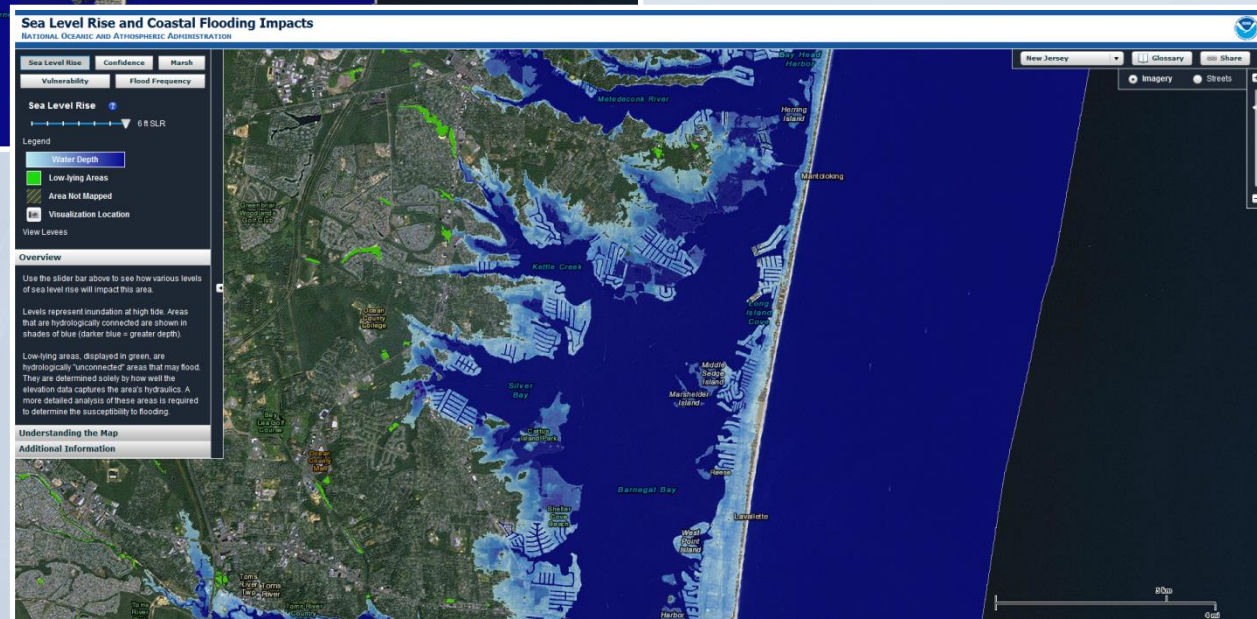
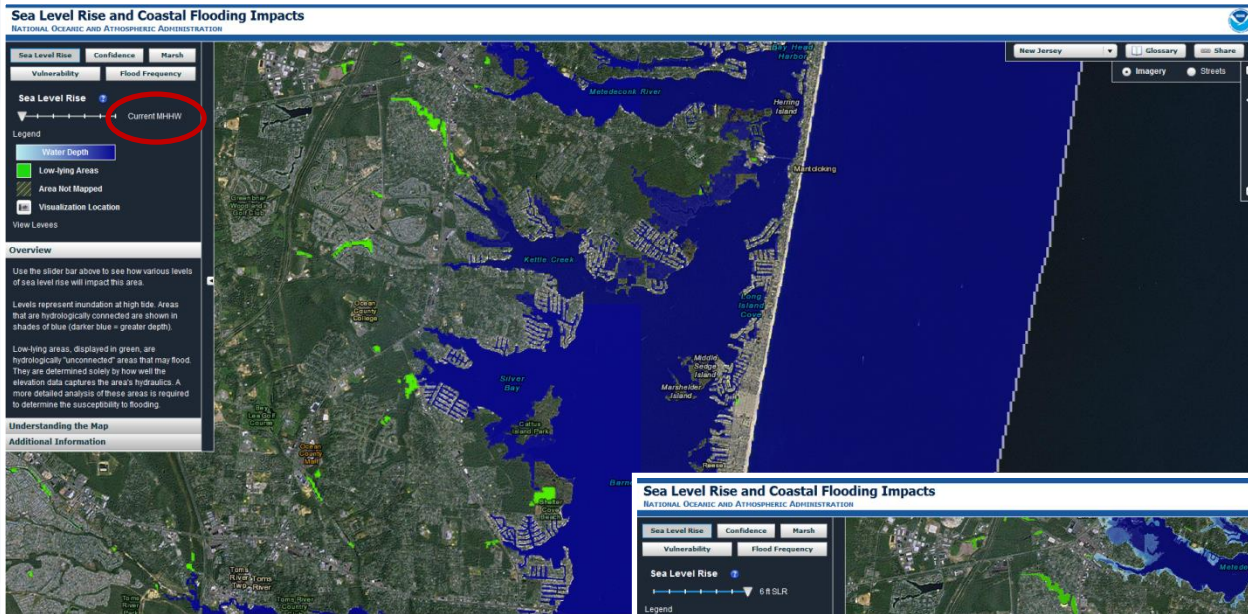
**How to Cite DEMs:**  
 For each DEM, cite the accompanying DEM Development Report.



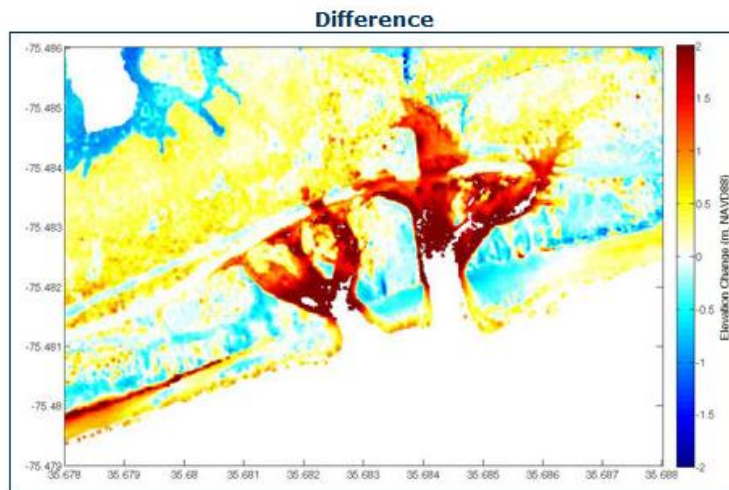
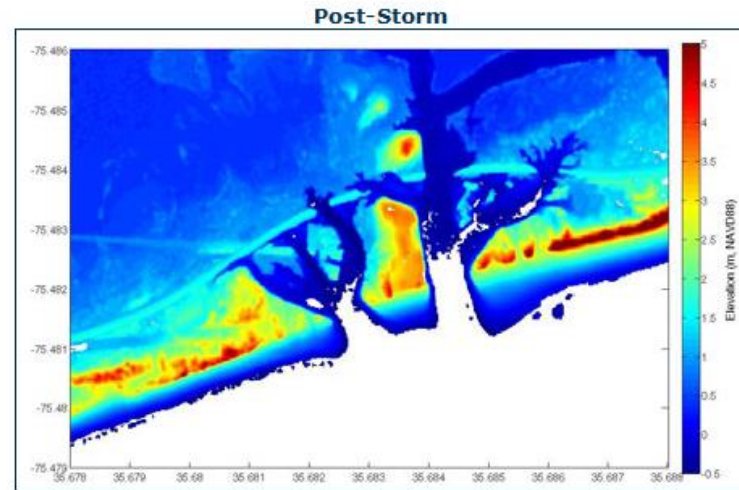
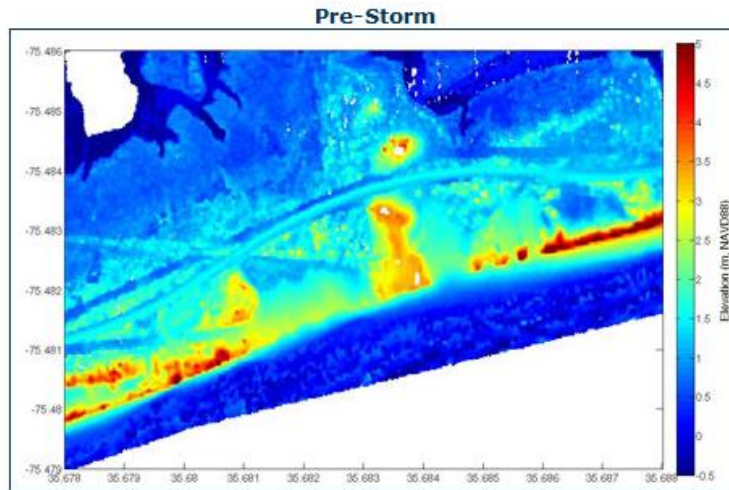
Source	Year	Data Type	Spatial Resolution	Original Horizontal Datum/Coordinate System	Original Vertical Datum
NGDC	1921 to 2008	NOS hydrographic survey soundings	Ranges from less than 10 m to 600 m (varies with scale of survey, depth, traffic, and probability of obstructions)	NAD 83 geographic	MLLW
NGDC	1984 to 2006	Multibeam swath sonar	gridded to 1 arc-second	WGS 84 geographic	Assumed Mean Sea Level
University of New Hampshire, Center for Coastal and Ocean Mapping, Joint Hydrographic Center	2009	Multibeam swath sonar	40 meter grid	WGS 84 geographic	Inferred Mean Sea Level
U.S. Army Corps of Engineers	2009	Hydrographic survey	Not Available	NAD 83 California State Plane I (feet)	MLLW
California State University Seafloor Mapping Laboratory	2005	Multibeam swath sonar	1 meter grid	WGS 84 UTM 10 North	NAVD 88
NOAA Office of Coast Survey	1992 to 2008	ENC extracted soundings	Not Available	WGS 84 geographic	MLLW



# Sea Level Rise/Coastal Flooding



# Emergency Response



**Location 5: Lidar topography from November 27-December 1, 2009 (Pre-Storm) and August 28-29, 2011 (Post-Storm) and topographic change (Difference) for a portion of the Outer Banks in the Pea Island National Wildlife Refuge, NC.** In the pre-storm image, note the two particularly low elevation areas between a relative high. During the storm, surge and waves were funneled through the lower areas, carving two breaches (post-storm image). The difference image shows the intricate pattern of erosion associated with the formation of the breaches. See [pre- and post-storm photo comparisons](#) for additional discussion.

Courtesy of USGS



National Oceanic and Atmospheric Administration

# Additional Applications

- Coastal Inundation/Sea Level Rise/Tsunami Modeling
- Erosion/Accretion/Shoreline Change
- Habitat/Wetland Restoration
- Dredging and Infrastructure Engineering (levees, jetties)
- Floodplain Mapping
- Topobathy DEM Creation
- Civil and Water Works Projects
- Easement and Setback Planning
- Marine Construction
- Coastal Engineering
- Coral Reef Mapping
- Analyzing Storm Impacts
- Real Estate Mapping
- Evacuation Route Mapping
- Site Management
- Insurance Studies
- Hazardous Waste Site Studies
- Groundwater mapping and modeling
- Feasibility Studies and Planning,
- Determining Local, State and National Boundaries
- Permitting
- Analyzing Environmental and Natural Resources
- Emergency Response
- ??? What Can You Imagine ???



# VDatum Website: vdatum.noaa.gov

(Version 4.4.2 Released, May 13, 2022)



## VERTICAL DATUM TRANSFORMATION

INTEGRATING AMERICA'S ELEVATION DATA

[Home](#) | [About VDatum](#) | [Download](#) | [Online](#) | [Docs & Support](#) | [Contact Us](#)

### Welcome to VDatum!

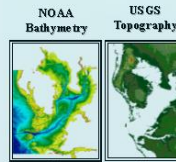
VDatum is a free software tool being developed jointly by NOAA's National Geodetic Survey (NGS), Office of Coast Survey (OCS), and Center for Operational Oceanographic Products and Services (CO-OPS). VDatum is designed to vertically transform geospatial data among a variety of tidal, orthometric and ellipsoidal vertical datums - allowing users to convert their data from different horizontal/vertical references into a common system and enabling the fusion of diverse geospatial data in desired reference levels.

[Download](#)

Download the newest VDatum (v3.6.1) and its datasets.

[Animated tutorial!](#)

The VDatum Demonstration Project in Tampa Bay, Florida



### Features

VDatum software is written in Java, so it runs on Mac OS X, Unix, VMP, and Windows.

Where available and uncertainties are established, VDatum supports the conversions among following:

- **Coordinate Systems:** Geographic, UTM, State Plane Coordinates (SPC), and geocentric (ECEF)
- **Horizontal Datums:** NAD27, NAD83(1986), and NAD83(HARN); and ellipsoidal datums such as ITRF, WGS84, and NAD83 serializations
- **Vertical Datums:**
  - **Ellipsoidal Datums:** NAD83, WGS84, ITRF88, ITRF89, ITRF90, NEOS 90, PNEOS 90, ITRF91, ITRF92, SIO/MIT 92, ITRF93, ITRF94, ITRF96, ITRF97, IGS97, ITRF2000, IGS00, IGS00, ITRF2005, IGS05, ITRF2008, IGS08, WGS84(transit), WGS84(G730), WGS84(G873), WGS84(G1150), WGS84(G1674), NAD83(PACP00), NAD83(MARP00)
  - **Orthometric Datums:** NAVD88, NGVD29, PRVD02, VIVD09, ASVD02, GUVD04, NMVD03, HAWAII EGM2008, EGM1996, and EGM1984
  - **Tidal Datums:** MLLW, MLW, LMSL, DTL, MTL, MHW, LWD, and MHHW
  - IGLD85
- **GEOID models:** GEOID12B, GEOID12A, GEOID09, GEOID06 (Alaska only), GEOID03, GEOID99, and GEOID96
- **EGM models:** EGM2008, EGM1996, and EGM1984
- **Supported file format:** text(ASCII), LIDAR(.LAS) version 1.0 to 1.2, ESRI ASCII Raster(.ASC), and ESRI 3D shapefile



National Oceanic and Atmospheric Administration

# VDatum: Interfaces

**ONLINE VERTICAL DATUM TRANSFORMATION**  
INTEGRATING AMERICA'S ELEVATION DATA

Home About VDatum Download Docs & Support Contact Us

Horizontal Information

Source Target

Reference Frame: NAD83(2011/2007/CORS96/HARN) - North American tech NAD83(2011/2007/CORS96/HARN) - North American tech

Coord. System: Geographic (Longitude, Latitude) Geographic (Longitude, Latitude)

Unit: meter (m) meter (m)

Zone: ALE - 0101 ALE - 0101

Vertical Information

Reference Frame: NAD83(2011/2007/CORS96/HARN) - North American tech MLLW

Unit: meter (m) meter (m)

Height Sounding Height Sounding

GEOID model: GEOID12B GEOID model: GEOID12B

Point Conversion ASCII File Conversion

Input Output

Longitude: -80.643768 Convert Longitude: -80.6437680

Latitude: 29.764377 Reset Latitude: 29.7643770

Height: 0 DMS Height: 29.661

Drive to on map Reset Map

to DMS

Vertical Uncertainty: 9.6551 cm

Vertical Area: FLGAeastshelf41\_0301:1:4

Alberating Horz. Datum Ellipsoidal Datum

NOAA's Vertical Datum Transformation - v3.6.1

Horizontal Information

Source Target

Datum: NAD83(2011/2007/CORS96/HARN) - North... NAD83(2011/2007/CORS96/HARN) - North...

Coord. System: UTM (Easting, Northing) UTM (Easting, Northing)

Unit: meter (m) meter (m)

Zone: 18 18

Vertical Information

Source Target

Datum: NAD83(2011/2007/CORS96/HARN) - North... MHW

Unit: meter (m) meter (m)

Height Sounding Height Sounding

GEOID model: GEOID12B

Point Conversion ASCII File Conversion File Conversion

Input Output

Easting: Convert Easting: File Report to DMS

Northing: Reset Northing:

Height: DMS Height: Vertical Uncertainty

## VDatum API Documentation

VDatum API Documentation describes how to use the APIs and includes code samples.

### JSON - Tidal API

- Response Elements
- Request URL
- Request parameters
- Sample URL requests and responses

#### Response Elements

Element	Description
src_horizontal_frame	Source Horizontal Reference Frame.
src_vertical_frame	Source Vertical Reference Frame.
src_vertical_unit	Source Vertical Unit
src_vertical_geoid	Source Vertical GEOID model.
src_lon	Source Longitude.
src_lat	Source Latitude.
src_height	Source Height.
tar_horizontal_frame	Target Horizontal Reference Frame.
tar_vertical_frame	Target Tidal Frame.
tar_vertical_unit	Target Vertical Unit.
tar_vertical_geoid	Target Vertical GEOID model.
tar_lon	Target Longitude.
tar_lat	Target Latitude.
tar_height	Result Target Height.

#### Request URL

[https://vdatum.noaa.gov/vdatumweb/api/tidal?json&tar\\_height&tar\\_h\\_frame&tar\\_v\\_frame&tar\\_v\\_unit&tar\\_v\\_geoid&tar\\_v\\_frame&tar\\_v\\_unit](https://vdatum.noaa.gov/vdatumweb/api/tidal?json&tar_height&tar_h_frame&tar_v_frame&tar_v_unit&tar_v_geoid&tar_v_frame&tar_v_unit)

## VDatum Command-line User Guide

### On This Page

- Point Conversion
- File Conversion

This User Guide describes how to run VDatum version 3.x without the graphical user interface.

Once you download VDatum software and its transformation grids, your computer is ready to transform geospatial data among several horizontal and vertical datums.

### General syntax:

- For running VDatum with the graphical user interface:  
`java -jar vdatum.jar`
- For help:  
`java -jar vdatum.jar -help`
- For converting without GUI:  
`java -jar VDatum.jar <georeferencing_parameters> [<point_conversion>] [<file_conversion>]`

### Georeferencing Parameters

#### Syntax:

`horz`:<source horizontal datum>[:<coordinate system>:<unit>:<zone>] [`ivert`:<source vertical datum>[:<unit>[:<height/sounding>[:<geoid>]]]] `ohorz`:<target horizontal datum>[:<coordinate system>:<unit>:<zone>] [`overt`:<target vertical datum>[:<unit>[:<height/sounding>[:<geoid>]]]]

#### where:

Parameter	Description
<code>ihorz</code>	Provides details about horizontal information of the source data.
<code>ivert</code>	Provides details about vertical information of the source data. If omitted, the transform is considered to be 2-dimension.
<code>ohorz</code>	Provides details about target horizontal information. If omitted, result will be horizontally referenced in NAD83, geographic coordinates.
<code>overt</code>	Provides details about target vertical information of the source data. If omitted, the transform is considered to be 2-dimension.
<coordinate system>	Either <code>geo</code> , <code>utm</code> , <code>spc</code> or <code>xyz</code> , corresponding to geographic coordinates, UTM coordinates, State Plane coordinates or geocentric coordinates. If omitted, the geographic coordinate system with horizontal coordinates in degrees (i.e., <code>geo:deg</code> ) are used.



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# VDatum: Documentation and Support



## VERTICAL DATUM TRANSFORMATION

INTEGRATING AMERICA'S ELEVATION DATA

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### Welcome to VDatum!

VDatum is a free software tool being developed jointly by NOAA's National Geospatial Technical Center (NGS), Office of Coast Survey (OCS), and Center for Operational Oceanographic Services (CO-OPS). VDatum is designed to vertically transform geospatial data of tidal, orthometric and ellipsoidal vertical datums - allowing users to convert different horizontal/vertical references into a common system and enabling geospatial data in desired reference levels.

### Features

VDatum software is written in Java, so it runs on Mac OS X, Unix, VMP, and Windows.

Where available and uncertainties are established, VDatum supports the conversions among following:

- Coordinate Systems:** Geographic, UTM, State Plane Coordinates (SPC), and geocentric (ECEF)
- Horizontal Datums:** NAD27, NAD83(1986), and NAD83(HARN); and ellipsoidal datums such as of ITRF, WGS84, and NAD83 serializations
- Vertical Datums:**
  - Ellipsoidal Datums:** NAD83, WGS84, ITRF88, ITRF89, ITRF90, NEOS 90, PNEOS 90, ITRF91, ITRF92, SIO/MIT 92, ITRF93, ITRF94, ITRF96, ITRF97, IGS97, IGS2000, IGS00, IGB00, ITRF2005, IGS05, ITRF2008, IGS08, WGS84(transit), WGS84(G730), WGS84(G873), WGS84(G1150), WGS84(G1674), NAD83(PACP00), NAD83(MARP00)
  - Orthometric Datums:** NAVD88, NGVD29, PRVD02, VIVD09, ASVD02, GUVVD04, NMVD03, HAWAII EGM2008, EGM1996, and EGM1984
  - Tidal Datums:** MLLW, MLW, LMSL, DTL, MTL, MHW, LWD, and MHHW
  - IGLD85
- GEOID models:** GEOID12B, GEOID12A, GEOID09, GEOID06 (Alaska only), GEOID03, GEOID99, and GEOID96
- EGM models:** EGM2008, EGM1996, and EGM1984
- Supported file format:** text(ASCII), LIDAR(.LAS) version 1.0 to 1.2, ESRI ASCII Raster(.ASC), and ESRI 3D shapefile

- Est. of VDatum Uncertainties
- User FAQs
- User Guide
- Command-line Guide
- Datum Tutorial
- Manual, Presentations & Publications
- Datum Demonstration Project in Tampa Bay, Florida
- Transformation Grid Format

**Download**



Integrated Bathy/Topo DEM

### Manual, Presentations and Publications

#### Manual

- VDatum Manual for Development and Support of NOAA's Vertical Datum Transformation Tool, VDatum, Version 1. 01, June 2012.

#### Presentations

- White, S. A. (2013). VDatum: Vertical Datum Transformation Tool. Presented to the Hydrographic Services Review Panel.

#### Publications

##### 2013

- Yang, J., E. Myers, I. Jeong, S. White (2013). VDatum for the Coastal Waters of Puerto Rico and the U. S. Virgin Islands: Tidal Datums, Marine Grid, and Sea Surface Topography. NOAA Technical Memorandum NOS CS 33.
- Yang, Z., E. Myers, I. Jeong, S. White (2013). VDatum for the Gulf of Maine: Tidal Datums and Topography of the Sea Surface. NOAA Technical Memorandum NOS CS 31.
- Hess, K., I. Jeong, S. White (2013). Revised VDatum For Eastern Florida. NOAA Technical Memorandum NOS CS 30.
- Xu, J., E. Myers, I. Jeong, S. White (2013). VDatum For Coastal Waters of Texas and Western Louisiana: Tidal Datums and Topography of the Sea Surface. NOAA Technical Memorandum NOS CS 29.

##### 2012

- Yang, Z., E. Myers, I. Jeong, S. White (2012). VDatum For Coastal Waters From The Florida Shelf to the South Atlantic Bight: Tidal Datums, Marine Grids, And Sea Surface Topography. NOAA Technical Memorandum NOS CS 27.

##### 2011

##### 2010

- Yang, Z., E. Myers, S. White (2010). VDatum For Eastern Louisiana And Mississippi Coastal Waters: Tidal Datums, Marine Grids, And Sea Surface Topography. NOAA Technical Memorandum NOS CS 19.
- Yang, Z., E. Myers, S. White (2010). VDatum For Great South Bay, New York Bight And New York Harbor: Tidal Datums, Marine Grids, and Sea Surface Topography. NOAA Technical Memorandum NOS CS 21.
- Xu, J., E. Myers, S. White (2010). VDatum for the Coastal Waters of North/Central California, Oregon and Western Washington: Tidal Datums and Sea Surface Topography. NOAA Technical Memorandum NOS CS 22.

##### 2009

### Frequently Asked Questions

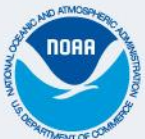
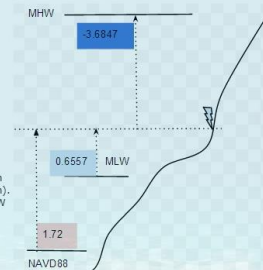
- Which OS does VDatum run on?
- I have the latest Java, however when I double click vdatum.bat, the command prompt window flashes for a split second and the application does not launch.
- Running "java -jar vdatum.jar" at the command prompt window gives me "java is not recognized as an internal or external command, operable program or batch file".
- I can't select any tidal datum, or NAD 27, NAD83(1986), NGVD29, IGLD85!
- I recieved a result of -999999.0. What does that mean?
- The -999999.0 is the no-data-value in our program. It occurs in areas where the transformations are invalid. In the tidal transformations, this -999999.0 value could mean that your elevation data are either out of the boundaries of our tidal transformation grids, or in the masked-out areas, i.e. inland or where are not covered by the tidal models.
- Why doesn't VDatum provide tidal datums inland?
- What are the VDatum bounding polygons and why are they utilized?
- While trying to convert from NAVD88 to MLLW, MLW, MHW, etc.. I got results showing that the MLLW and MLW are higher than MHW and MHHW. Could it be program bug or something mixed up?

No, it isn't a program bug, nor a mix up.

Let's consider the diagram on the right, assuming a point (at the lightning bolt) has following elevation values (height values):

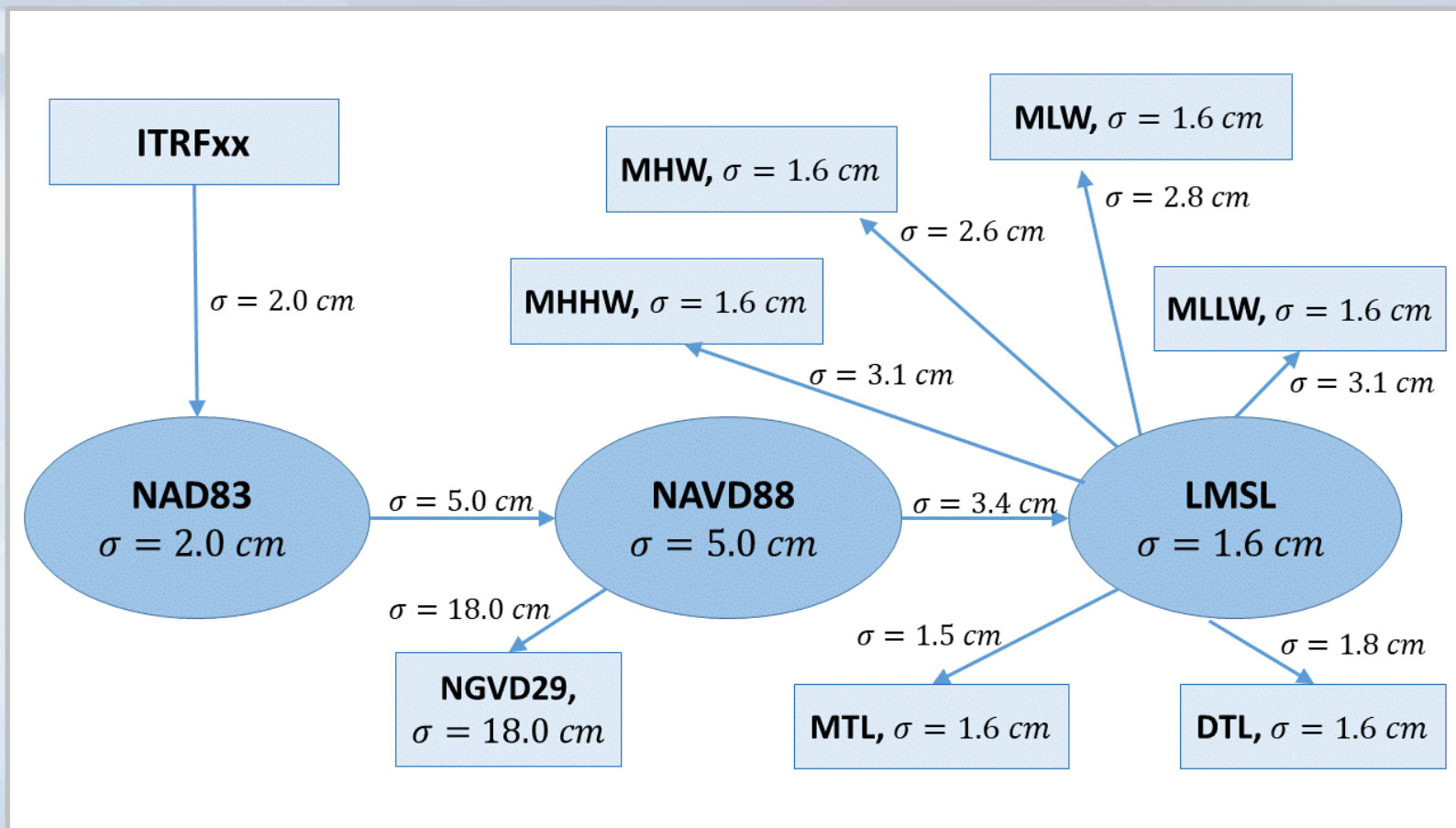
- NAVD88: 1.72m
- MLW: 0.6557m
- MHW: -3.6847m

where the original elevation value is relative to NAVD88 (1.72m). Using VDatum to get elevation values referenced in MLW (0.6557m), and in MHW is (-3.6847m). Since the origin of MHW is above the origin of MLW, the elevation result of MHW will be less than that of MLW.



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# VDatum Uncertainty Modeling



See: [vdatum.noaa.gov/docs/est\\_uncertainties.html](http://vdatum.noaa.gov/docs/est_uncertainties.html)



National Oceanic and Atmospheric Administration

# Operational: Vertical Datum Transformation Uncertainty

20090721\_47122H2102-works.las.log x

2016/06/01 13:10:30

NOAA's Vertical Datum Transformation v3.6

	INPUT	OUTPUT
Coordinate System:	State Plane	State Plane
Horizontal Datum:	NAD83	NAD83
Horizontal Unit:	m	m
Zone:	4601	
Vertical Datum:	NAD83	NAVD88
Vertical Unit:	m	m
Height/Sounding:	height	height
GEOID model:		geoid12b
Vertical Area:	geoid12b	
Vertical Uncertainty:	7.3485cm	

From: C:\temp\las\_files\las\_files\20090721\_47122H2102-works.las

To: C:\temp\las\_files\las\_files\result\20090721\_47122H2102-works.las

Number of processed Points: 333773

Number of valid-transform Points: 333773

Number of points in this output file (NODATA points were excluded): 3

NOAA's Vertical Datum Transformation - v3.6.1

Horizontal Information

	Source	Target
Datum:	NAD83(2011/2007/CORS96/HARN) - North...	NAD83(2011/2007/CORS96/HARN) - North...
Coord. System:	Geographic (Longitude, Latitude)	Geographic (Longitude, Latitude)
Unit:		
Zone:		

Vertical Information

	Source	Target
Datum:	NAD83(2011/2007/CORS96/HARN) - North...	MHW
Unit:	meter (m)	meter (m)
	<input checked="" type="radio"/> Height <input type="radio"/> Sounding	<input checked="" type="radio"/> Height <input type="radio"/> Sounding
	<input type="checkbox"/> GEOID model:	<input checked="" type="checkbox"/> GEOID model: GEOID12B

Point Conversion | ASCII File Conversion | File Conversion

Input	Output
Longitude: -77.818	Longitude: -77.8180000
Latitude: 34.133	Latitude: 34.1330000
Height: 0	Height: 36.9576
	Vertical Uncertainty: 9.5844cm
Vertical_Area: NCcoast11_8301	

File Report  to DMS



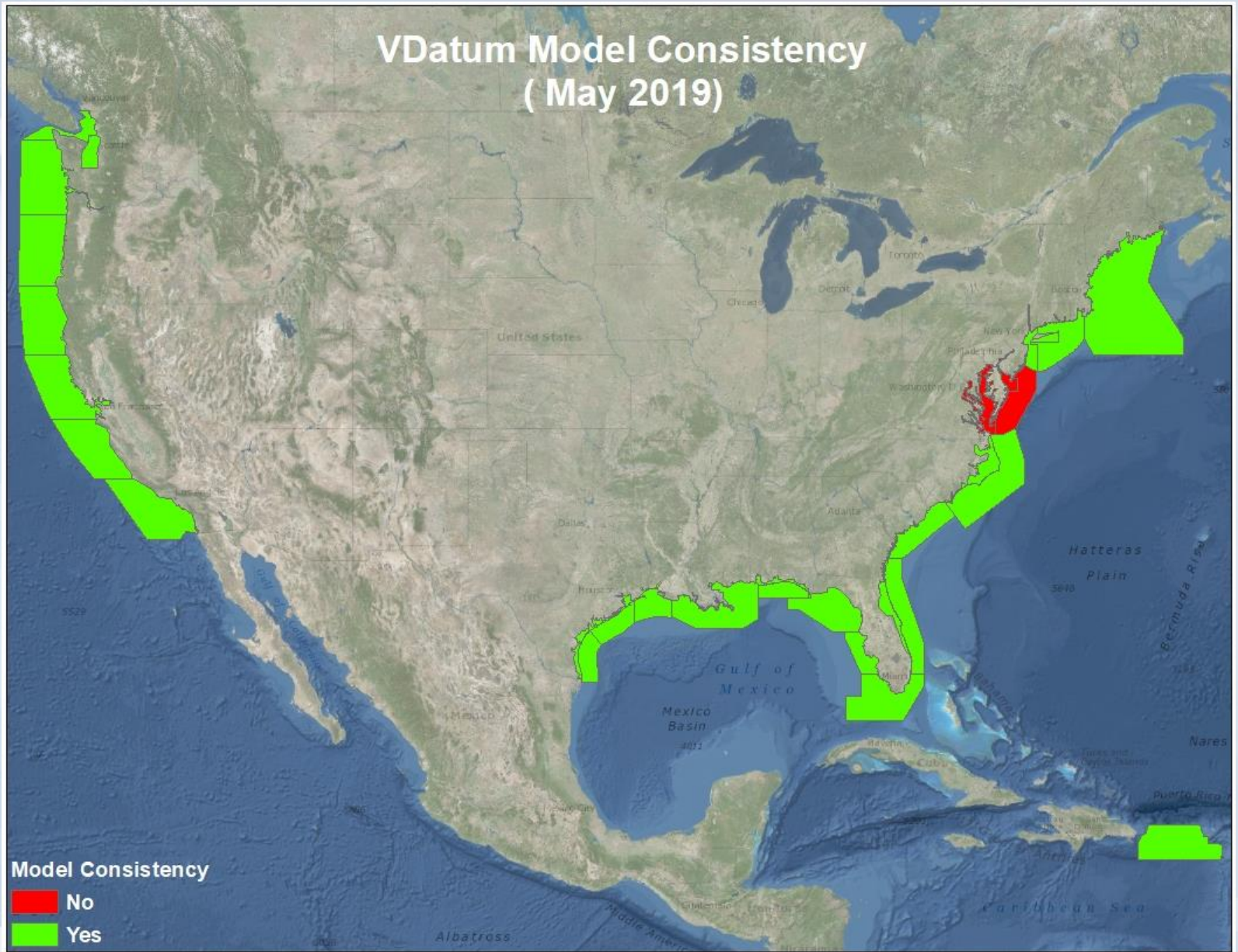
National Oceanic and Atmospheric Administration

# What's Next: *Strategic Priorities*

- Create Consistency between Regional Models
- Reducing Regional Model Uncertainty to <10cm
- Increasing Coverage
- Next Generation TSS Model (utilizing gravimetric GEOID transformation roadmap) – ***GPS on Tidal Benchmarks***
- Spatially Varying Uncertainty
- Software Development
- Communication and Outreach

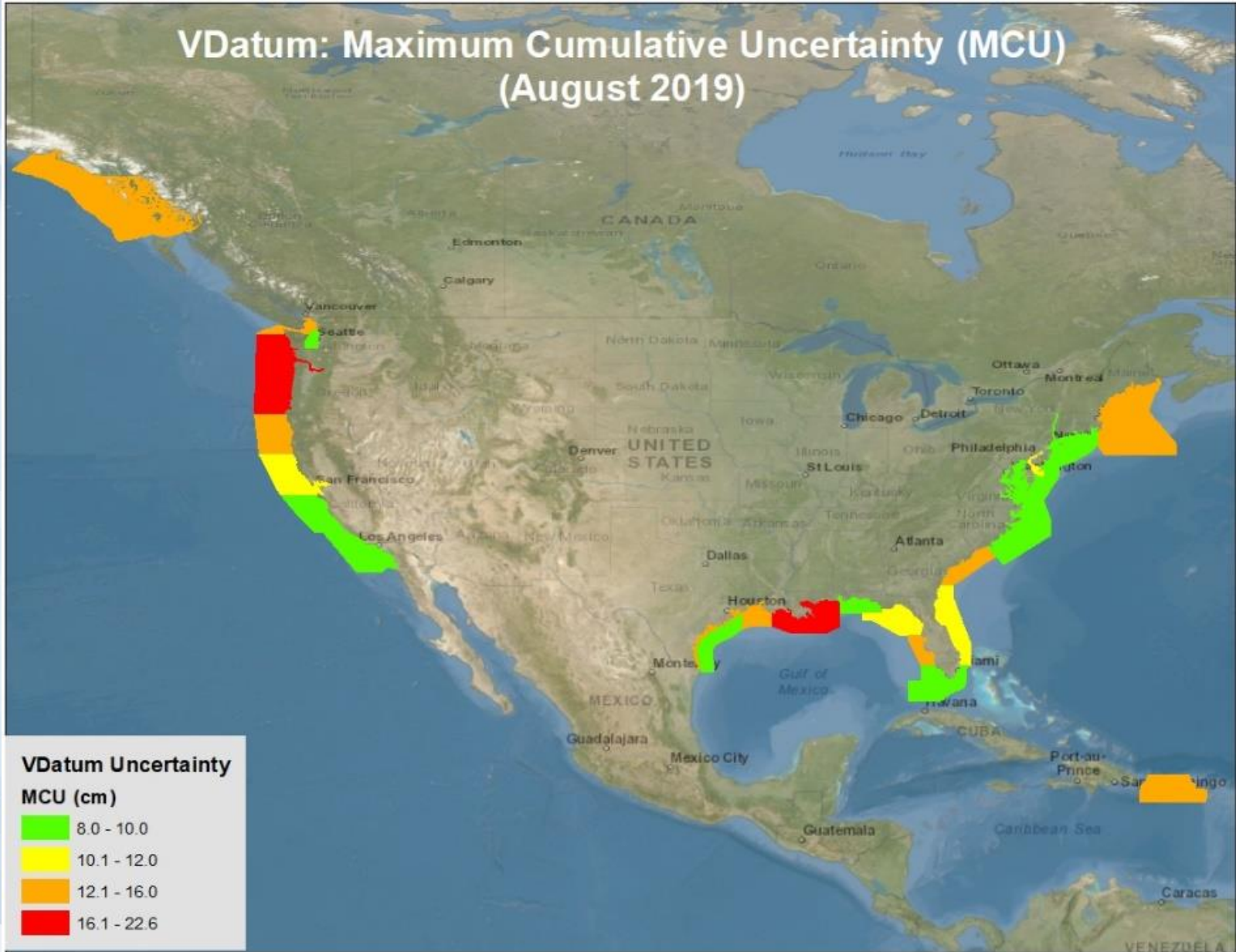


# VDatum Model Consistency ( May 2019 )



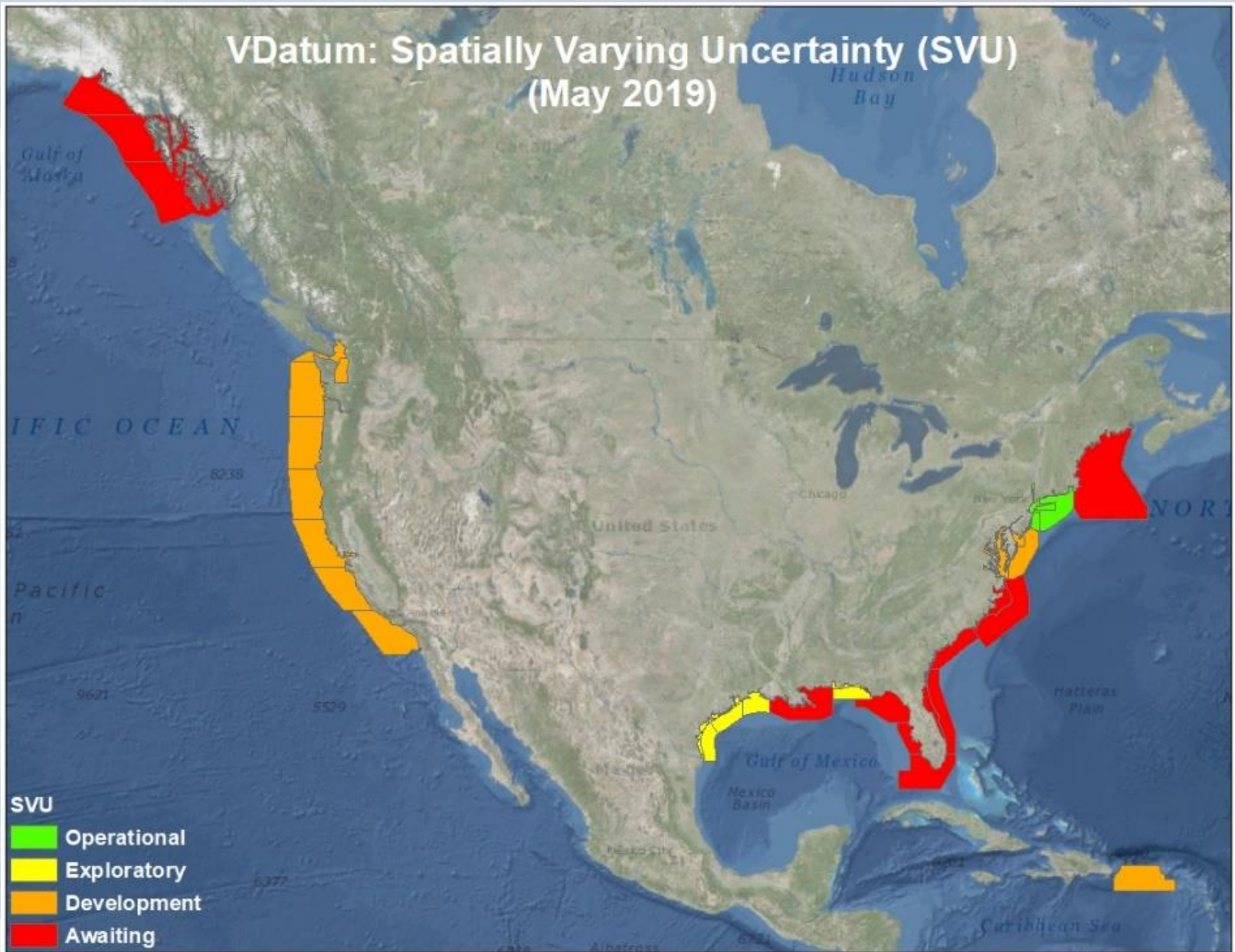
National Oceanic and Atmospheric Administration

# VDatum: Maximum Cumulative Uncertainty (MCU) (August 2019)



National Oceanic and Atmospheric Administration

# VDatum: Spatially Varying Uncertainty (SVU) (May 2019)



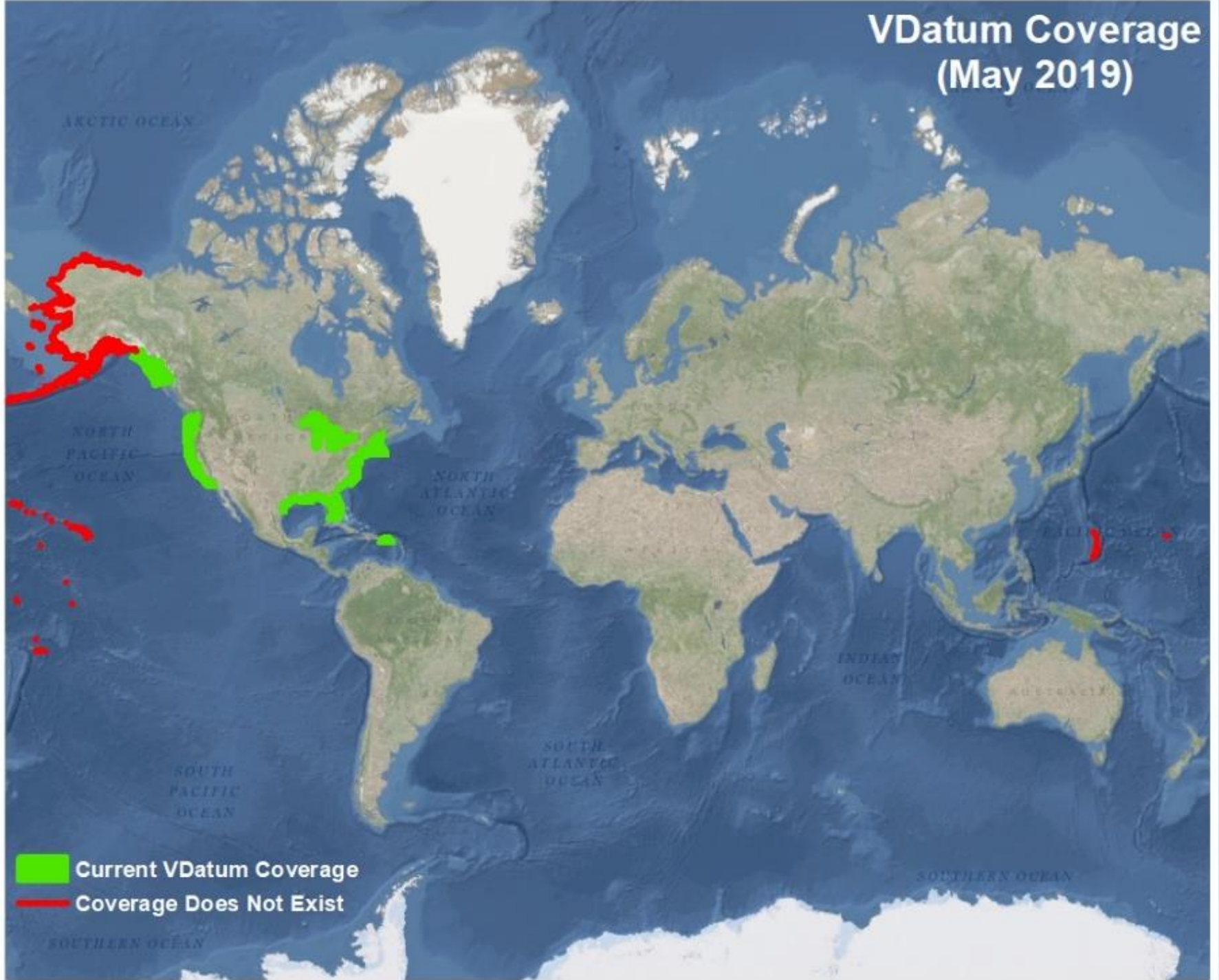
SVU

-  Operational
-  Exploratory
-  Development
-  Awaiting



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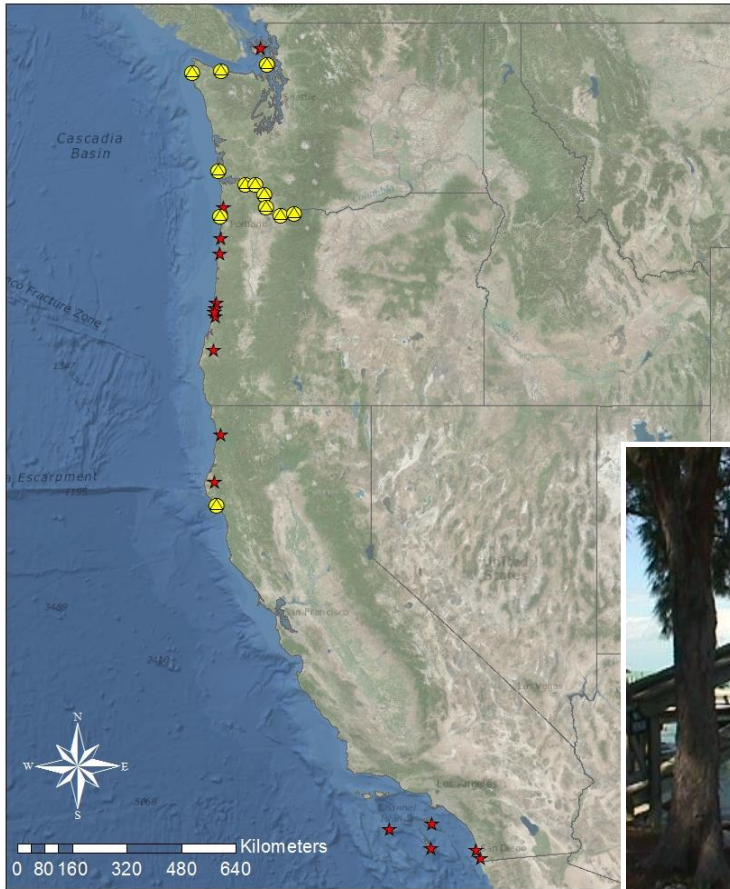
# VDatum Coverage (May 2019)



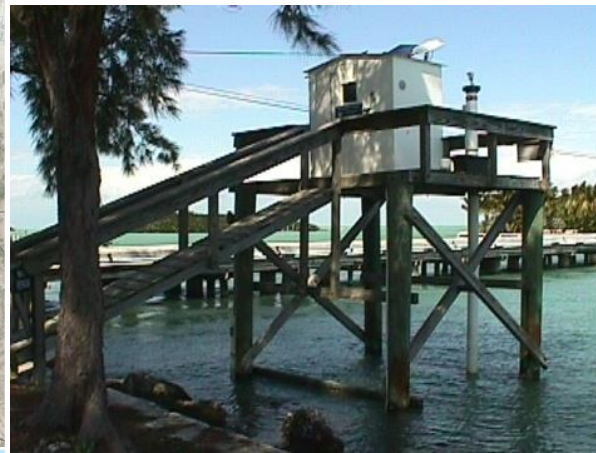
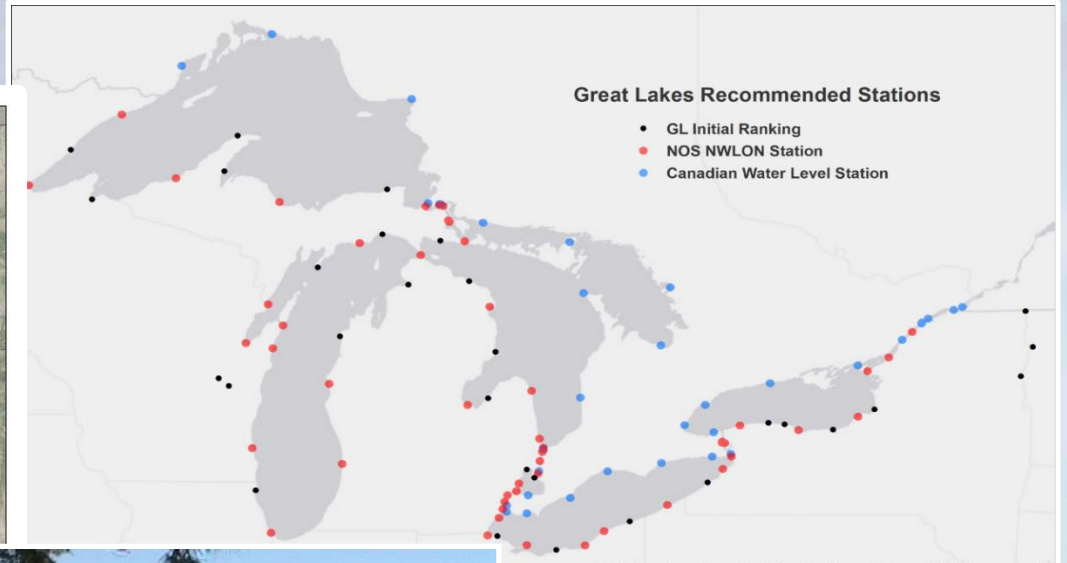
- Current VDatum Coverage
- Coverage Does Not Exist



# Foundational Data: Tidal



● FY15 Gauge Funding  
★ FY16 Gauge Funding (will fund approximately 12 of 16 prioritized sites)

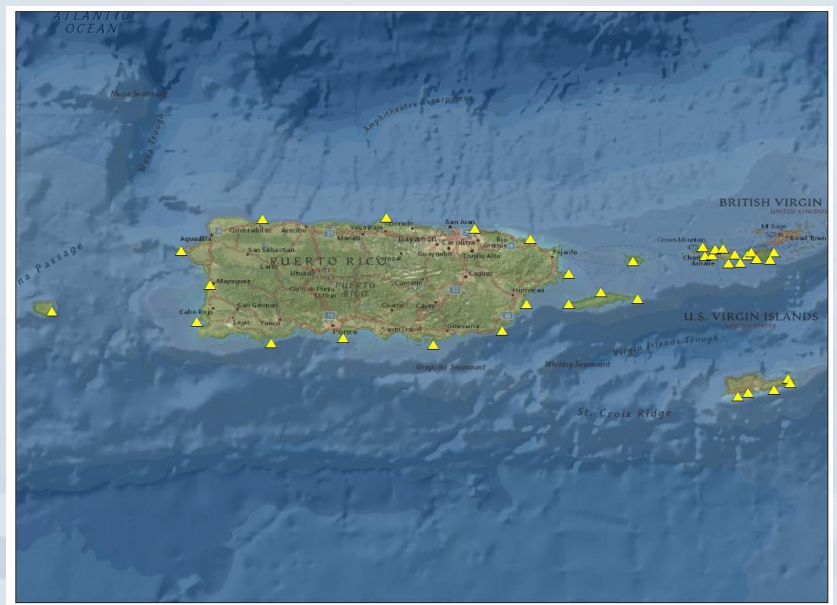
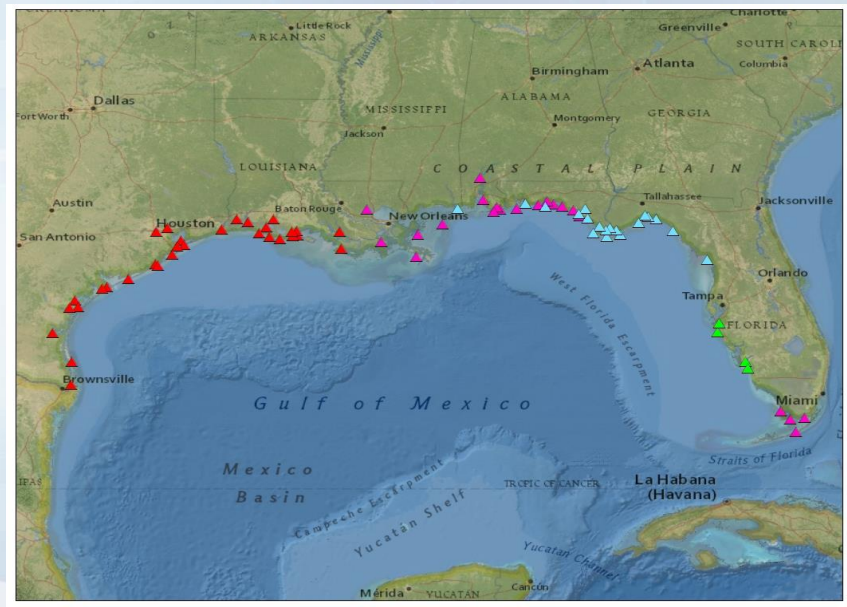
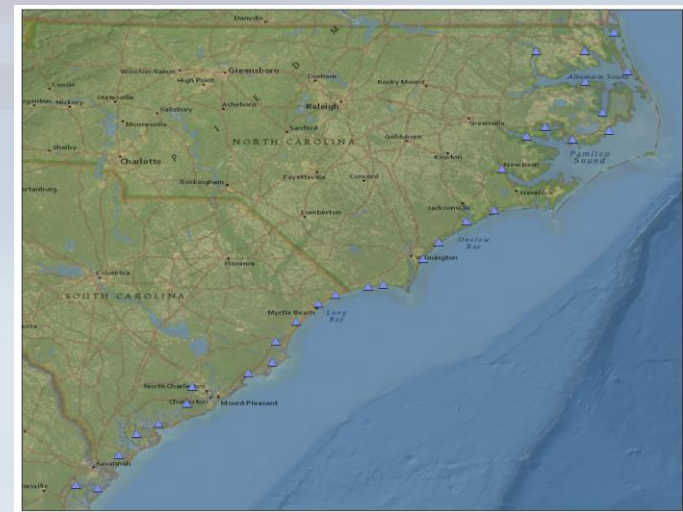
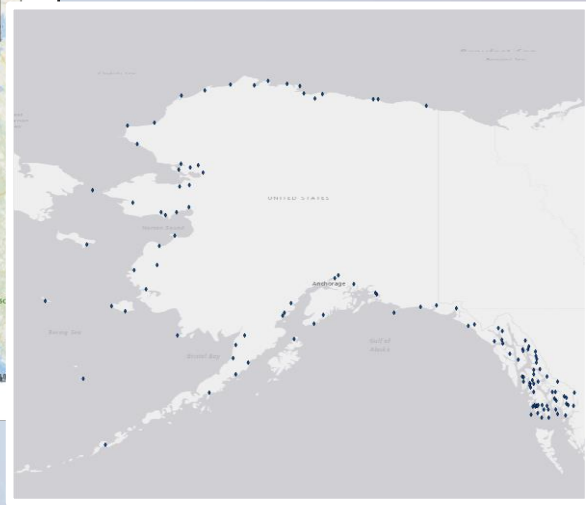
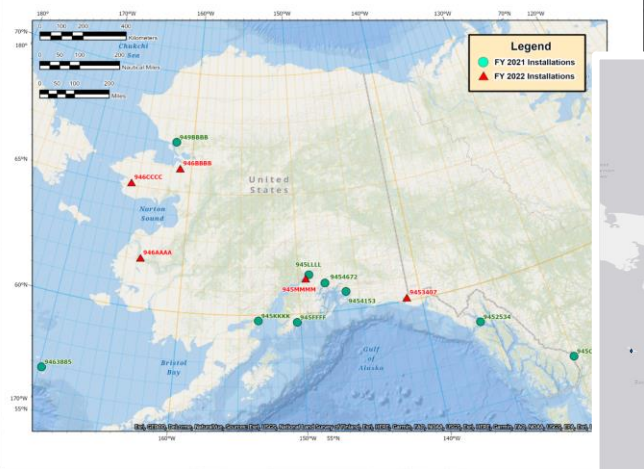


**NY/LIS Bight Gauging**  
● FY 15  
★ FY 16



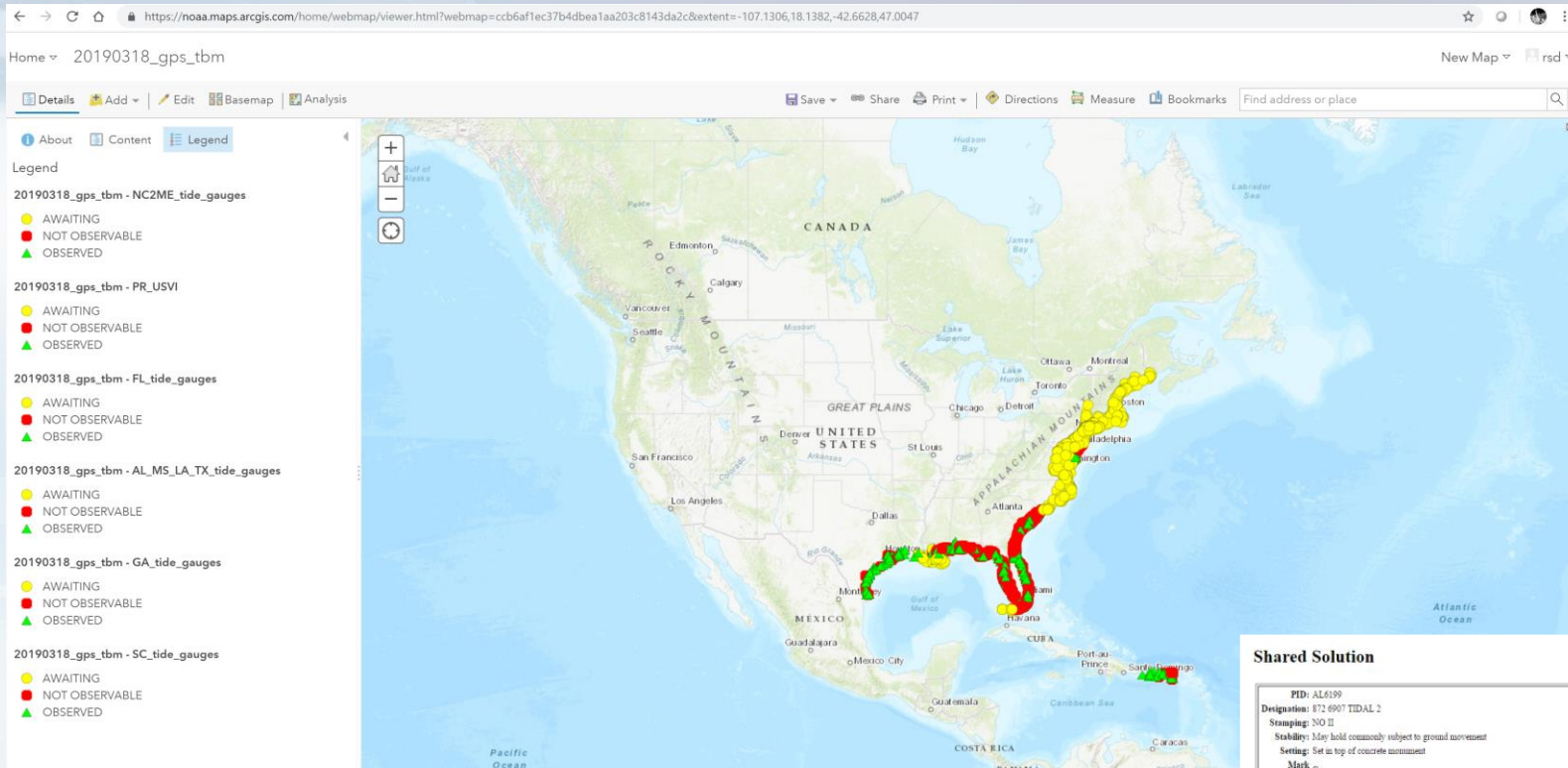
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# Foundational Data: Tidal



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# Foundational Data: Geodetic



## Shared Solution

**PID:** AL6199  
**Designation:** 872 6907 TIDAL 2  
**Stamping:** NO II  
**Stability:** May hold continuously subject to ground movement  
**Setting:** Set in top of concrete monument  
**Mark:**  
**Condition:** G  
**Description:** The bench mark is a disk set in the top of a concrete monument, 3.66 m (12.0 ft) SW of the SW corner of the Bradley's two story frame house, located at the inside corner of sidewalk, below the grass.  
**Observed:** 2016-02-06T16:08:00Z [See Also 1293](#)  
**Source:** OPUS - page 1209.04



Close-up View

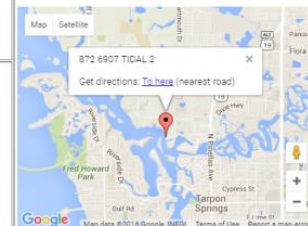
[REF FRAME: NAD_83(2011)] [EPOCH: 2013.0000] [SOURCE: NAVD83 (Computed using GEOID12B)] [UNITS: m] [SET PROFILE] [DETAILS]	
<b>LAT:</b> 28° 9' 34.27151" = 0.012 m	<b>UTM 17 SPC 902FLW)</b>
<b>LO:</b> -82° 46' 1.76794" = 0.005 m	<b>NORTHING:</b> 3116136.435m 424124.109m
<b>ELL HD:</b> -25.168 = 0.002 m	<b>EASTING:</b> 326489.766m 124653.519m
<b>X:</b> 708497.621 = 0.008 m	<b>CONVERGENCE:</b> -0.83418006° -0.36206031"
<b>Y:</b> -5582599.630 = 0.024 m	<b>POINT SCALE:</b> 0.99997158 1.00001121
<b>Z:</b> 2902091.614 = 0.005 m	<b>COMBINED FACTOR:</b> 0.99997522 1.00001485
<b>ORTHO HT:</b> 1.952 = 0.040 m	

### CONTRIBUTED BY

[Stephen A White](#)  
 National Geodetic Survey

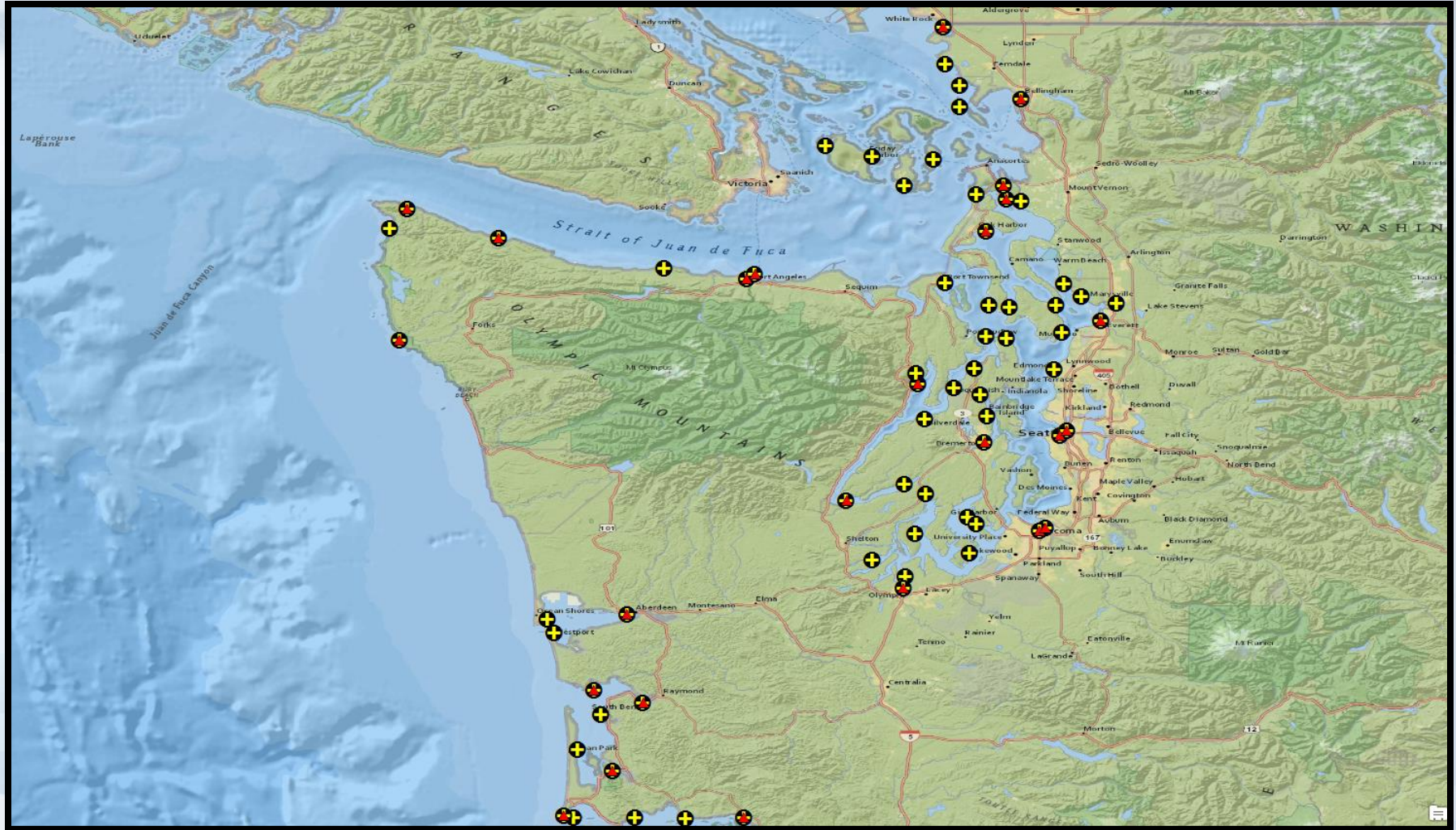


Horizon View



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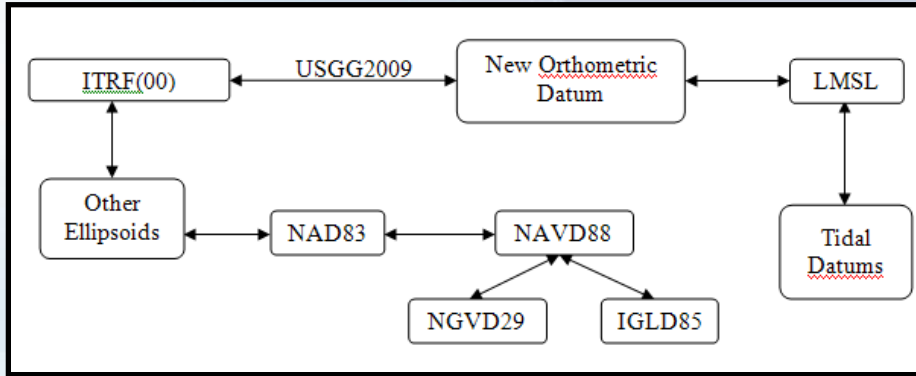
# Hydrodynamic vs. TSS Modeling



National Oceanic and Atmospheric Administration

# Future Enhancements: Next Generation TSS Development

## New Proposed Transformation Roadmap based on a purely Gravimetric GEOID



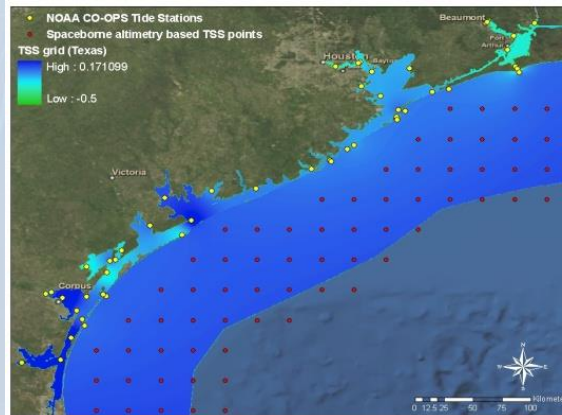
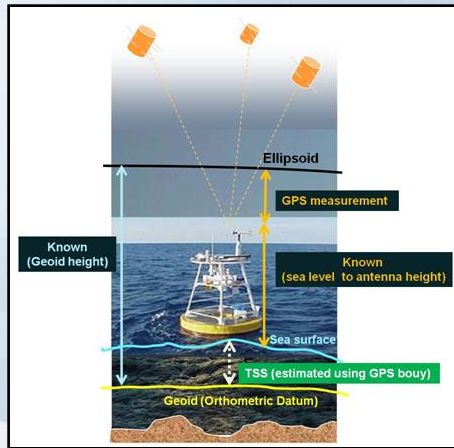
New GEOID: Coastal gravity field improvement



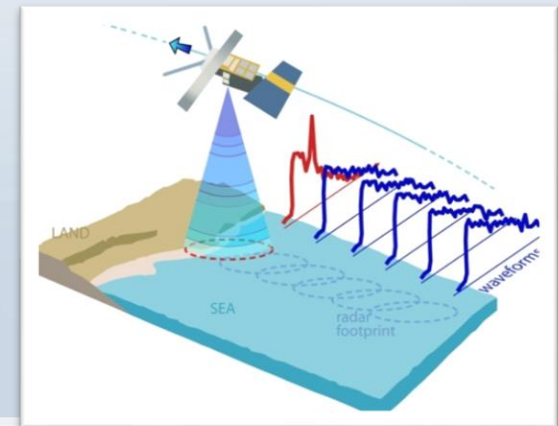
A Must: GPS Campaign on bench marks to determine new relationships



Wish List: GPS tide buoys to be utilized for data input and validation



Satellite Altimetry/Derived Products to better understand offshore TSS

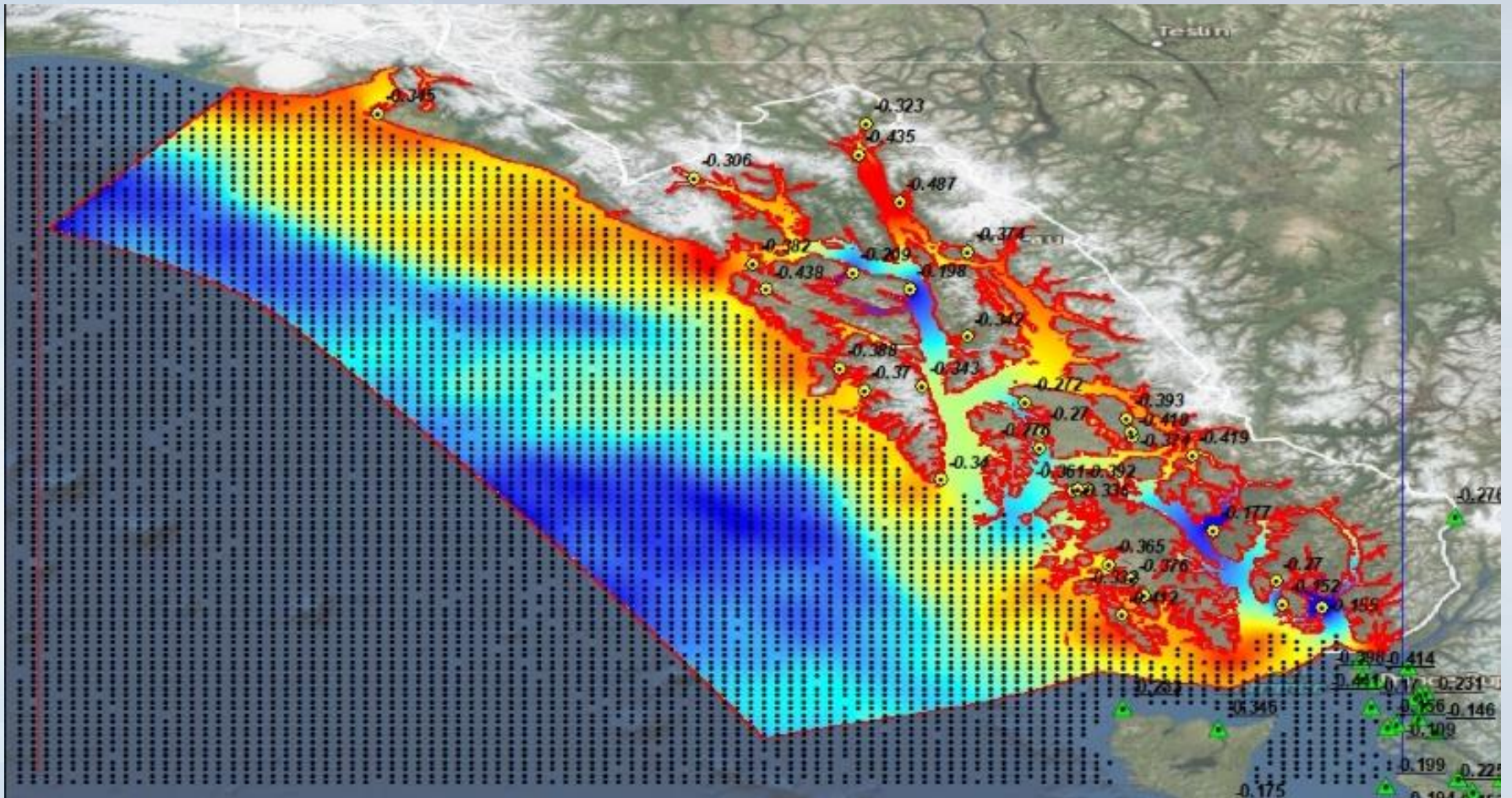


Re-tracked coastal altimetry data to capture nearshore sea surface height signal



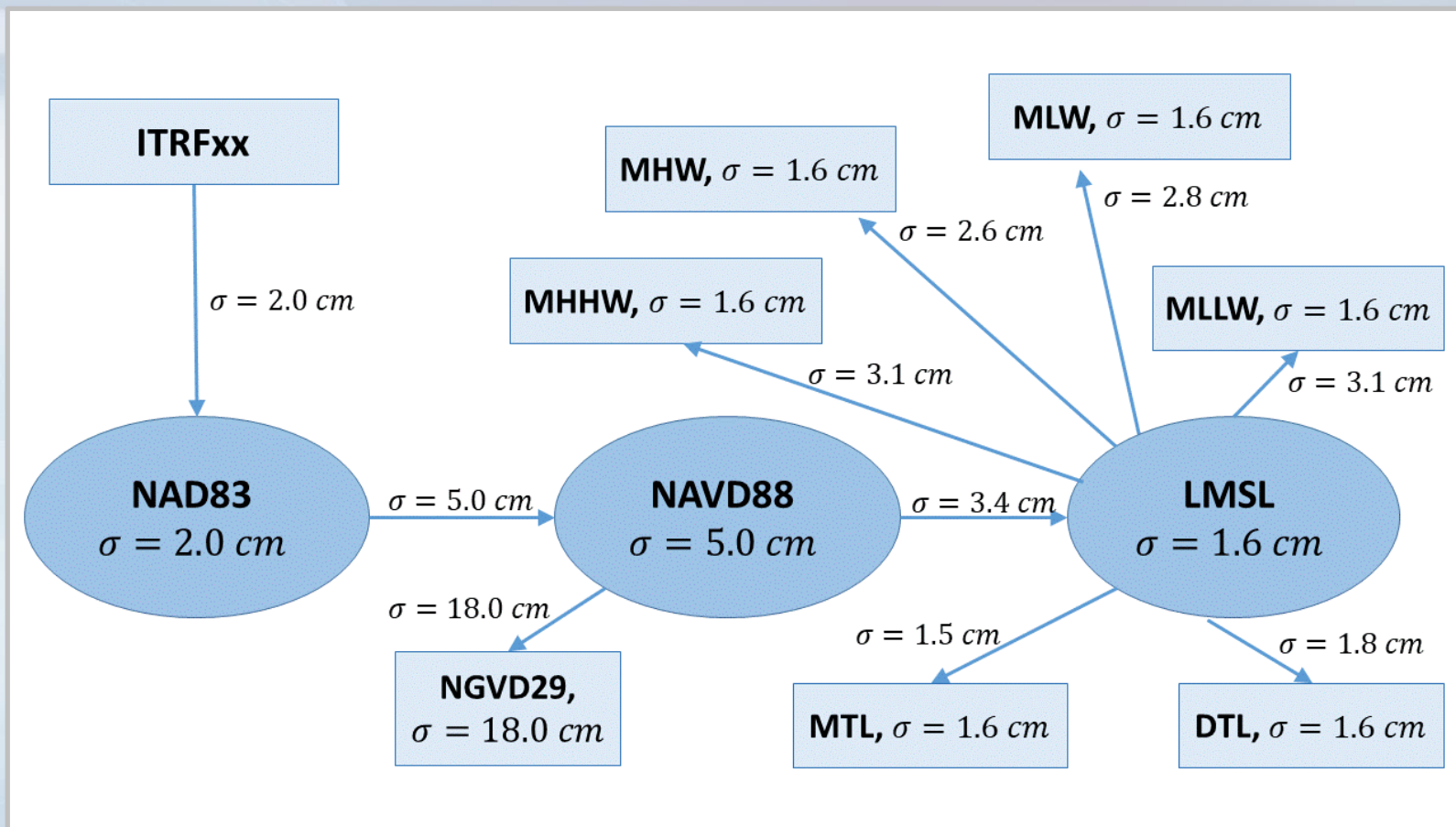
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# Southeast Alaska (Released 2019)



National Oceanic and Atmospheric Administration

# VDatum Uncertainty Modeling



See: [vdatum.noaa.gov/docs/est\\_uncertainties.html](http://vdatum.noaa.gov/docs/est_uncertainties.html)



# Spatially Varying Uncertainty (Phase 2: Transition to Operations)

**Table 2.** The regression equations and parameters for estimating uncertainties in tidal datums for Mean Low Water (from Bodnar, 1981)

$$S1M = 0.0068 \text{ ADLWI} + 0.0053 \text{ SRGDIST} + 0.0302 \text{ MNR} + 0.029$$

$$S3M = 0.0043 \text{ ADLWI} + 0.0036 \text{ SRGDIST} + 0.0255 \text{ MNR} + 0.029$$

$$S6M = 0.0019 \text{ ADLWI} + 0.0023 \text{ SRGDIST} + 0.0207 \text{ MNR} + 0.030$$

$$S12M = 0.0045 \text{ SRSMN} + 0.128 \text{ MNR} + 0.025$$

Where:

$S$  is the standard deviation (in feet).

$M$  is the number of months of subordinate station observation.

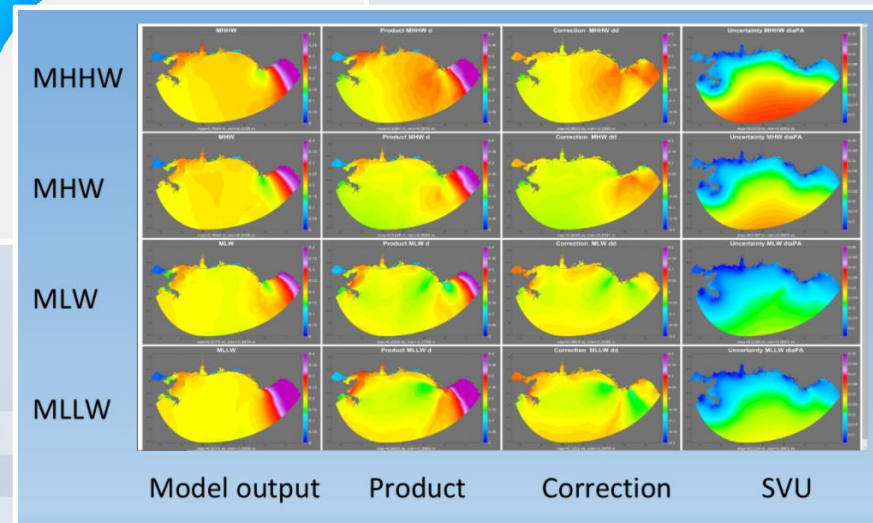
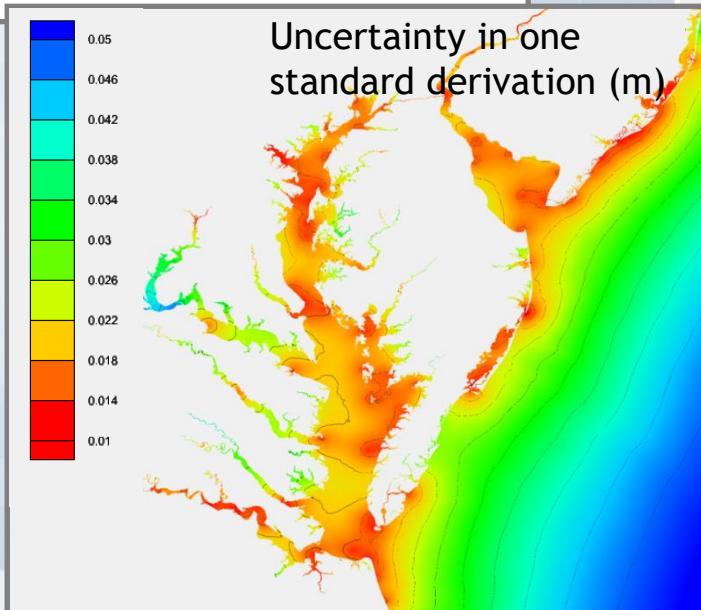
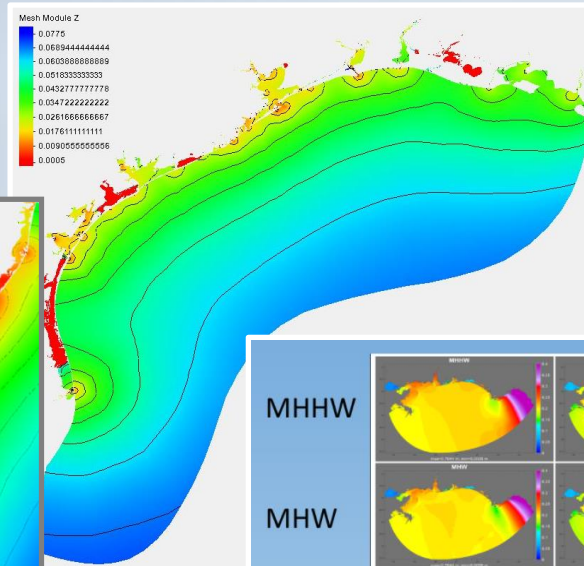
$ADLWI$  is the absolute time difference of the Low Water Intervals between control and subordinate stations (in hours).

$SRGDIST$  is the square root of the geographic distance between control and subordinate stations (in nautical miles).

$MNR$  is a mean range ratio that is defined as the absolute value of the difference in mean range between control and subordinate stations divided by the mean range of tide at the control station (using range values in feet), and

$SRSMN$  is the square root of the sum of the mean ranges at the control and subordinate stations (in feet).

- Statistical data assimilation is used to blend model results and data, also providing the associated uncertainty.





# VDatum Version Updates: [vdatum.noaa.gov](http://vdatum.noaa.gov)

(Version 4.4.2 Released, May 13, 2022) Notable updates since COVID

## 3.9:

- Availability of Low Water Datum transformation for the Great Lakes

## 4.0:

- Integration of NADCON 5.0 release 20160901
- xGEOID18B incorporation
- Southeast Alaska Regional Model Release
- New York Bight/Long Island Sound Regional Model Update
- Ordinary High Water Mark (OHWM) relative to IGLD 1985

## 4.1:

- Integration of VERTCON 3.0 release 20190601
- Support for ITRF 2014
- GEOID18 incorporation
- xGEOID19b incorporation
- Spatially Varying Uncertainty (SVU) implementation for NY/LIS regional models

## 4.2:

- New support for xGEOID20b (BETA)
- New support for GEOID18 Spatially Varying Uncertainty
- New support for varying uncertainty associated with individual hybrid GEOIDs
- Opened up NGVD29 to NAVD88 conversions in Alaska, Local Tide “LT” conversion with PRVD02, VIVD09, ASVD02, NMVD03, and the GUVVD63 conversion to GUVVD04 associated with the VERTCON 3.0 release 20190601.
- Full VDatum API (BETA) Release

## 4.3:

- Updated Chesapeake and Delaware Bay Regional Model, that includes Spatially Varying Uncertainty
- Added Spatially Varying Uncertainty Availability layer into the online map

## 4.4:

- Updated Continental United States West Coast Regional Model, that includes Spatially Varying Uncertainty (SVU)
- Updated website to include information on Interpolation usage
- Partial Implementation of new HTDP version 3.4.0 (the following regions have been implemented, with additional to be incorporated in the near future)



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# VDatum: Moving Forward

## Version 4.5:

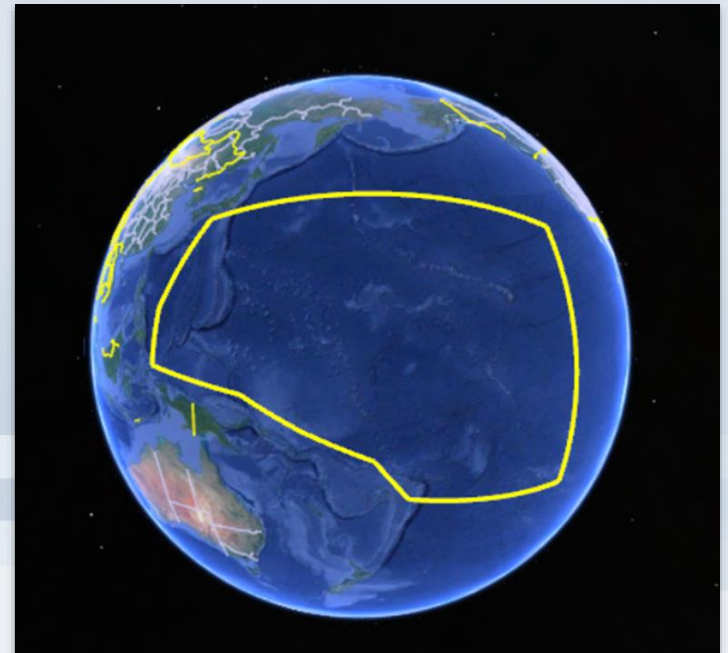
- CRD implementation
- Additional HTDP 3.4.0 regions
- NCAT (NADCON5), changes NGS is making

## Regional Model Development and Updates Schedule:

- PR/USVI (FY24)
- TX/Western LA (FY24)
- Statewide AK Model (FY24) - *High Uncertainties may be present due to known data gaps*
- HI and Pacific Model (2027)
- Regional Model, Gulf of Mexico, Caribbean, East Coast (2027)

## Moving towards Regional Modeling Approach:

- ❖ **4 Regional Models**
  - West Coast CONUS
  - Gulf of Mexico/Caribbean/East Coast
  - Alaska
  - Pacific Islands
- ❖ **Allows us to be agile in updating more frequently, ingesting new data, and fixing any issues**



# What's Being Replaced with the Modernization of Reference Frames

## Horizontal

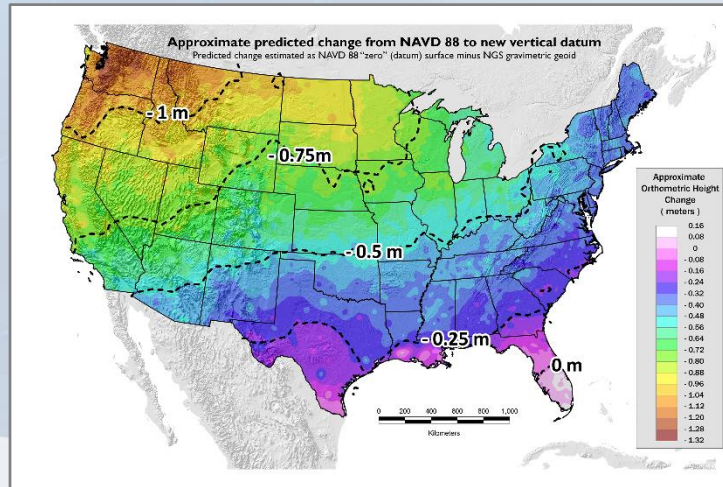
- NAD 83(2011)
- NAD 83(PA11)
- NAD 83(MA11)

Latitude  
Longitude  
Ellipsoid Height  
State Plane Coordinates

## Vertical

- NAVD 88
- PRVD 02
- VIVD09
- ASVD02
- NMVD03
- GUVVD04
- IGLD 85

Heights

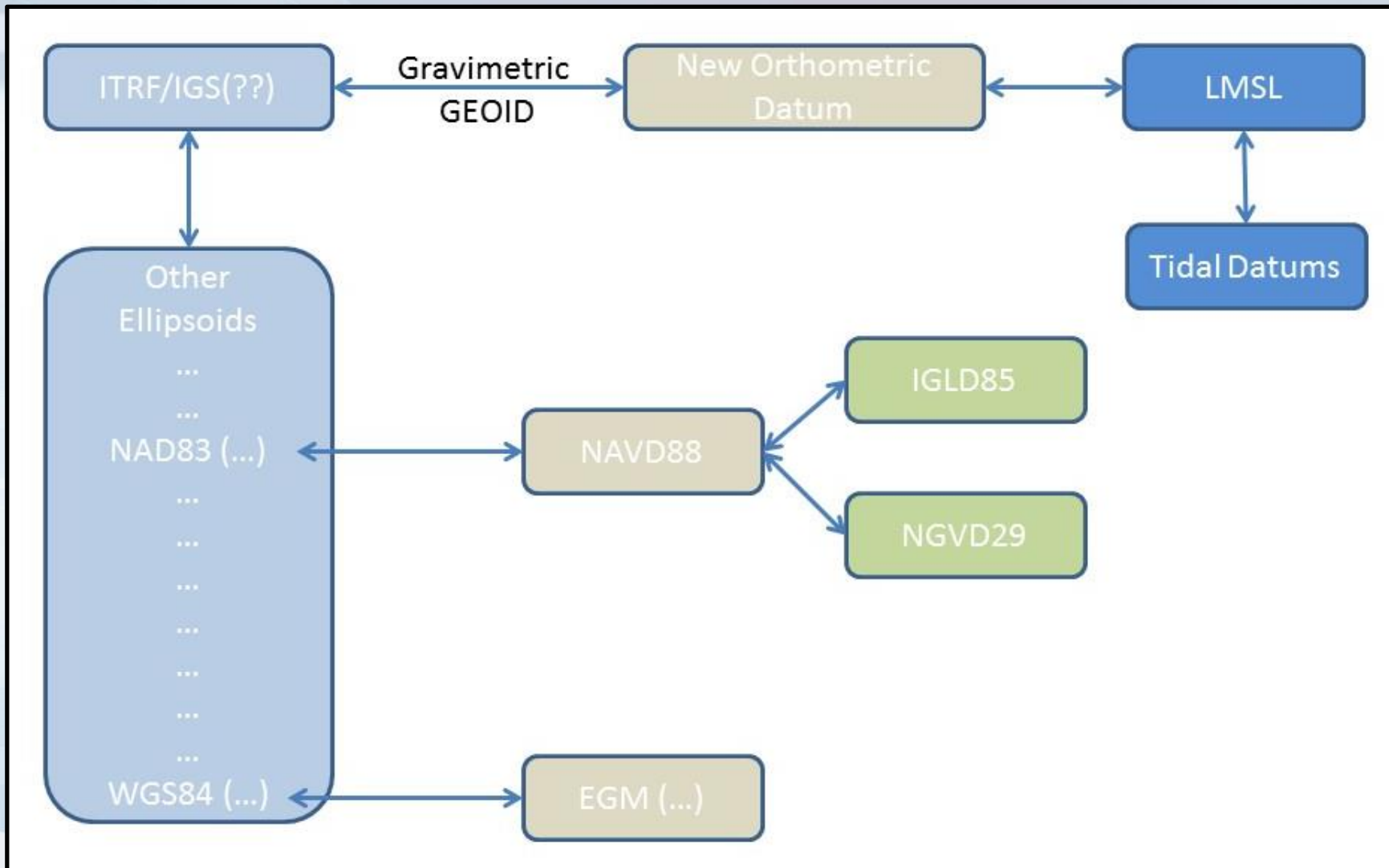


- Approximate level of geoid mismatch known to exist in the NAVD 88 zero surface.
- Does not include local subsidence issues

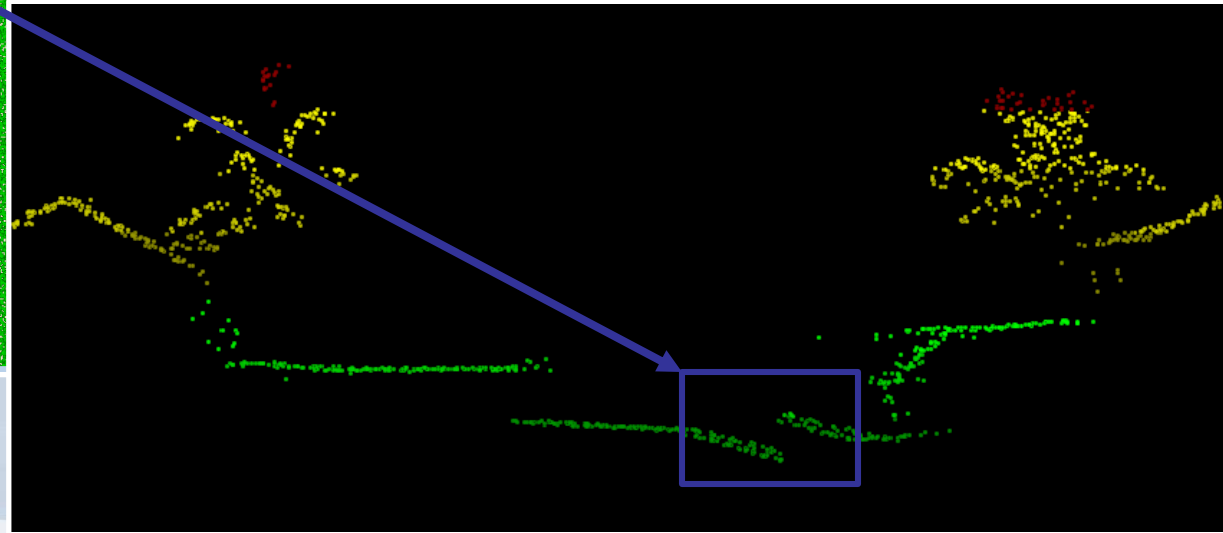
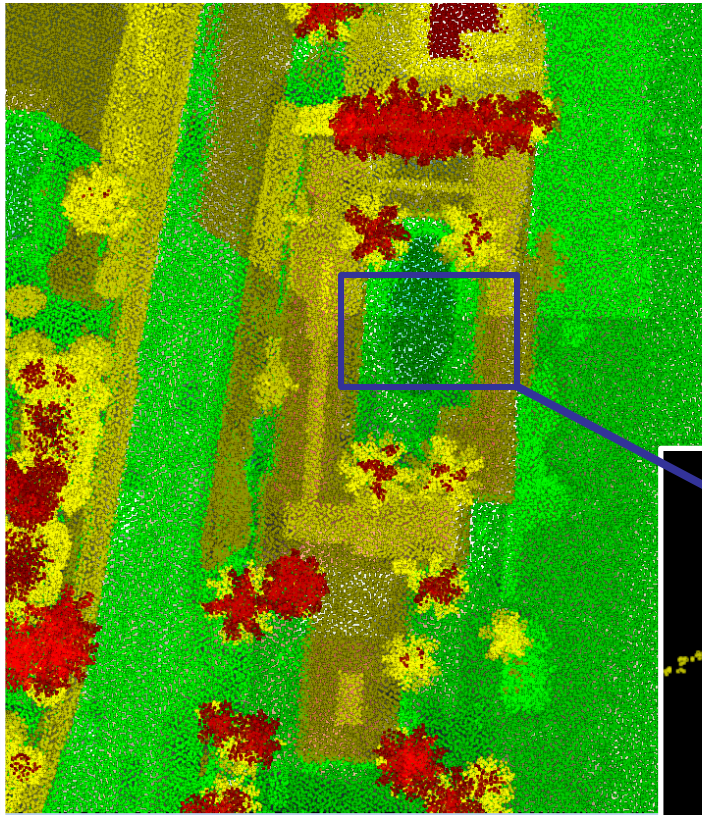


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# VDatum: Updated NSRS



# Point Cloud Discrepancies



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There should not be a crack in the bottom of pool !!

# Applying the new GEOID incorrectly

4-6 Degree sloping beach



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Positioning America for the Future

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## New Datums: Replacing NAVD 88 and NAD 83

To improve the National Spatial Reference System (NSRS), NGS will replace all three North American Datum of 1983 (NAD 83) frames and all vertical datums, including the North American Vertical Datum of 1988 (NAVD 88), with four new terrestrial reference frames and a geopotential datum.

The new reference frames will rely primarily on Global Navigation Satellite Systems (GNSS), such as the Global Positioning System (GPS), as well as on a gravimetric geoid model resulting from our Gravity for the Redefinition of the American Vertical Datum (GRAV-D) Project.

These new reference frames will be easier to access and to maintain than the current NSRS, which relies on physical survey marks that deteriorate over time.



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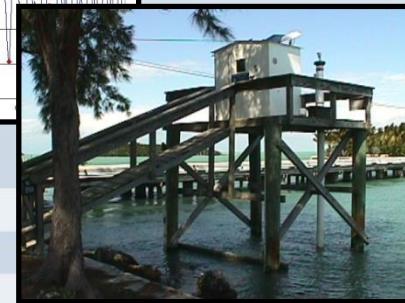
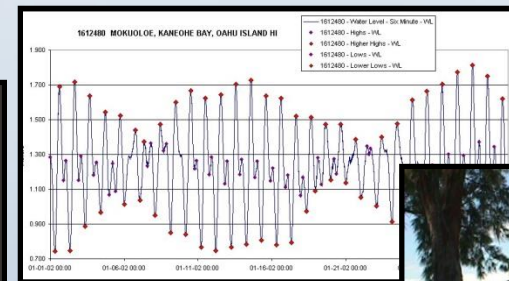
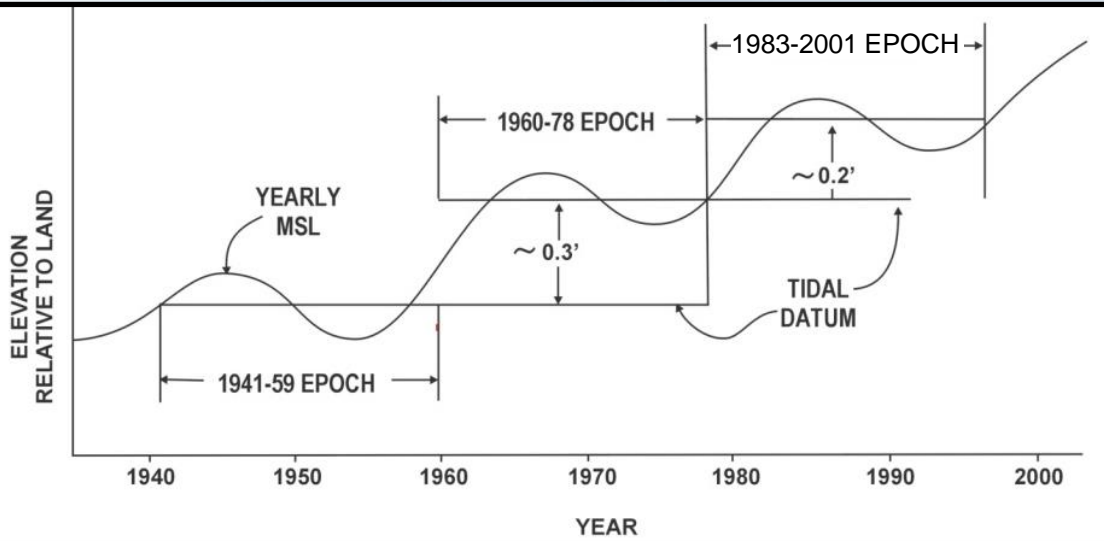
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# National Tidal Datum Epoch (NTDE)

Anticipated release 2025 time frame

*Next NTDE will be computed on period of (2002-2020)*

- Official time period of tidal observations that are used for primary datum calculations
  - Time it takes the Earth, Moon, & Sun to complete an epoch tidal cycle
  - 19 year time period (Current NTDE is 1983-2001)
  - Considered for revision every ~20-25yrs
  - Includes the longest period tidal variations (*18.6 year node cycle*)
  - Averages out seasonal fluctuations
  - Provides a nationally consistent tidal datum network by accounting for seasonal and apparent environmental trends in sea level that affect the accuracy of tidal datums





# Summary

**The VDatum transformations tool from NOAA allows us to transform vertical datasets between ellipsoidal, orthometric and tidal datums...**

- Assuring data is transformed correctly
- Enabling multiple uses for datasets across applications (Coastal Resilience, Intelligence, and place-based)
- Permitting merging of disparate data sets to a common reference
- And providing transformation uncertainty estimates for intelligent decision-making and analysis.



# VDatum: Contact Us

**NOAA** NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
UNITED STATES DEPARTMENT OF COMMERCE

## VERTICAL DATUM TRANSFORMATION

INTERGRATING AMERICA'S ELEVATION DATA

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Thank you for visiting NOAA/NOS's VDatum website. Take our website user survey. We welcome your ideas, comments, concerns, and suggestions.

- User FAQs
- **General Discussions, Help Requests, Bug Reports, Comments etc..**Please send email to [vdatum.info@noaa.gov](mailto:vdatum.info@noaa.gov)

For general discussion, please briefly state your concerns in the subject of your message, such as: Tidal modeling, or Software question.

For help requests or bug reports, please provide as much detail as you could, including specific error messages you may be receiving and sample of your data.

- **Subscribe to our mailing list to receive update about VDatum:** Please use the form on the right.

**Your email address and other personal information will remain private and will not be used for purposes other than the communications you request via the form below. For more information, please read our complete Privacy Policy.**

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Required. Please choose a topic

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# Thank You!

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