# 2021 Alaska Coastal & Ocean Mapping Summit

## Agency Mapping Updates

**December 1st, 2021 | Virtual**

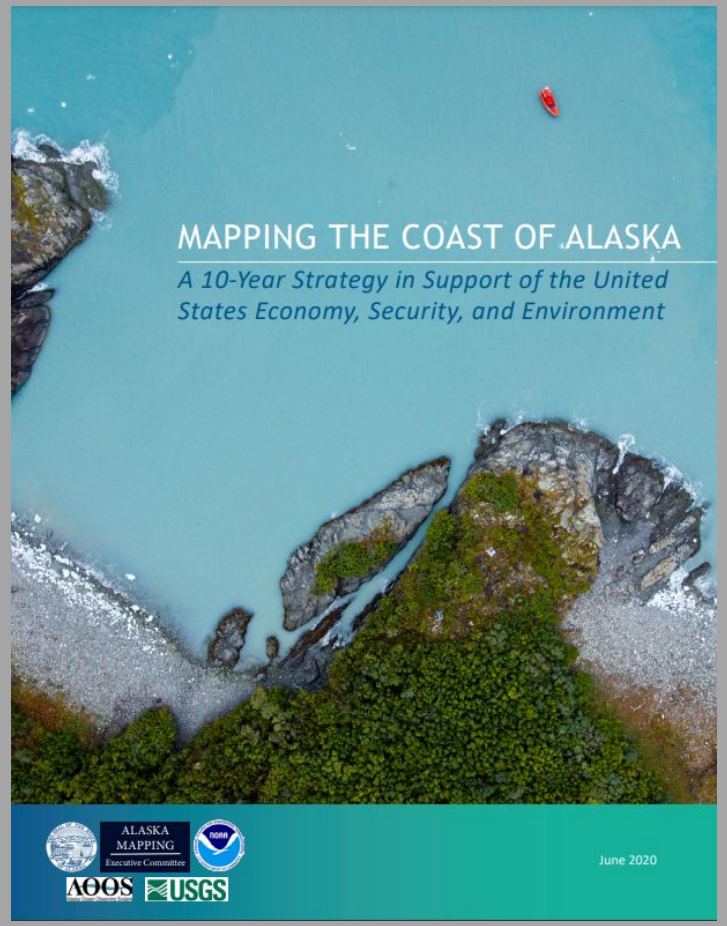
Dewberry

# ALASKA COASTAL MAPPING STRATEGY DATA ACQUISITION DASHBOARD

Hillary Palmer - Coordinator

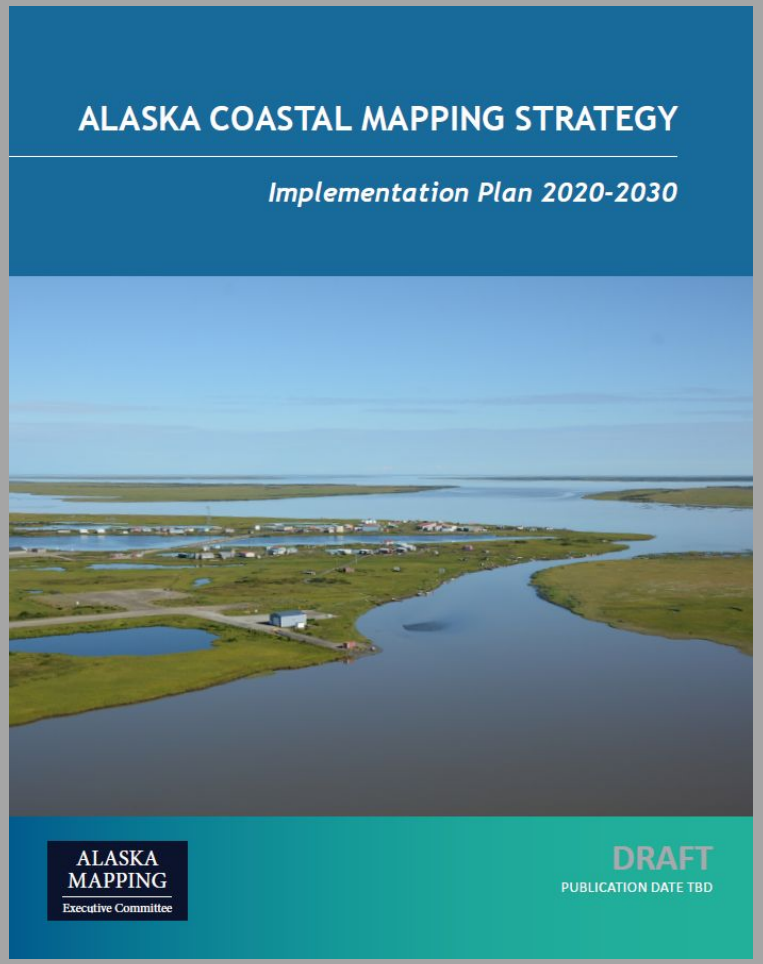
**December 1st, 2021**

# Strategy for Mapping Alaska's Coastline




1. **Build on existing mapping partnerships to meet Alaska's coastal mapping needs**
2. Expand coastal data collection to deliver the priority geospatial products stakeholders require
3. Leverage innovation in mapping technology development
4. **Conduct strategic communications to promote widespread stakeholder engagement**

# Coastal Mapping Implementation Plan

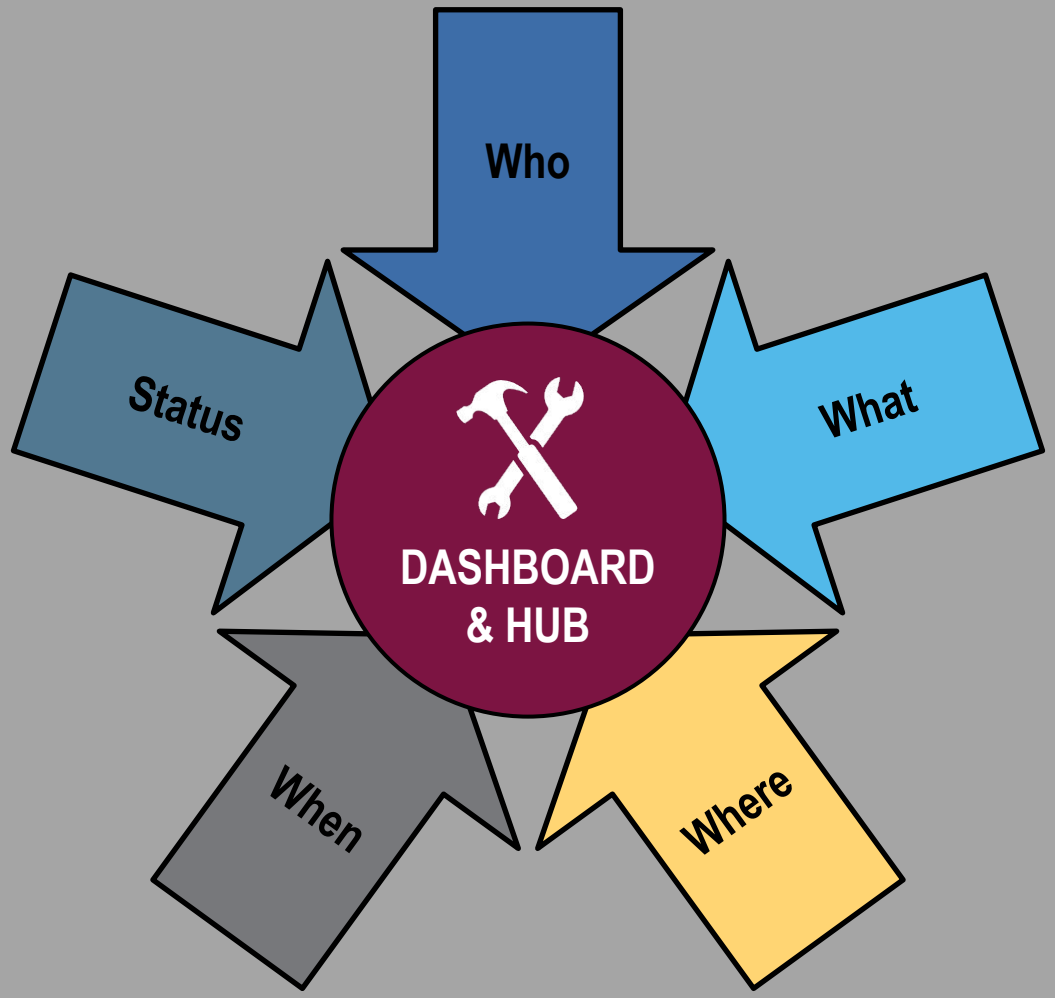



- Elevation data – topography & nearshore bathymetry
- Orthorectified imagery
- Shoreline Vector at MHW, MLLW
- Positional control required for accuracy

# We need some tools & a place to keep them!

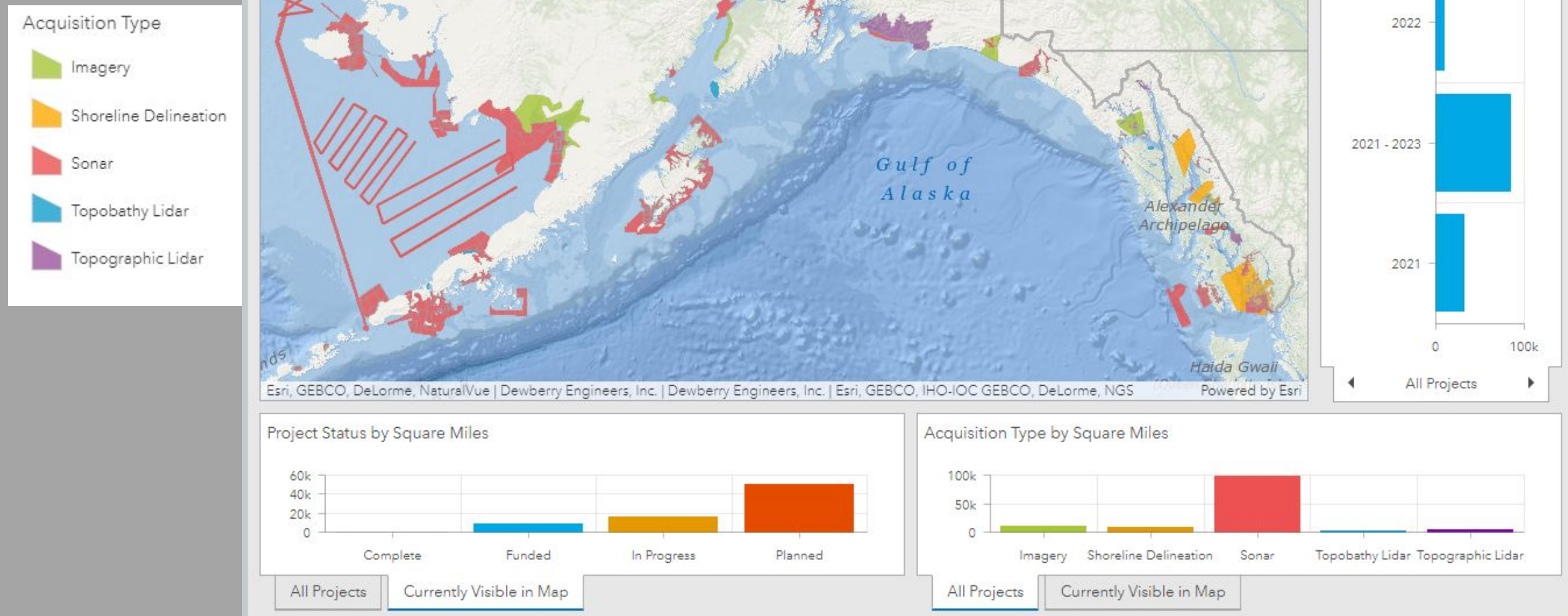
- Facilitate inter-agency coordination
- Identify cost-share opportunities
- Promote situational awareness
  - Existing data
  - Future data collection plans
- Track our progress

https://alaska-coastal-mapping-strategy-dewberry.hub.arcgis.com/

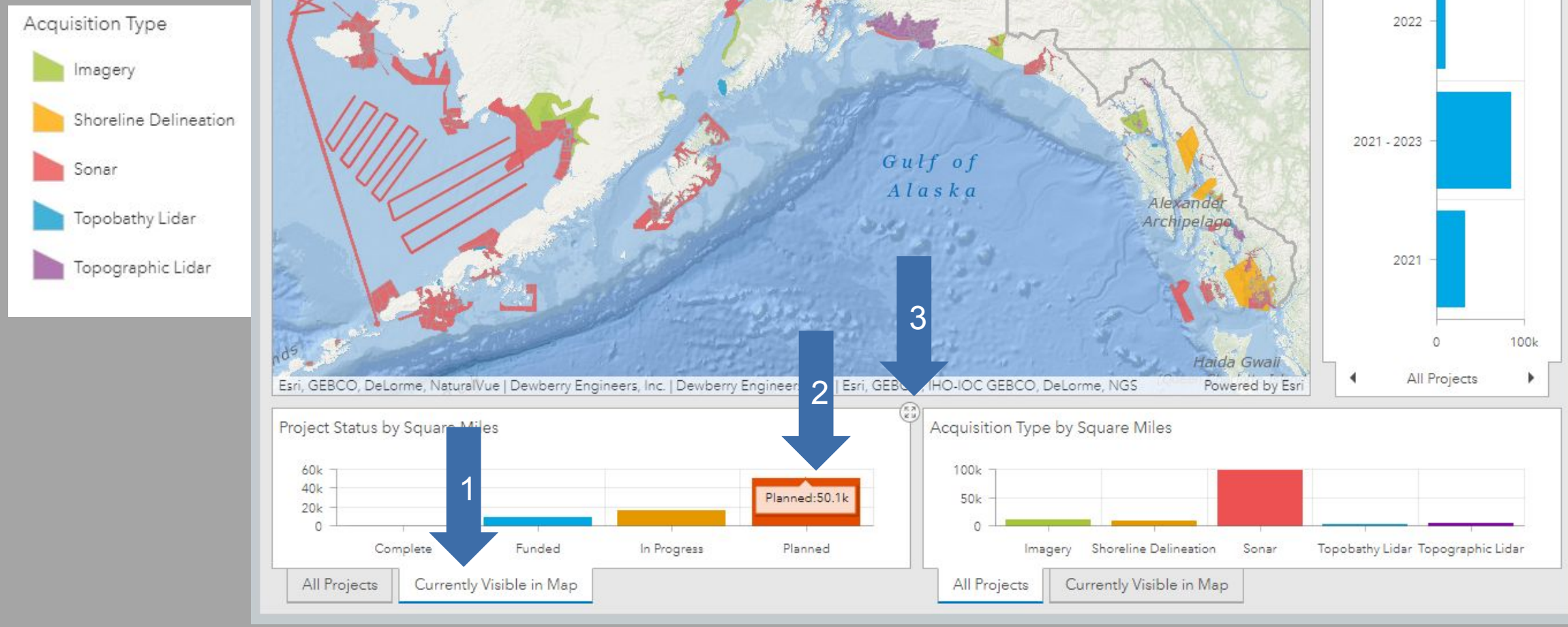


https://alaska-coastal-mapping-strategy-dewberry.hub.arcgis.com/pages/dashboard

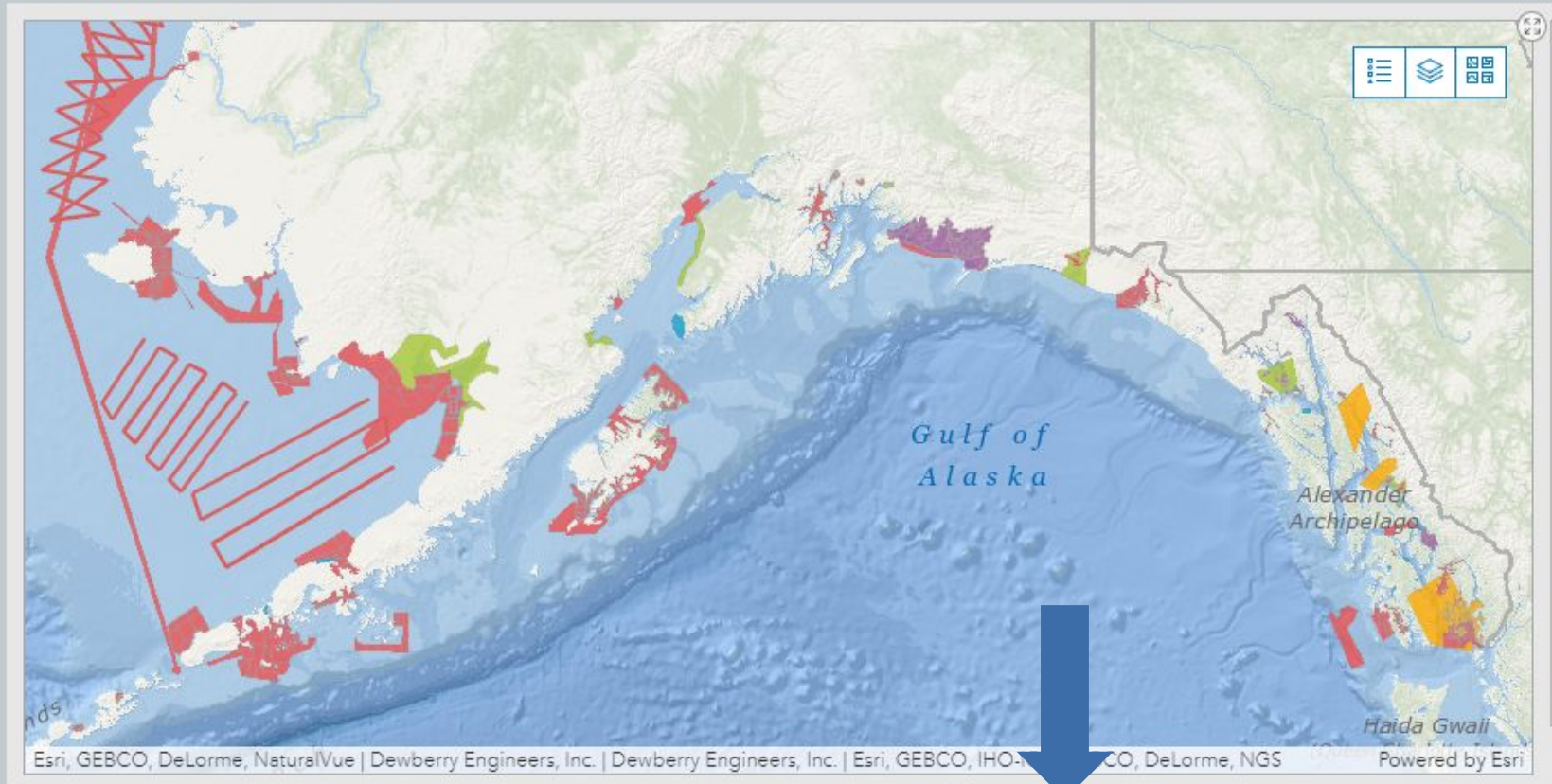
# Alaska Data Acquisition Dashboard



# Alaska Data Acquisition Dashboard



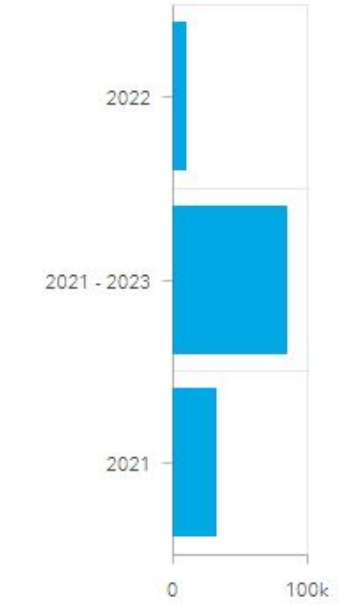
# Alaska Data Acquisition Dashboard




Acquisition Type

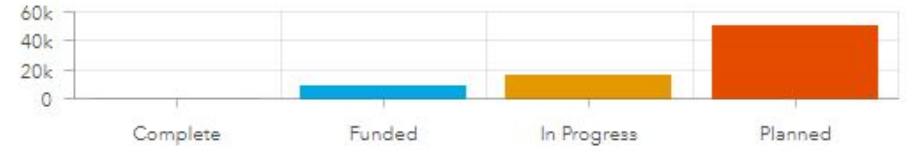
- Imagery
- Shoreline Delineation
- Sonar
- Topobathy Lidar
- Topographic Lidar

Acquistion Year(s) by Square Miles



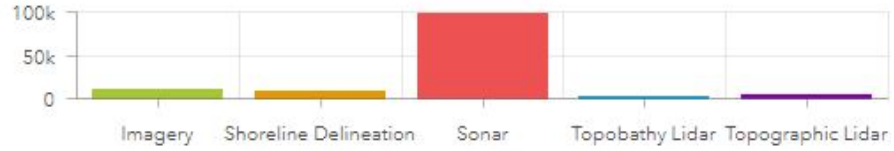

All Projects

Project Status by Square Miles



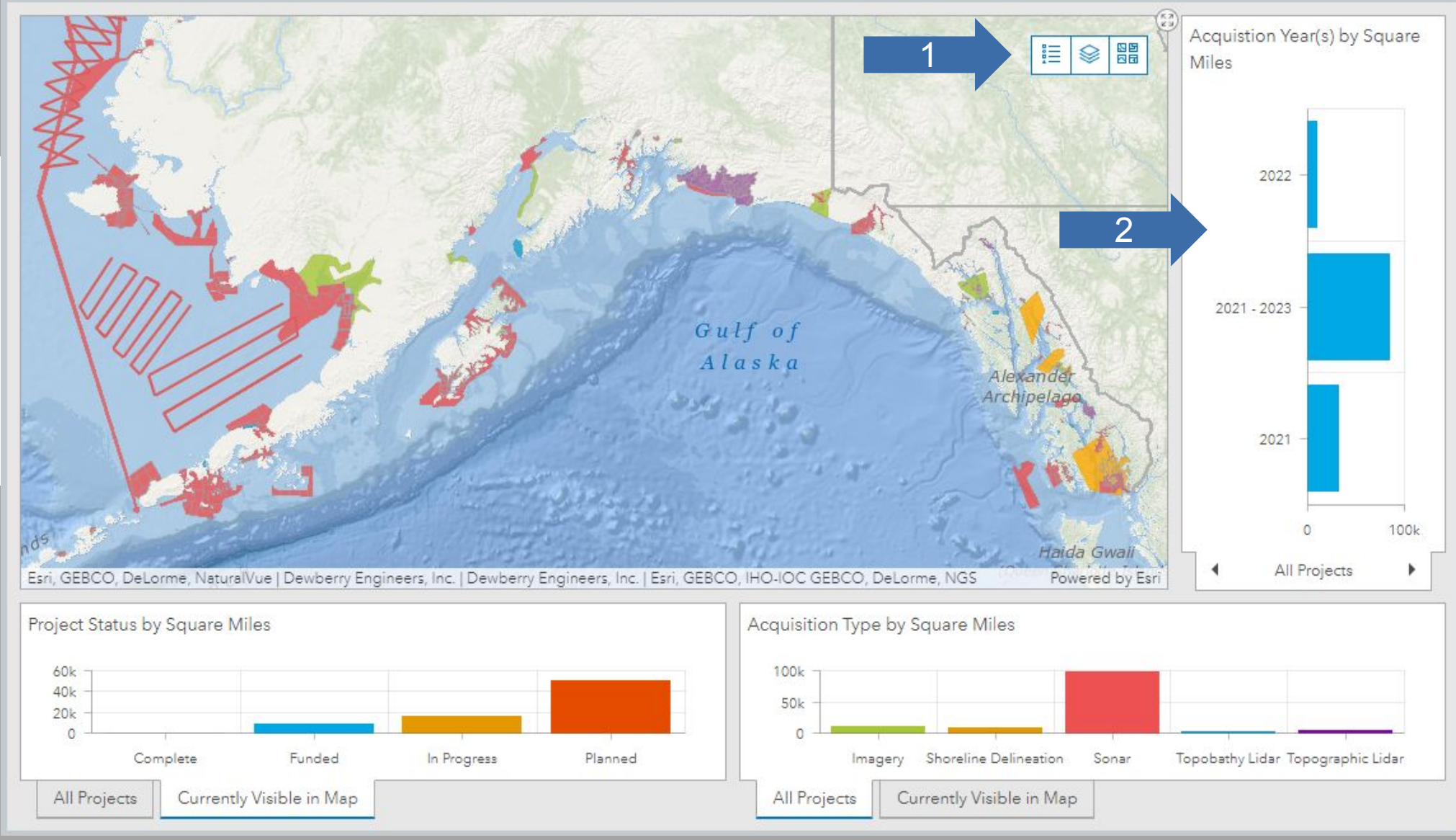

All Projects | Currently Visible in Map

Acquisition Type by Square Miles




All Projects | Currently Visible in Map

# Alaska Data Acquisition Dashboard



# We want more!

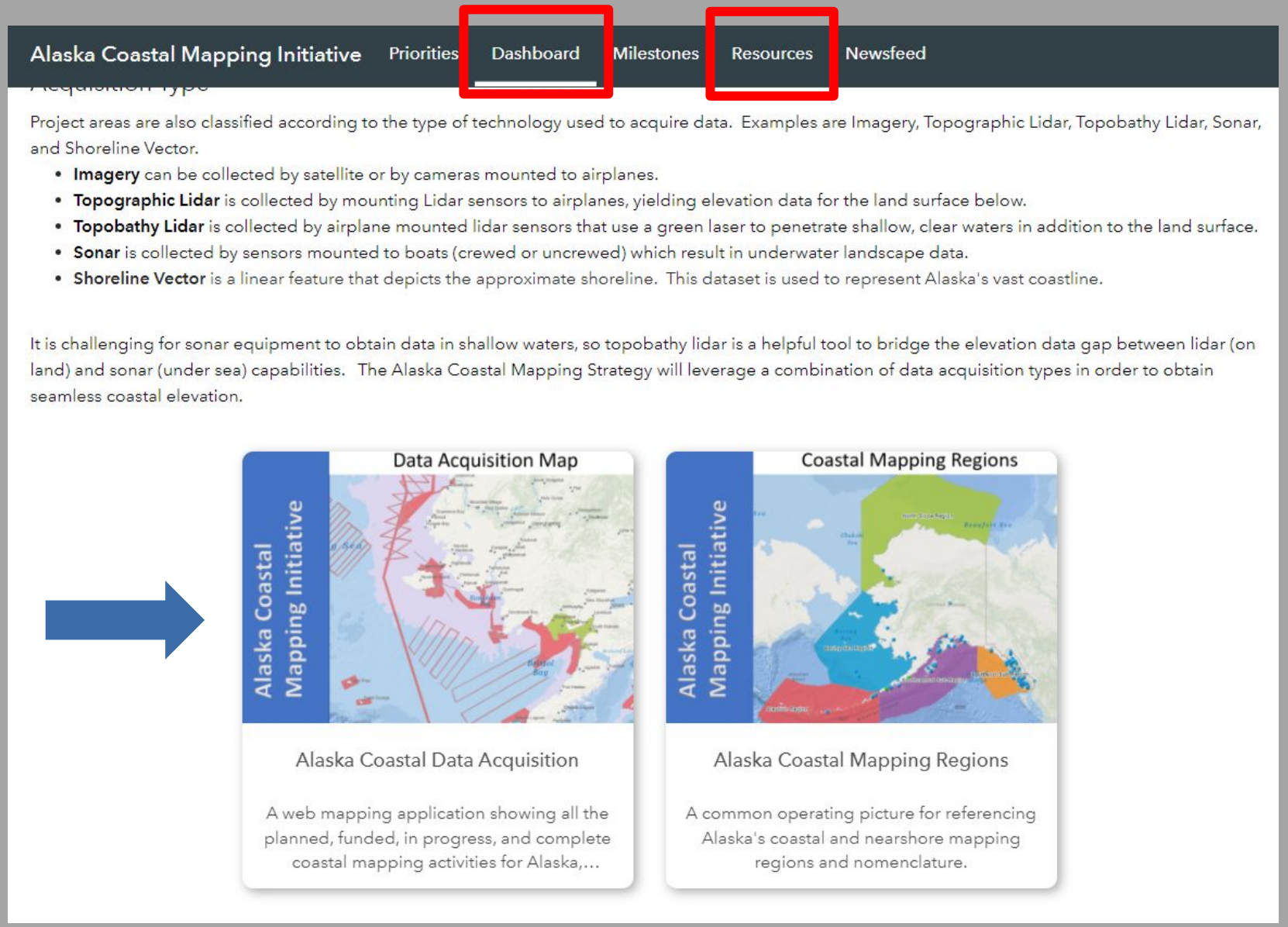
- Bigger map
- More data filtering options
- Answer complex questions
  - Fields: Agency, Data Type, Status, Year, POC

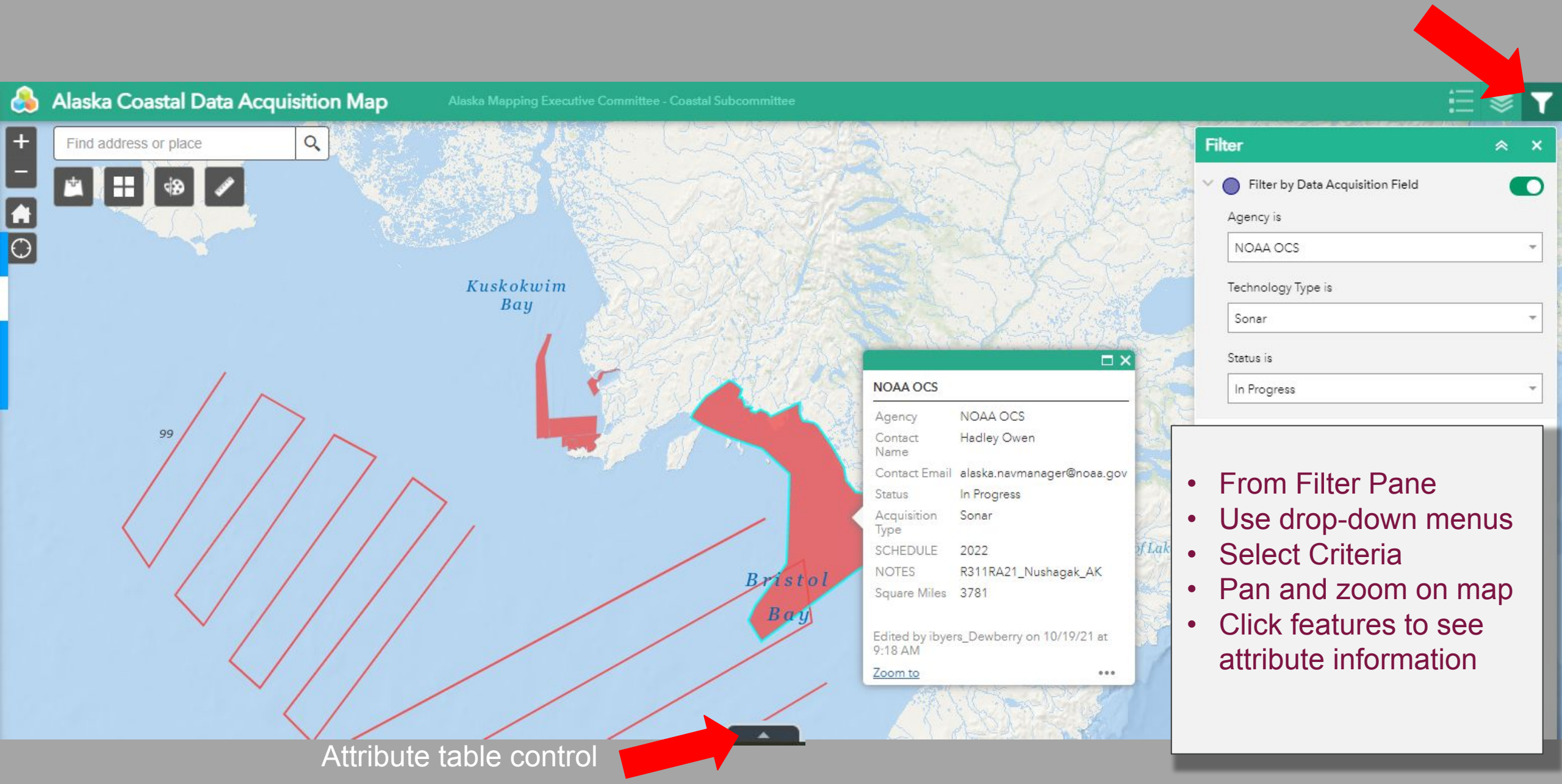
Introducing the Alaska Coastal Data Acquisition Web Map!
and ArcGIS Hub site!

Featured on both
the Dashboard page
&
Resources page

Group Filter Widget

Agency = NOAA
Data Type = Sonar
Status = In Progress




Alaska Coastal Data Acquisition Map
Alaska Mapping Executive Committee - Coastal Subcommittee
Find address or place
Kuskokwim Bay
Bristol Bay
99
Filter
Filter by Data Acquisition Field
Agency is
NOAA OCS
Technology Type is
Sonar
Status is
In Progress
NOAA OCS
Agency NOAA OCS
Contact Name Hadley Owen
Contact Email alaska.navmanager@noaa.gov
Status In Progress
Acquisition Type Sonar
SCHEDULE 2022
NOTES R311RA21_Nushagak_AK
Square Miles 3781
Edited by ibyers_Dewberry on 10/19/21 at 9:18 AM
Zoom to
Attribute table control
• From Filter Pane
• Use drop-down menus
• Select Criteria
• Pan and zoom on map
• Click features to see attribute information

# Benefits of Open Data

- Anyone with ArcGIS Pro can copy the Service URL and view it with their own private data assets or data needs

  https://services.arcgis.com/mXosPCpkF9n8TYTE/arcgis/rest/services/Alaska_Coastal_Data_Acquisition/FeatureServer

- Anyone with a free AGOL account can leverage the geospatial features & attribution for further analysis/visualization
- Also shared to SeaSketch
- Potential for Public-Private Partnerships

# Other new resources…

## Interactive Map Gallery

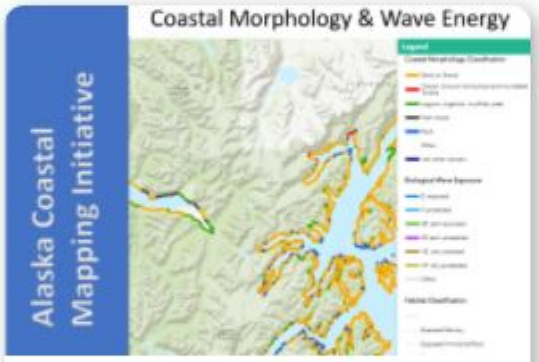
Click on a map below to open in full screen and interact with the data!

**Funding Partnership Opportunities**

See what agencies are collecting data (lidar, sonar, imagery...etc), where they are collecting it, and when they plan to collect it by using Data Acquisition Map.

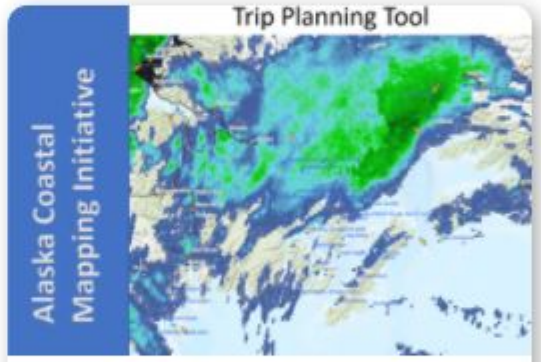

### Alaska Coastal Jurisdictions

This application displays administrative boundary and jurisdictional information fro…




### Alaska Coastal Morphology and Wave Exposure Map

A web mapping application that contains data displaying coastal morphology classification,…




### Alaska Coastal Mapping Trip Planning Tool

This web application includes the extents of existing shoreline vectors, tide gauge network,…


### Alaska Coastal Data Acquisition

A web mapping application showing all the planned, funded, in progress, and…

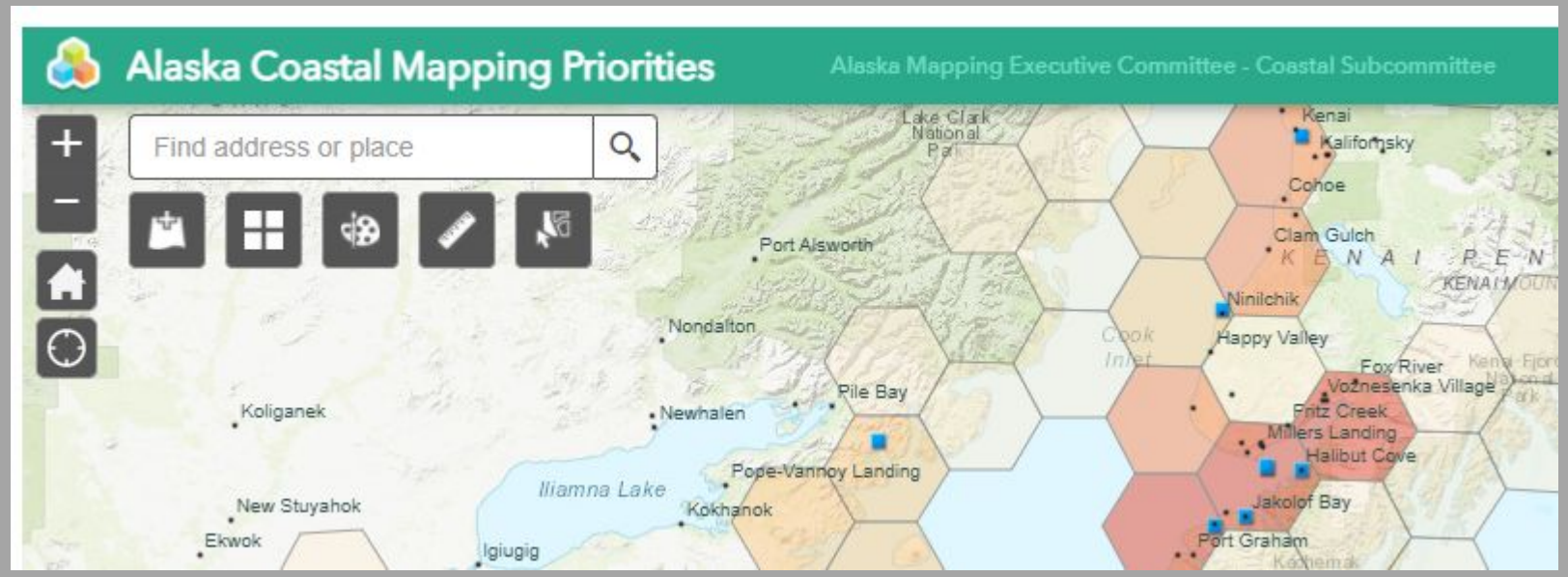
# Other new resources…

## Determining Coastal Mapping Priority Areas

What parts of Alaska's coast get mapped first? What are the specific mapping needs of the community? To help answer these questions and more, a detailed survey was conducted in 2019 to help ensure data collection efforts met the broadest user needs possible and were conducted in the most efficient manner. The StoryMap shown below outlines survey parameters and the results.

Read the final report recently published on June 28th, 2021.

2019 Alaska Coastal Mapping Prioritization Survey - Final Report



# Other new resources…

## StoryMap Gallery

Click on a story map below to interact and learn!

## Implementation Plan Milestones

The objectives and program milestones shown below will guide the implementation of the 10-year effort to map Alaska's coastal and nearshore areas. Progress made on these milestones will be revised frequently so please check back often for updates!

IP_Milestone_Tracker.xlsx 1 / 4 100%

AMEC - Coastal Subcommittee Implementation Plan Milestone Status

| Objective | Milestone | Due Date | Interval | Status |
|---|---|---|---|---|
| **1.0 Build on Existing Mapping Partnerships to Meet Alaska's Coastal Mapping Needs** | | | | |
| **1.1 Establish a Team for Alaska Coastal Mapping Implementation** | | | | |
| 1.1.1 | Create a Coastal Subcommittee (CS); co-chairs identified; meetings held on regular basis; AMEC reporting procedures established | Dec-2020 | | Complete |
| 1.1.2.1 | Convene Alaska Coastal Mapping Summit | Dec-2020 | Annual | Complete |
| 1.1.2.2 | Stakeholder input integrated into draft IP | Dec-2020 | | Complete |
| 1.1.2.3 | Coastal Mapping Summit Summary notes and follow-up actions released | Jan-2021 | Annual | Complete |
| 1.1.3.1 | Draft ACMS IP submitted to AMEC for review | Dec-2020 | | Complete |
| 1.1.3.2 | Draft ACMS IP published for public comment | Oct-2021 | | In Progress |

## Upcoming Webinars

NOAA Science Seminar Series

# Other new resources…

***Are You Trying to Find Existing Data?***

*Check out these helpful resources:*

NOAA's Digital Coast

State of Alaska Geoportal

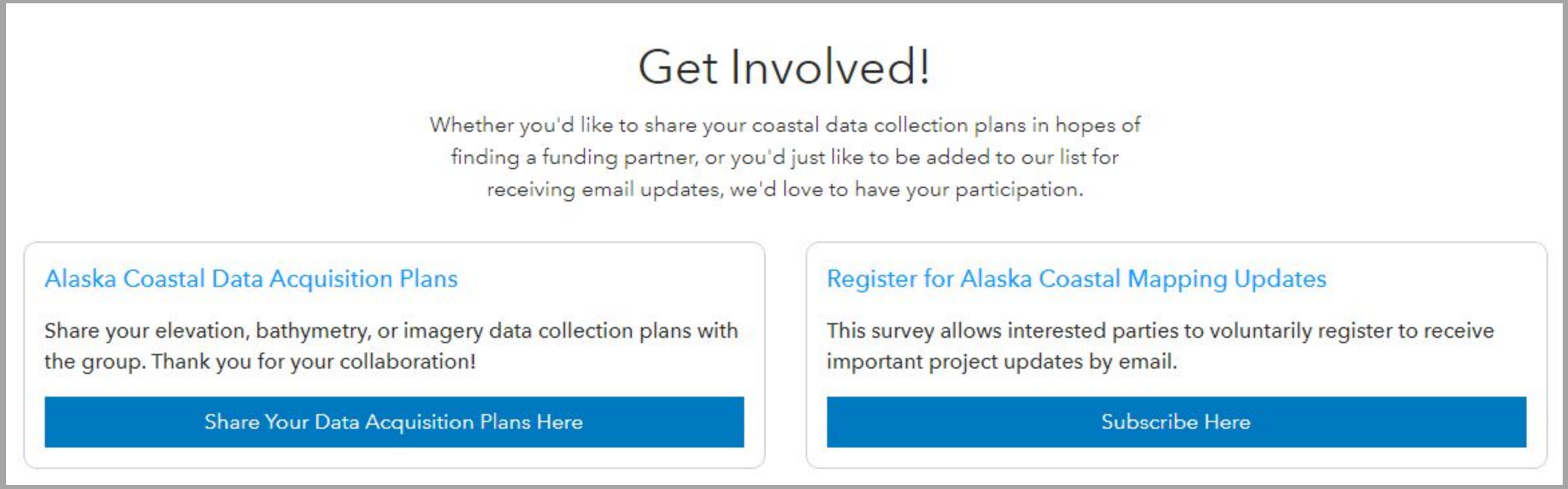
Alaska DGGS Elevation Portal

U.S. Interagency Elevation Portal

USGS's The National Map

AOOS Ocean Data Explorer

# Other new resources…



Photos by Susan Sommer

# Thank you!

Hillary Palmer – Coordinator

hpalmer@Dewberry.com

# Alaska DGGS Mapping Update

Jaci Overbeck, Alaska Coastal Hazards Program Manager

**December 1st, 2021 | Virtual**

# State of Alaska Coastal Mapping Report

## 2021 Alaska Coastal Mapping Summit

# Alaska Coastal Hazards Program

## Coastal Hazards Assessments

- Erosion Exposure Assessment
- Stakes for Stakeholders: Community-Based Erosion Monitoring
- National Coastal Resilience Fund Flood Assessments

## In order to assess hazards, you must have the baseline data:

- Western Alaska photogrammetric digital surface models and orthoimagery (2015)
- UAV operations and training (tribal and borough collaborations)
- Bathymetry crowd source data (AOOS/NOAA Hydroball)
- Water level sensors (AOOS)
- Lidar

***We are collecting!***

## Much more than hazards…

- Co-chair, Alaska Mapping Executive Committee Coastal Subcommittee
- Co-chair, Alaska Geospatial Council Coastal & Ocean Technical Working Group
- Chair, Alaska Water Level Watch

***We are coordinating!***

DGGS graduate intern Roberta Glenn works with Native Village of Wainwright IGAP Coordinator Cheryl Panik to install erosion monitoring sites.

# 2021 Summer Field Mapping

**Yukon-Kuskokwim Delta**

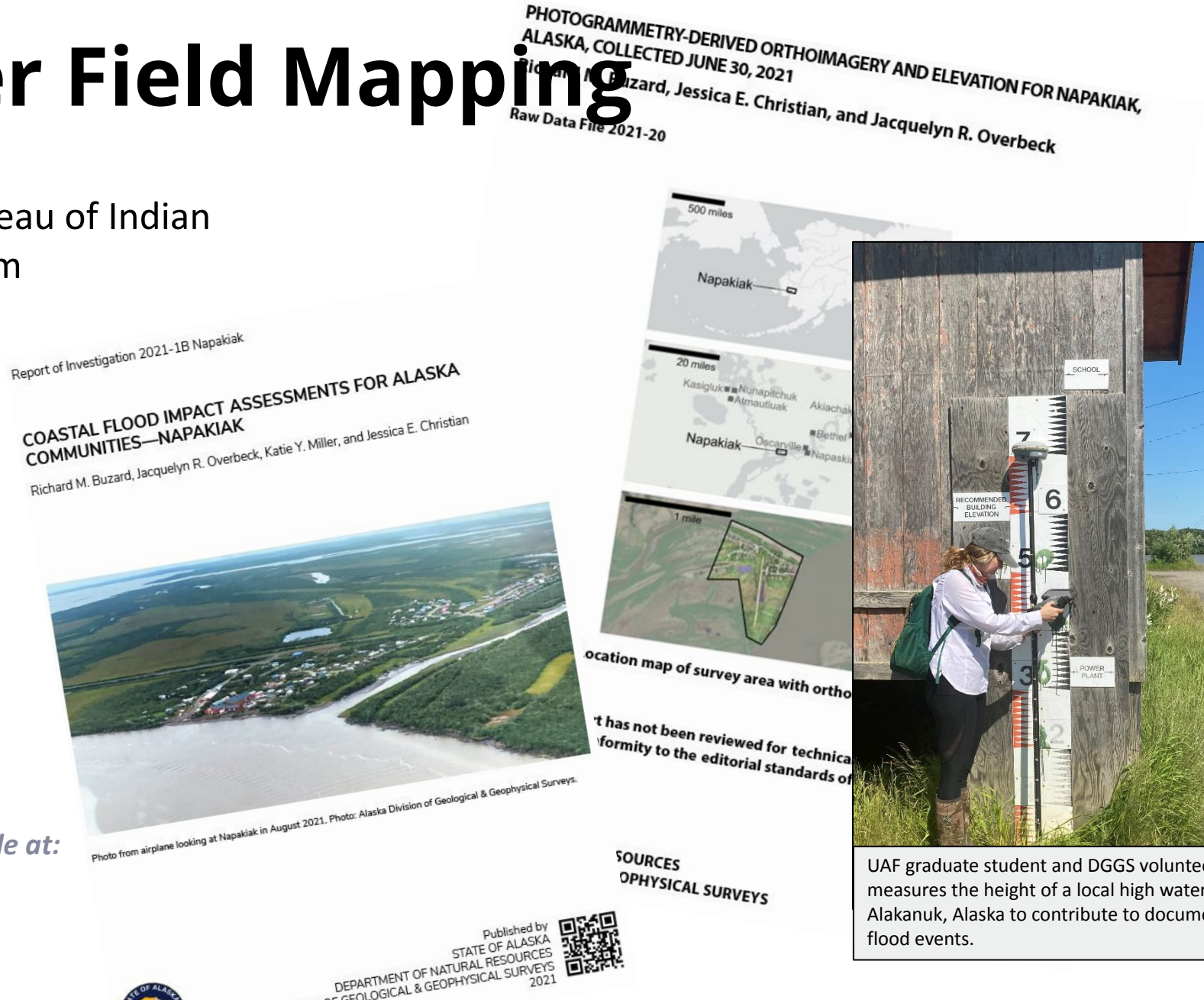
Tribal Collaborations using Bureau of Indian Affairs Tribal Resilience Program

- Napakiak
- Kotlik
- Alakanuk

Tasks

- UAV imagery/DSM
- Ground control
- Single-beam bathymetry
- Historical flood markers
- Lidar at Napakiak

***Flood assessments will be made available at:***
***https://dggs.alaska.gov/pubs/id/30573***
***Baseline data available from:***
***https://dggs.alaska.gov/pubs/***







UAF graduate student and DGGS volunteer Jessica Christian measures the height of a local high water mark indicator in Alakanuk, Alaska to contribute to documenting historical flood events.

# 2021 Summer Field Mapping

**State of Alaska ASTAR Coastal Hazards Project**

Conduct baseline mapping in North Slope communities where gaps exist to support flood and erosion mapping. 2021 started in Wainwright as well as tidal datum collections in Point Lay.

**Wainwright**

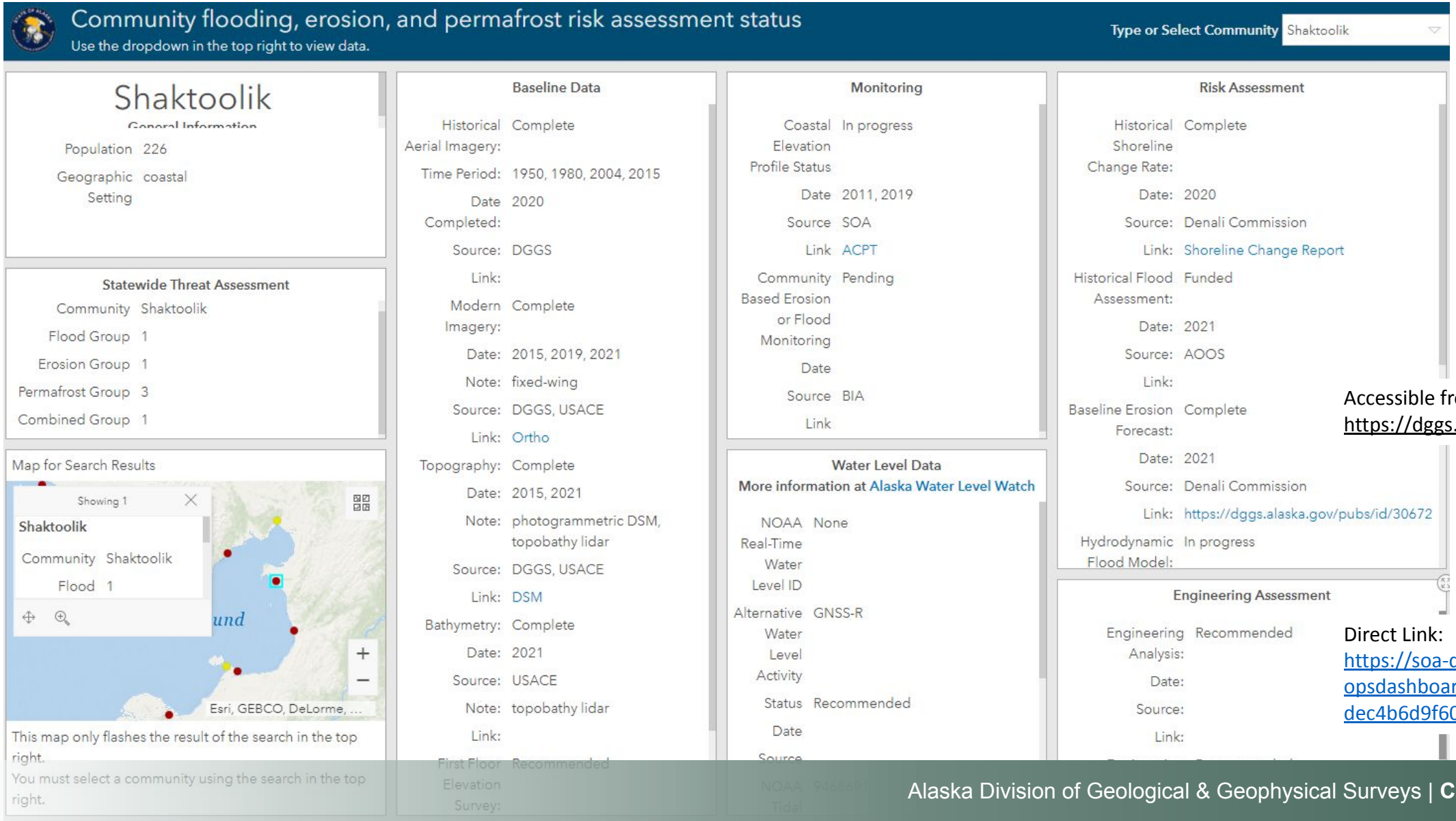
- **Coastal elevation profiles with permafrost probe**
- **Beach sediment sampling**
- **Single-beam bathymetry**
- **Community-based erosion monitoring installation**

**Other Efforts**

- **USGS 3DEP lidar 2019**
- **JALBTCX topobathy lidar 2021**
- **Coast survey bathymetry**

Boat operator with the Olgoonik Corporation Blair Patkotak and Jaci Overbeck, DGGS, tow the hydroball for single-beam bathymetry collection.

# Getting Data into the Hands of Users




Accessible from:
https://dggs.alaska.gov/hazards/coastal/

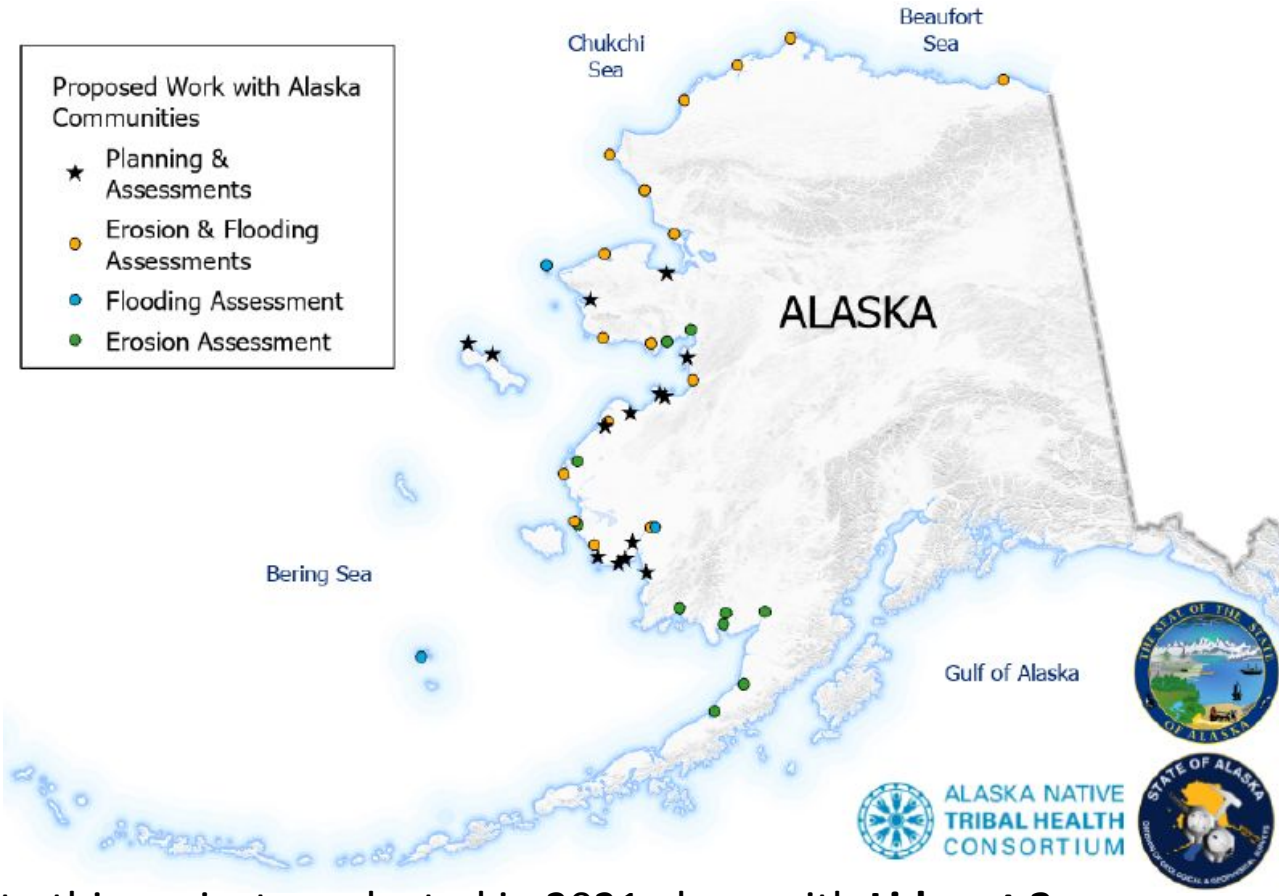
Direct Link:
https://soa-dnr.maps.arcgis.com/apps/opsdashboard/index.html#/ba8ebf93adec4b6d9f601e2d59179fdd

# National Coastal Resilience Fund

Building Capacity and Conducting Coastal Risk Assessments in Remote Alaska Native Communities

Collaboration between AK DGGS, ANTHC, and AK DCRA.


Andrew Herbst, DGGS, sets up a base station for lidar collections around the Kuskokwim Delta.




Match to this project conducted in 2021 along with **Lidar at 3** communities (Kipnuk, Kwigillingok, and Tuntutuliak).

Community outreach team has begun identifying community collaborators.

# Alaska Water Level Watch

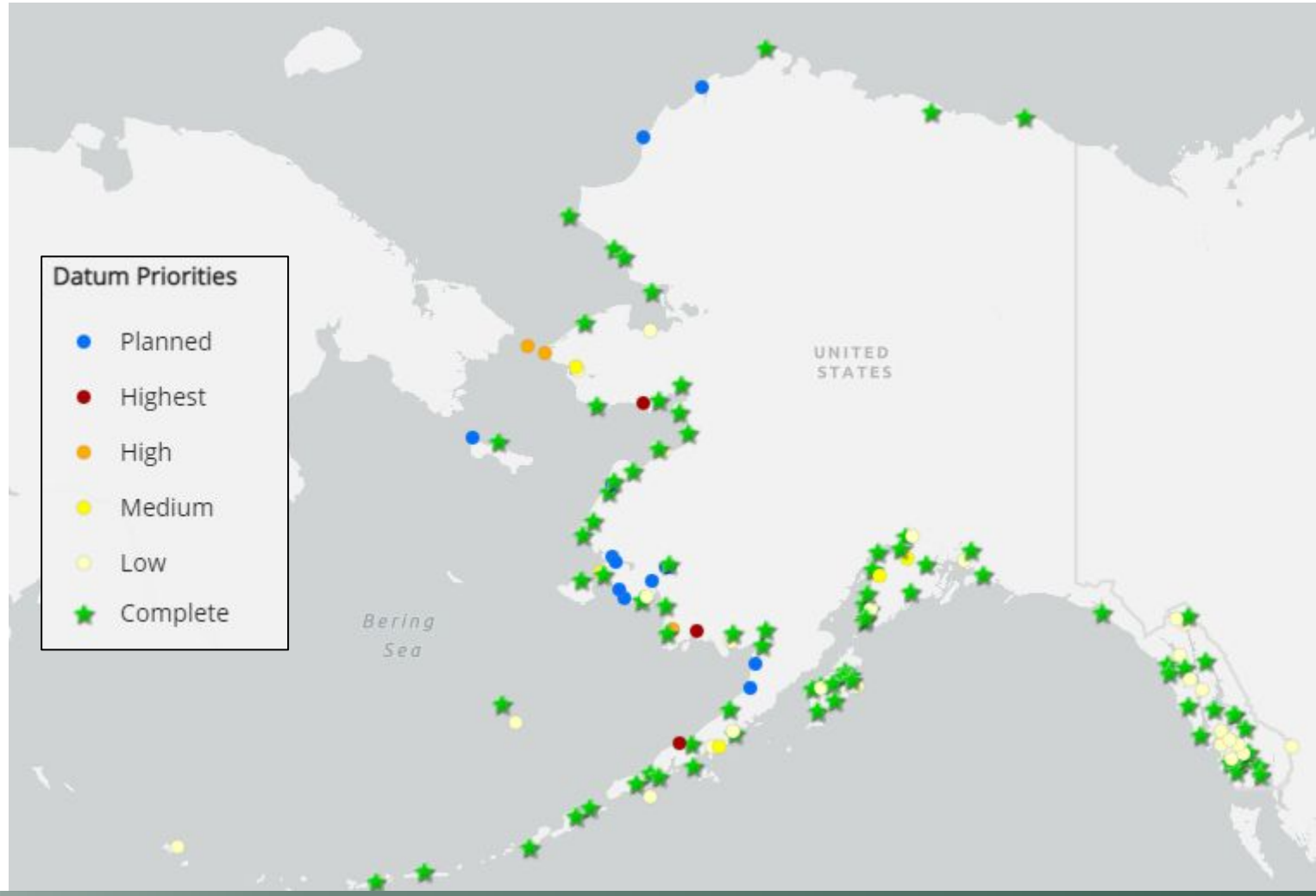
**Without VDatum, at least every community should have a datum conversion from water level to land.**

**Planned and Recently Completed**
State of Alaska – Point Lay and Wainwright

NOAA Office of Coastal Management—Gambell, Homer, Kwigillingok, Chefornak, Kipnuk, Newtok/Mertarvik.

NOAA Office of Coast Survey—Bristol Bay sites.

**Tidal Datums from Short-term Occupations**




This map is updated at https://arcg.is/Xf4j9

# Alaska Water Level Watch

**In support of the NWLON, partner stations help fill gaps in real-time water level monitoring.**

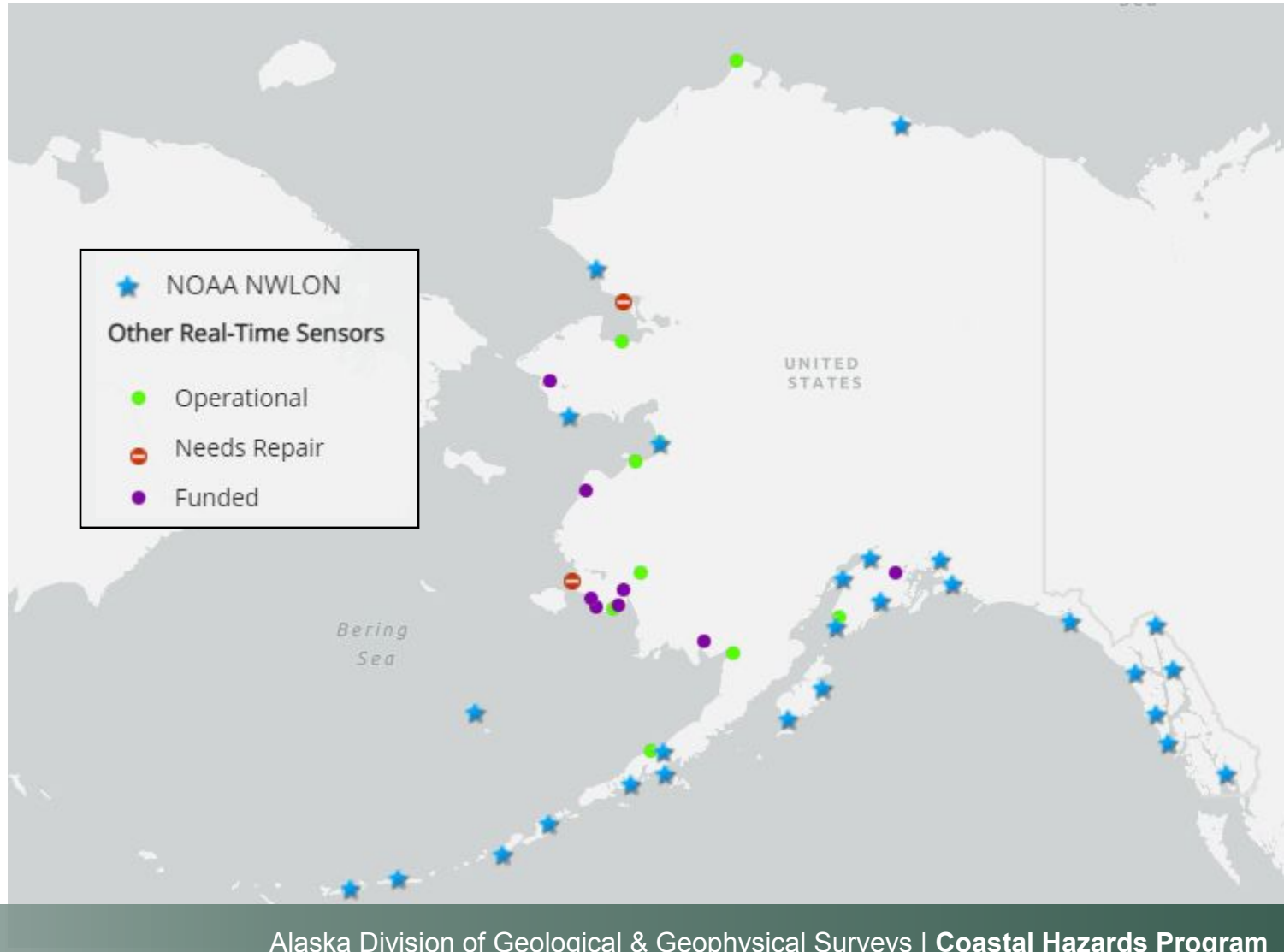
**2021 Updates Funded through the Alaska Ocean Observing System**

- Dillingham coming online soon
- Kwigillingok iGage installation
- Deering iGage repair
- Nelson Lagoon iGage repair
- Utqiagvik GNSS-R installation

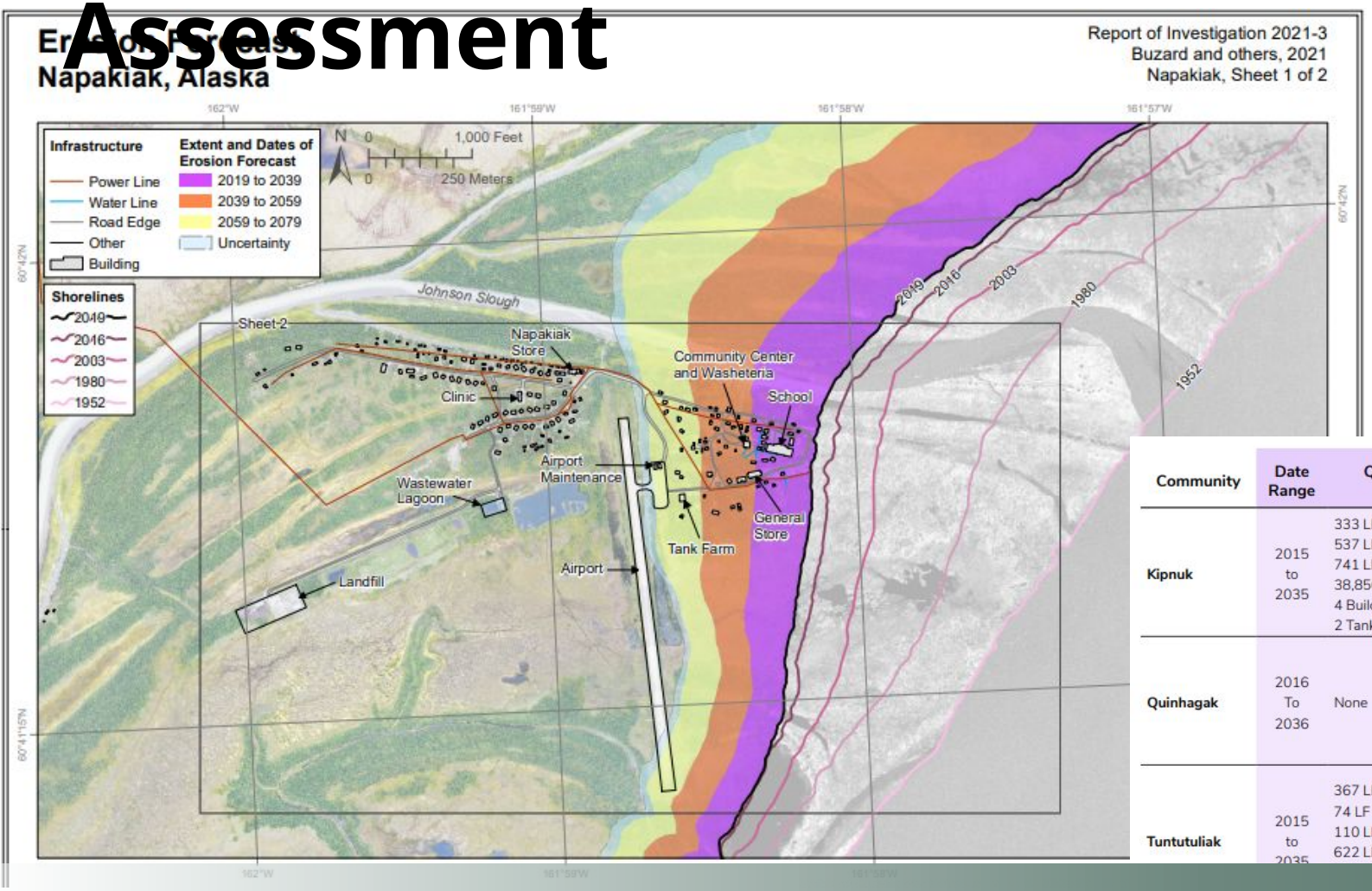
AOOS
Alaska Ocean Observing System

**This map is updated at** https://arcg.is/Xf4j9

**Real-time Water Level Sensors**



# Using Data to Create Products: Erosion Assessment





**Erosion forecast completed for 48 communities in October 2021**

| Community | Date Range | Quantity of Exposed Infrastructure | Date Range | Quantity of Exposed Infrastructure | Date Range | Quantity of Exposed Infrastructure | Other |
|---|---|---|---|---|---|---|---|
| **Kipnuk** | 2015 to 2035 | 333 LF Power Line<br>537 LF Fuel Line<br>741 LF Road & Boardwalk<br>38,850 SF Barge Landing<br>4 Buildings<br>2 Tank Facilities | 2035 to 2055 | 768 LF Power Line<br>340 LF Fuel Line<br>1,781 LF Road & Boardwalk<br>3,480 SF Barge Landing<br>9 Buildings<br>1 Tank Facility | 2055 to 2075 | 837 LF Power Line<br>210 LF Fuel Line<br>79 LF Water Line<br>1,928 LF Road & Boardwalk<br>17 Buildings | n/a |
| **Quinhagak** | 2016 To 2036 | None | 2036 to 2056 | None | 2056 to 2076 | 69,319 SF Wastewater Lagoon | **Floodplain**<br>32 Buildings<br>3,398 LF Power<br>1,123 LF Water<br>8,071 LF Road<br>1 City Dock |
| **Tuntutuliak** | 2015 to 2035 | 367 LF Power Line<br>74 LF Fuel Line<br>110 LF Water Line<br>622 LF Boardwalk | 2035 to 2055 | 400 LF Power Line<br>245 LF Fuel Line<br>331 LF Water Line<br>1,466 LF Boardwalk<br>23,256 SF Barge Landing | 2055 to 2075 | 505 LF Power Line<br>199 LF Fuel Line<br>362 LF Water Line<br>946 LF Boardwalk<br>145,237 SF Barge Landing | n/a |

# 2022 Digital Coast Fellowship

## Harnessing Energy on Alaska Coastal Mapping Initiatives to Support Resilient Coastal Communities

*Bolster communication networks with Alaskan stakeholders to map 66,000 miles of rugged coastline, seeking engagement, inclusion, and equity among growing local, tribal, state, federal, and private partnerships which enhance data sharing and access.*

**House within Alaska Geospatial Council and National States Geographic Information Council. Once fellow selection process completed, start August 2022.**

**Applications due January 21:**
**https://coast.noaa.gov/fellowship/digitalcoast.html**

# VDatum Update

Stephen White, NOAA RSD

**December 1st, 2021 | Virtual**

# VDatum

## Vertical Datum Transformation Tool

Stephen A. White

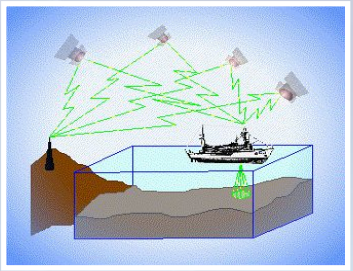
Alaska Coastal Mapping Summit

December 1, 2021

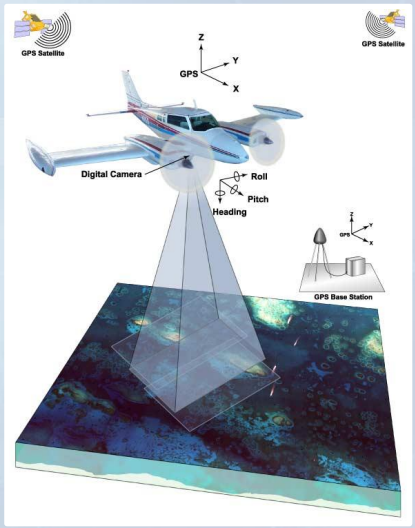
National Oceanic and Atmospheric Administration

# What Vertical Datum is My Data in?

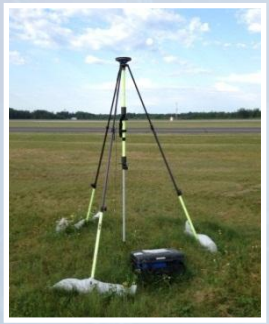
## Ellipsoidal Datums



*RTK-GPS vertical referencing Hydrographic Surveys*




*Lidar*

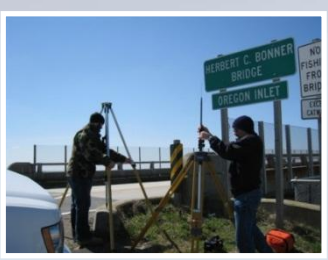


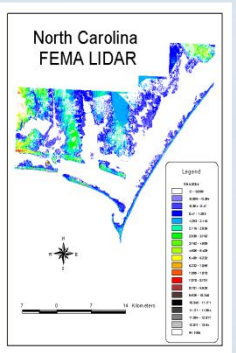
*GPS*

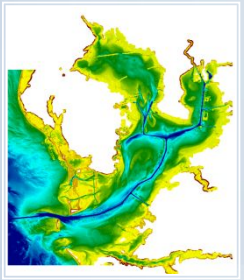
?

## Orthometric Datums

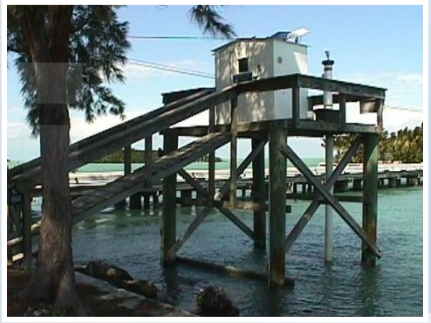
*USGS Topography*



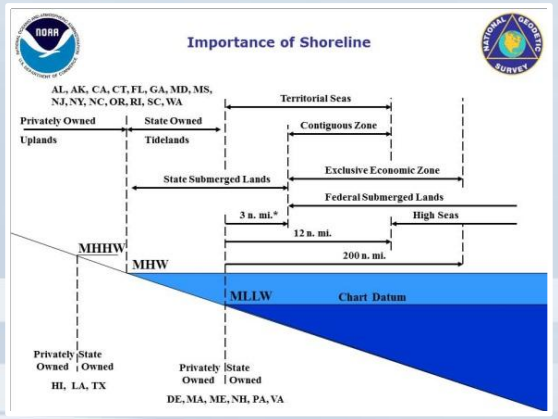



*NOAA Bathymetry (MLLW)*



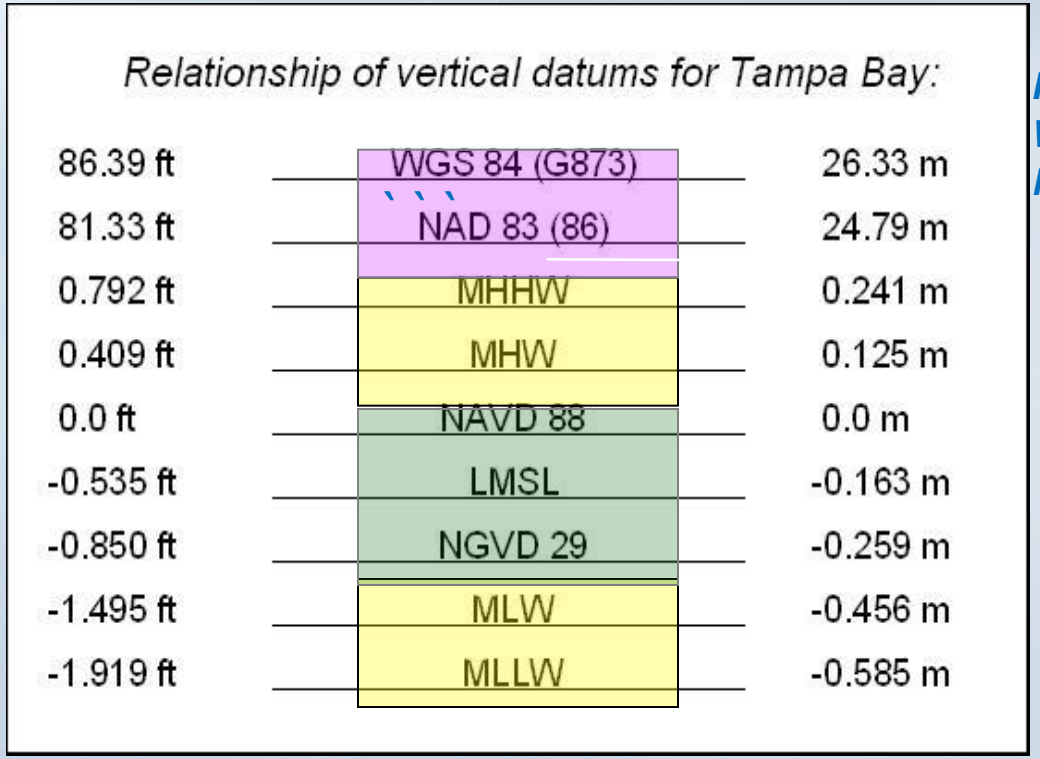
## Tidal Datums




National Oceanic and Atmospheric Administration

# All elevation data is referenced to a vertical datum.

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




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

## Ellipsoid Datums

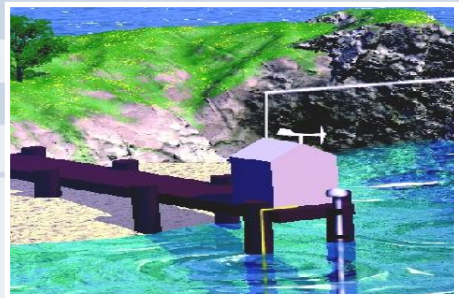
***ITRF, WGS 84, NAD 83 (NSRS)***

## Orthometric Datums

***NAVD 88, NGVD 29***


## Tidal Datums

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



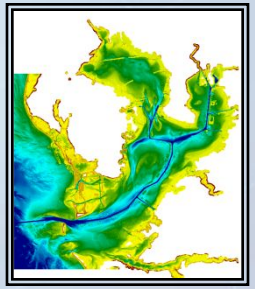
National Oceanic and Atmospheric Administration

# Development and Use of VDatum

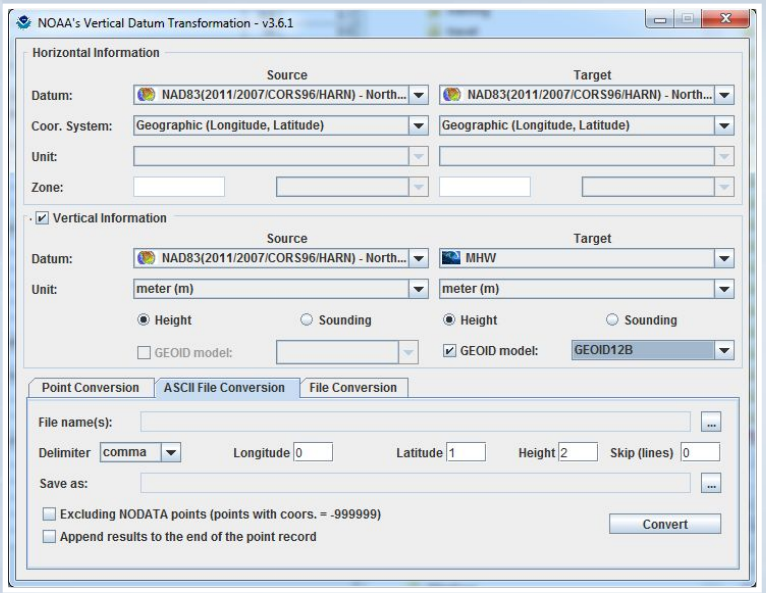
***Mapping the Land-Sea Interface:***

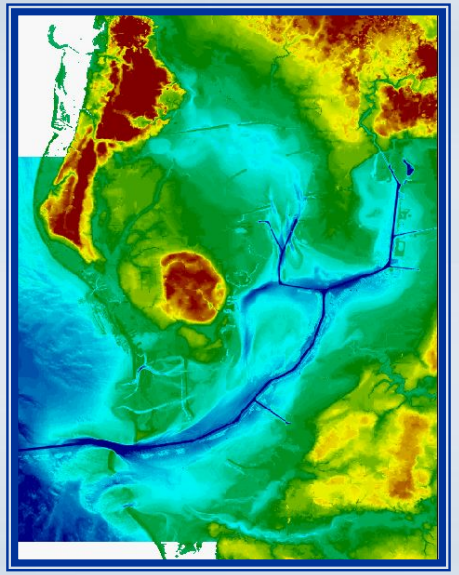
VDatum converts elevation data (heights and soundings) among different vertical datums

USGS Topography



NOAA Bathymetry



***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)**

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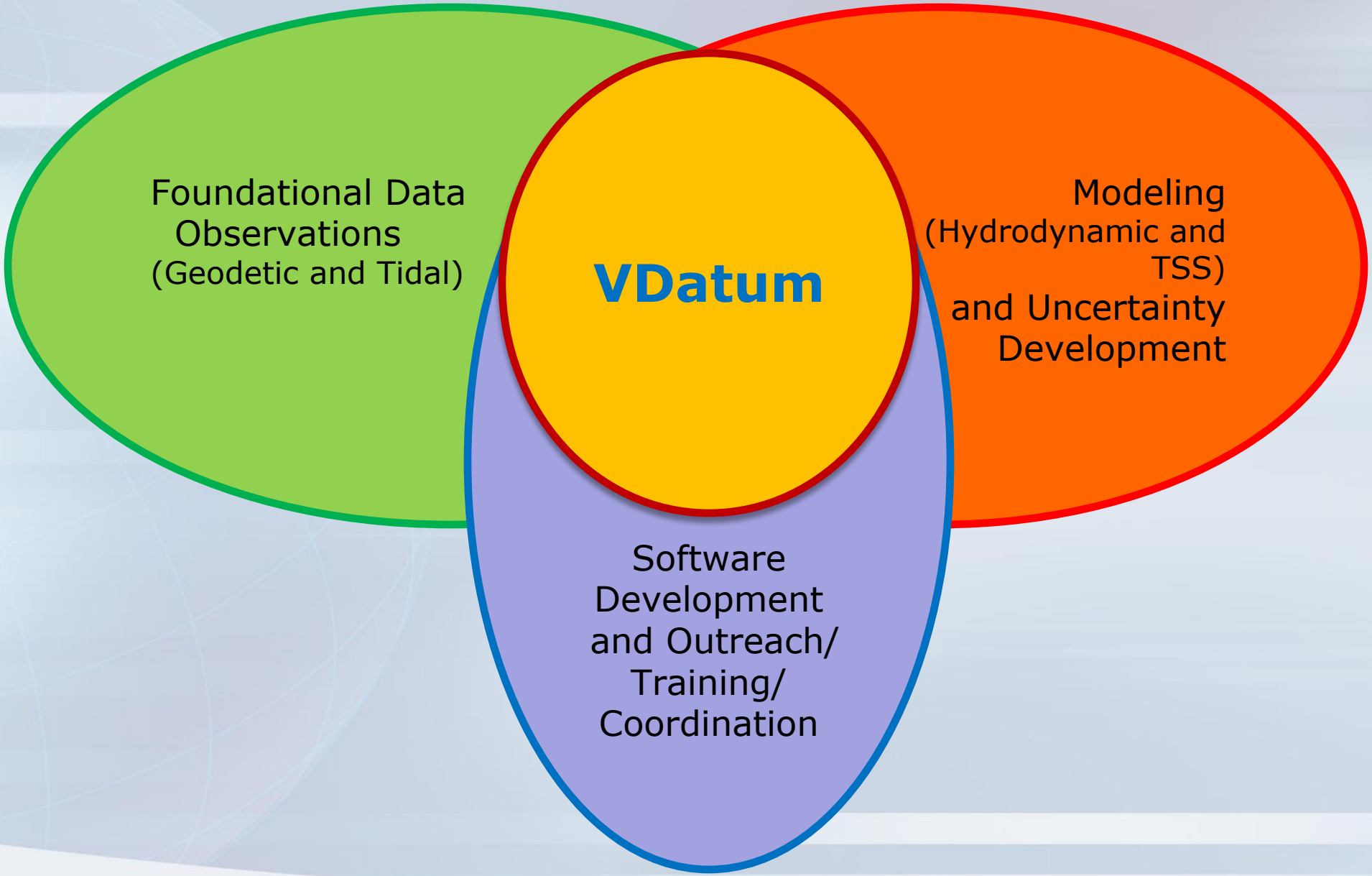
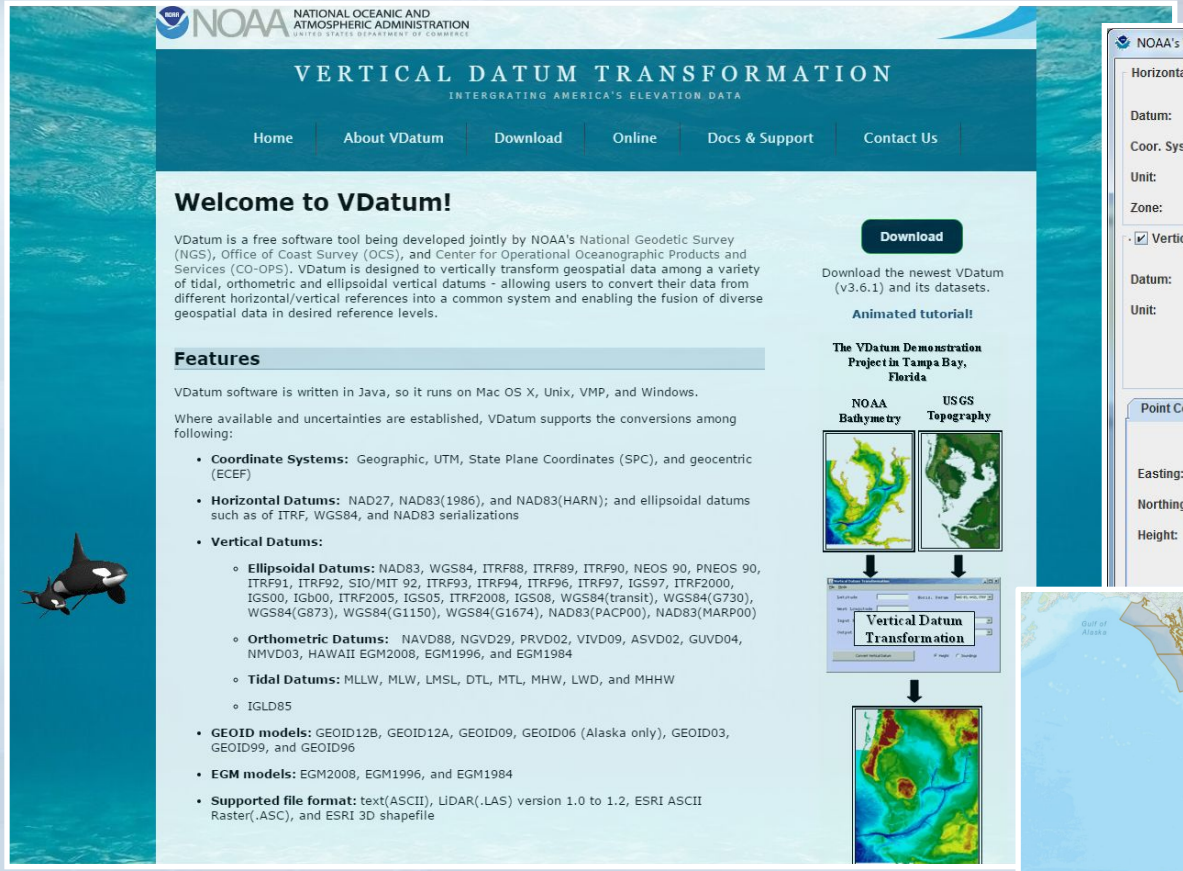
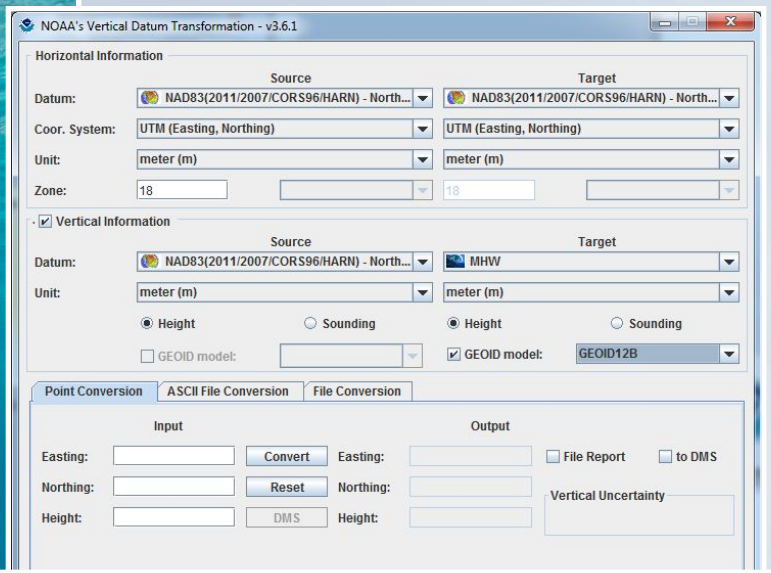
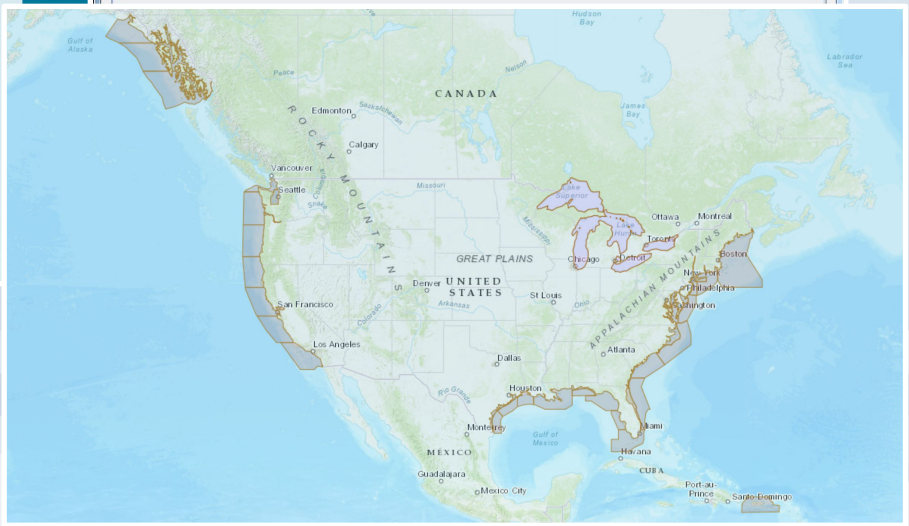

Foundational Data Observations (Geodetic and Tidal)
VDatum
Modeling (Hydrodynamic and TSS) and Uncertainty Development
Software Development and Outreach/ Training/ Coordination

# VDatum Website: vdatum.noaa.gov

## (Version 4.3, September 22, 2021)

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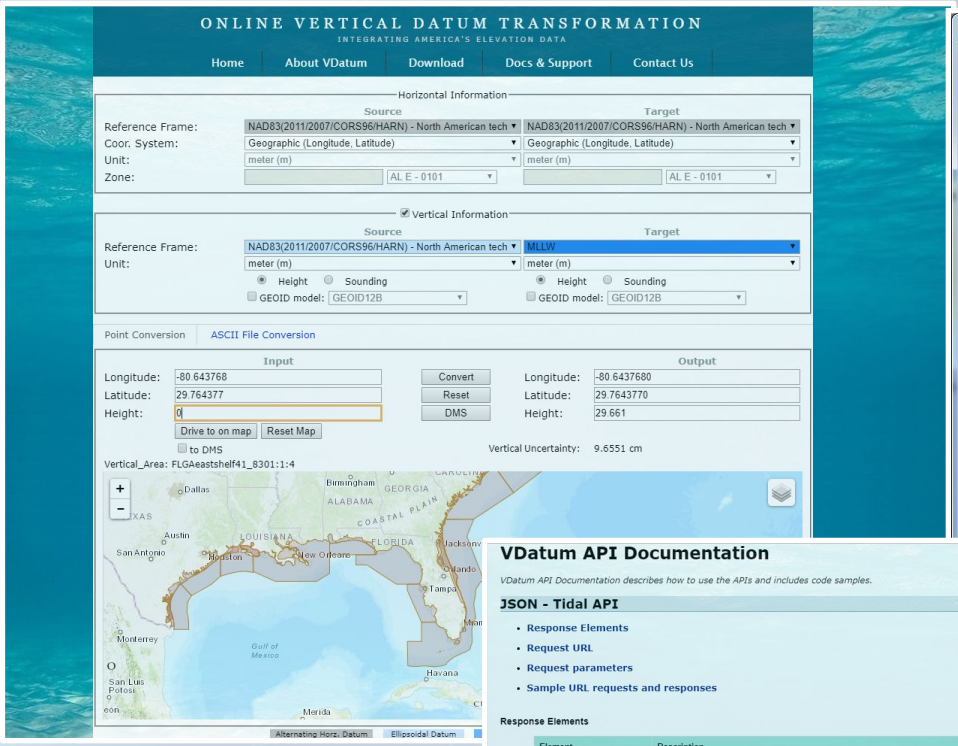
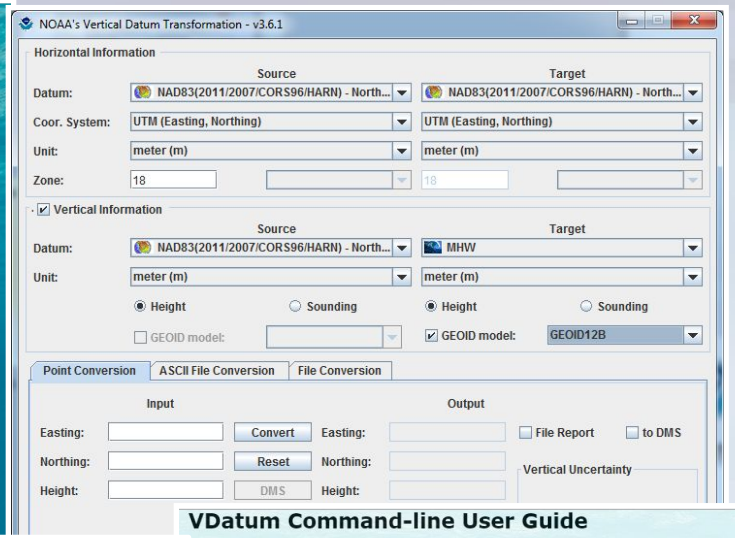
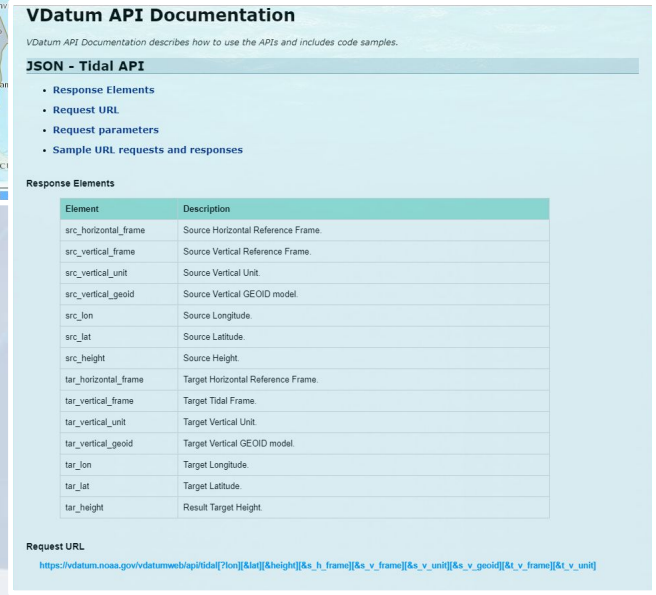
# VDatum: Interfaces



## VDatum API Documentation

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

### JSON - Tidal API

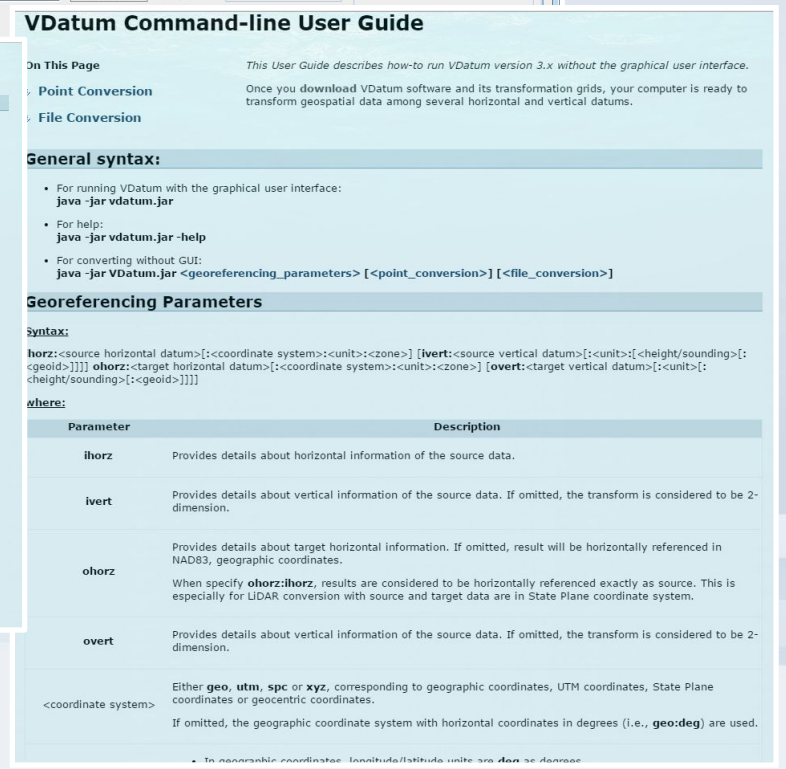
- Response Elements
- Request URL
- Request parameters
- Sample URL requests and responses

**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[?lon][&lat][&height][&s_h_frame][&s_v_frame][&s_v_unit][&s_v_geoid][&t_v_frame][&t_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:**

**ihorz:**<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 |
|---|---|
| **ihorz** | Provides details about horizontal information of the source data. |
| **ivert** | Provides details about vertical information of the source data. If omitted, the transform is considered to be 2-dimension. |
| **ohorz** | Provides details about target horizontal information. If omitted, result will be horizontally referenced in NAD83, geographic coordinates.<br>When specify **ohorz:ihorz**, results are considered to be horizontally referenced exactly as source. This is especially for LiDAR conversion with source and target data are in State Plane coordinate system. |
| **overt** | Provides details about vertical information of the source data. If omitted, the transform is considered to be 2-dimension. |
| <coordinate system> | Either **geo**, **utm**, **spc** or **xyz**, corresponding to geographic coordinates, UTM coordinates, State Plane coordinates or geocentric coordinates.<br>If omitted, the geographic coordinate system with horizontal coordinates in degrees (i.e., **geo:deg**) are used. |

- In geographic coordinates, longitude/latitude units are **deg** as degrees

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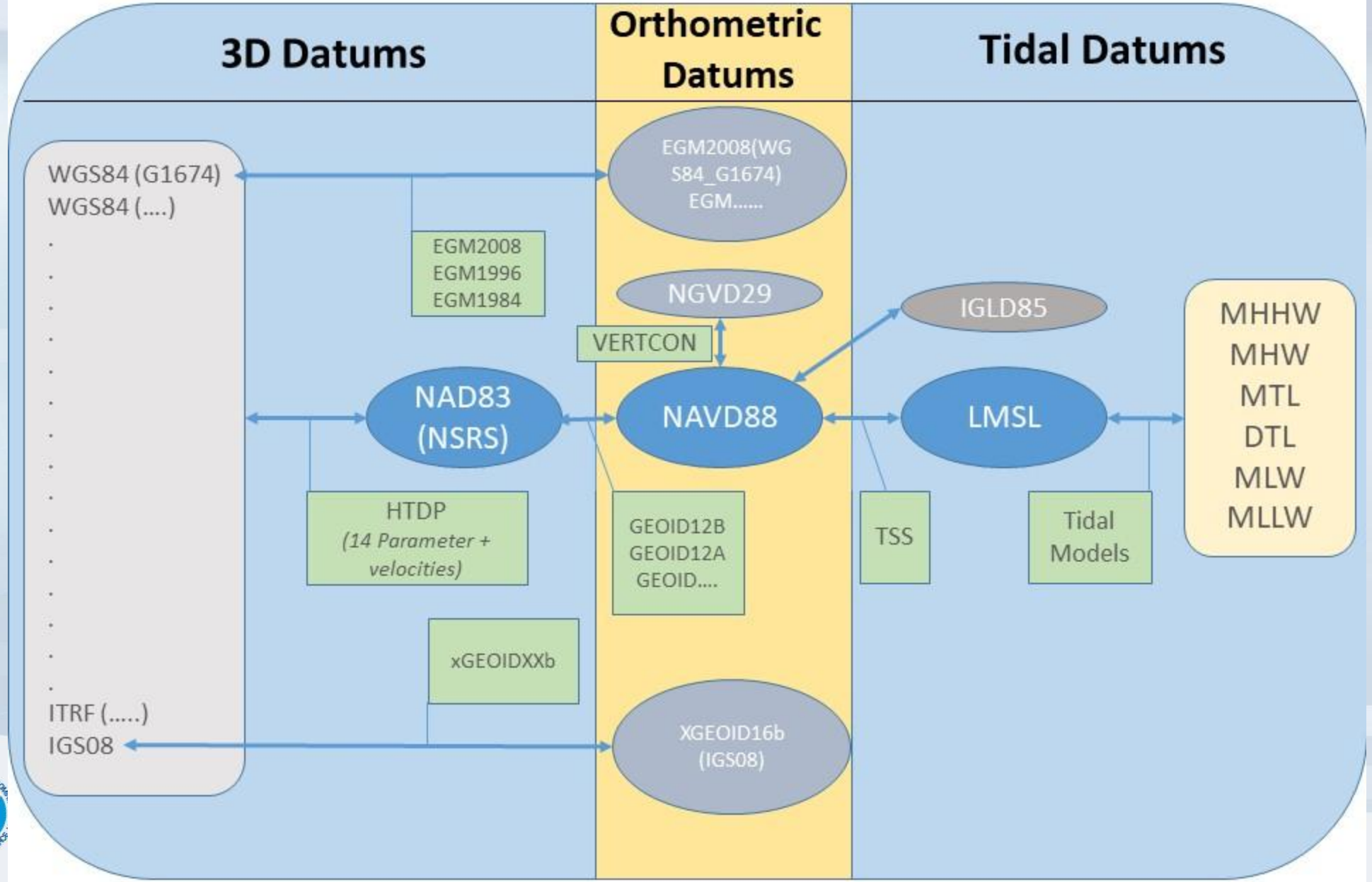
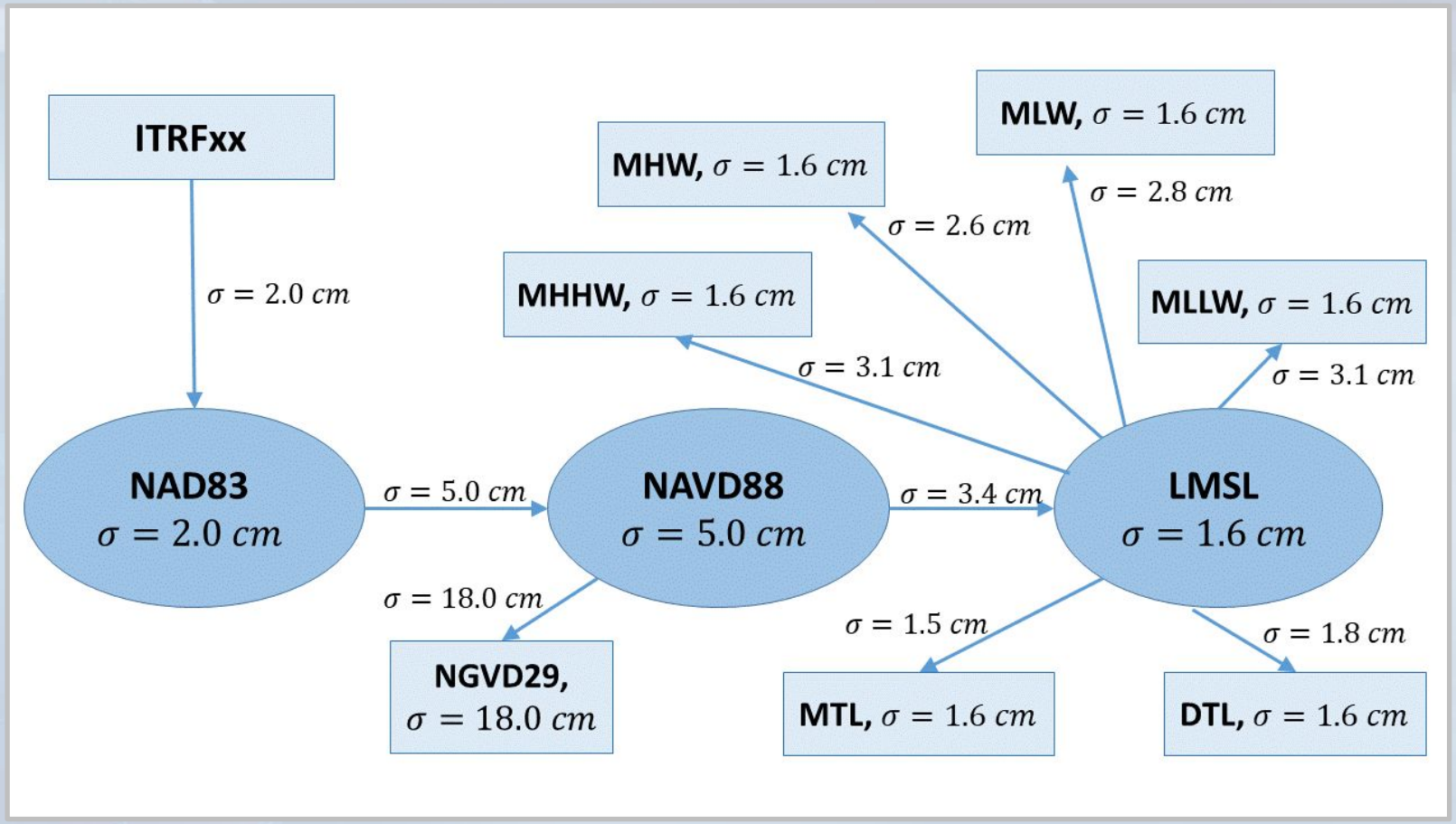
# Vertical Datum Transformation "Roadmap"



# VDatum Uncertainty Modeling



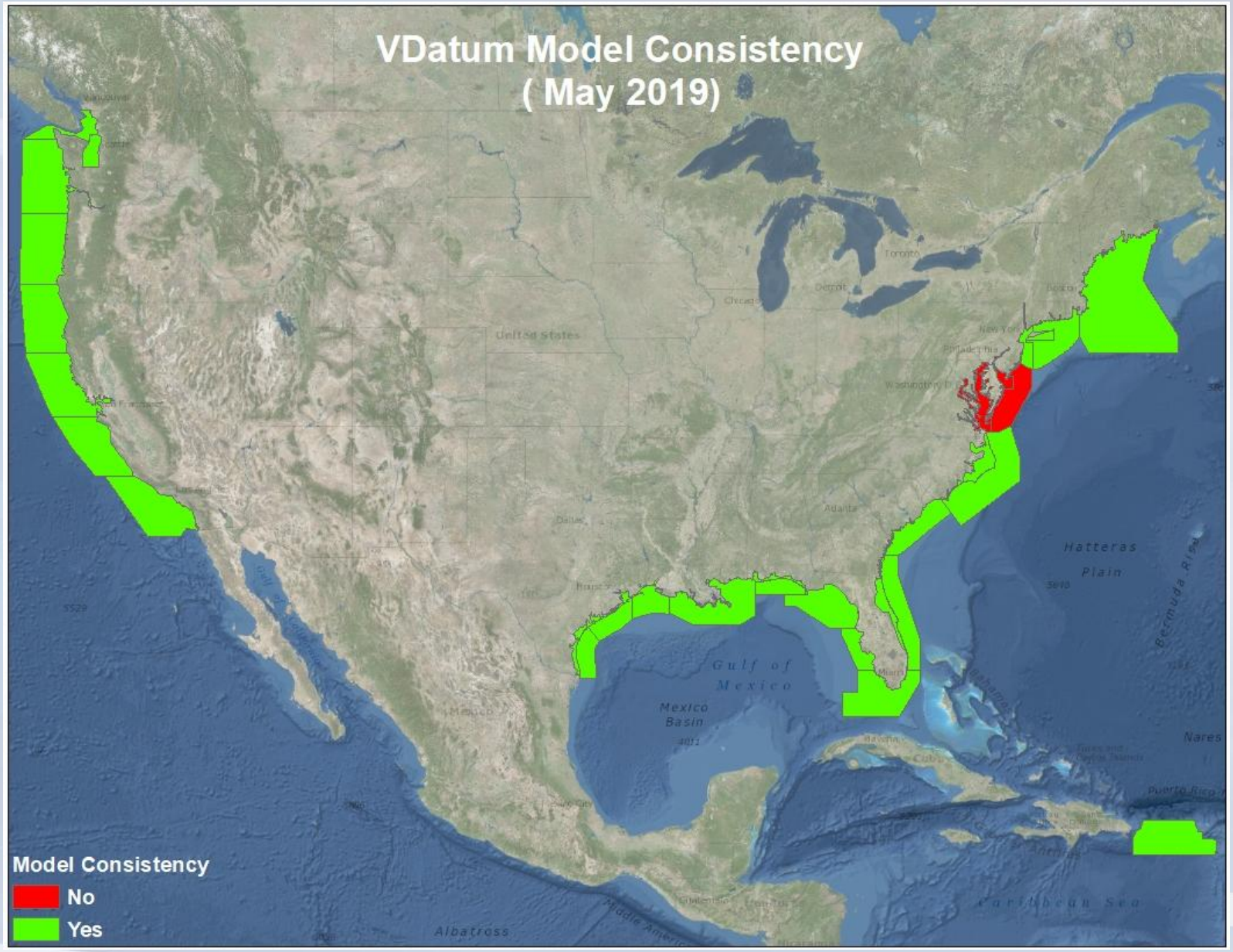

See: vdatum.noaa.gov/docs/est_uncertainties.html

# 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) – ***GNSS on Tidal Benchmarks***
- Spatially Varying Uncertainty
- Software Development

# VDatum Needs for Alaska

- **Foundational Data needs to be acquired before model development can be initiated:**
  - **Water Level Observations** (with GNSS ellipsoidal ties)
  - **Geodetic GNSS Ellipsoidal Observations** on tidal benchmarks at historical Water Level Observation sites throughout the state
- **Model Development**
  - Processing, Ingestion, and Publication of Water Level and Geodetic Observations for NOAA acceptance into development.
  - Hydrodynamic Development and Simulations (Tidal Datums)
  - Topography of the Sea Surface Development (TSS)
  - Spatially Varying Uncertainty Development
  - Software Integration
- **Iterative Version Development (Future)**
  - As we learn what issues present themselves after model development and uncertainty analysis, additional data (Bathymetry, Shoreline, Foundational Water Level and Geodetic Data needs) maybe needed for an iterative approach to revisions for enhanced coverage and decrease of uncertainties for users needs.

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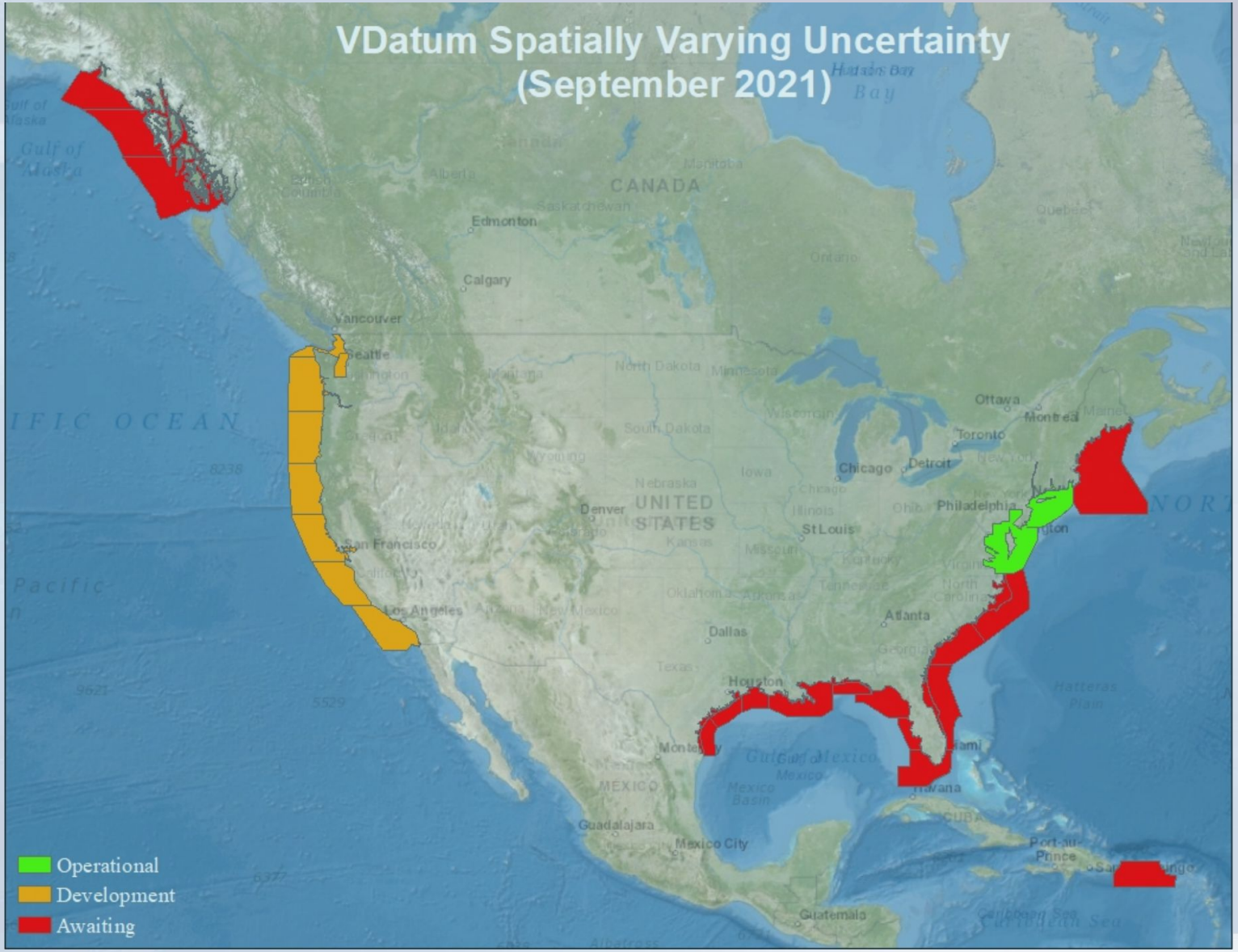


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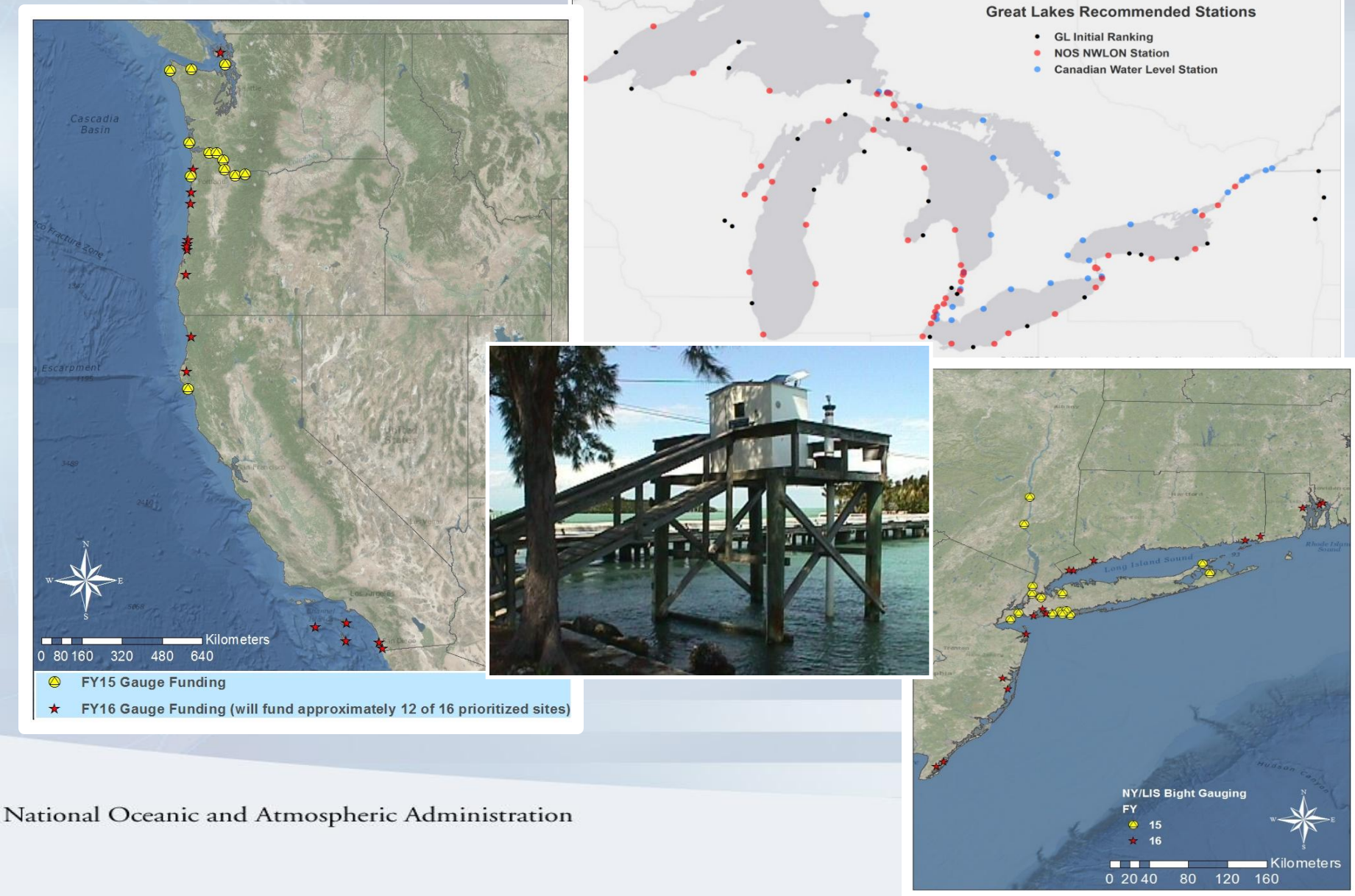
# Foundational Data: Tidal

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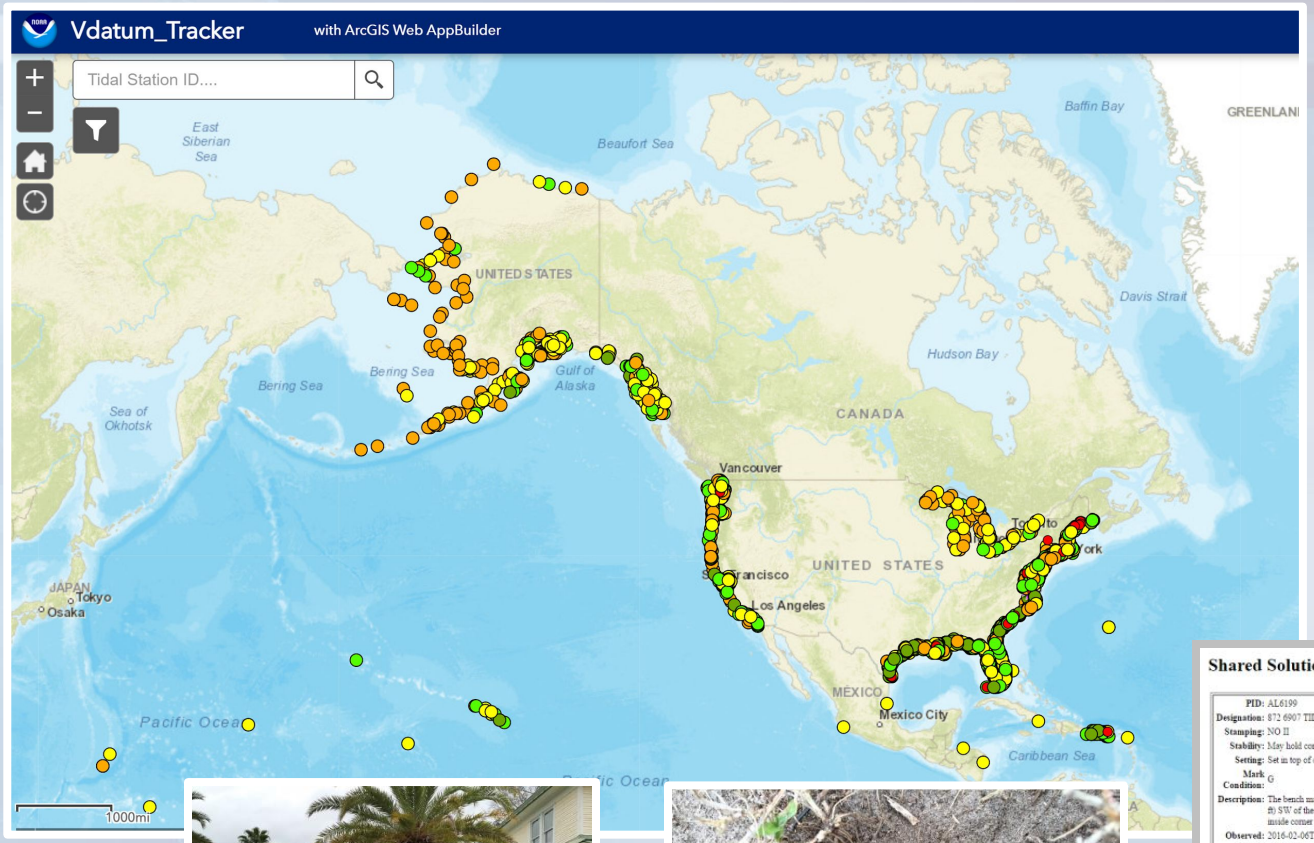
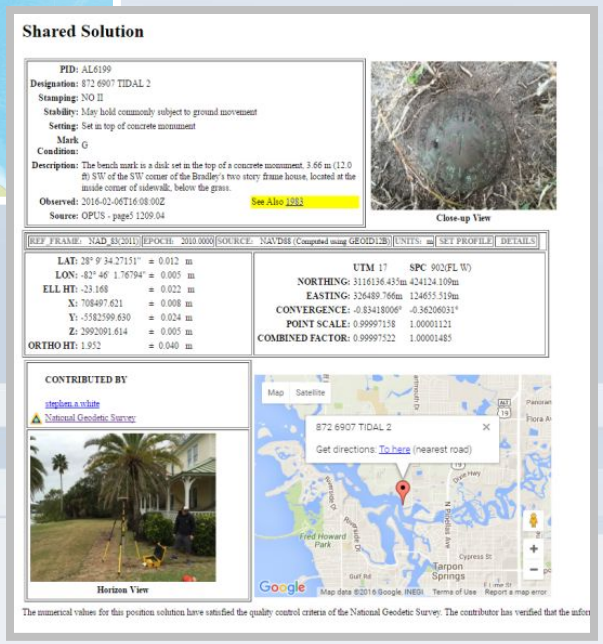
# VDatum Prioritized List of 40 Water Level Observations

# Foundational Data: Geodetic

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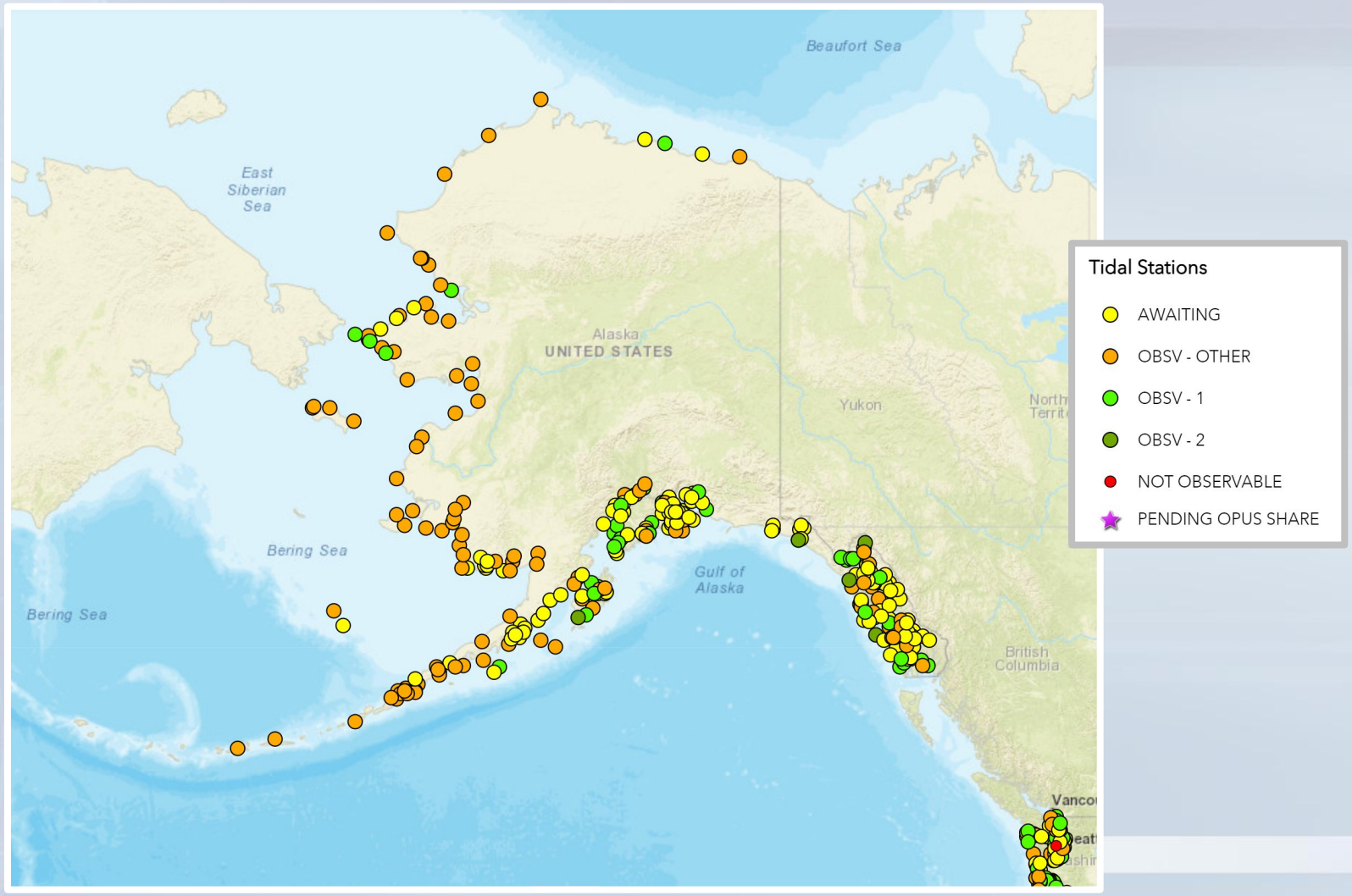
# Foundational Data: Geodetic

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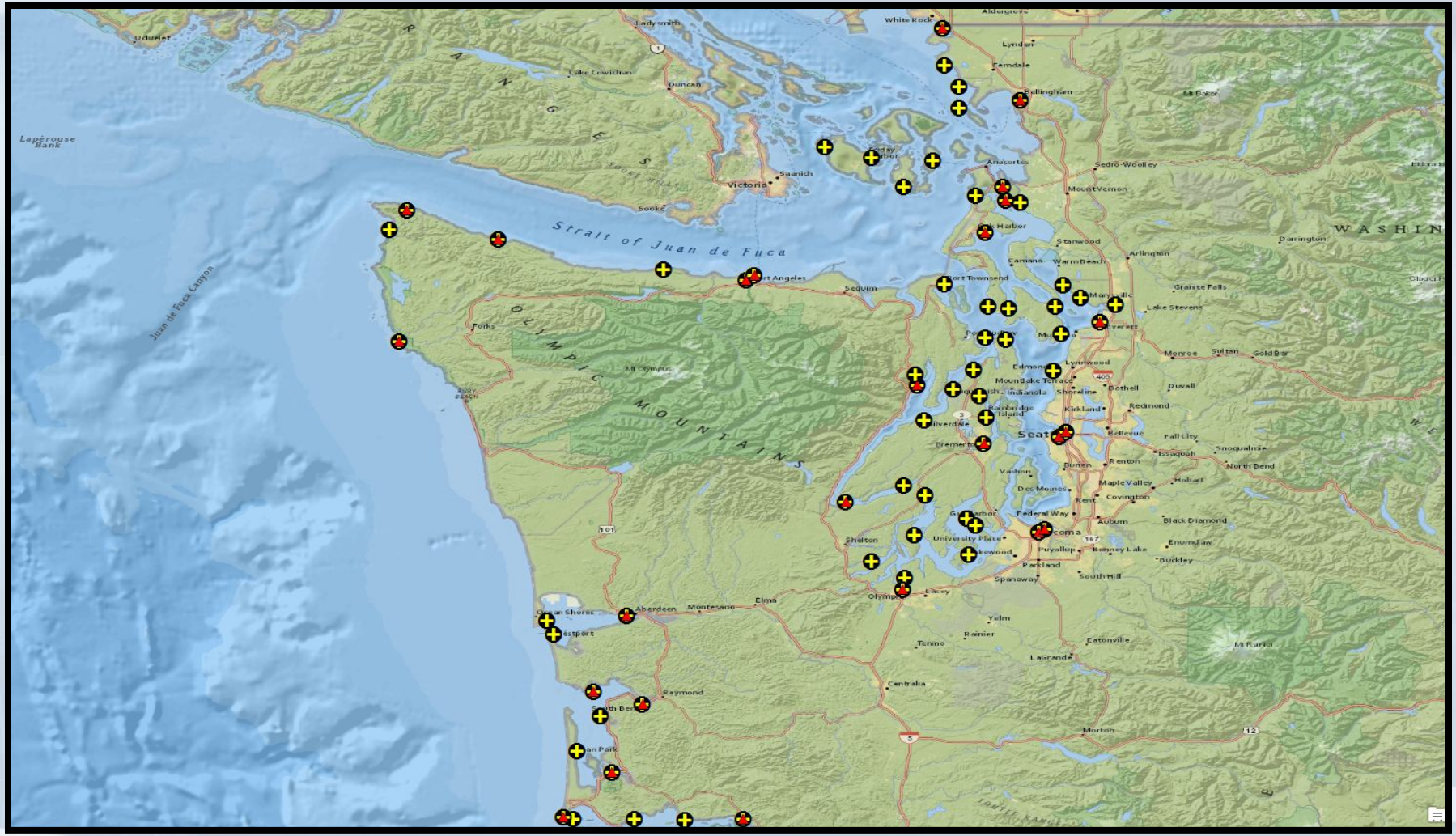
# Hydrodynamic vs. TSS Modeling

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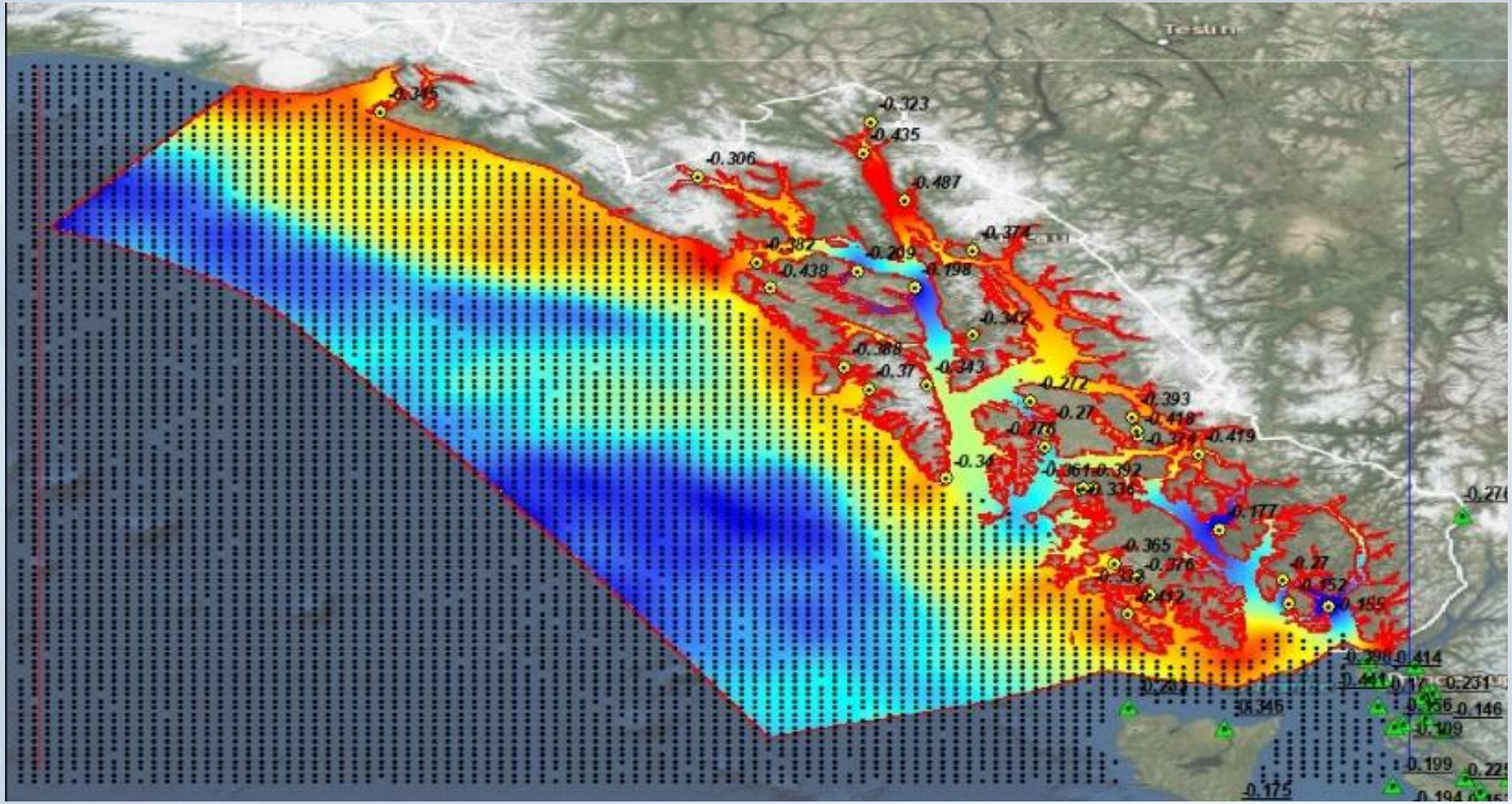
# Southeast Alaska (Released 2019)

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# 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 ADLWI + 0.0053 SRGDIST + 0.0302 MNR + 0.029

S3M = 0.0043 ADLWI + 0.0036 SRGDIST + 0.0255 MNR + 0.029

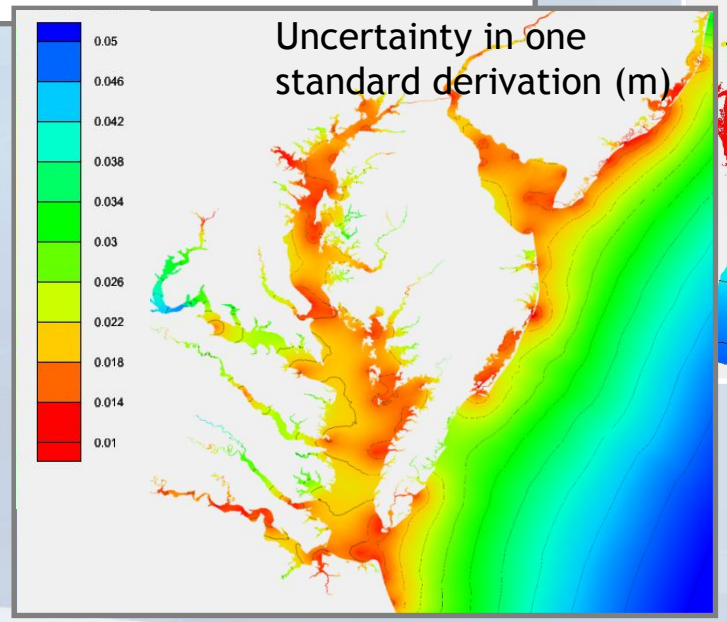
S6M = 0.0019 ADLWI + 0.0023 SRGDIST + 0.0207 MNR + 0.030

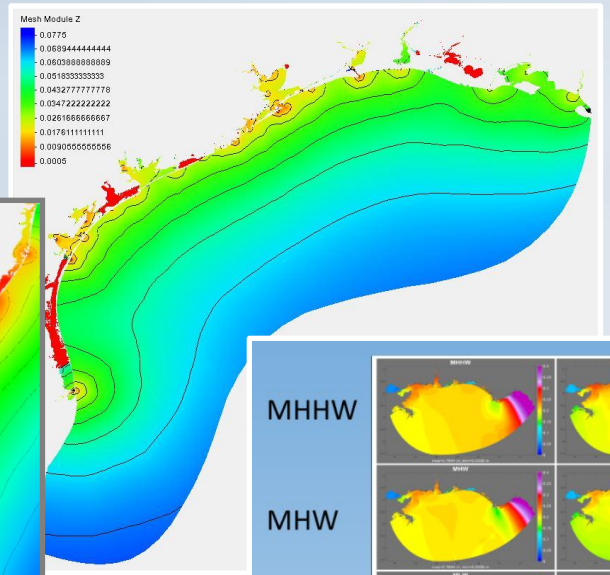
S12M = 0.0045 SRSMN + 0.128 MNR + 0.025

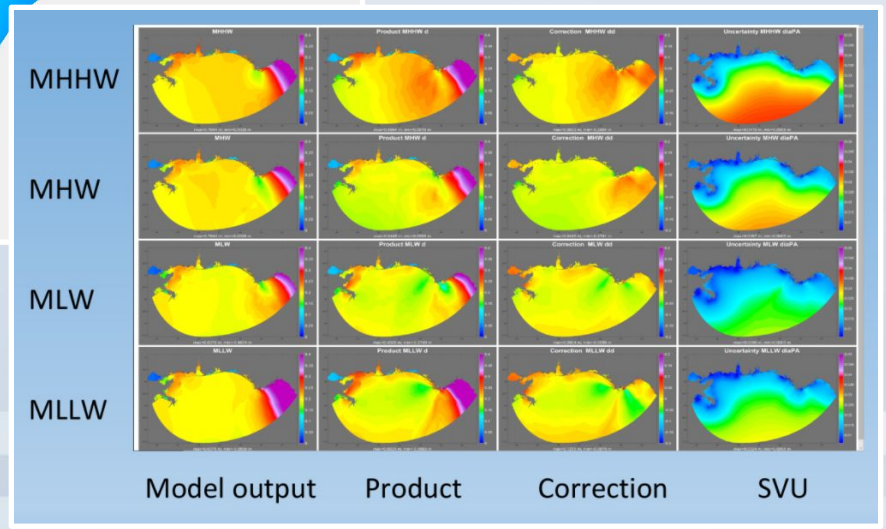
Where:

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.

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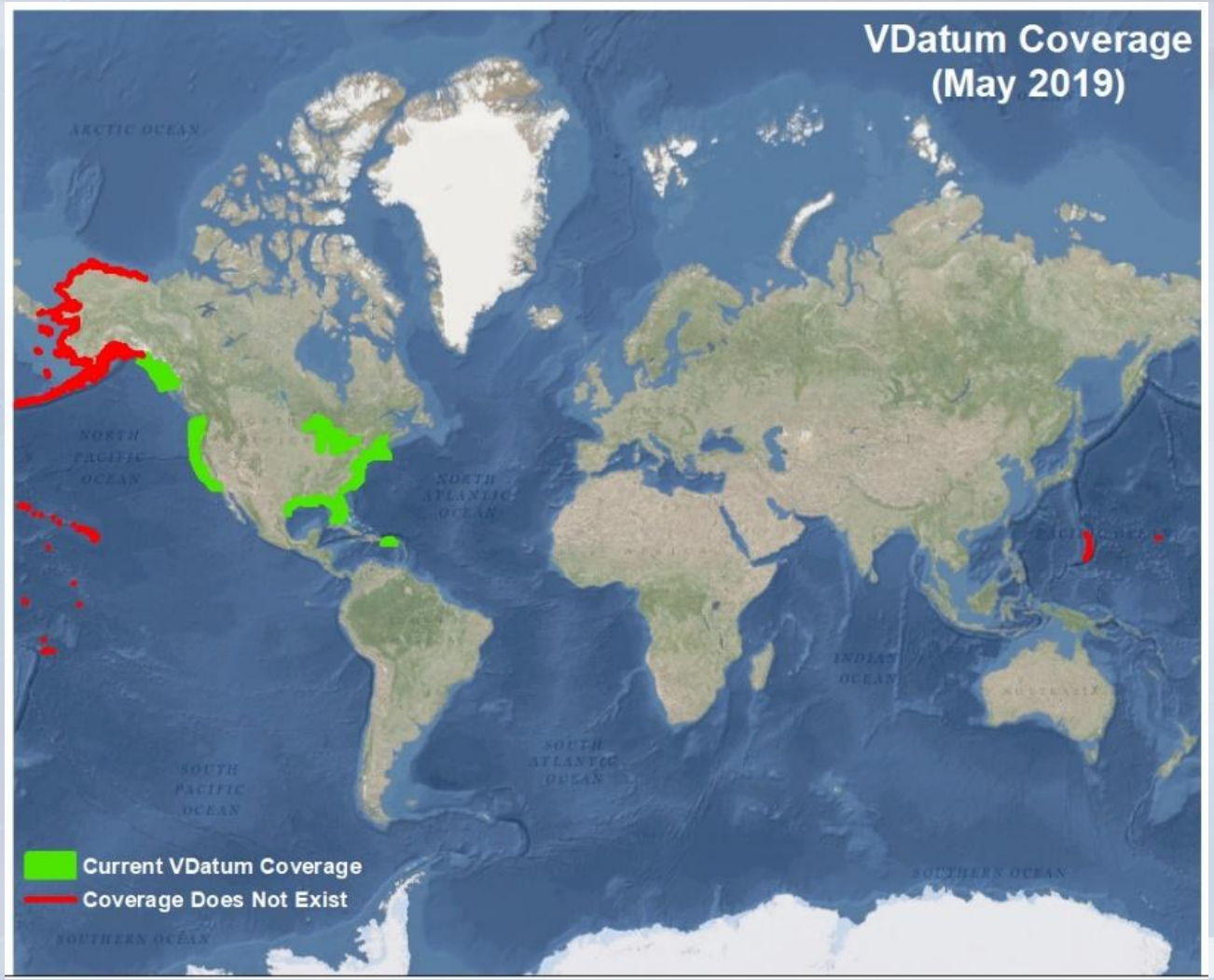
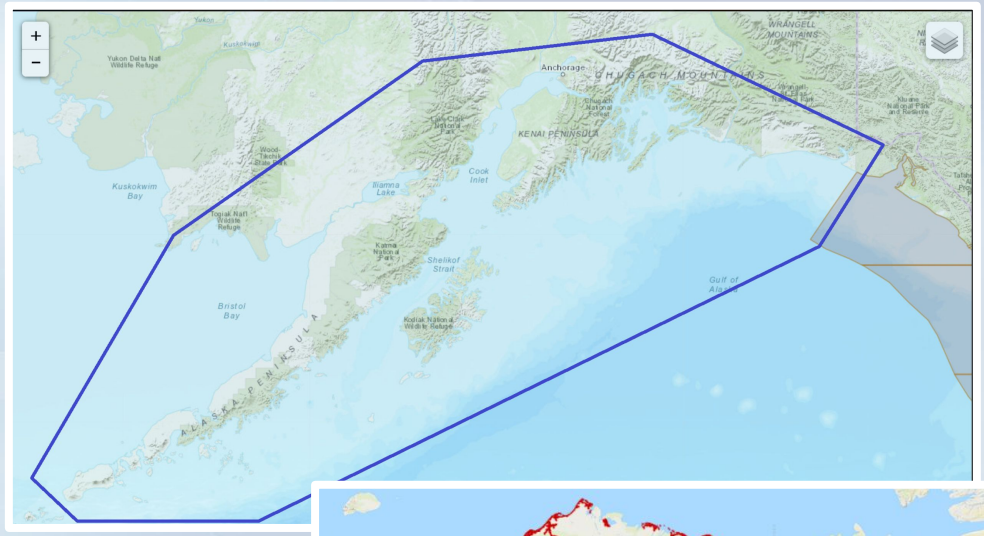
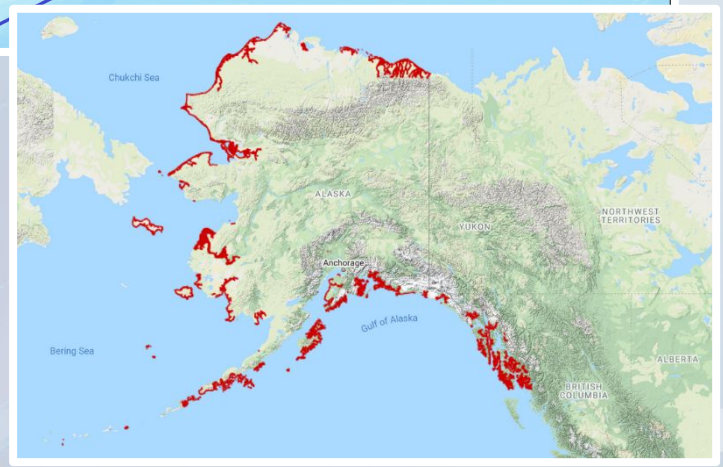
# Transition to Regional Modeling Approach



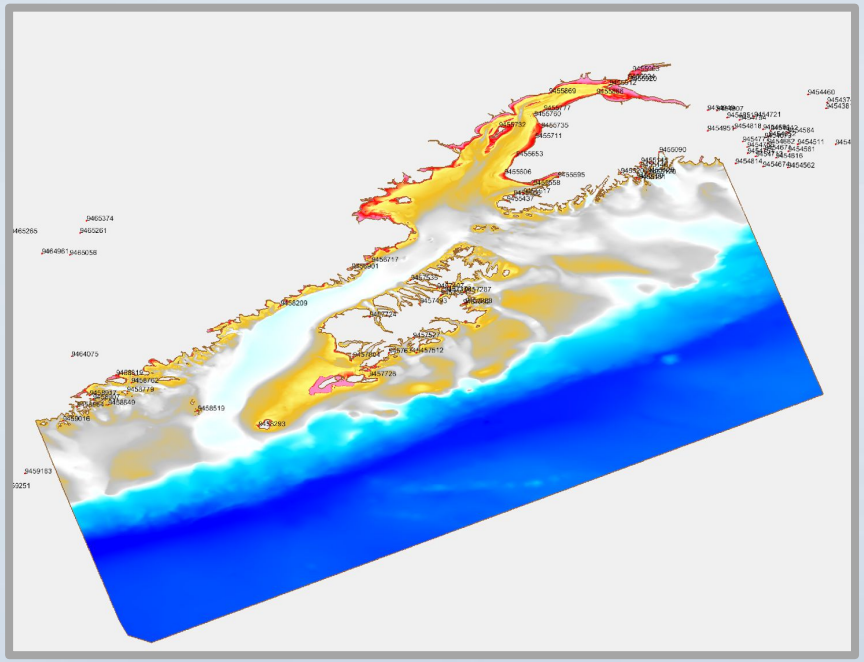
# Shoreline and Bathymetry

## CUSP "Planned"




## Bathymetry



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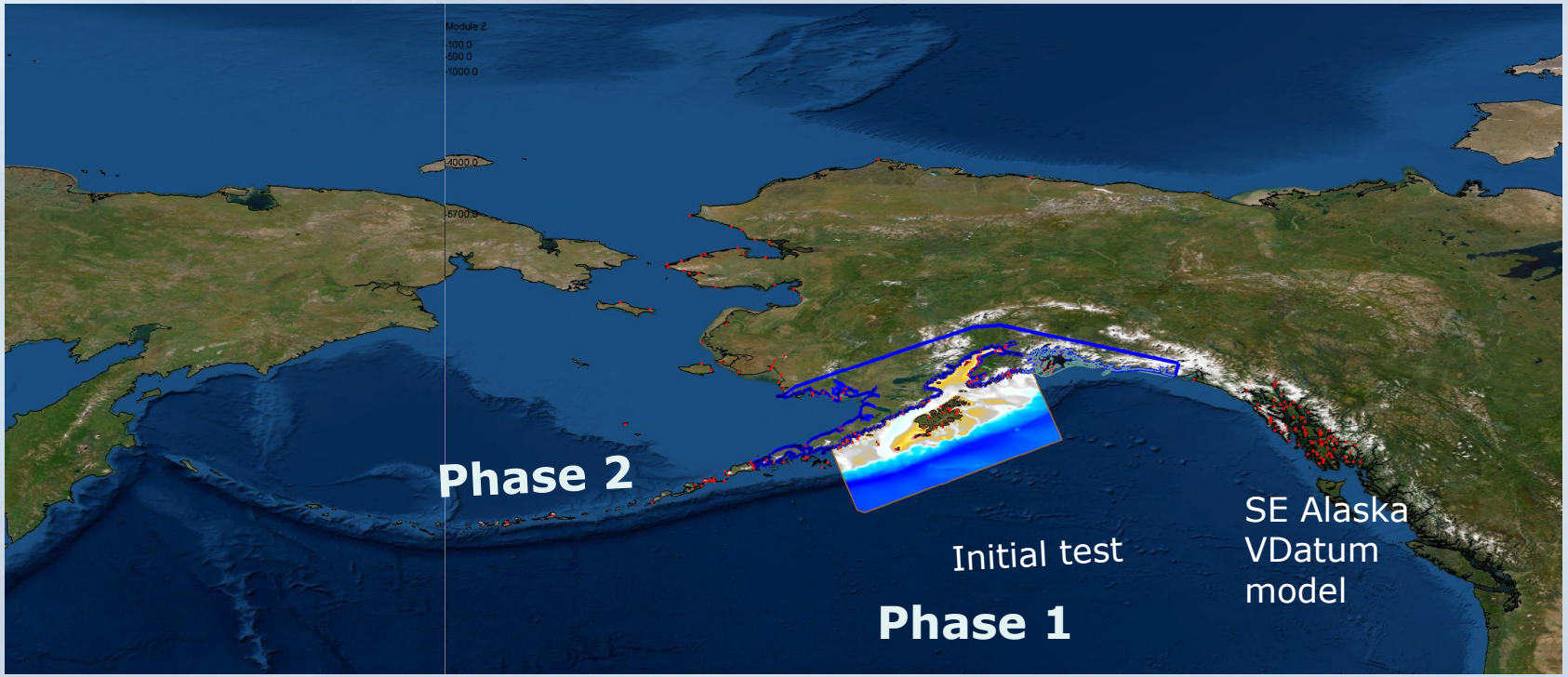
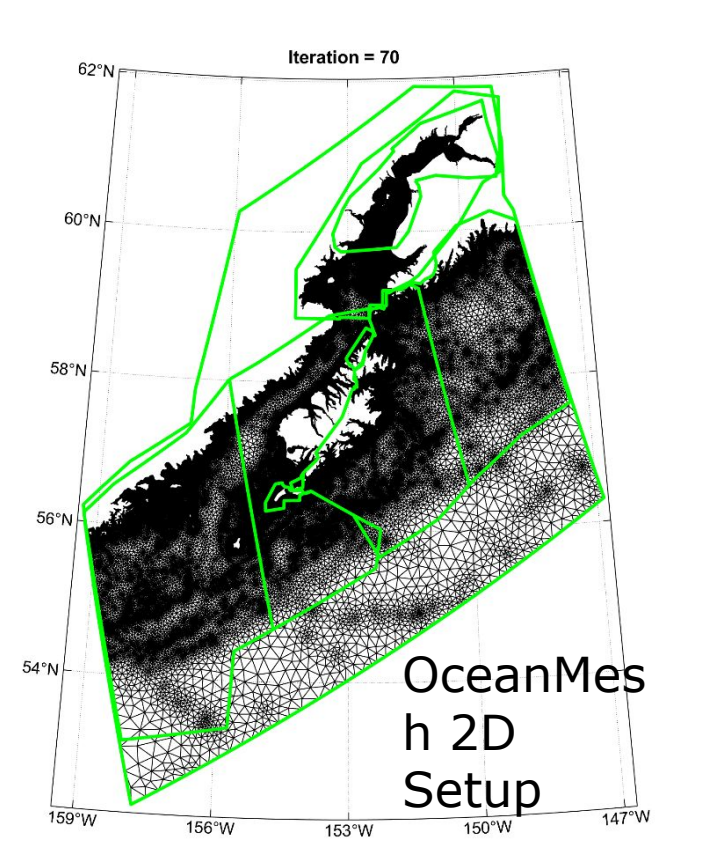
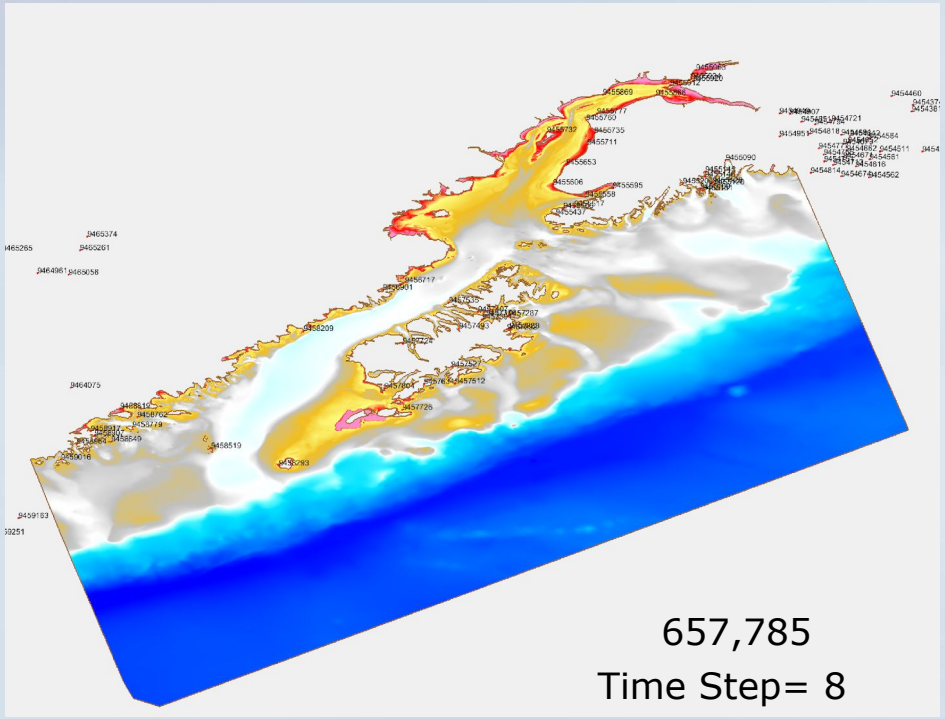
# Alaska VDatum Initial Model Testing

## Cook Inlet and Kodiak Island



# Mesh Development



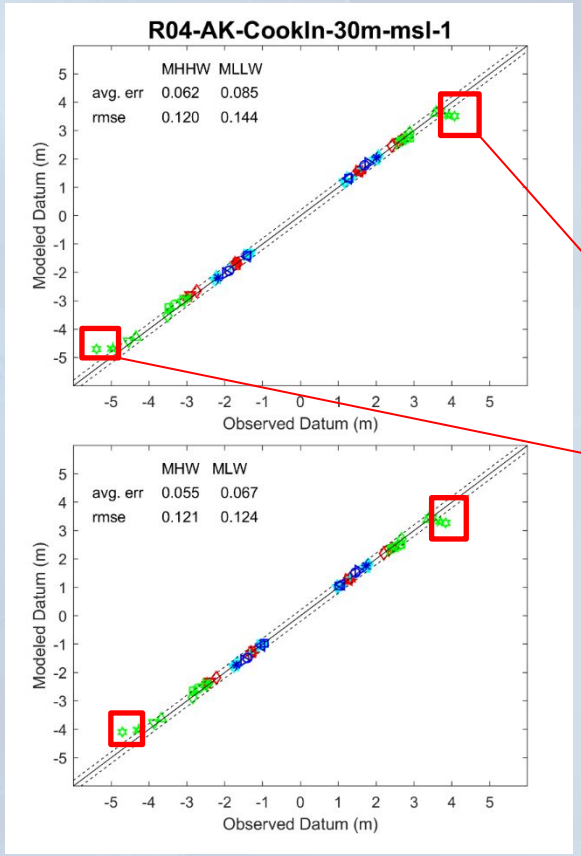



657,785

Time Step= 8 sec

```
min_el =15-30 m;
max_el_ns = 120 m;
dt =4 sec
```

# Model Validation with 44 CO-OPS tide stations



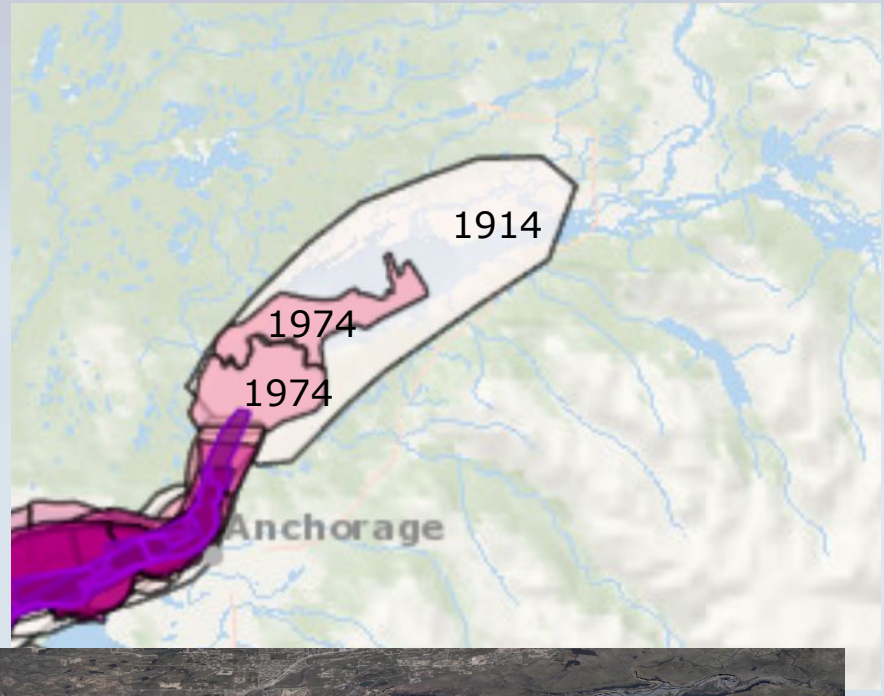

| | | | obs/mode/error MHHW | MLLW (cm) ; | | obs/model MHW | MLW | |
|---|---|---|---|---|---|---|---|---|
| 1 | 9455090 | 155 | 156 | 2 | -170-165 -4 | 126 | 127 | -127-126 |
| 2 | 9455120 | 155 | 156 | 0 | -170-165 -5 | 127 | 127 | -128-125 |
| 3 | 9455128 | 154 | 157 | 3 | -168-166 -2 | 127 | 128 | -127-127 |
| 4 | 9455145 | 155 | 158 | 3 | -169-171 3 | 127 | 129 | -128-130 |
| 5 | 9455146 | 155 | 158 | 3 | -170-177 7 | 127 | 129 | -128-132 |
| 6 | 9455151 | 155 | 157 | 2 | -170-166 -4 | 128 | 128 | -128-127 |
| 7 | 9455159 | 157 | 159 | 2 | -170-168 -2 | 129 | 130 | -130-129 |
| 8 | 9455204 | 158 | 159 | 2 | -173-166 -7 | 131 | 131 | -131-128 |
| 9 | 9455437 | 242 | 247 | 5 | -274-266 -8 | 220 | 219 | -223-219 |
| 10 | 9455500 | 259 | 260 | 1 | -291-280 -11 | 234 | 232 | -240-232 |
| 11 | 9455517 | 260 | 263 | 3 | -293-283 -10 | 235 | 235 | -242-236 |
| 12 | 9455558 | 265 | 267 | 1 | -297-286 -10 | 240 | 238 | -246-239 |
| 13 | 9455595 | 269 | 271 | 3 | -300-291 -9 | 244 | 242 | -249-243 |
| 14 | 9455606 | 265 | 267 | 2 | -296-289 -7 | 240 | 240 | -243-239 |
| 15 | 9455653 | 270 | 271 | 1 | -313-301 -12 | 249 | 245 | -254-247 |
| 16 | 9455711 | 281 | 274 | -7 | -332-314 -18 | 261 | 248 | -270-256 |
| 17 | 9455732 | 261 | 253 | -7 | -310-300 -10 | 237 | 229 | -250-242 |
| 18 | 9455735 | 288 | 275 | -13 | -348-323 -25 | 265 | 250 | -283-264 |
| 19 | 9455760 | 282 | 275 | -7 | -344-328 -16 | 260 | 252 | -279-267 |
| 20 | 9455777 | 291 | 295 | 4 | -351-343 -8 | 269 | 273 | -285-281 |
| 21 | 9455866 | 359 | 363 | 5 | -435-428 -6 | 338 | 340 | -367-363 |
| 22 | 9455869 | 288 | 293 | 5 | -351-352 2 | 267 | 271 | -285-288 |
| 23 | 9455912 | 367 | 366 | -1 | -454-443 -11 | 345 | 343 | -387-377 |
| 24 | 9455920 | 387 | 355 | -31 | -502-468 -34 | 365 | 333 | -433-402 |
| 25 | 9455934 | 392 | 354 | -37 | -495-468 -27 | 370 | 332 | -427-401 |
| 26 | 9455963 | 407 | 351 | -56 | -539-470 -68 | 384 | 327 | -470-410 |
| 27 | 9456717 | 200 | 203 | 4 | -222-218 -4 | 176 | 176 | -173-173 |
| 28 | 9456901 | 199 | 204 | 5 | -220-220 0 | 174 | 177 | -172-175 |
| 29 | 9457283 | 130 | 131 | 1 | -135-135 -0 | 101 | 103 | -101-103 |
| 30 | 9457287 | 131 | 135 | 4 | -141-138 -2 | 105 | 106 | -106-106 |
| 31 | 9457292 | 130 | 132 | 2 | -137-134 -3 | 103 | 103 | -104-103 |
| 32 | 9457376 | 159 | 167 | 7 | -185-180 -5 | 131 | 136 | -134-132 |
| 33 | 9457391 | 139 | 144 | 5 | -146-147 1 | 112 | 115 | -111-113 |
| 34 | 9457407 | 195 | 193 | -2 | -222-215 -6 | 169 | 165 | -168-166 |
| 35 | 9457493 | 206 | 208 | 2 | -225-225 -0 | 179 | 180 | -175-178 |
| 36 | 9457512 | 117 | 118 | 1 | -132-132 -1 | 99 | 98 | -98 -96 |
| 37 | 9457527 | 119 | 120 | 2 | -135-134 -1 | 99 | 100 | -98 -98 |
| 38 | 9457535 | 204 | 207 | 3 | -224-222 -2 | 178 | 178 | -174-176 |
| 39 | 9457634 | 118 | 119 | 2 | -134-133 -1 | 99 | 99 | -98 -97 |
| 40 | 9457724 | 202 | 205 | 4 | -218-220 3 | 173 | 177 | -168-174 |
| 41 | 9457726 | 126 | 131 | 5 | -141-144 3 | 108 | 110 | -103-105 |
| 42 | 9457804 | 170 | 177 | 8 | -188-194 6 | 145 | 151 | -140-149 |
| 43 | 9458209 | 179 | 185 | 7 | -198-203 6 | 153 | 158 | -149-157 |
| 44 | 9458293 | 127 | 132 | 6 | -141-141 0 | 101 | 105 | -95 -97 |

Knik Arm stations

# Bathymetry Data Sources

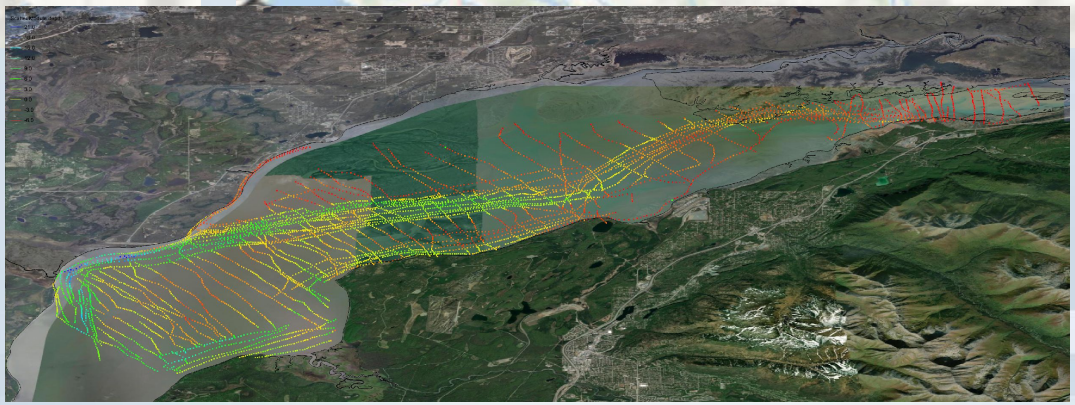
NOS BAGs Data Coverage (high quality data)


Old Point Bathy survey Data

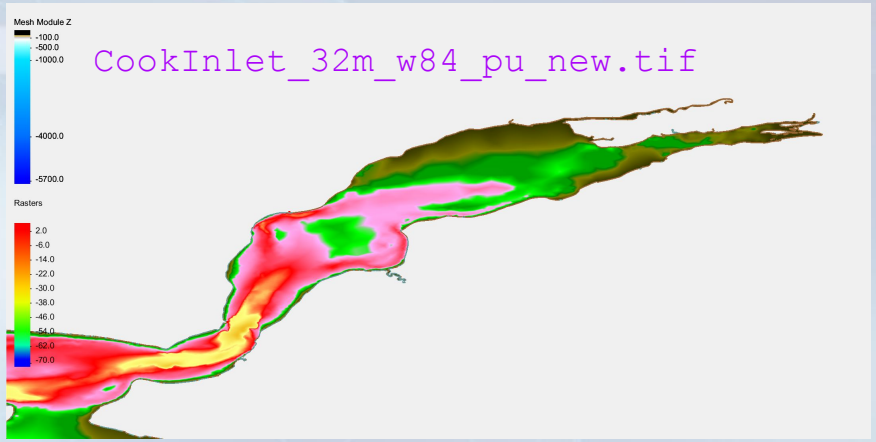



## 1914 Bathy survey data

It doesn't match the satellite image nor CUSP shoreline.



## Run 04


Mesh Module Z
-100.0
-500.0
-1000.0
-4000.0
-5700.0
Rasters
2.0
-6.0
-14.0
-22.0
-30.0
-38.0
-46.0
-54.0
-62.0
-70.0
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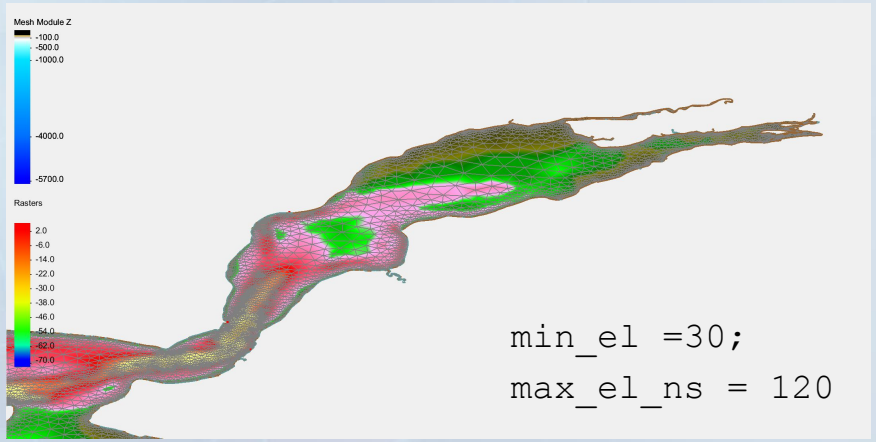
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Rasters
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-6.0
-14.0
-22.0
-30.0
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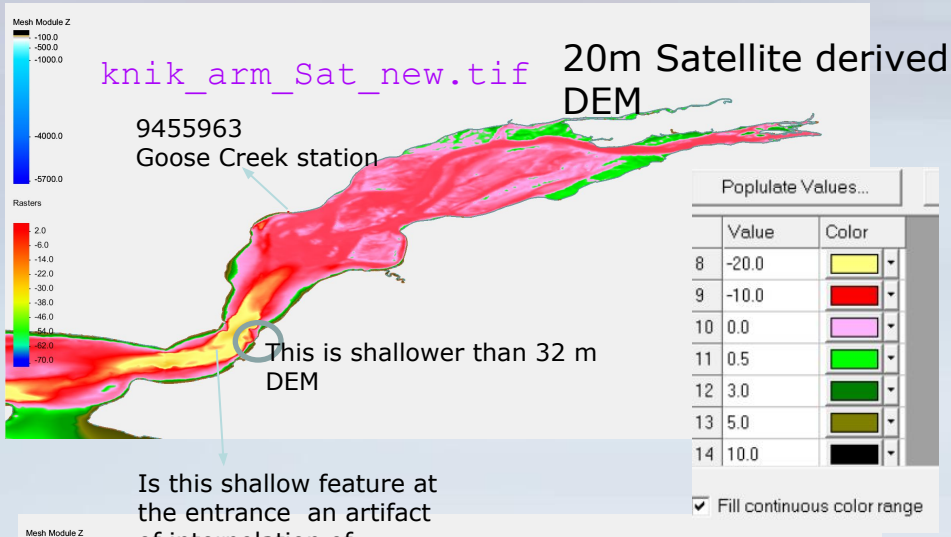
## Run 05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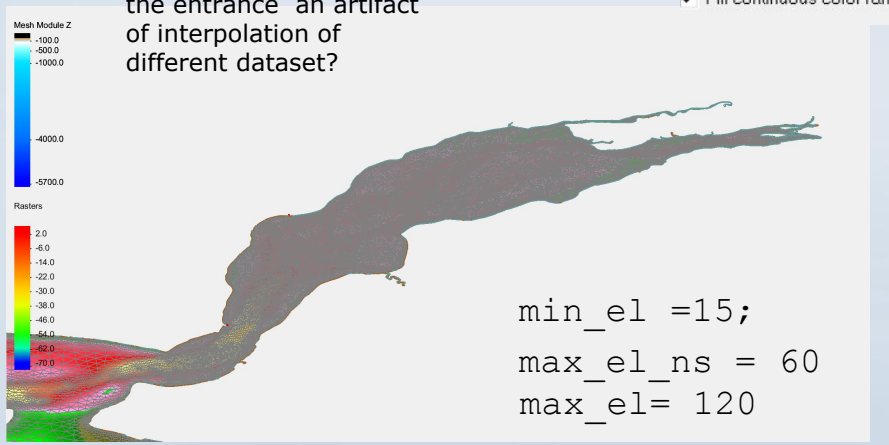
-30.0
-38.0
-46.0
-54.0
-62.0
-70.0
knik_arm_Sat_new.tif
20m Satellite derived DEM
9455963
Goose Creek station
This is shallower than 32 m DEM
Is this shallow feature at the entrance an artifact of interpolation of different dataset?
Poplulate Values...
Value
Color
8 -20.0
9 -10.0
10 0.0
11 0.5
12 3.0
13 5.0
14 10.0
Fill continuous color range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Rasters
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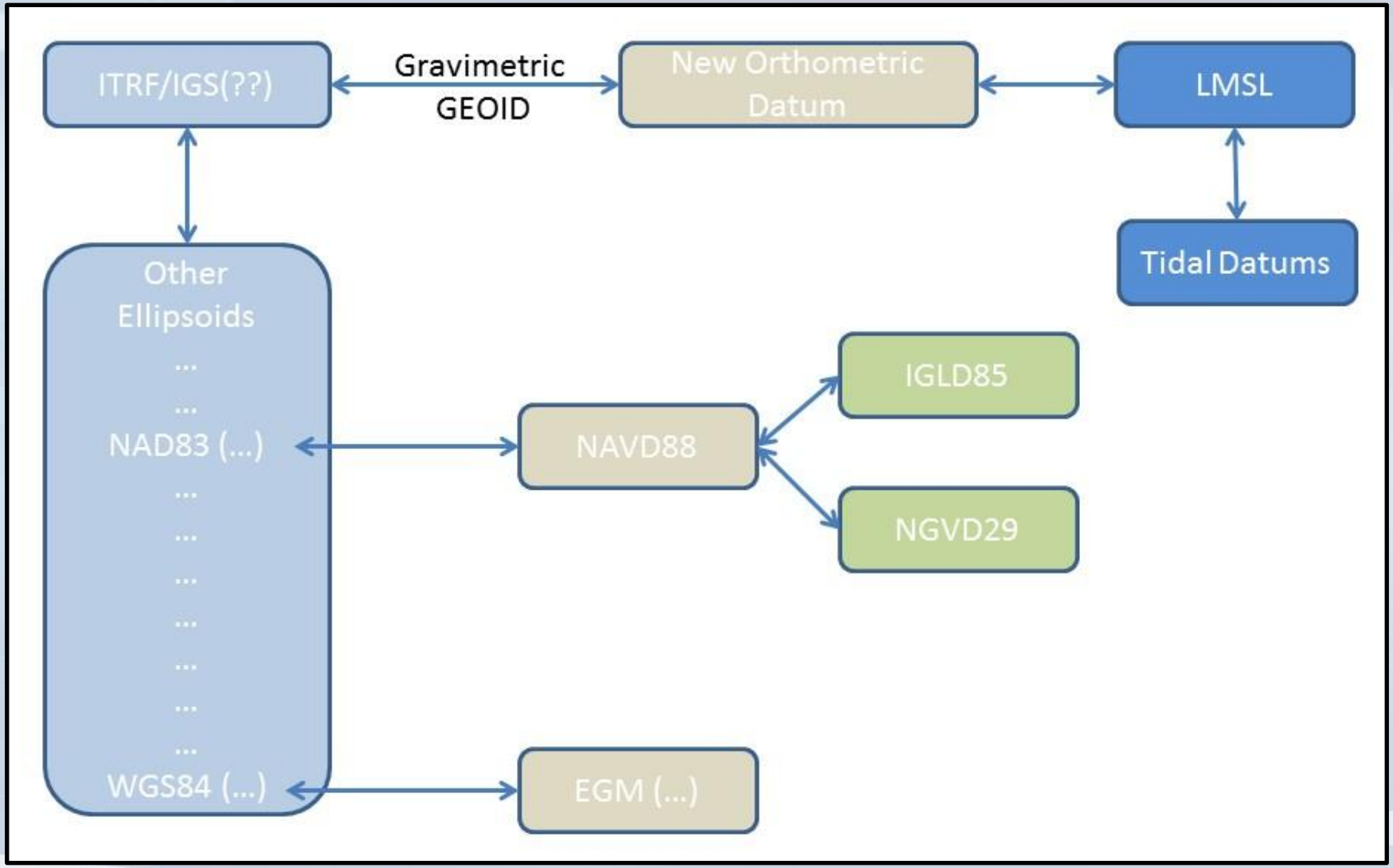
# VDatum: *Updated NSRS*

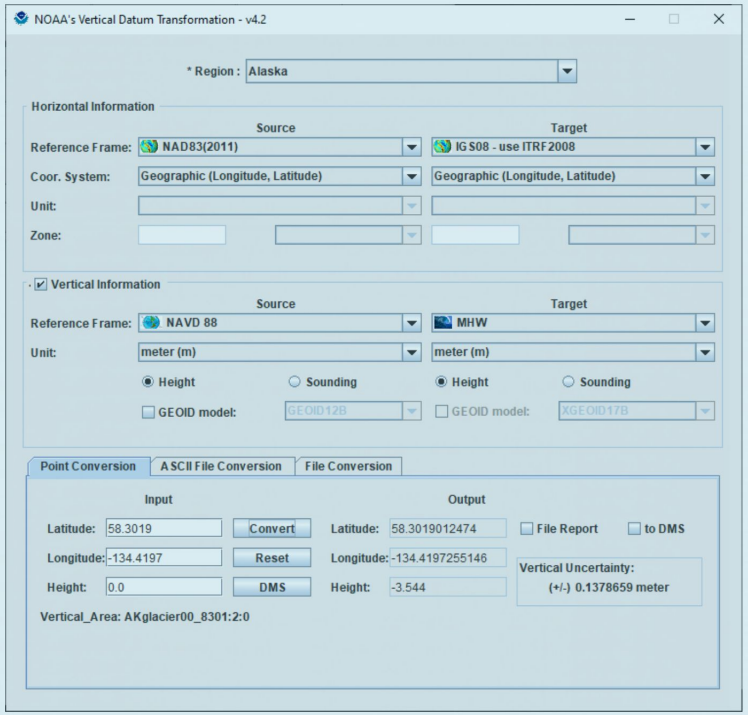


# VDatum: Preparing for an *Updated NSRS*

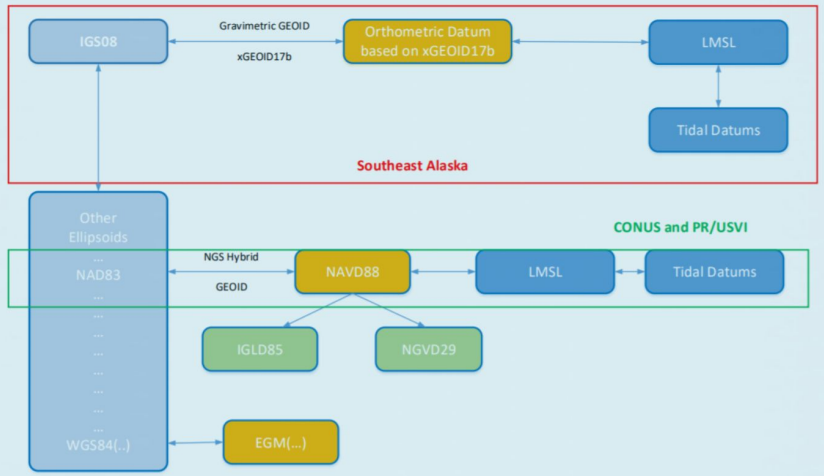
## SE Alaska

When transforming in the Southeast Alaska regional model and traversing to Local Mean Sea Level (LMSL) or other Tidal Datums, it is important to understand the transformation roadmap differs from that of other currently supported VDatum regional models. You will notice that the Target Horizontal reference frame automatically changes to IGS08 when selecting LMSL or a Tidal Datum as the source or target vertical datum while in Alaska. The reason for this is that our roadmap traverses through IGS08, then utilizes xGEOID17B, and then into LMSL with the Topography of the Sea Surface (TSS) and then to tidal datums. All other VDatum regional models traverse through NAD83 and then to NAVD88 utilizing a NGS Hybrid GEOID.

Sample Scenario:




SEAK Tidal Vertical Datum Transformation "Roadmap" shows the difference from CONUS & PR/USVI Tidal roadmap.

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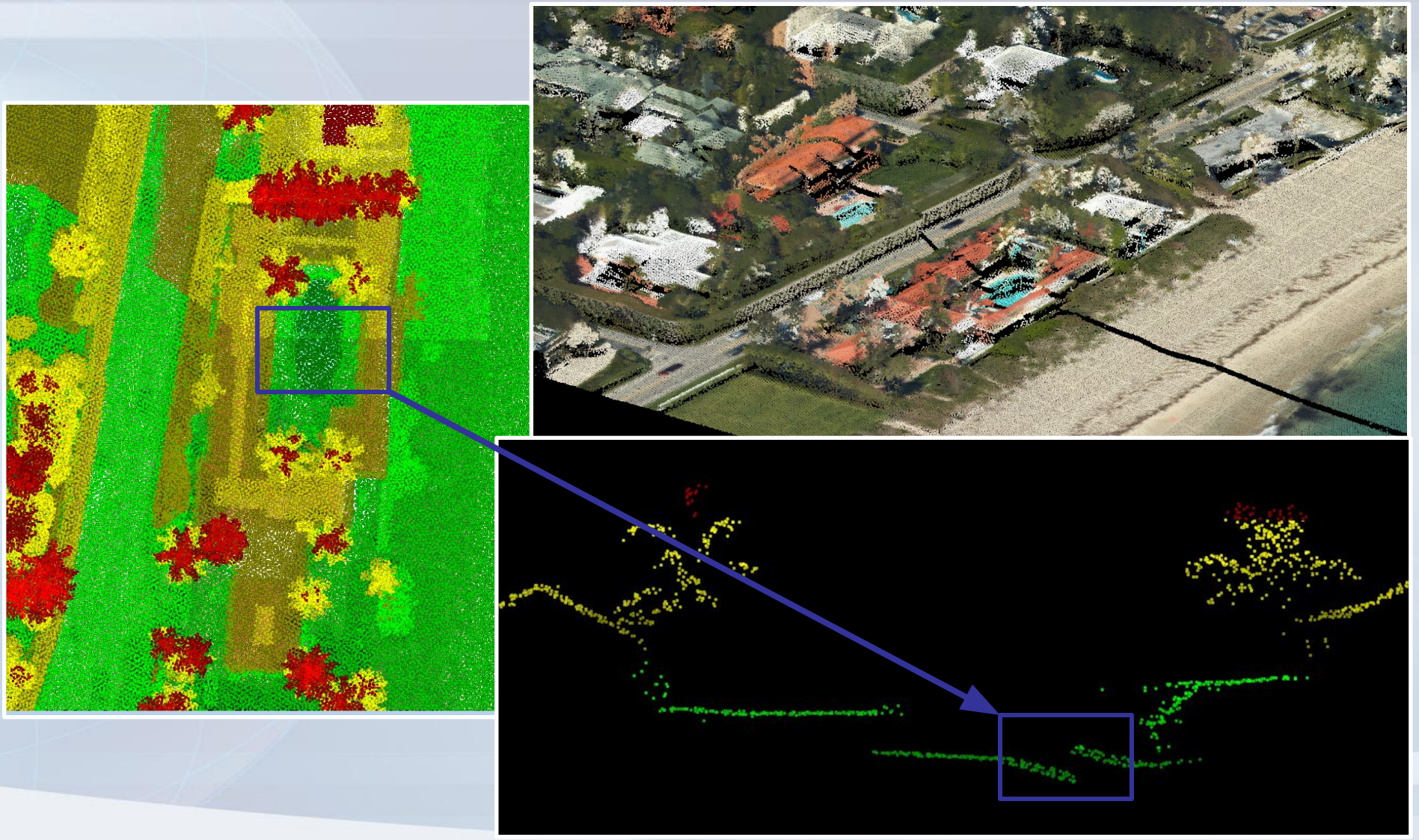
# Point Cloud Discrepancies



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

# Applying the new GEOID incorrectly

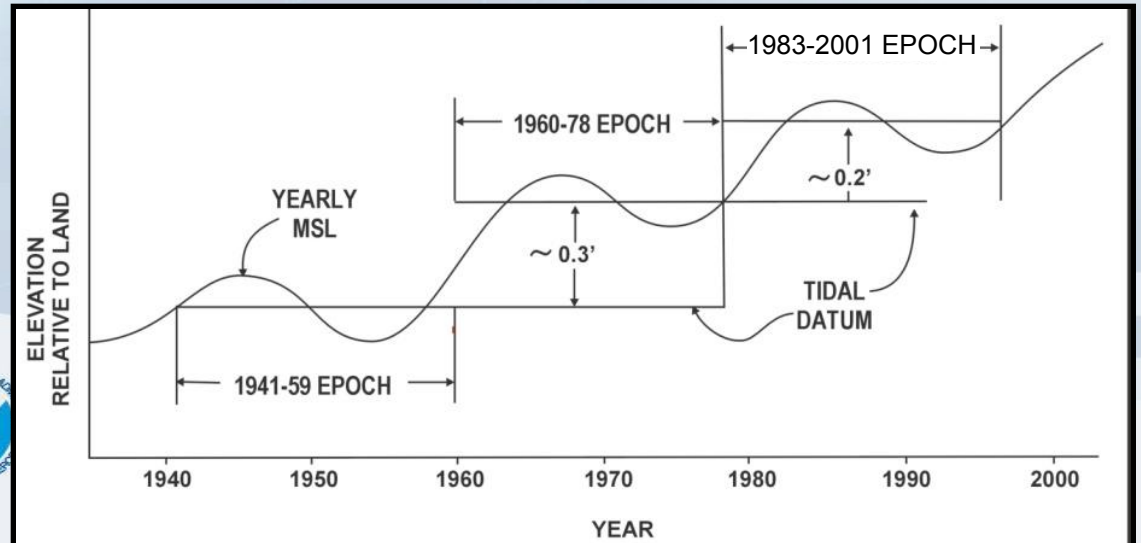
4-6 Degree sloping beach

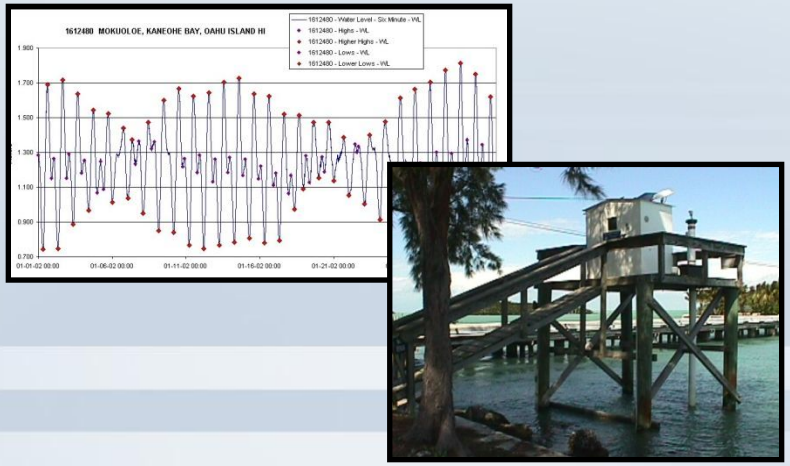
# National Tidal Datum Epoch (NTDE)

## 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



# Thank You!

## Contact Information:

**Email:** ***vdatum.info@noaa.gov***

**Website:** ***http://vdatum.noaa.gov***

***Stephen White***
Email: stephen.a.white@noaa.gov
Phone: (240) 533-9588

National Oceanic and Atmospheric Administration

# NOAA Remote Sensing Division

Stephen White

**December 1st, 2021 | Virtual**


# NGS Coastal Mapping Program

## Shoreline, Imagery, and Nearshore Bathymetry

Stephen White
Remote Sensing Division
National Geodetic Survey

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**

National Oceanic and Atmospheric Administration

# The RSD Coastal Mapping Program

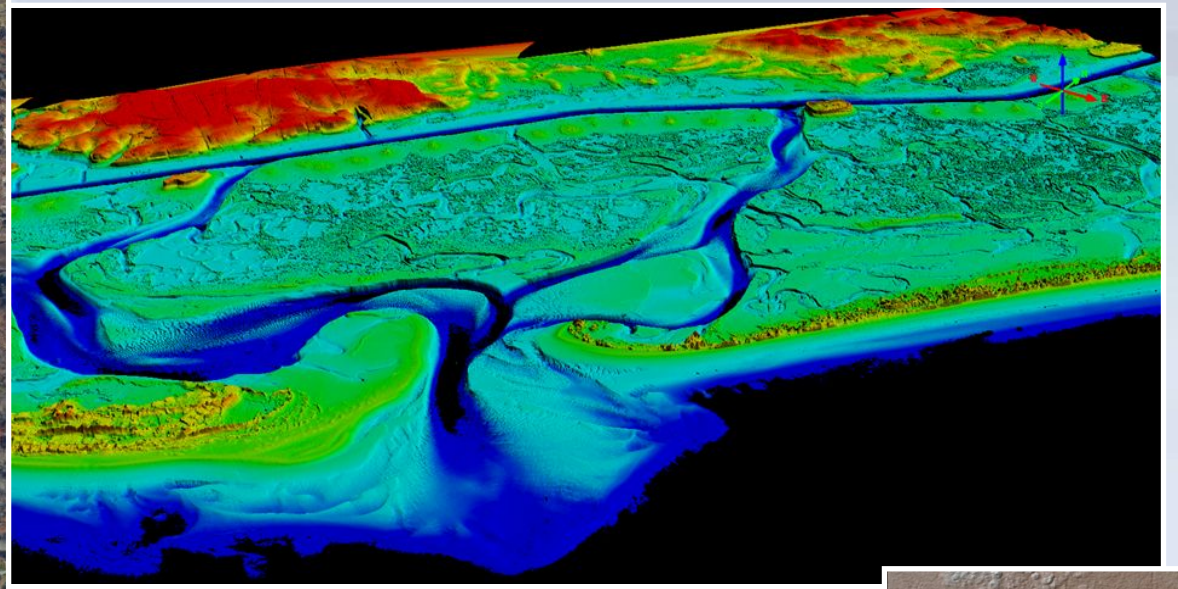
- **A congressional mandate to conduct remote sensing surveys of coastal regions of the United States and its possessions for demarcating the nation's legal coastline.**

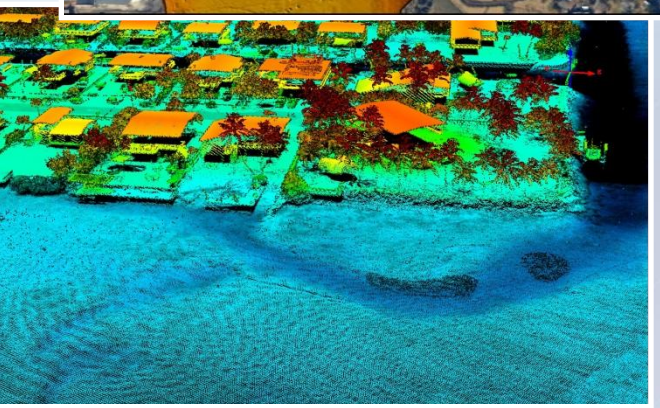
- **Goals:**
  - Provide the Nation With Accurate, Consistent, Up-to-Date National Shoreline
  - Acquire Nearshore Elevation Data

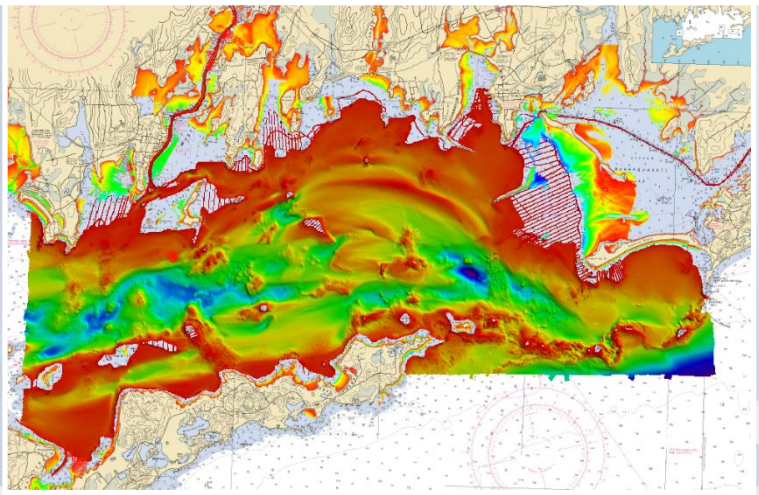
- **Sources:**
  - **Lidar**
  - **Digital Cameras**
  - **High Resolution Satellites**
  - **UAS**

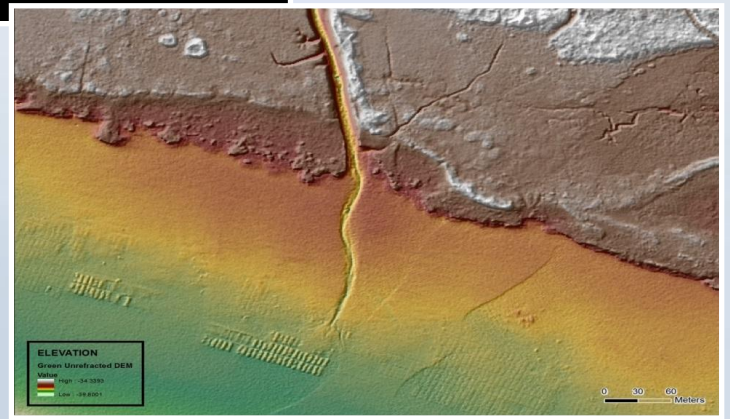
National Oceanic and Atmospheric Administration

# NGS's Topobathy lidar data







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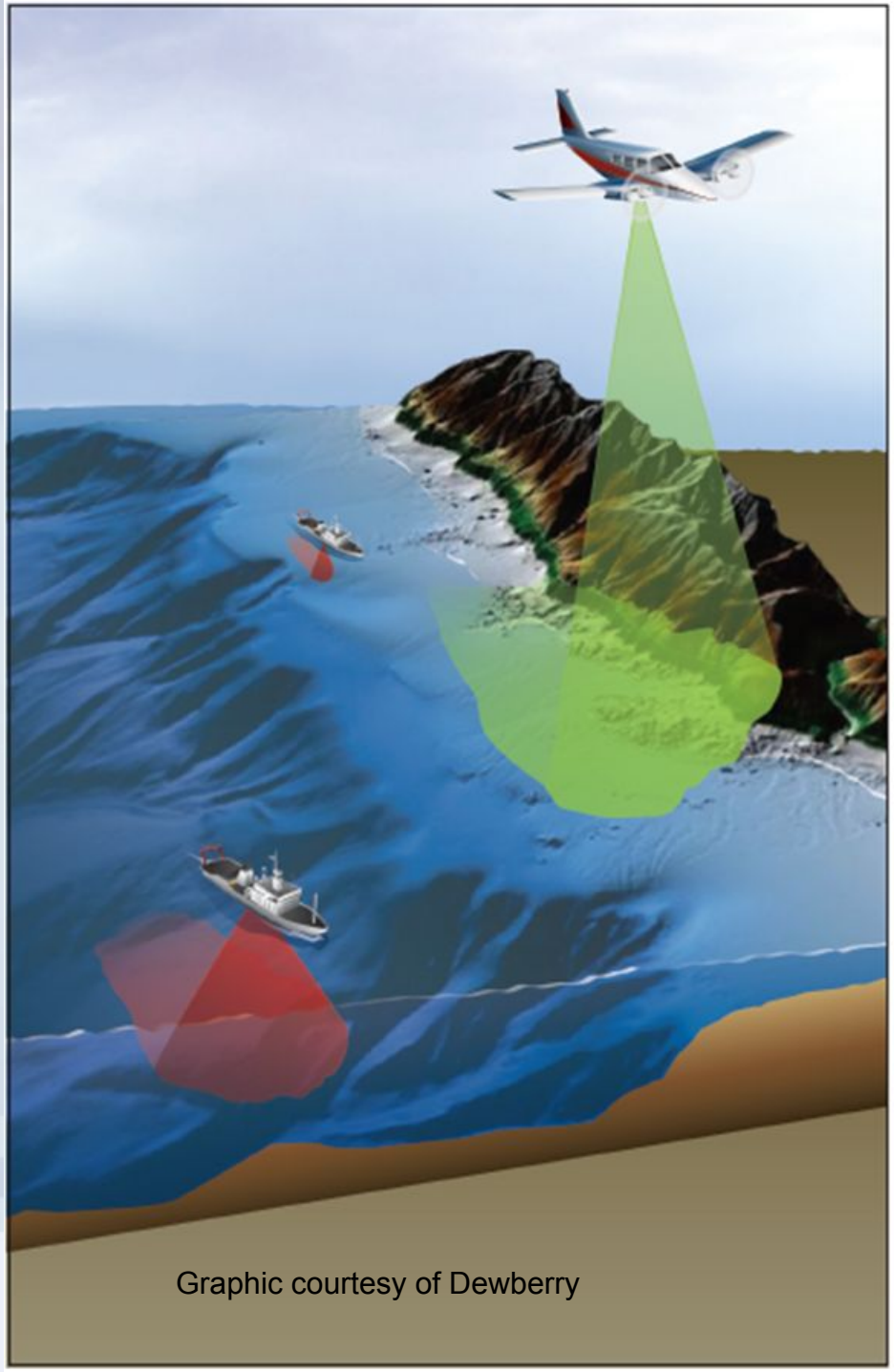
# Support of Hydrographic Surveys

- 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

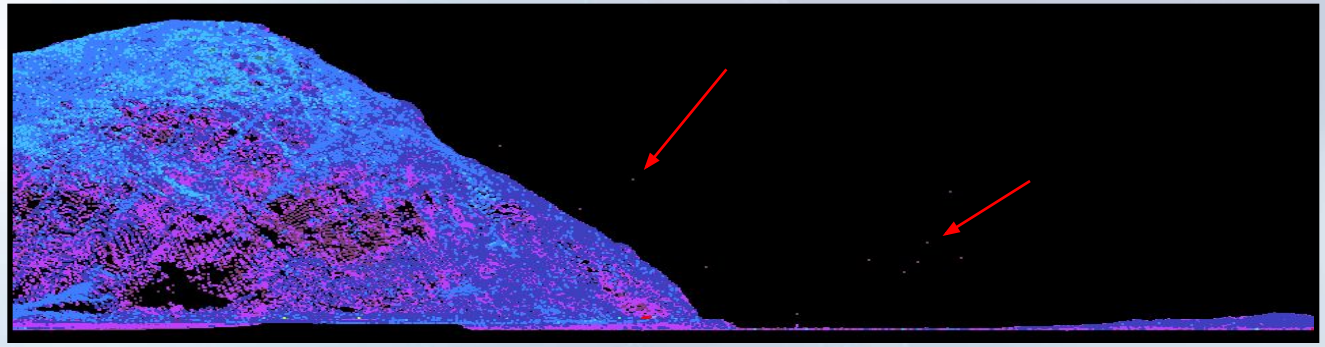


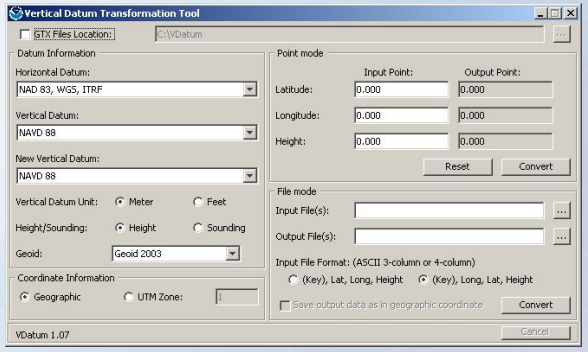
Graphic courtesy of Dewberry

National Oceanic and Atmospheric Administration

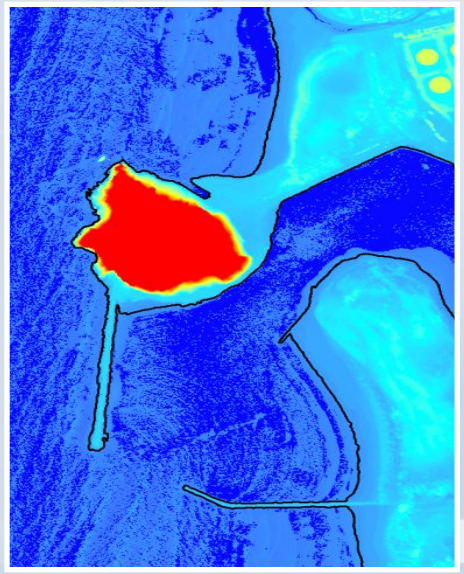
# Lidar Shoreline Extraction

Edit Lidar Point Cloud

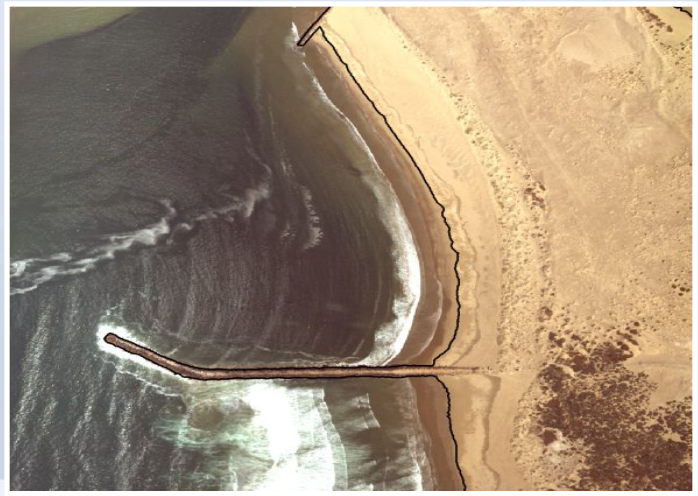





VDatum



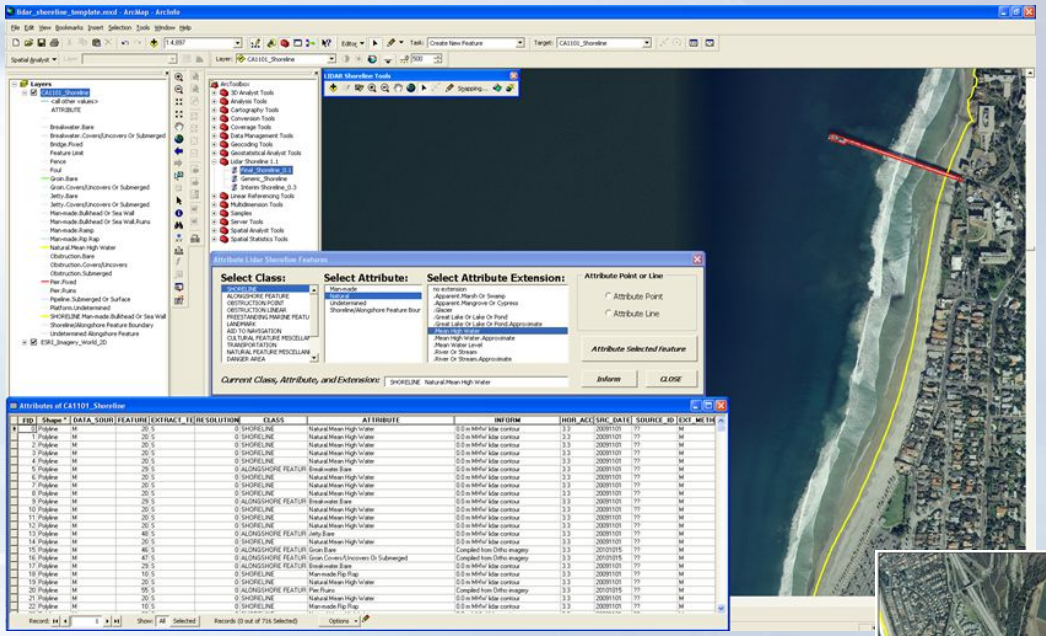
Contour Shoreline from DEM



Quality Control &
Feature Attribution

National Oceanic and Atmospheric Administration

# Imagery



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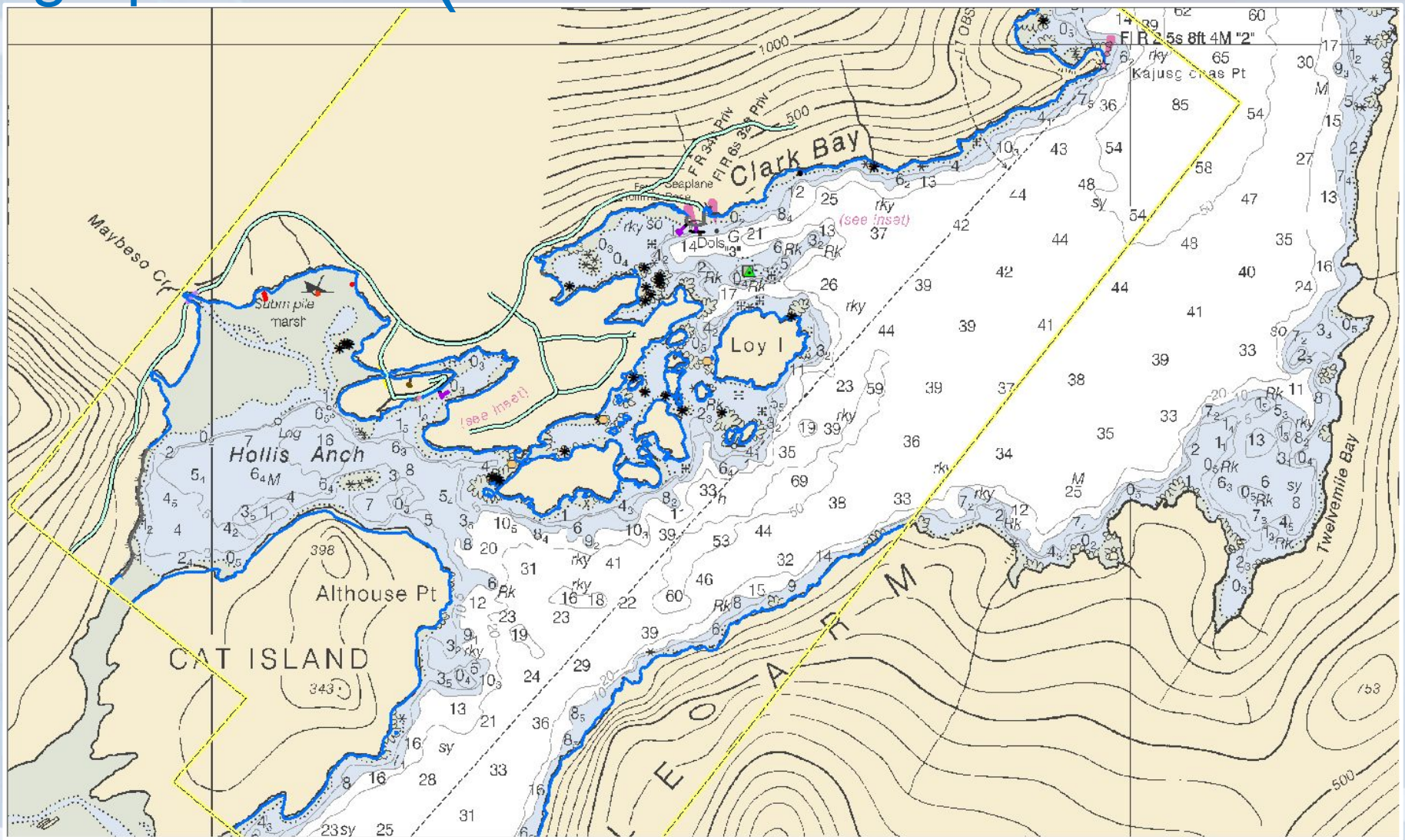
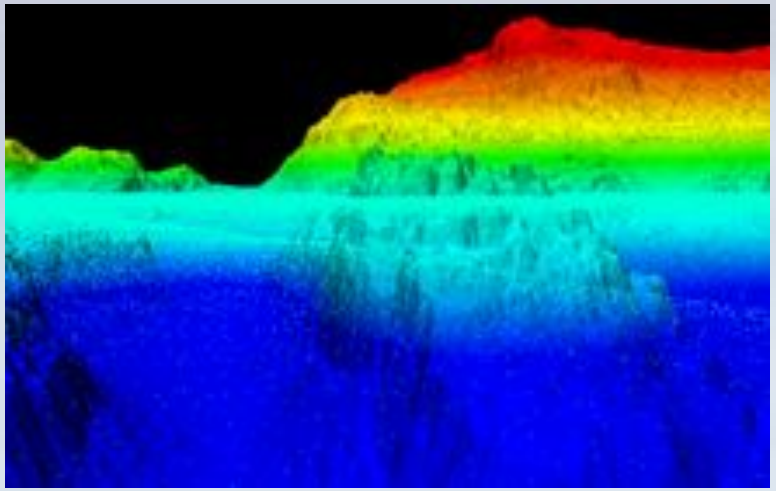
# Geographic Cells (Nautical Chart Shoreline)

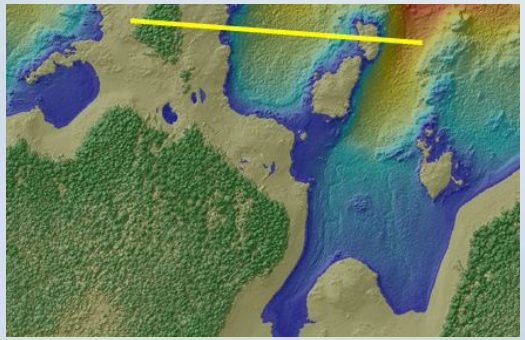


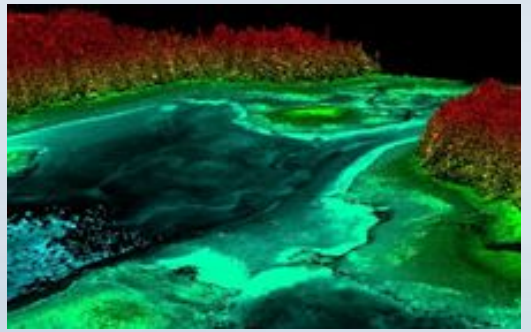

National Oceanic and Atmospheric Administration

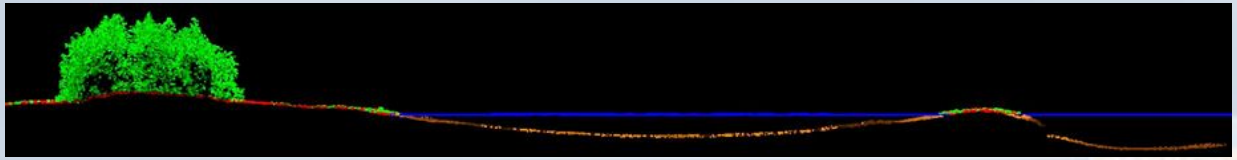
# Coastal Mapping Program (CMP): Revillagigedo Channel, AK

- **Sensors**
  - Leica Chiroptera 4X/Hawkeye 4X (topobathy)
  - Riegl 1560ii (NIR)
  - UltraCam Eagle (4 band Imagery)
- **Acquisition**
  - Initial Area – 6/8/21 – 7/3/21
  - Optional Area – 7/30/21 – 8/2/21
  - Imagery in Optional Area is still pending due to weather
- **Ground Survey**
  - Limited paved/hard ground
  - Access mostly by boat
- **Bathy Penetration**
  - Average depth of extinction ~12 meters
  - Max depths ~16-20+ meters





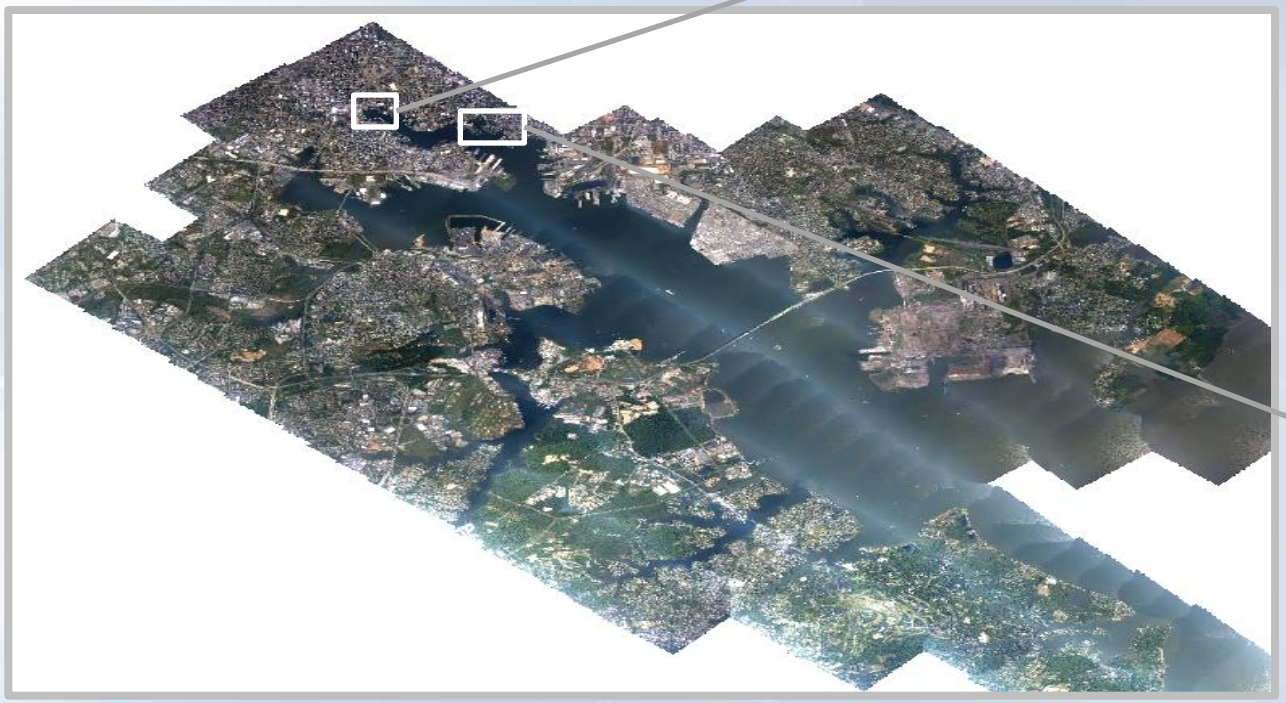




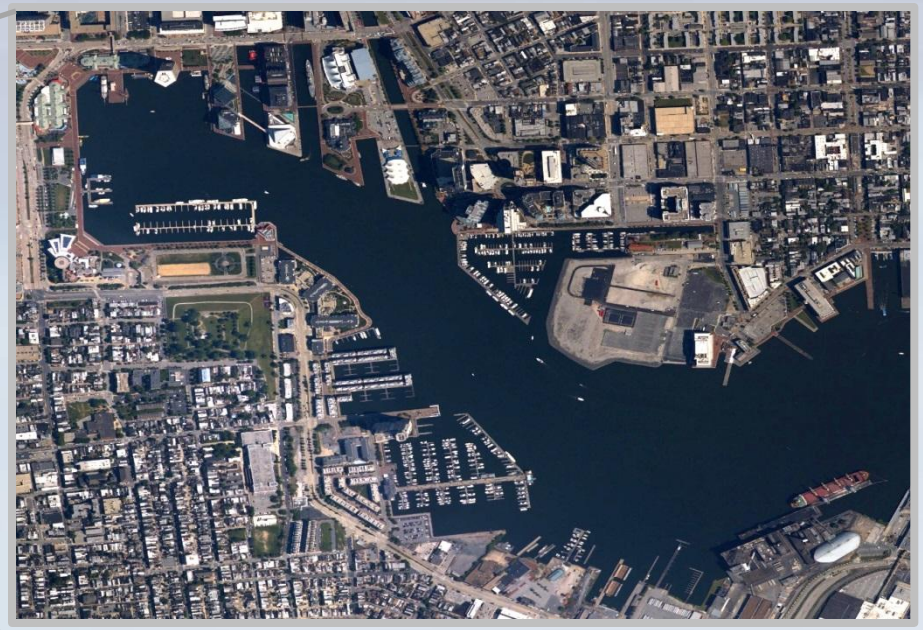
National Oceanic and Atmospheric Administration

NV5 GEOSPATIAL

# High Resolution Digital Aerial Imagery and Shoreline

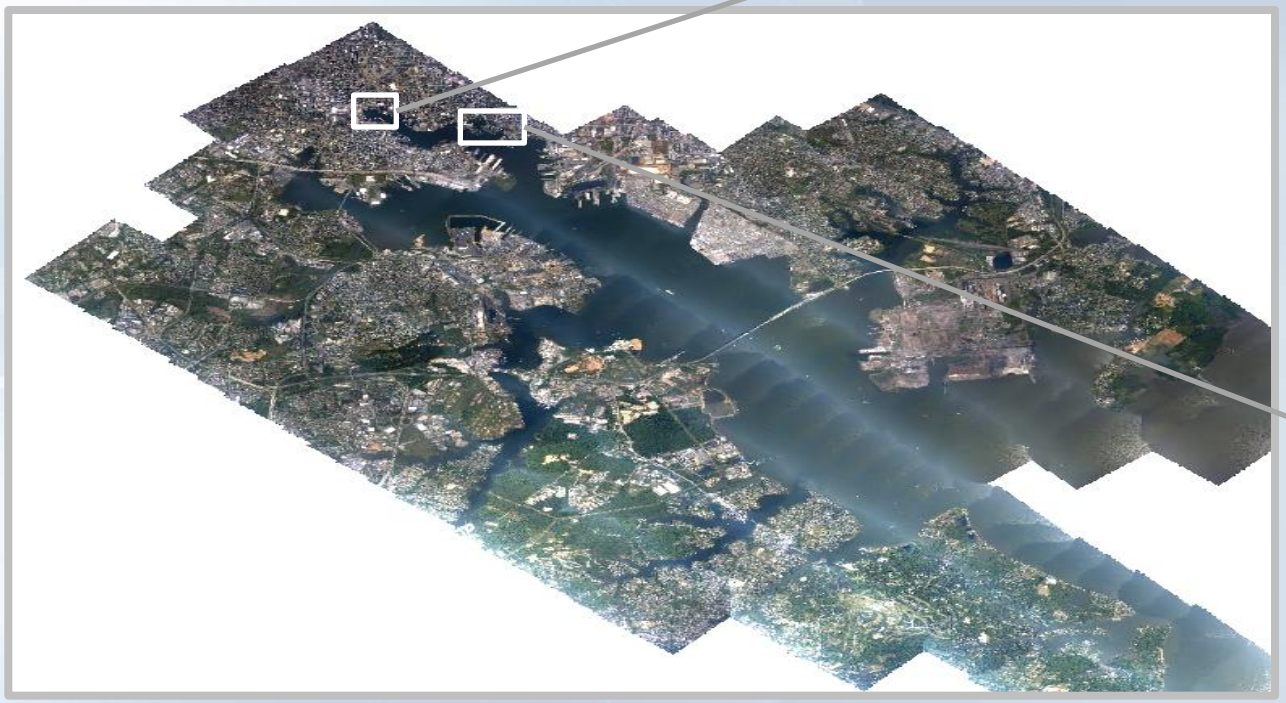


Baltimore, MD

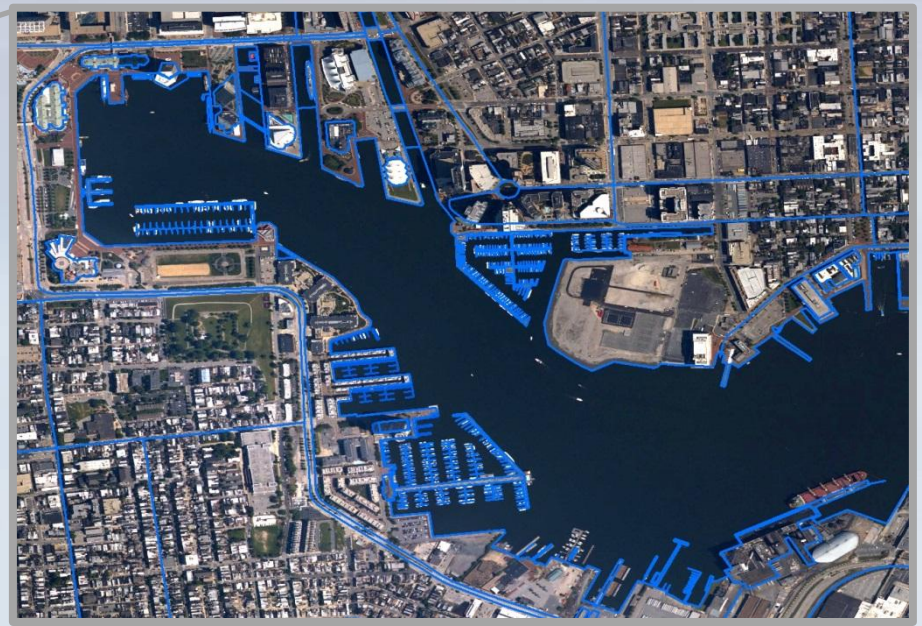


National Oceanic and Atmospheric Administration

# High Resolution Digital Aerial Imagery and Shoreline

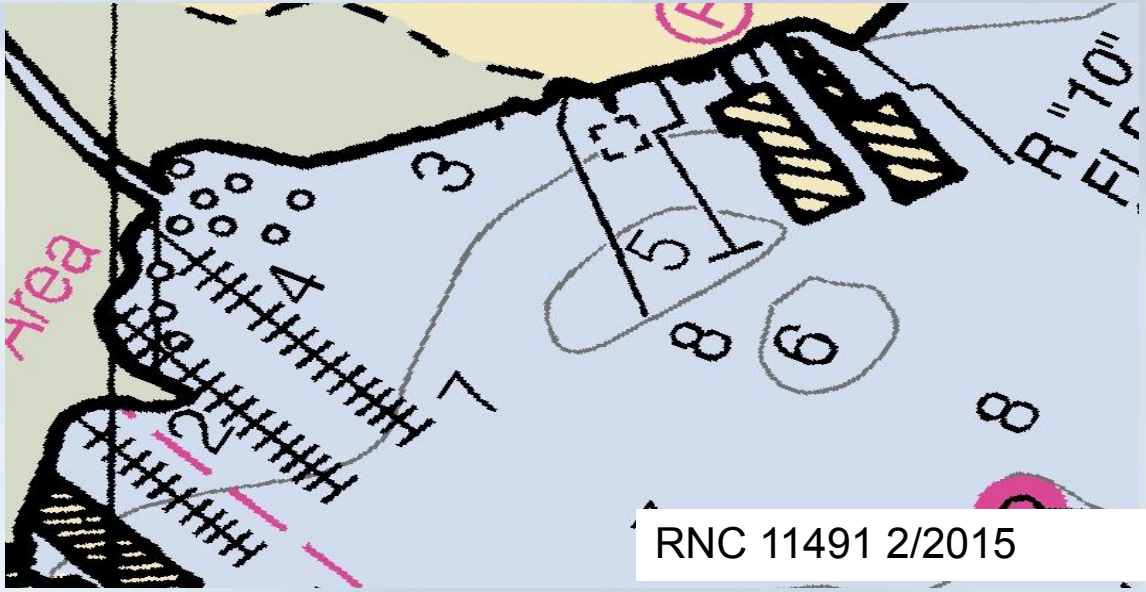


Baltimore, MD

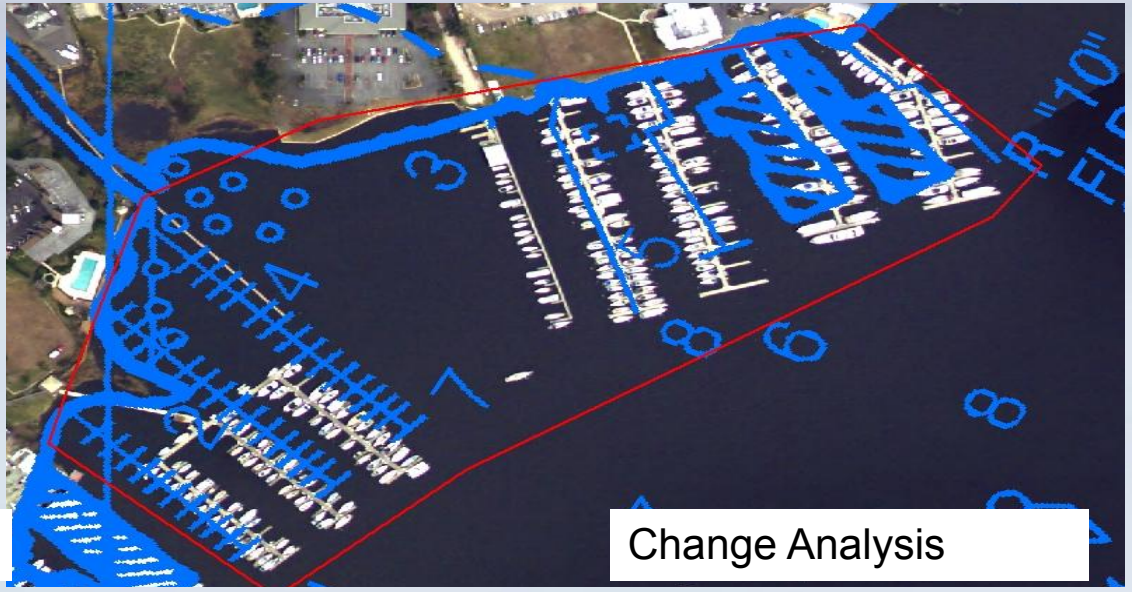


National Oceanic and Atmospheric Administration

# Coast and Shoreline Change Analysis Program (CSCAP)




RNC 11491 2/2015



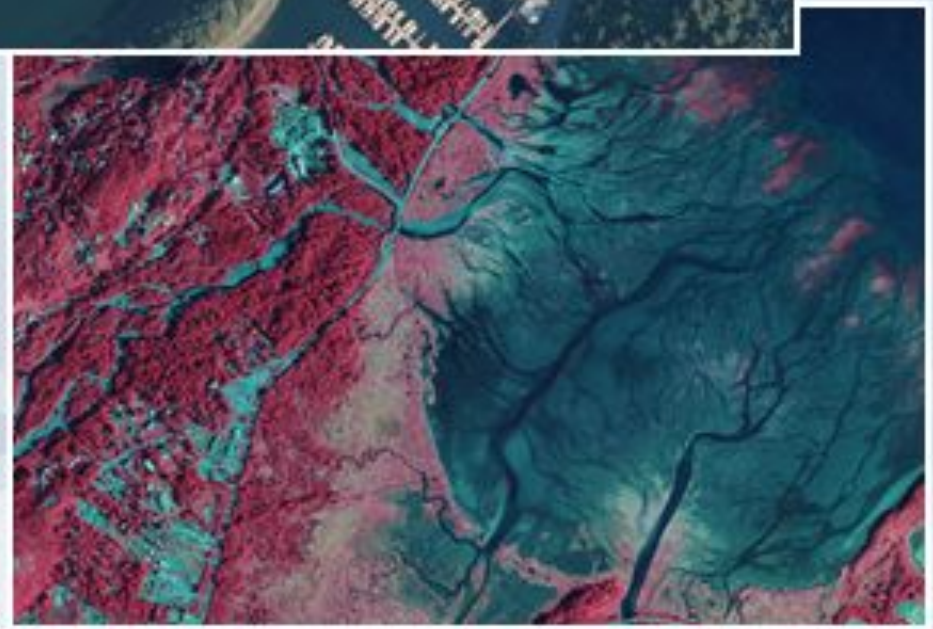

Change Analysis

Shoreline Compilation (GC 11196)


Updated RNC

# Coastal Shoreline and Change Analysis Program (CSCAP) : Alaska Ports

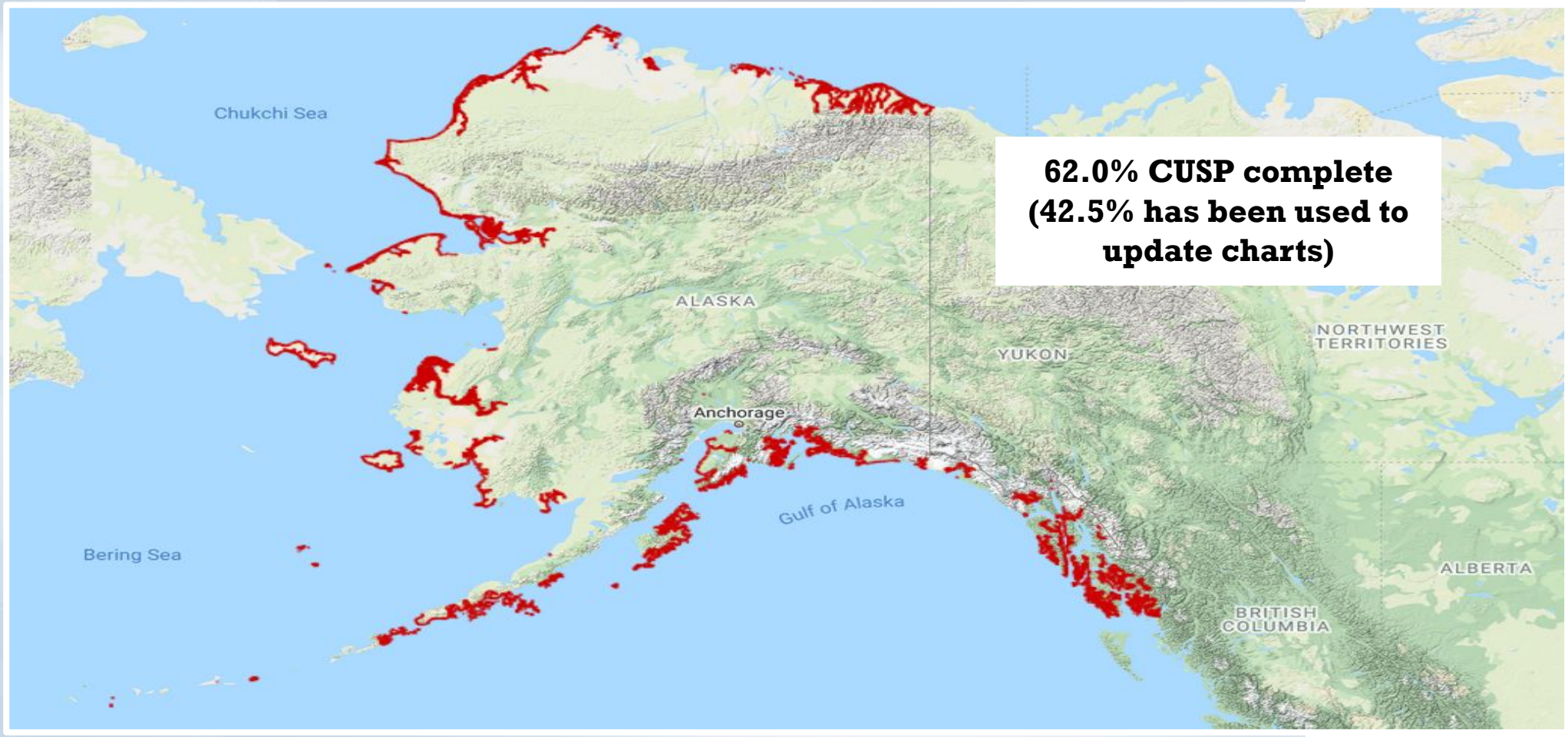




- **Ports:** Anchorage, Juneau, Ketchikan, Kivalina, Kodiak, Nikiski-Kenai, Petersburg, Valdez
- **Imagery:**
  - Stereo and Ortho products
  - 4-band (R,G,B,NIR)
  - 25cm orthos

National Oceanic and Atmospheric Administration

# Continually Updated Shoreline Product (CUSP)




https://www.ngs.noaa.gov/NSDE/

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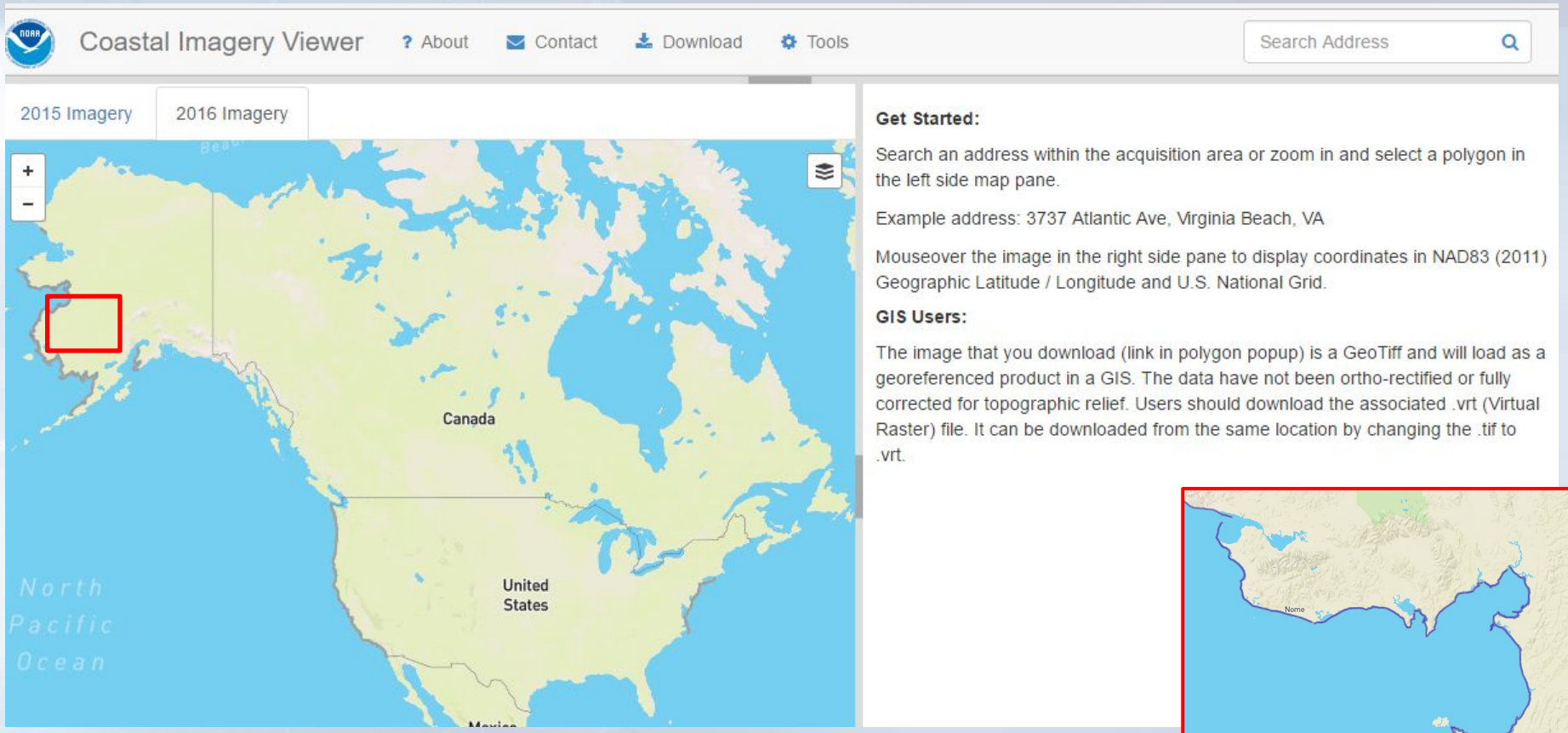
# Coastal Semi-Oblique Imagery viewer

https://geodesy.noaa.gov/storm_archive/coastal/viewer/index.html





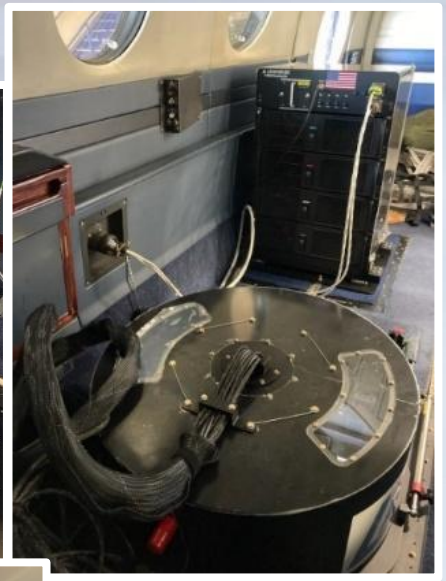


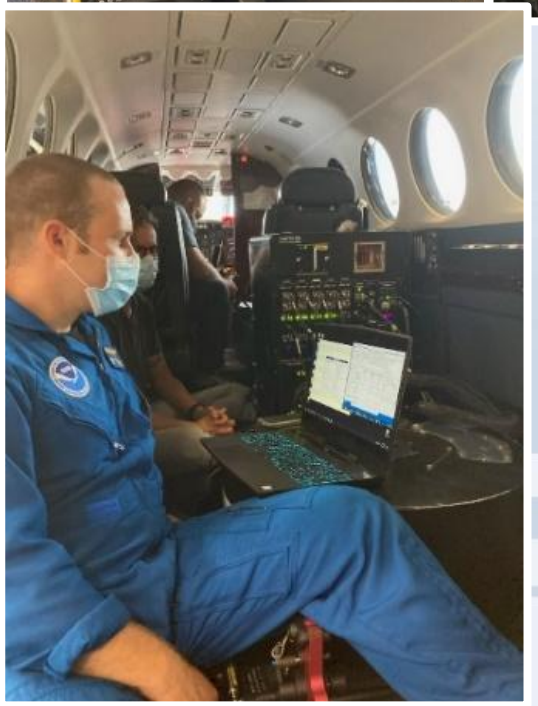
National Oceanic and Atmospheric Administration

# New Camera System

**Digital Sensor System (DSS) V6** (King Air)

- 150MP RGB camera (x2)
- 100MP NIR camera (x2)
- Nadir and Oblique orientations



National Oceanic and Atmospheric Administration

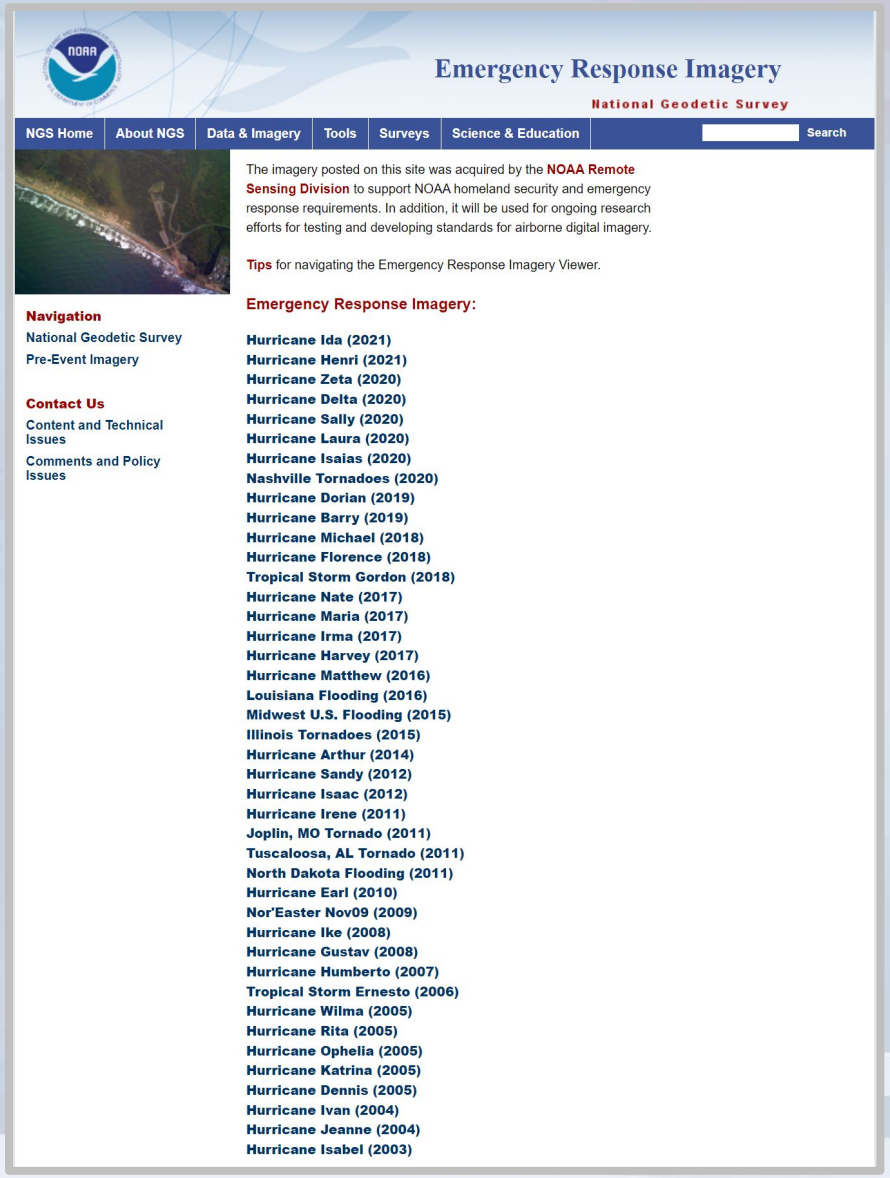
# Emergency Response

Remotely sensed data is acquired to support NOAA's homeland security and emergency response requirements.

NOAA maintains the capability to provide tools, technology, and expertise in a timely and efficient manner.

The remotely sensed data collected is disseminated to federal, state, and local government agencies as well as the general public to facilitate support efforts.

# Emergency Response

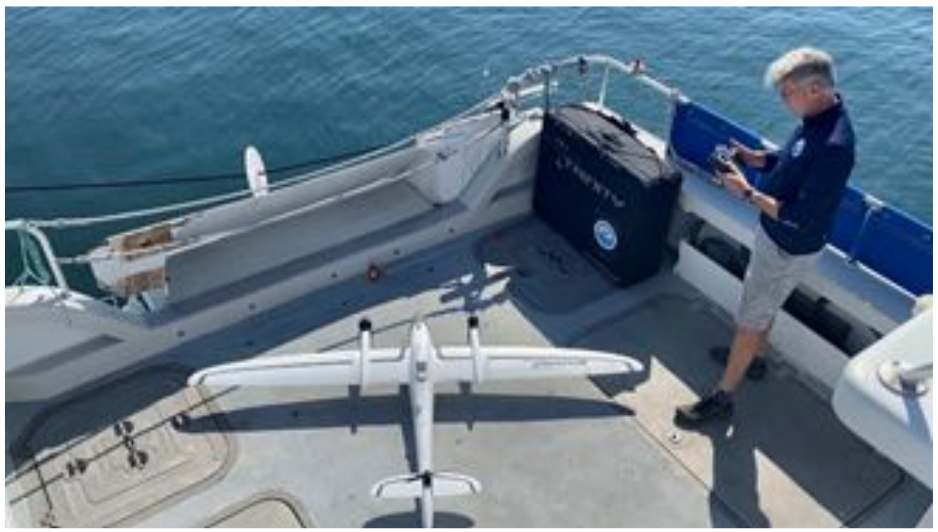


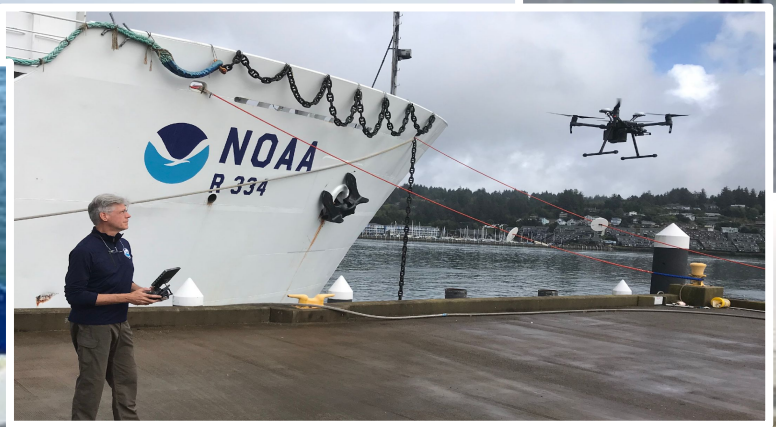

https://storms.ngs.noaa.gov/

National Oceanic and Atmospheric Administration

# Uncrewed Aerial Systems (UAS)

- Joint RSD/HSD effort to train operators to pilot NOAA-owned UAS from NOAA hydrographic ships and small boats
- Developing the capability and procedures to launch and recover a VTOL UAS from NOAA ships and small boats



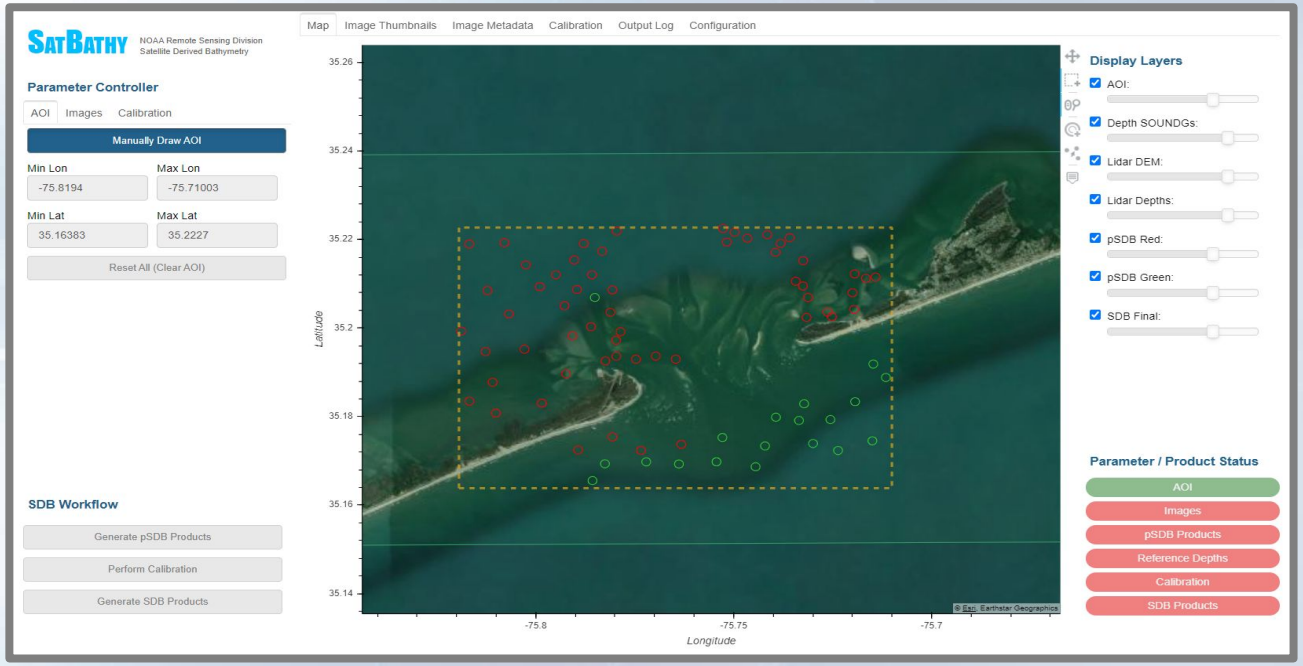



# Uncrewed Aerial Systems (UAS)

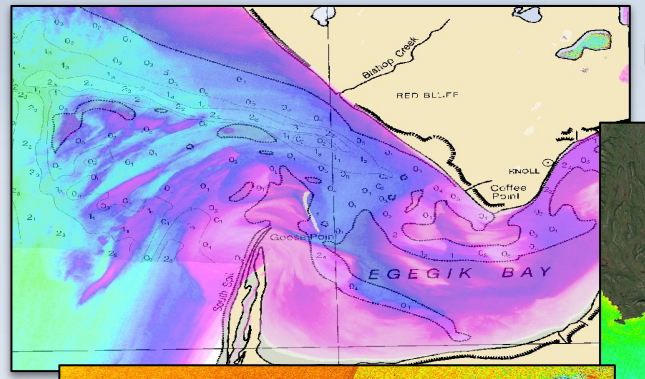
- Imagery acquisition to support CSCAP

# Satellite Derived Bathymetry (SDB)

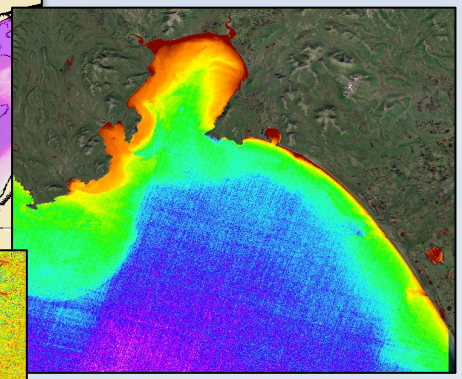
## SatBathy Tool Overview (Alpha v1.0)



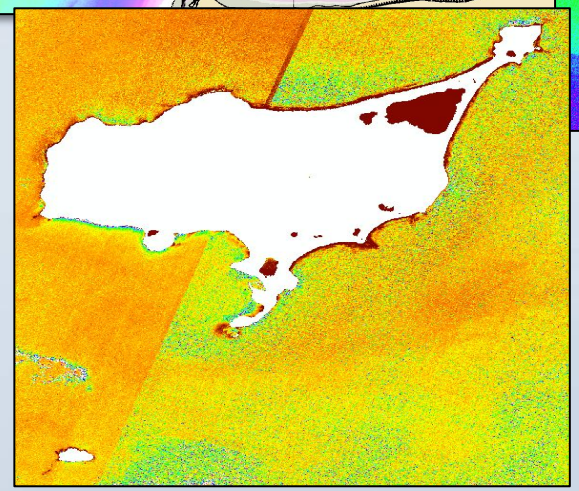

## Testing




**Egegik, AK**



**2021 Nushagak composite**



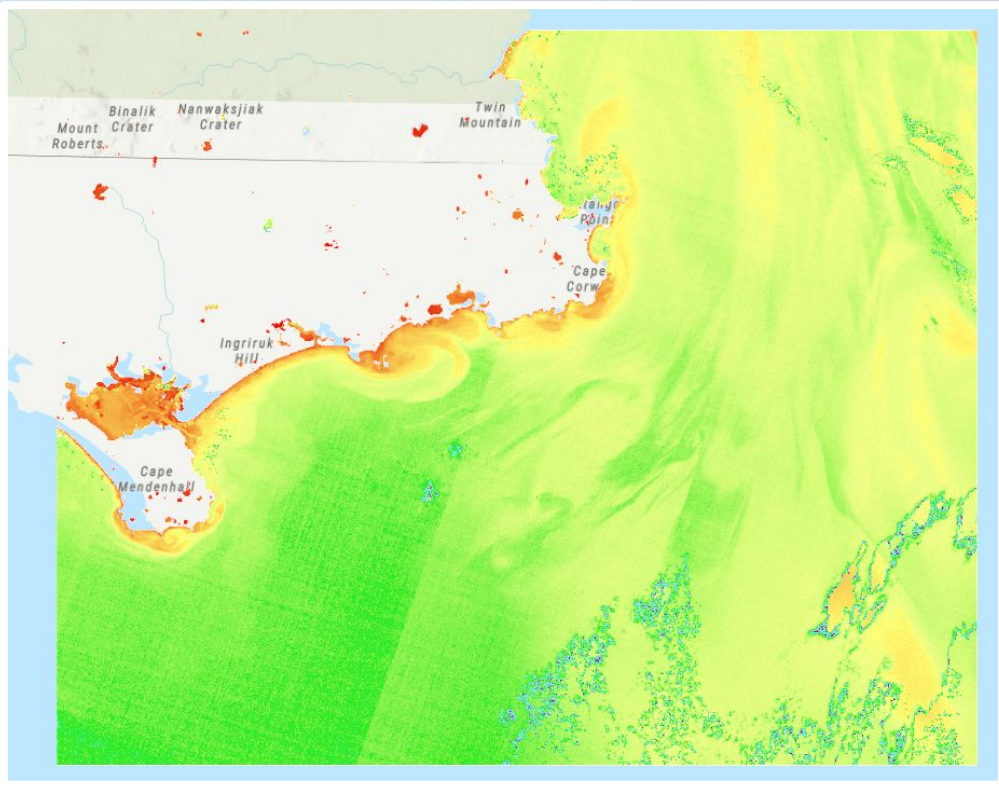
**Pribilof Island - Apr 1- June 30 composite**

**Pribilof artifact**: known Sentinel-2 issue over water:

- Banding effect is caused by sensor construction, alternating detectors
- Impacts the acquisition timing and relative azimuth
- Results in incongruities and artifacts in images

National Oceanic and Atmospheric Administration

# First order approximation: automating clipping at SDB extinction depth for operational testing during FY21 field season



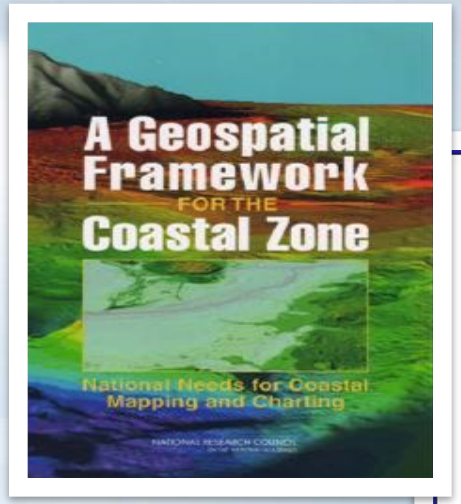

**Nunivak, AK**

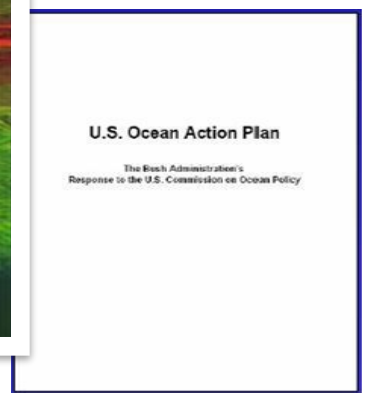
SDB clipped to 3.4m so the ships could junction with and stay safely offshore

Hope to have this implemented in Beta v1.0 or 1.1

National Oceanic and Atmospheric Administration

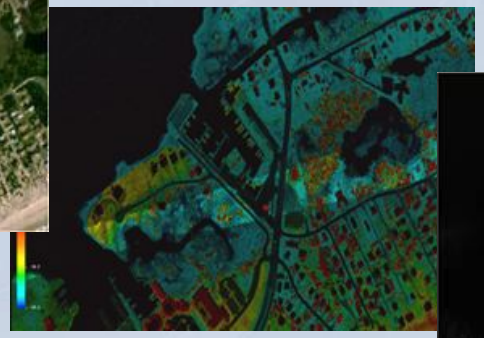
# Integrated Ocean and Coastal Mapping (IOCM)

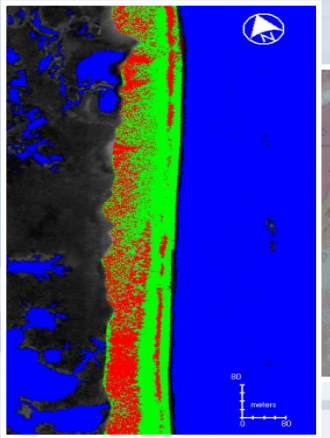


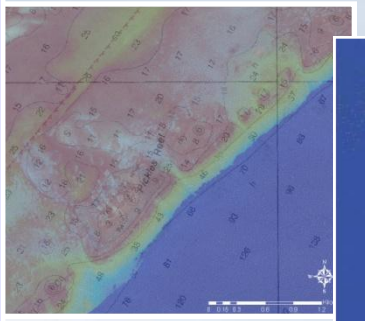



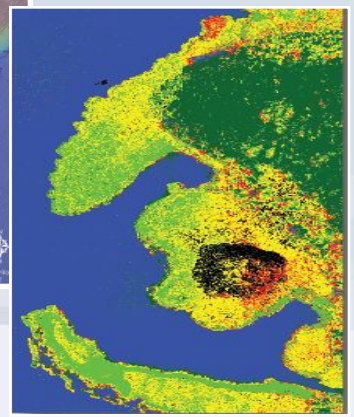

**The practice of acquiring, managing, integrating and disseminating ocean and coastal geospatial mapping data in such a manner that permits these data and their derivative products to be easily accessed and used by and for the greatest range of users and purposes.**

**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.**









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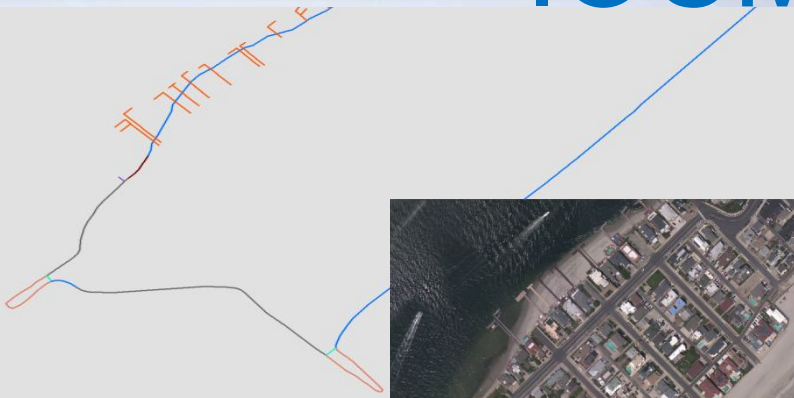
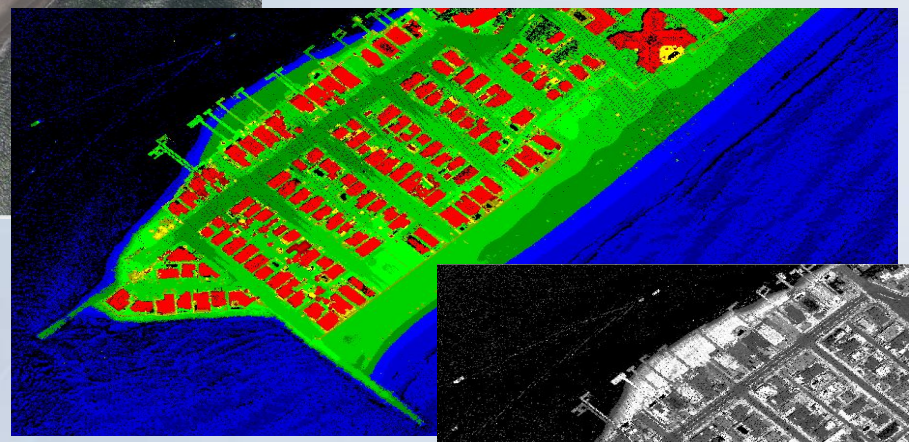
# IOCM Products/Deliverables

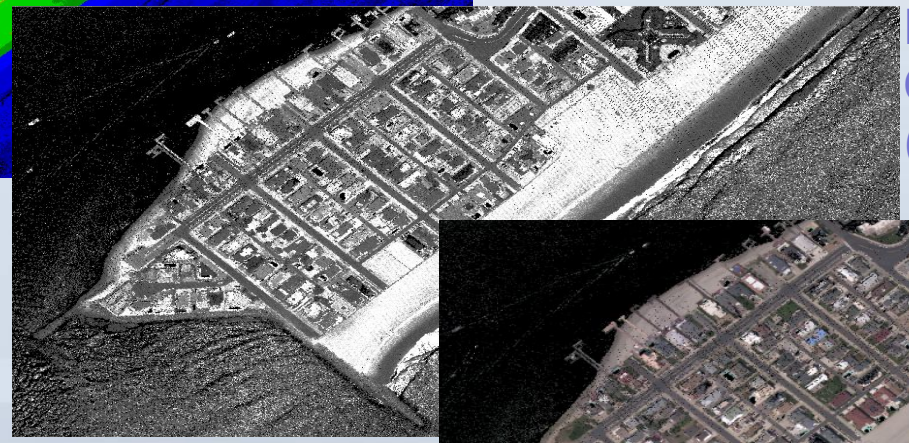
Shoreline



Ortho Mosaic Imagery



Lidar Point Cloud (elevation)



Lidar Point Cloud (intensity)

TPU

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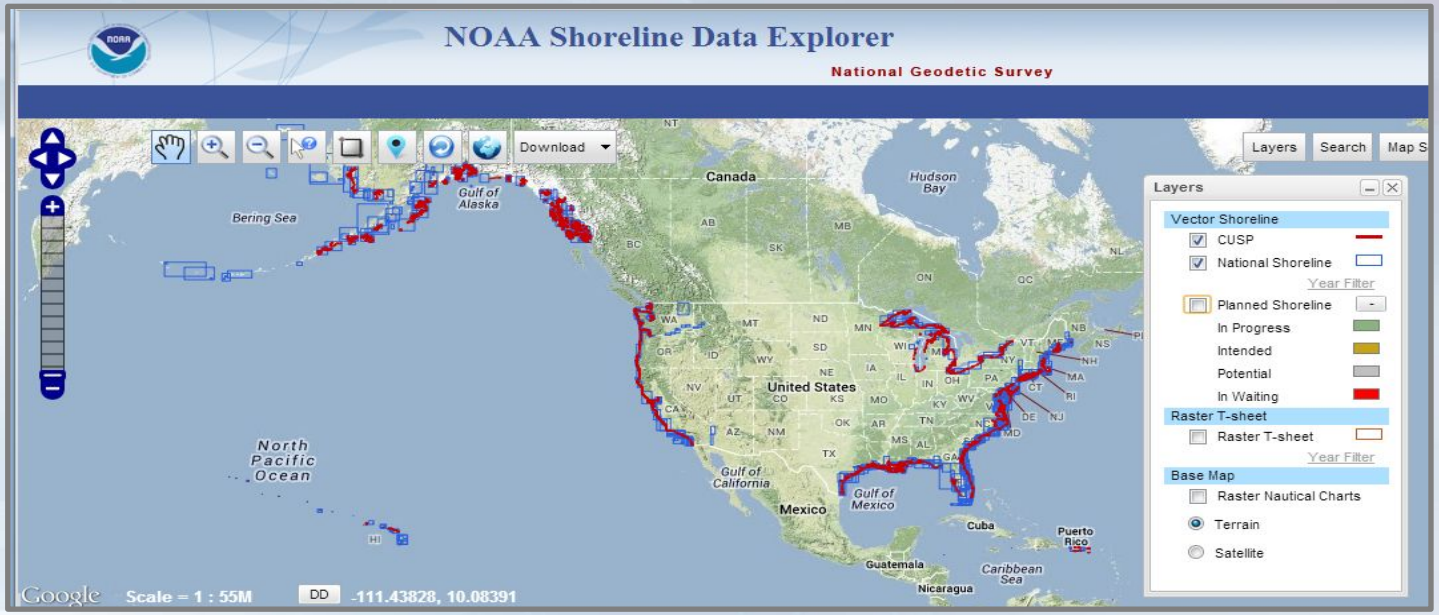
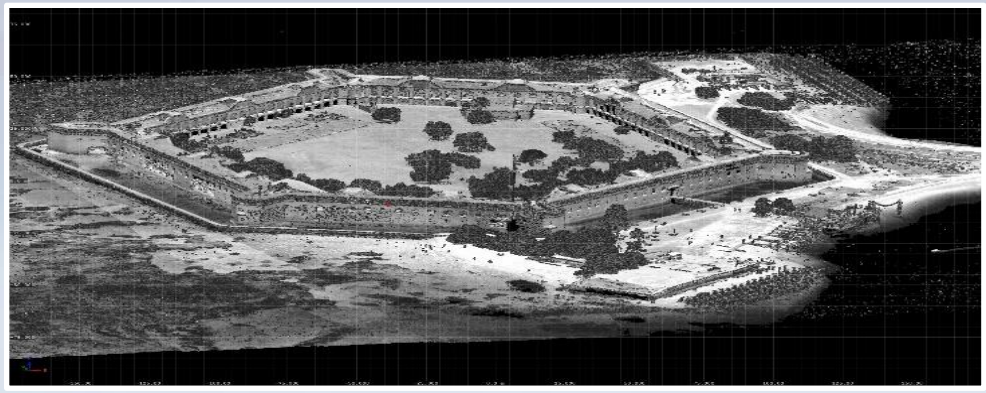
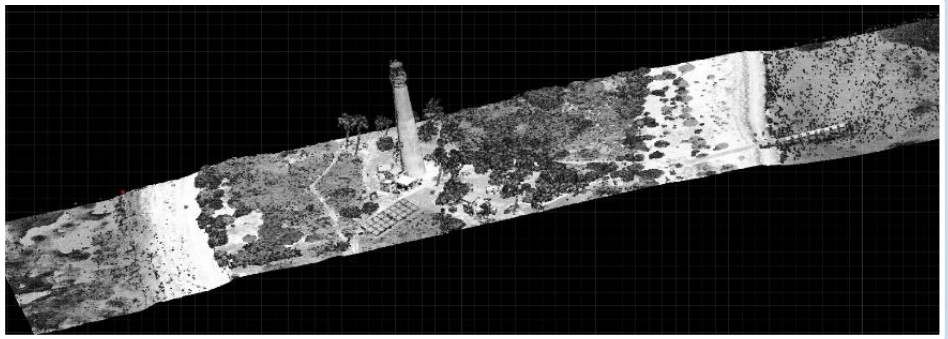
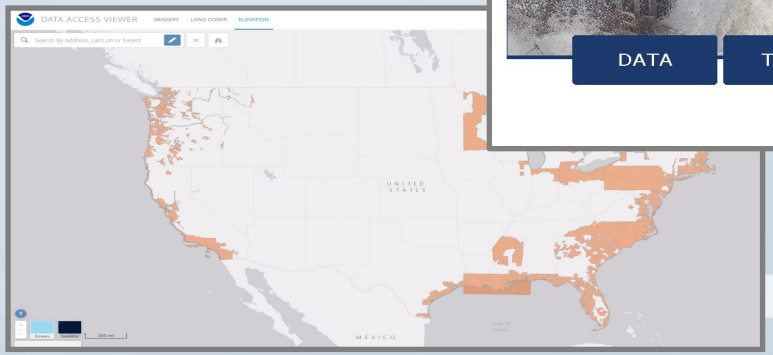
# Distribution of Data

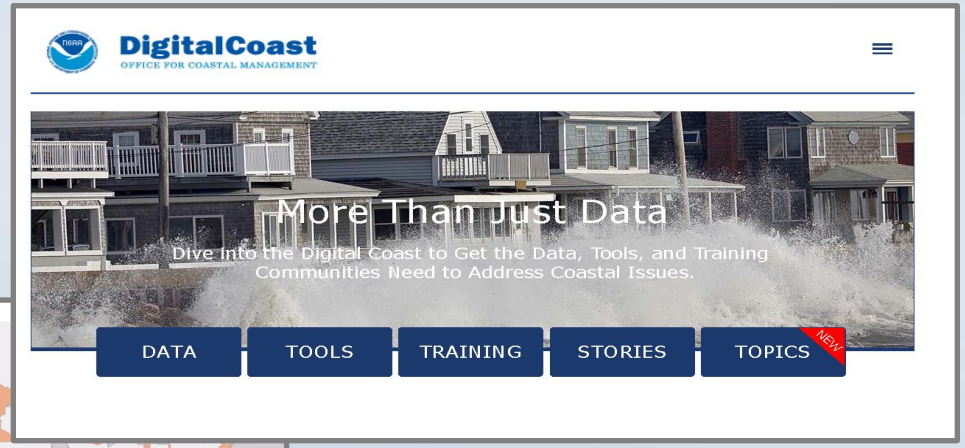



## Shoreline (http://www.ngs.noaa.gov/NSDE/)










## Lidar and Imagery:

https://coast.noaa.gov/digitalcoast/

National Oceanic and Atmospheric Administration

# Questions?

**Mike Aslaksen**
**Chief, Remote Sensing Division**
**NOAA National Geodetic Survey**
mike.aslaksen@noaa.gov

# National Park Service

Tahzay Jones

**December 1st, 2021 | Virtual**

National Park Service
U.S. Department of the Interior

# 2021 Mapping Update

Acquisition of an ASV for multibeam mapping

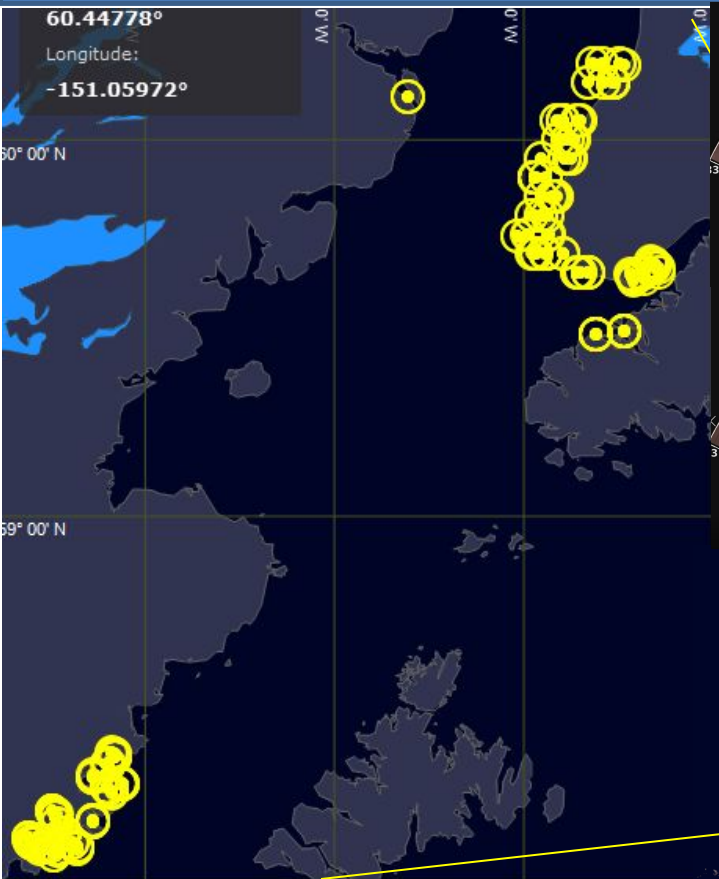
Single Beam bathymetry surveys of coastal lakes and lagoons at Malaspina

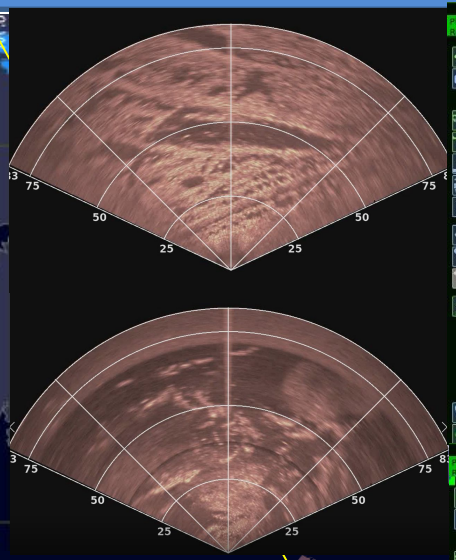
Pressure transducers retrieval of tidal station in Chinitna Bay

Benchmark relocations and occupations within in SW Alaska

## Benthic Habitat Mapping Partnership with UAF, USGS

ROV dives in Cook Inlet, Kachemak Bay, and Shelikof Strait focused on areas between 10m and 30m





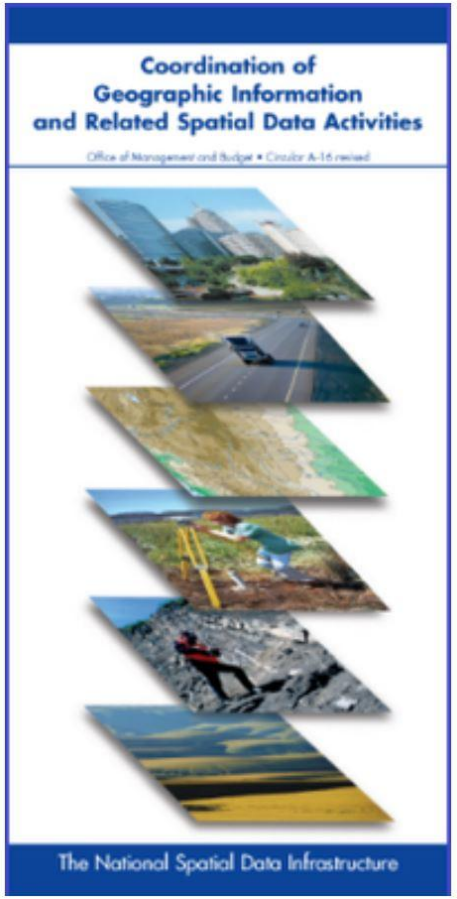
# U.S. Geological Survey

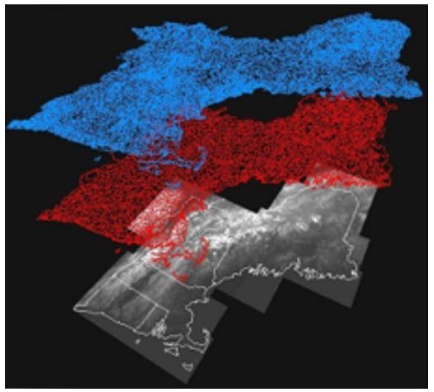
Brian Wright

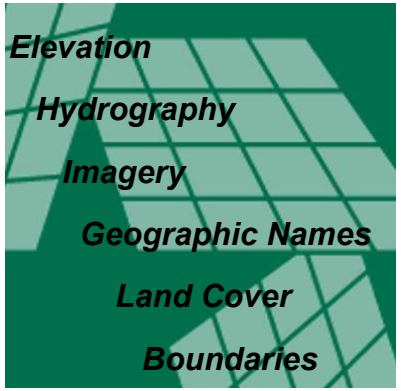
**December 1st, 2021 | Virtual**

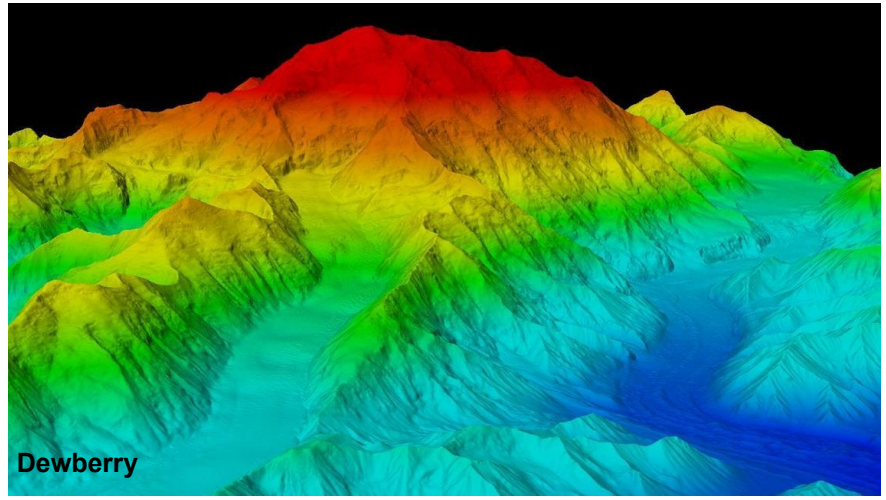
# US Geological Survey
# National Geospatial Program

# Statewide Mapping Themes






## 2021 Alaska Coastal and Ocean Mapping Summit

Brian Wright
National Map Liaison - Alaska
User Engagement Office
bwright@usgs.gov
907-201-0113

# National Geospatial Program

*Mission is to provide national topographic information to advance science, support government, enlighten citizens, and enable decision making*

## OMB Circular A-16
## NGDA Data Themes & Lead Agency (USGS)

| National Leadership | USGS Program Emphasis |
|---|---|
| OMB A-16 Lead for Elevation Terrestrial | 3D Elevation Program (Statewide IfSAR Collection) |
| OMB A-16 Lead for Hydrography Terrestrial | National Hydrography Dataset (NHD)<br>Watershed Boundaries Dataset (WBD)<br>NHDPlus High Resolution |
| OMB A-16 Lead for Digital Orthoimagery | SPOT Imagery<br>MAXAR (WorldView) |
| Topographic Maps | Topographic Maps (Historic Collection)<br>US Topo (2012-Present) |

## Alaska Mapping Executive Committee
## Tracked Mapping Themes

| Theme | Metric | 2020 Goal | Oct 2021 Status |
|---|---|---|---|
| Hydrography | NHD<br>WBD<br>NHDPlus HR | Complete by 2030 | 13% complete |
| Gravity | % GRAV-D acquired | Mainland by 2019<br>Aleutians by 2022 | 100% Mainland Alaska<br>50% Aleutians |
| Shoreline Mapping | % updated | Complete by 2026<br>Dependent upon budget appropriations | 58.7% complete<br>42.5% has been used to update charts) |
| Coastal Mapping | In development | Complete by 2030 | Draft Implementation Plan reviewed by OSTP/OMB and prepared for public comment |
| Wetlands | NWI | Complete by 2029 | 75.4% contracted |
| Elevation | IfSAR | Completed in 2020 | Establishing new requirements/priorities |
| Imagery | 1-m GSD | Complete this update cycle in 2023 | Completed.<br>Establishing new refresh requirements/priorities |

# 3D Elevation Program

*Goal to complete nationwide lidar (IfSAR in AK) to provide the first-ever national baseline of consistent high-resolution elevation data*

- Cooperatively funded program seeking to align federal, state, local, private and non-government organizations investments for high resolution elevation data
- Support a wide range of applications, including projects related to energy infrastructure construction and safety, and mitigate risks from natural hazards
- Address Federal, state and other mission-critical requirements
- Leverage the capability and capacity of private mapping firms
- Program oversight and management lead by USGS

Program Milestones:

- Statewide IfSAR completed in FY 2020
- Completion of US Topo production for Alaska FY21

USGS science for a changing world

The National Map
Your Source for Topographic Information

# Broad Agency Announcement

- Competitive application process for federal funding assistance for lidar collection
- Federal agencies, state and local governments, tribes, academic institutions, and the private sector are eligible
- Released on August 16, 2021. Initial submissions were due October 8, 2021.
- The Announcement remains open until **June 1, 2022** pending available funding
- Program released in federal fiscal year of 2021, awards and acquisition occur in FY22
- Additional selections will be made depending on availability of funding
- Proposals can request an Independent Government Cost Estimate

*The most important factors are project location, geographic overlap with areas identified by federal agencies as areas of interest for lidar acquisition, project cost and cost share (funds contributed by applicants) and technical approach. These factors are equally valued. Secondary factors include areal extent and maturity of applicant's proposal and (maturity of) designated funding sources."*

Program Highlights: Since the conception of the BAA in 2016, an Alaska proposal has been awarded each year

# BAA Acquisition Criteria in Alaska

Proposals for lidar acquisition in Alaska will be considered for the following targeted acquisition areas;

- Critically targeted geographies identified by multiple agencies in the original NEEA study
- Areas that overlap with Federal priorities
- Alaska coastlines extending to the 50-foot elevation line. Additional extents may be considered in developed areas or areas of populated native communities to support geo-hazard and flood related assessment and mitigation
- Flat geographies of the Yukon delta including all US Fish and Wildlife Service refuge lands therein, and in north central Alaska surrounding Barrow
- The area of the Yukon River basin identified for native Alaskan village flood risk
- Larger municipalities with Federal Aviation Administration (FAA) regulated airport facilities and FAA's identified Alaska Peninsula flight approach area. Primary transportation corridors to include existing and proposed railways, highways, ports, and major river corridors

# Resources

**FY22 Broad Agency Announcement**
https://www.usgs.gov/core-science-systems/ngp/3dep/fy22-usgs-broad-agency-announcement-baa?qt-science_support_page_related_con=0#qt-science_support_page_related_con

**3D Elevation Program**
https://www.usgs.gov/core-science-systems/ngp/3dep/what-is-3dep?qt-science_support_page_related_con=0#qt-science_support_page_related_con

**USGS Lidar Base Specifications**
https://www.usgs.gov/core-science-systems/ngp/ss/lidar-base-specification-online

**US Interagency Elevation (Topographic-Topobathy-Bathymetry) Inventory**
https://coast.noaa.gov/inventory/

**Alaska Mapping Initiative**
https://www.usgs.gov/core-science-systems/ngp/user-engagement-office/alaska-mapping

**Alaska Mapping Executive Committee**
https://www.usgs.gov/core-science-systems/ngp/user-engagement-office/alaska-mapping-executive-committee

# 2021 Alaska Coastal & Ocean Mapping Summit

USGS Coastal Change Hazards

Ann E. Gibbs, Pacific Coastal and Marine Science Center (agibbs@usgs.gov)

# COASTAL CHANGE HAZARDS SCIENCE AND PRODUCTS

USGS science for a changing world

## Shoreline change assessments

https://marine.usgs.gov/coastalchangehazardsportal/

## Future flood hazard modeling (CoSMoS-AK)

https://www.usgs.gov/centers/pcmsc/science/coastal-storm-modeling-system-cosmos

## Total water level and coastal change forecasting

https://www.usgs.gov/centers/spcmsc/science/operational-total-water-level-and-coastal-change-forecasts

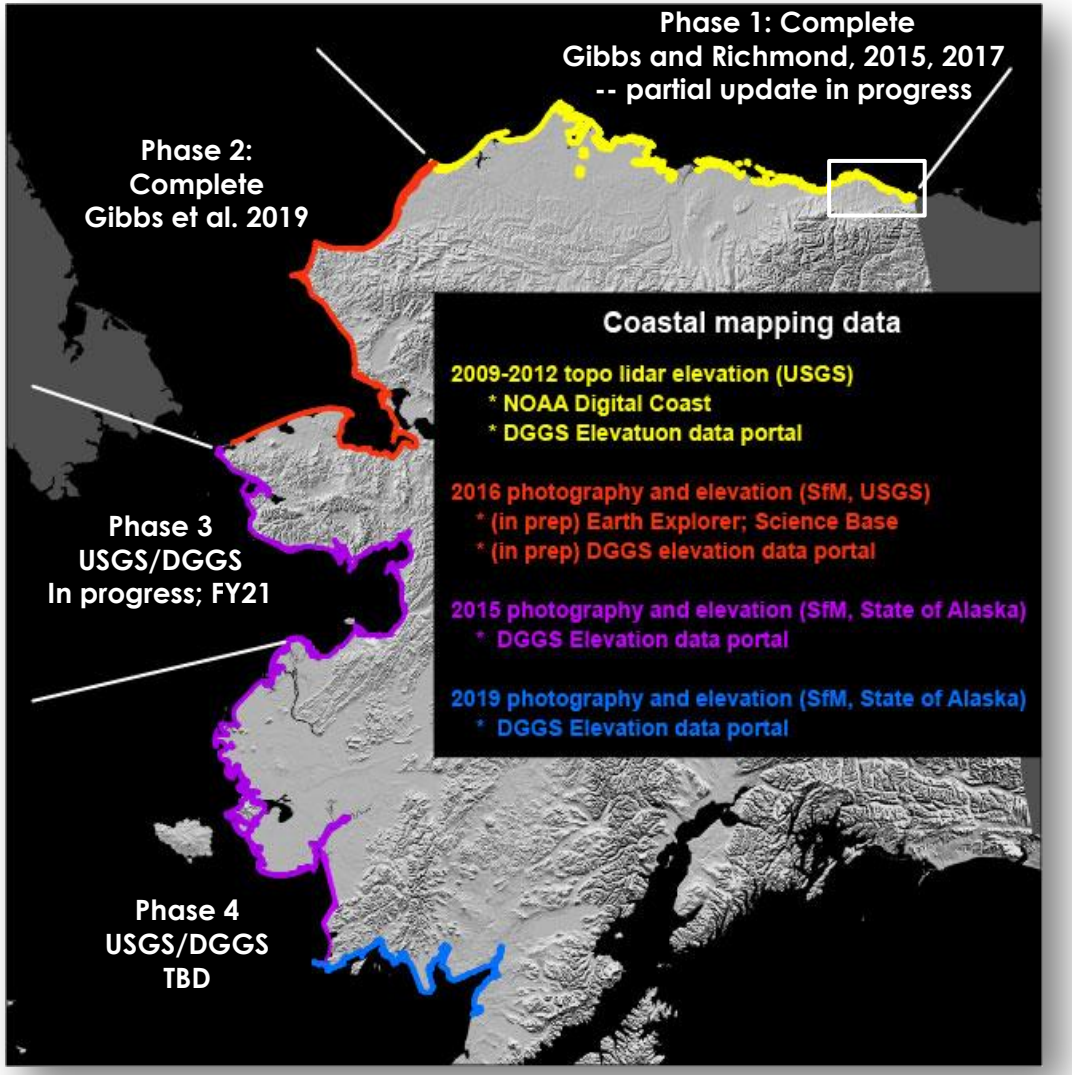
## Coastal observing cameras

https://www.usgs.gov/centers/pcmsc/science/using-video-imagery-study-wave-dynamics-unalakleet

https://www.usgs.gov/centers/pcmsc/science/using-video-imagery-study-sediment-transport-and-wave-dynamics-nuvuk-point

# Shoreline change assessments

POC: Ann Gibbs (agibbs@usgs.gov)




## Long-term collaboration with State of Alaska/DGGS

- USGS: continuous coast, regional focus
- DGGS: community focus
- Utilize similar methodology and data sources
- Leverage acquisition and processing of datasets

## Status

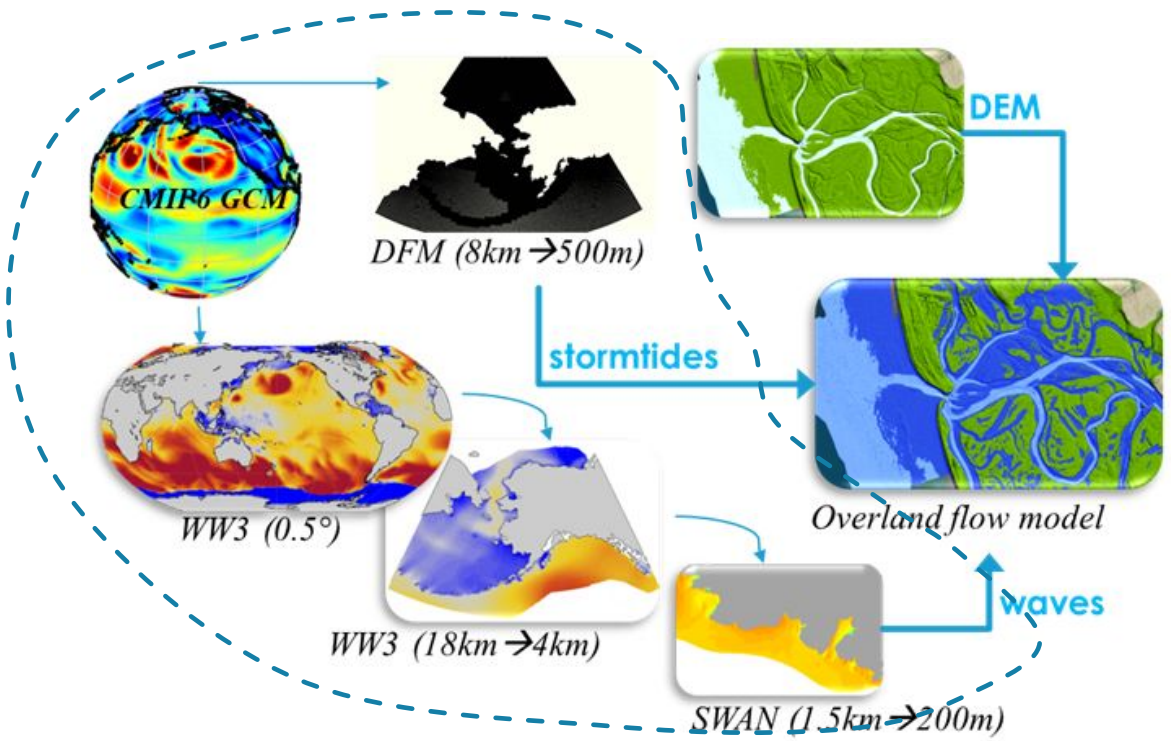
- Bering Strait to US-Canada border complete (1940s to 2010-16)
- Norton Sound in progress (1950s to 2015)
  - Registering historical imagery (1950s B&W, 1970s AHAP)
- Updates
  - *In progress:* ANWR; 2017 NOAA photography
  - *Future:* Based on new ACMS acquisitions
- Elevation-based shoreline
  - Conformance with the rest of the nation
  - Based on updated geodetic and tidal datum information
- Satellite derived shorelines and change projections

# Future flood hazard modeling (CoSMoS-AK)

POC: Li Erikson (PCMSC) lerikson@usgs.gov;
Dee Williams (AKRO) dmwilliams@usgs.gov

***Characterize past and future coastal flood hazards at villages and built environments Alaska***

- Running a series of numerical models to map flood hazards out to 2050
  - Multiple sea level rise + *future* storms scenarios




- *Planned final product: flood hazard maps for all combinations of 6 ranges of sea-level rise and 6 storm return periods (36 total)*
- *Develop and inform adaptation strategies through a web-based and stakeholder decision support tools via collaboration with ANTHC, AK-CASC, and others*
- Currently limited to select coastal villages and locations where adequate DEMs and elevation datum information exist


1. *Unalakleet*
2. *Utqiagvik*
3. *Kotzebue*
4. *Elim*
5. *Deering*
6. *Kivalina*
7. *Point Hope*
8. *Teller*
9. *Prudhoe Bay*
10. *Kaktovik*
11. *Golovin*
12. *Oliktok Pt.*
13. *Bullen Pt.*
14. *Lonely*
15. *Cape Simpson*
16. *Shaktoolik*
17. *Nome*

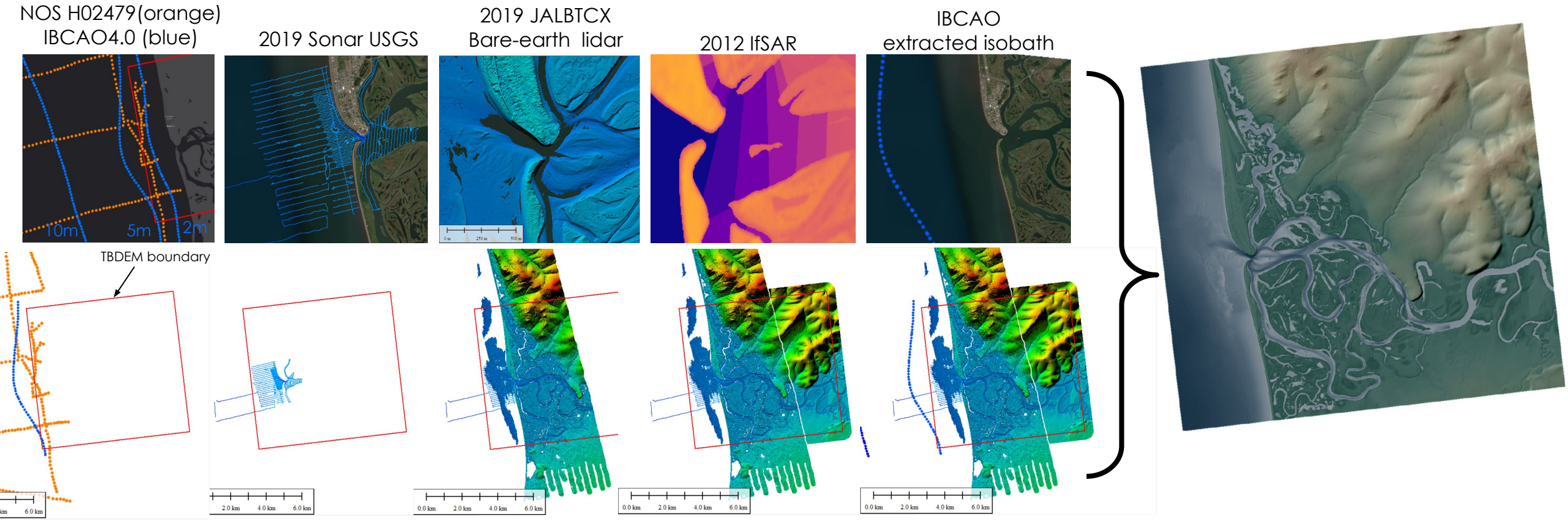
# Future flood hazard modeling (CoSMoS-AK)

POC: Ann Gibbs (agibbs@usgs.gov)

**Accuracy of the model is strongly influenced by nearshore bathymetry** (< 20-30 m; depending on coastal morphology; e.g. bay vs open coast) **and elevation surface** (overland flow).

**Currently:** Building seamless TB-DEMS with available bathymetry and elevation data.

Expand USGS CoNED efforts beginning FY23



# Future flood hazard modeling (CoSMoS-AK)

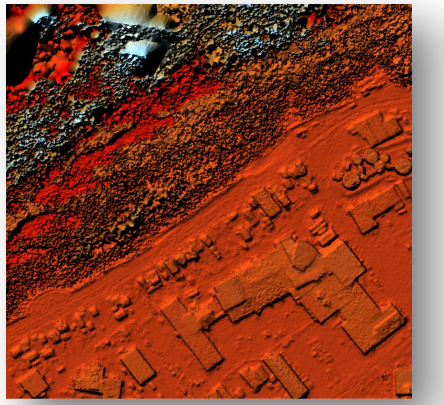
POC: Ann Gibbs (agibbs@usgs.gov)

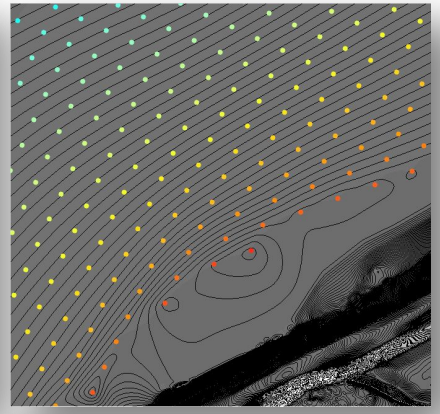
Fodar

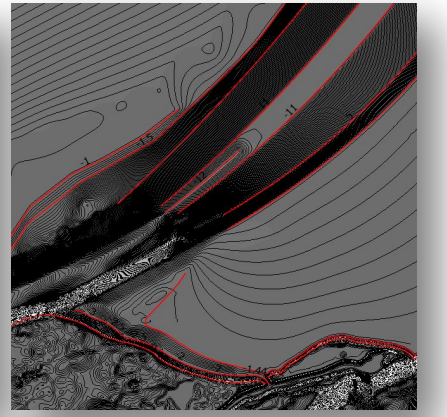
+ multibeam

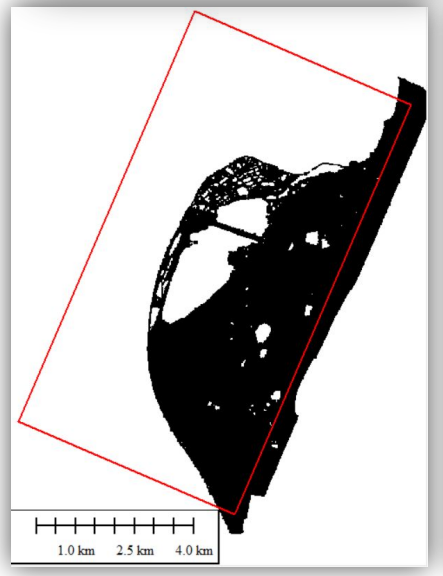
+ IBCAO 4.0

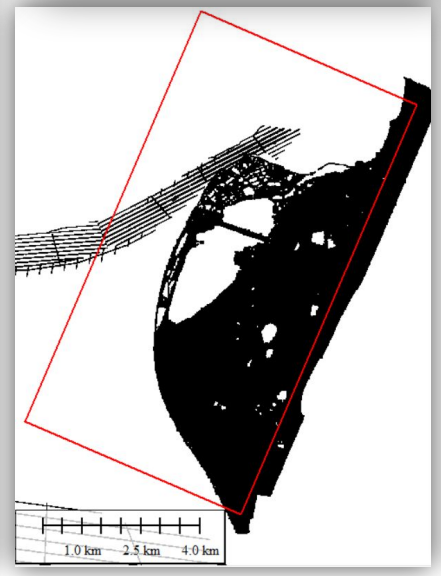
+ interpreted

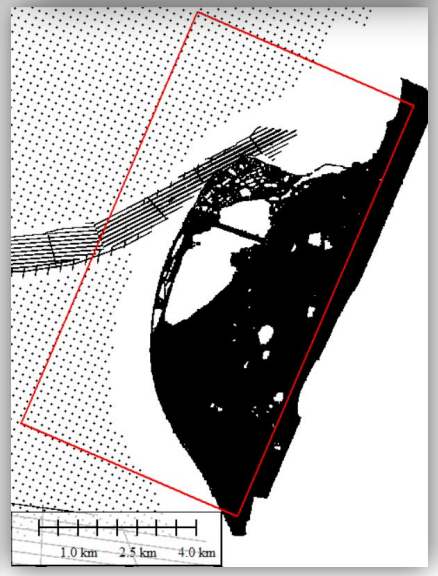


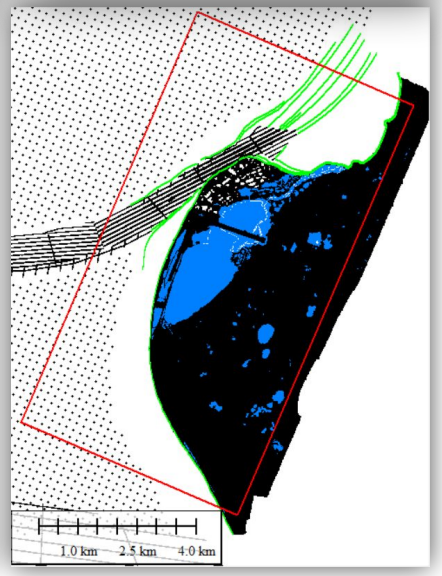


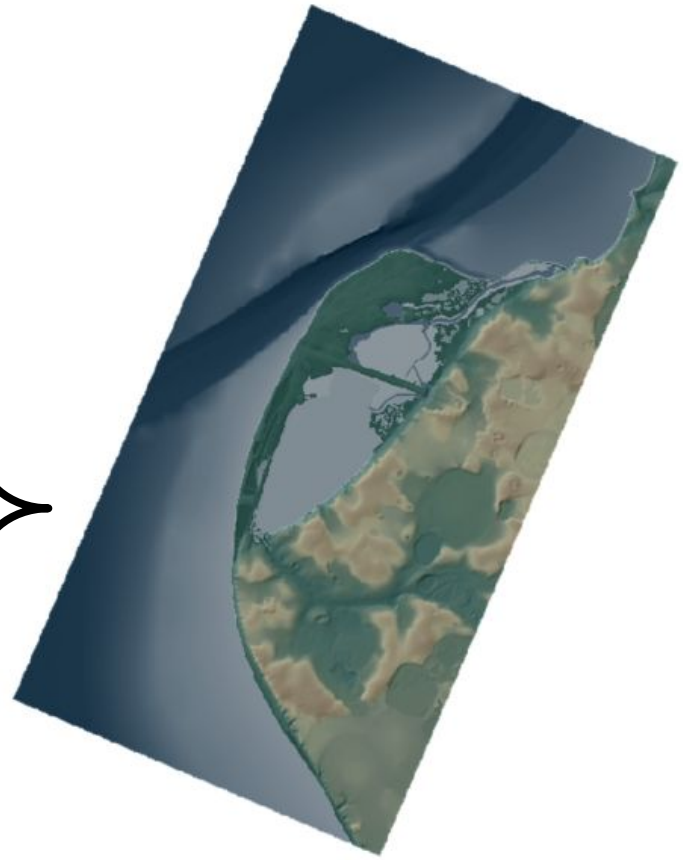




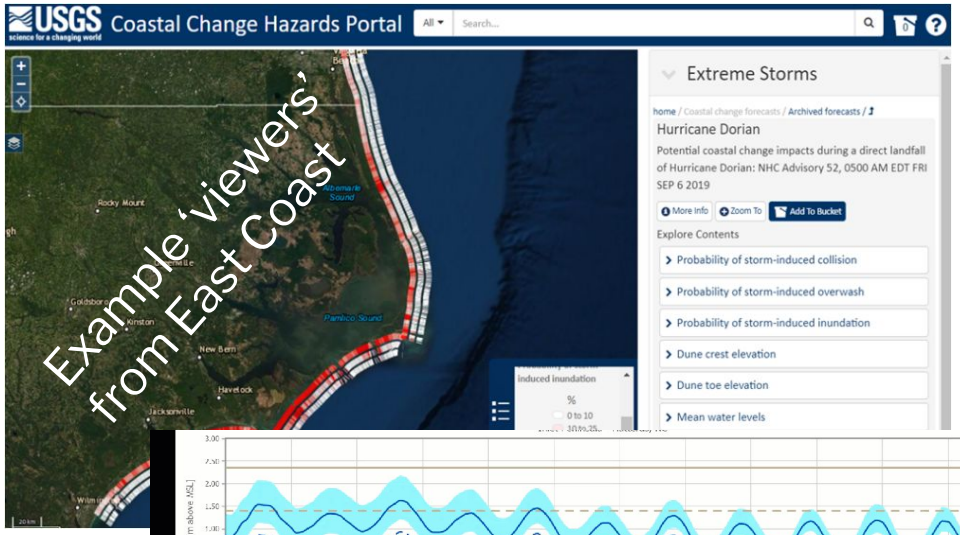



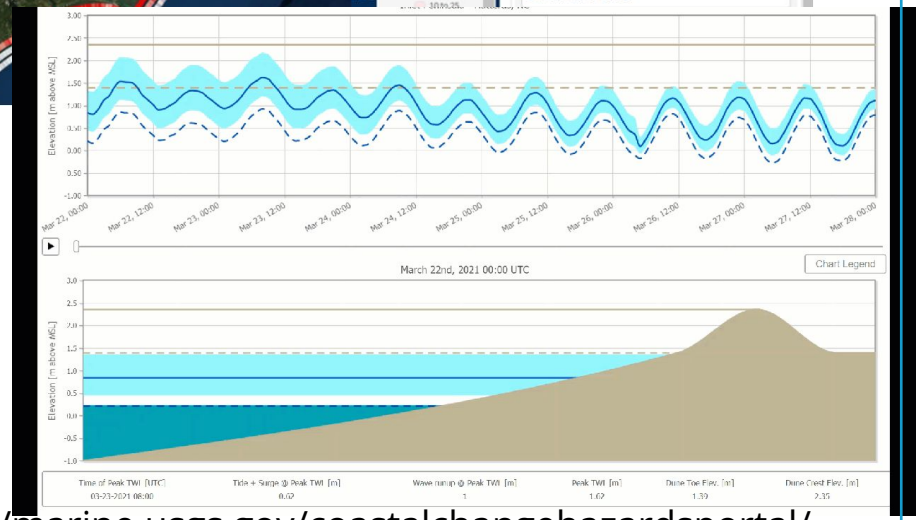
**Blue** = water masks, areas of constant elevation
**Green** = lines of constant elevation

# Operational total water level and coastal change forecasts

POC: Li Erikson;
lerikson@usgs.gov

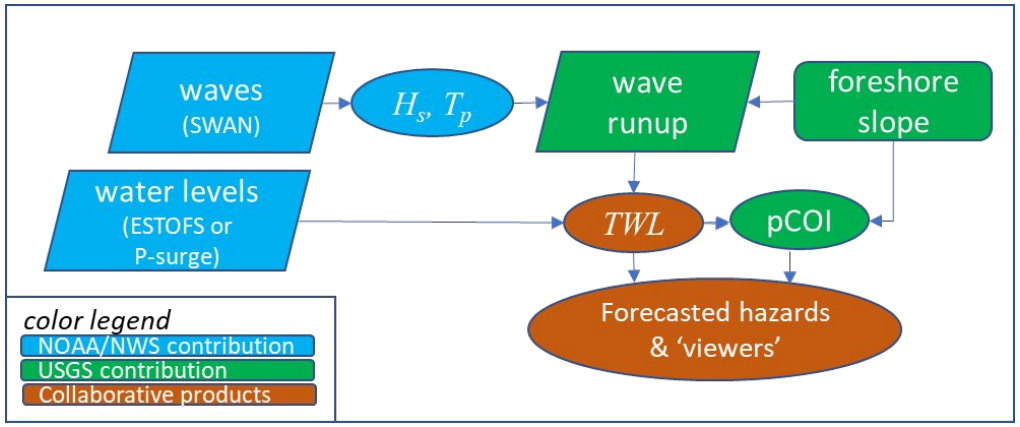
**Buildout of a 6-day forecast system for coastal flooding & probability of erosion**




https://marine.usgs.gov/coastalchangehazardsportal/
https://coastal.er.usgs.gov/hurricanes/research/twlviewer/

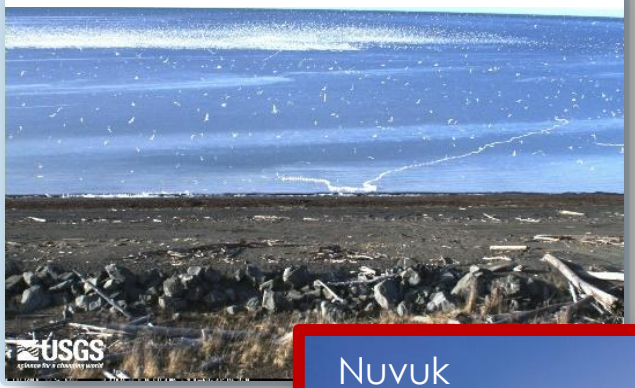
- Ongoing collaboration with NOAA/NWS
- East Coast in ~2015. National expansion to Gulf coast, West coast, and Alaska
- Provides 144 hour forecasted total water levels and probabilities for collision, overwash, or impact (pCOI)
- **Accuracy of TWL models is strongly influenced by nearshore bathymetry** (< 20-30 m; depending on coastal morphology; e.g. bay vs open coast) **and elevation surface** (overland flow).
- **Wave runup strongly influenced by nearshore bathymetry (< 5 m) and foreshore slope.**



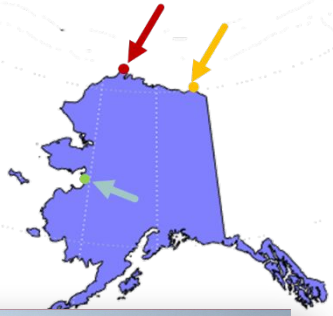
# Coastal observing cameras

POC: Dan Nowacki;
dnowacki@usgs.gov

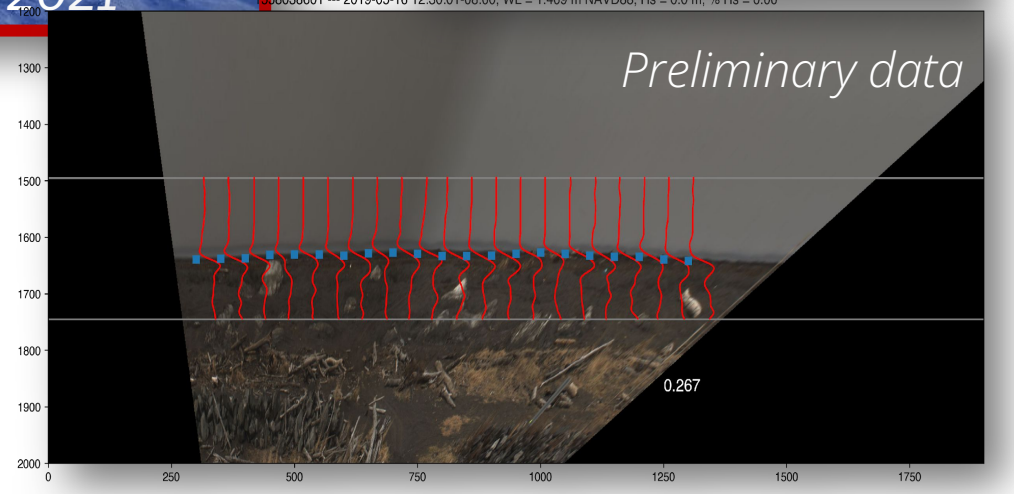
Unalakleet: Installation 2018




**Unalakleet** installed 2018
(joint USGS/DGGS effort)
**Nuvuk/Point Barrow** installed 2021
**Barter Island** 2018-2019





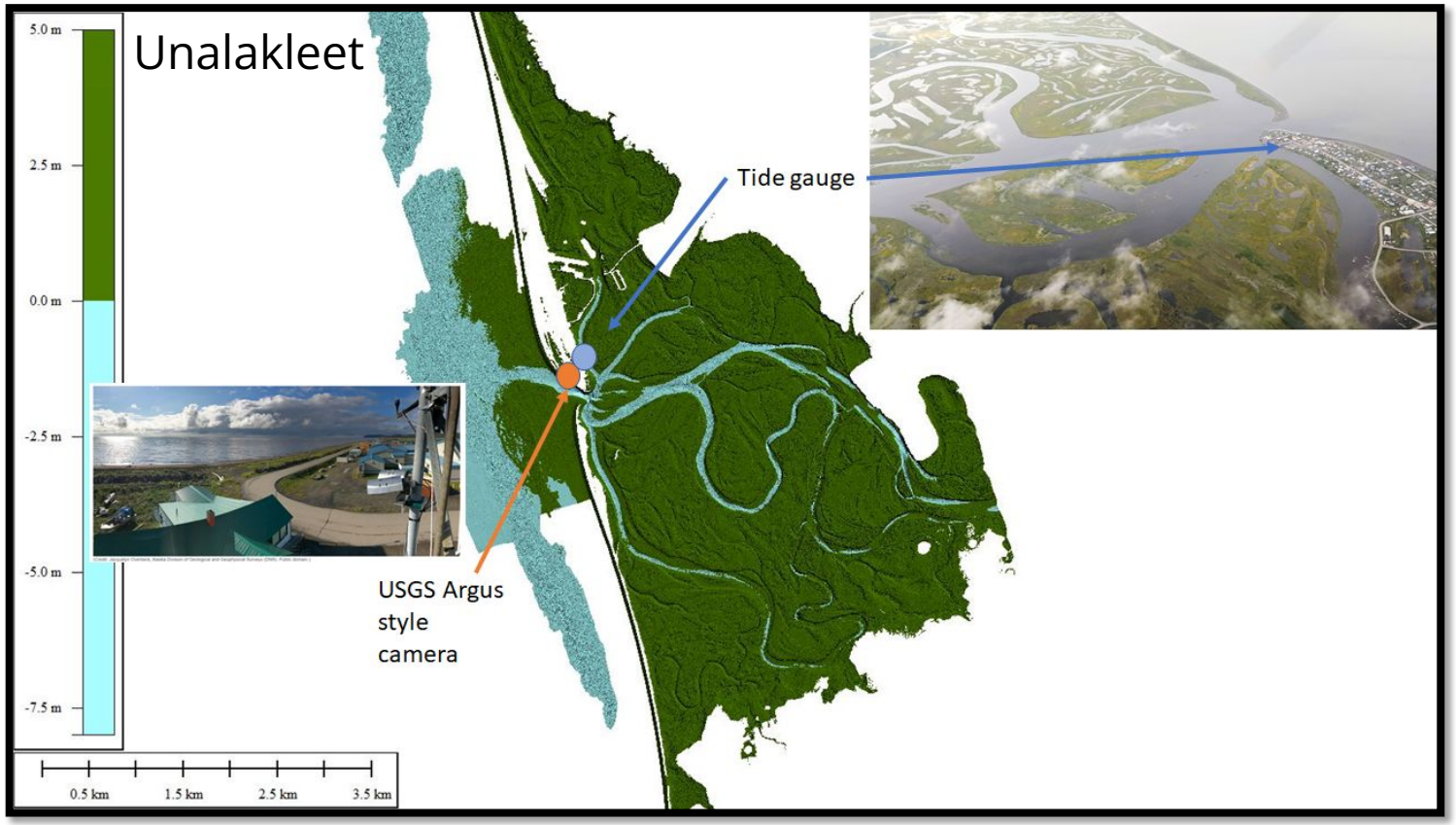

## High-resolution, web-enabled video camera systems

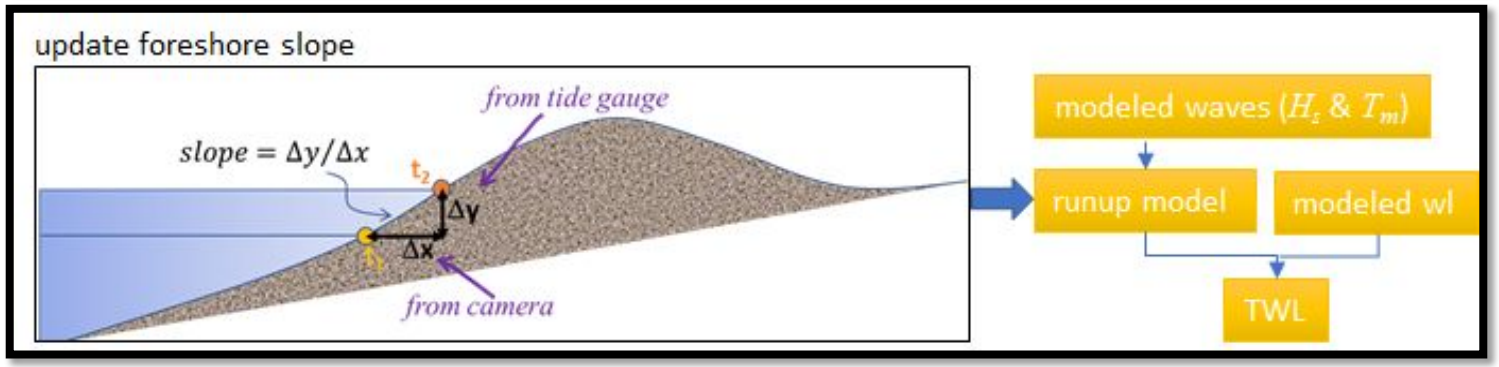
- Monitoring coastal change
- Measuring wave runup and validating TWL forecast models
  - **LWI (shoreline) extracted from imagery and used as validation for TWL forecasts**
- Quantifying nearshore morphodynamics to improve forecasts
  - **Dynamic updating of foreshore slope and incorporating into TWL forecasts (quantify variability, improve model)**
  - **Calculate nearshore bathymetry**
- Characterizing wave conditions (height, period)
- Assessing sediment entrainment in ice
- Tracking nearshore sea-ice dynamics

# Coastal observing cameras

POC: Dan Nowacki;
dnowacki@usgs.gov

## Shoreline and foreshore slope extraction



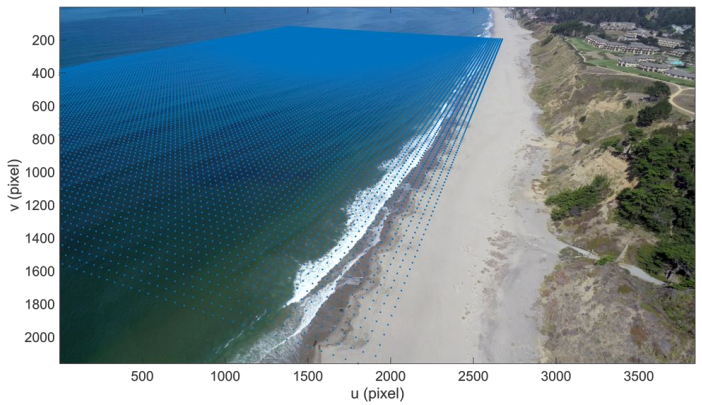
# Coastal observing cameras

POC: Dan Nowacki;
dnowacki@usgs.gov

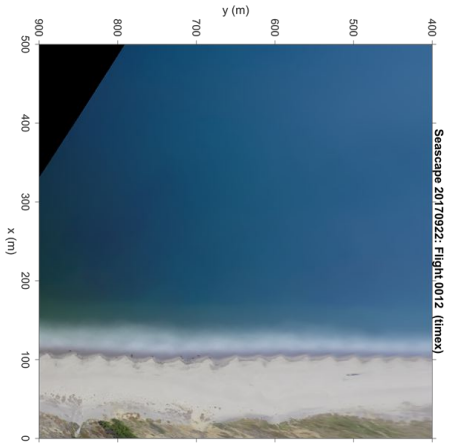
## *Estimating nearshore bathymetry using optical observations of propagating waves*

*Example from Seascape Beach, Central CA (POC: Shawn Harrison, NRL, formerly USGS)*

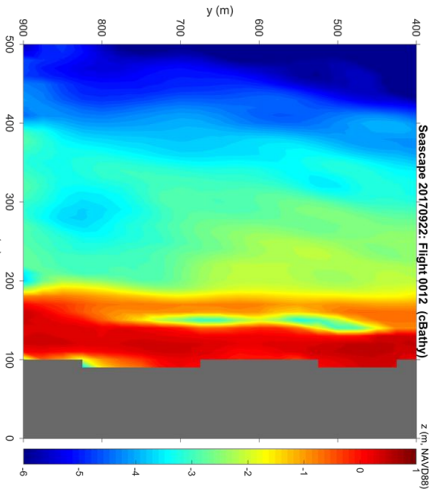
**Pixel identification**




**Rectification**




**"cBathy"**




***Algorithm and approach that is gaining much traction since its initial development in 2013.***

*remote sensing* ***New paper just out in July 2021*** MDPI

*Article*

**Updates to and Performance of the cBathy Algorithm for Estimating Nearshore Bathymetry from Remote Sensing Imagery**

Rob Holman [1,*] and Erwin W. J. Bergsma [2]

# End of Presentation

Thank you!

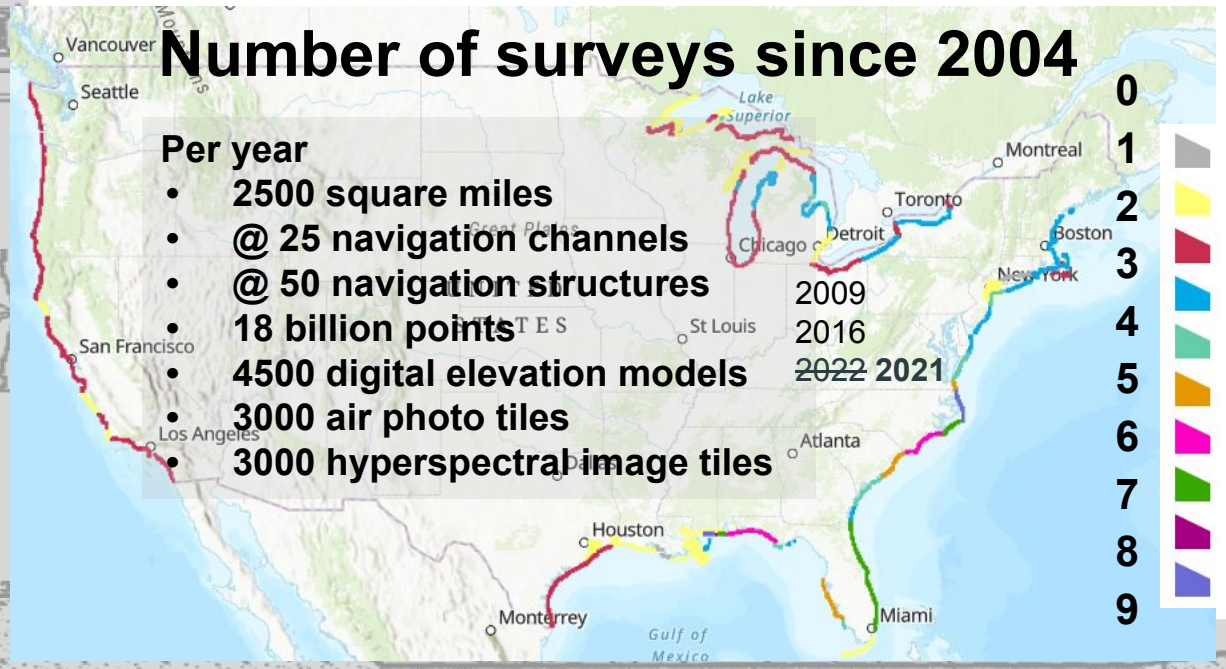
# JALBTCX - Joint Airborne Lidar & Bathymetry Technical Center of Expertise

Chris Macon

**December 1st, 2021 | Virtual**

# National Coastal Mapping Program

- Develops regional, repetitive, high-resolution, high-accuracy elevation and imagery data
- To build an understanding of how the coastal zone is changing
- Facilitates management of sediment and projects at a regional, or watershed scale


# TOPOGRAPHIC/BATHYMETRIC PILOT PROJECT IN ALASKA

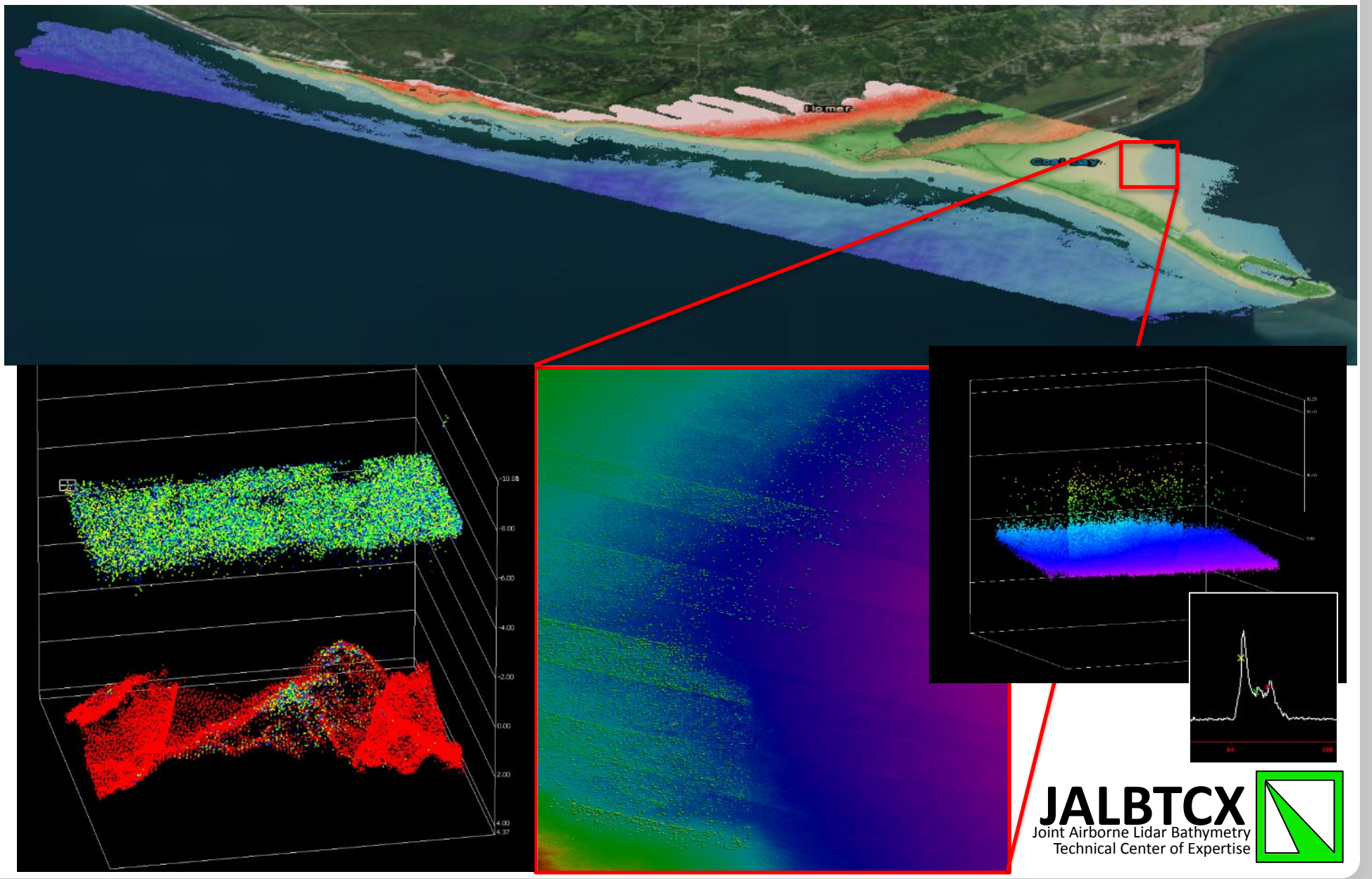
June 10-12, 2018

406M Valid Returns

21.4 m Max Depth

47 Flightlines

25.5 Miles$^2$



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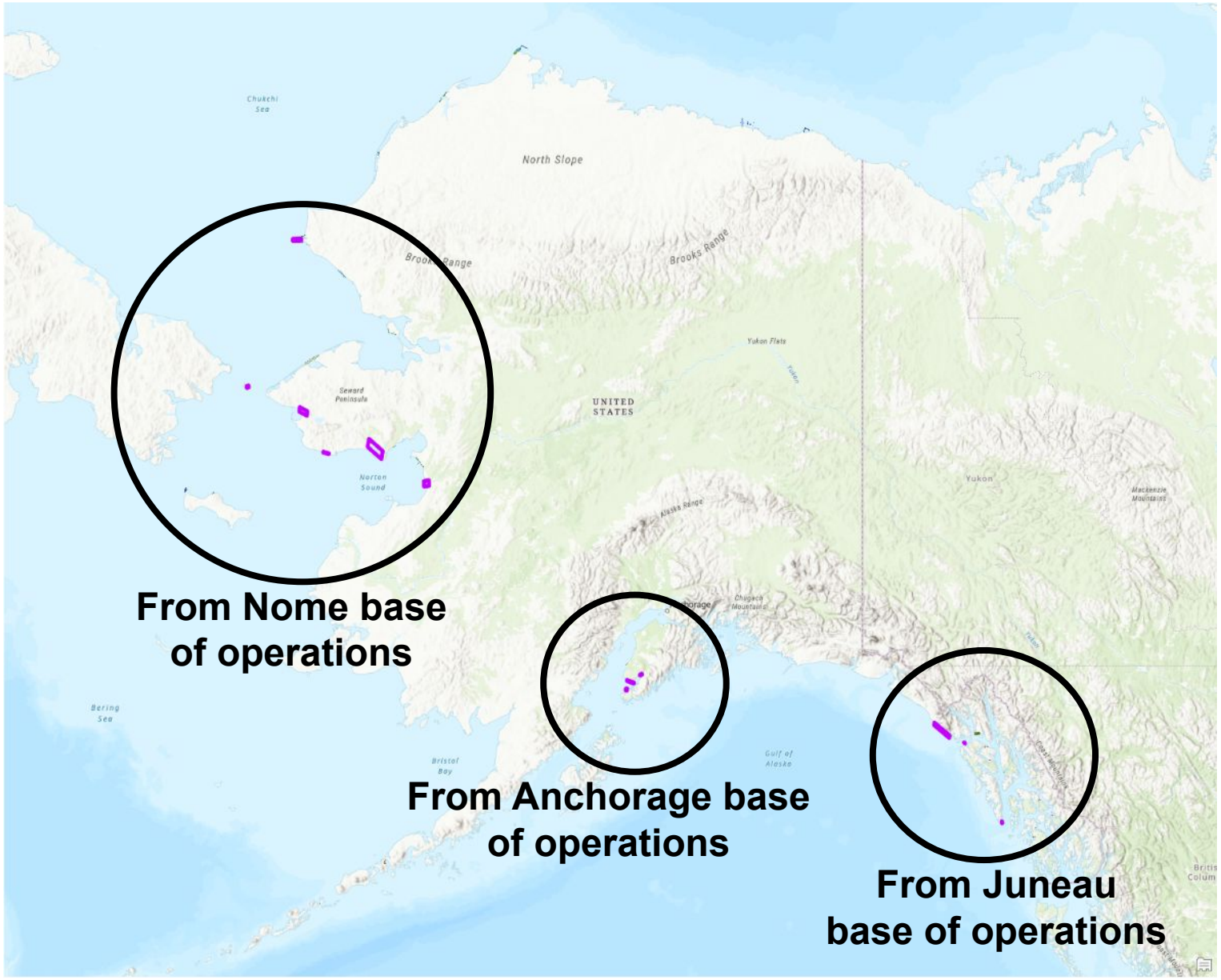
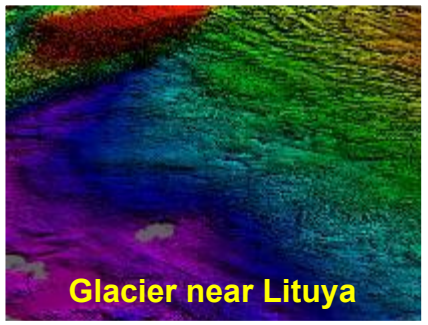
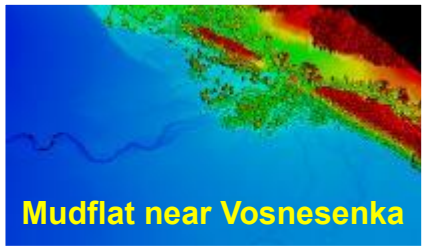
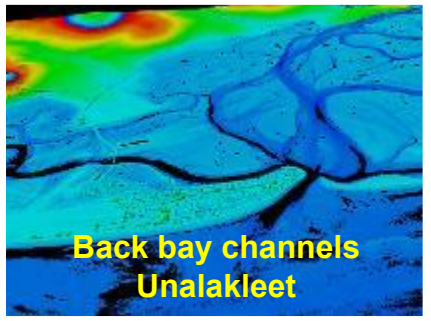
# 2019 JALBTCX Topo/Bathy Operations





- Utilized NAVO return transit from INDOPACOM
- July 4 – July 29
- 13 Flight days between 9 July and 27 July
- 18 Flights
- 100 Engine Hours
- 54 Survey Hours
- 40 Transit Hours
- ~ 1/3 of days impacted by Weather
- Delivered Data on 17 Dec to USACE, DGGS, and NPS

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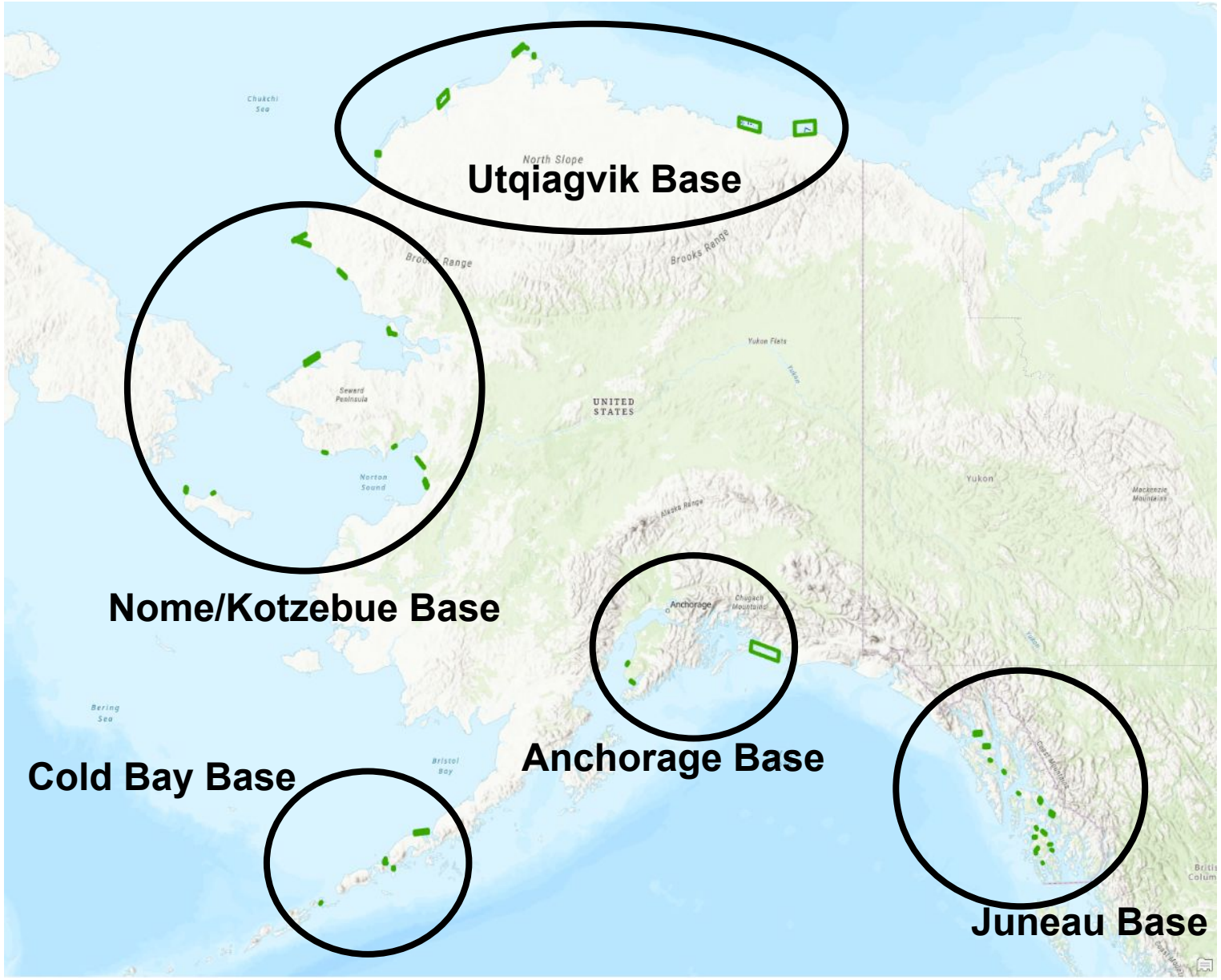
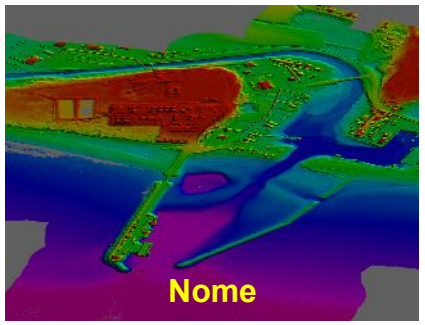
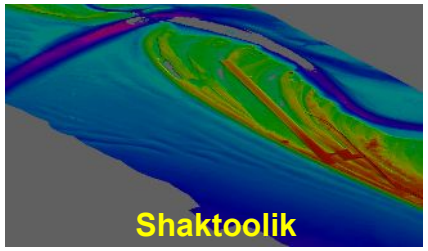
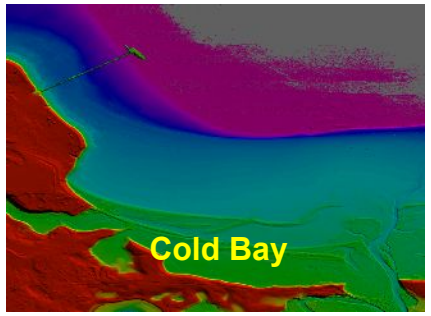
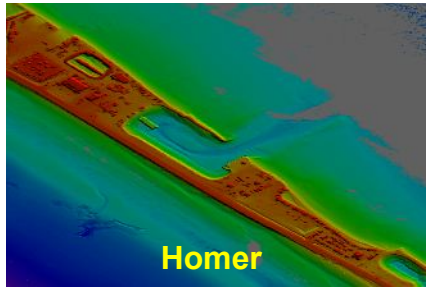
# 2021 JALBTCX Topo/Bathy Operations




- 2 Campaigns (~June/~August) due to weather and sea ice

- May 30 – June 29
- 32 Days
- 35 Flights – 12 Hours

- Aug 3 – Aug 26
- 24 Days
- 21 Flights – 78 hours

- 764 Lines
- 9.15 Line KM Flown

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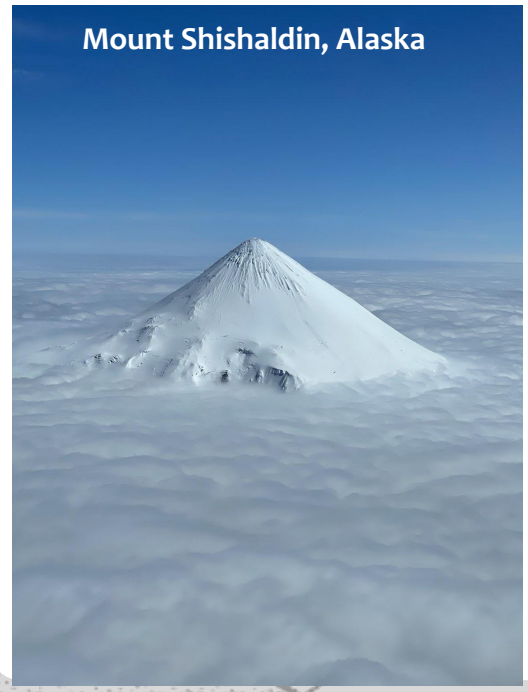
# Ice, snow, clouds


Kivalina, AK, 23 June 2021

Cape Blossom, AK, 22 June 2021




*31 May 2021* *22 June 2021*

*Pictures taken from JALBTCX aircraft of sea ice covering the survey area at Cape Blossom, AK.*

Klawock, AK, June 2021

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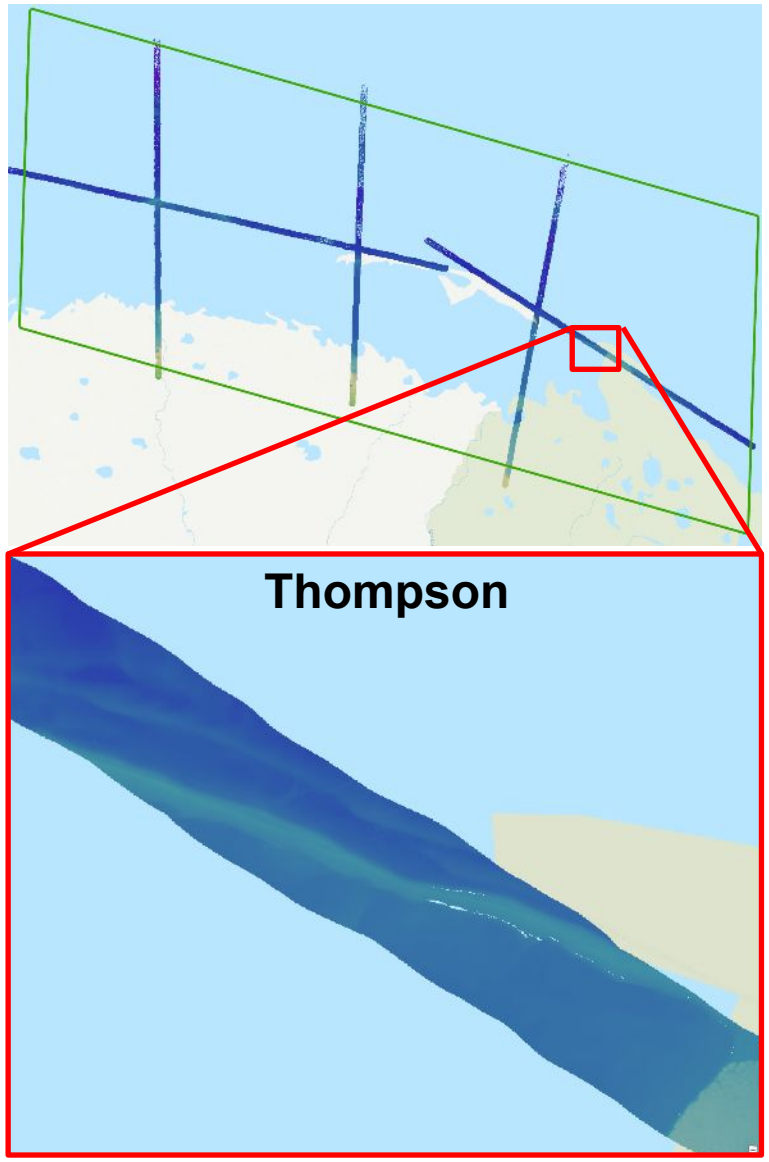
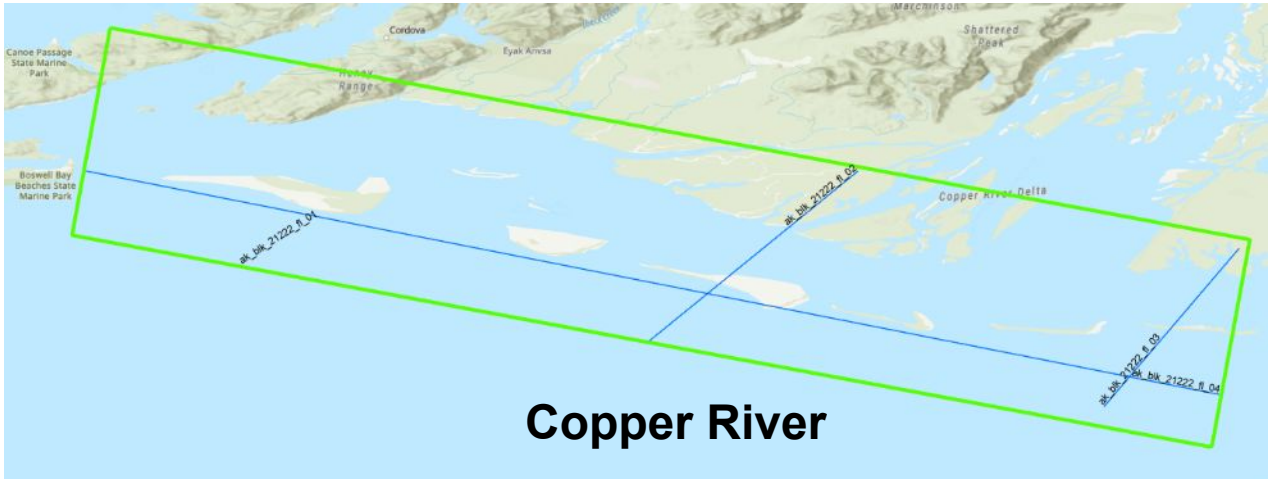
Jennifer.M.Wozencraft@usace.army.mil

# 2021 JALBTCX Topo/Bathy Exploratory Collections





- Exploratory lines flown at Copper River, Thompson, Kaktovik
- Decent Results on the North Slope
- No bathy data near Copper River

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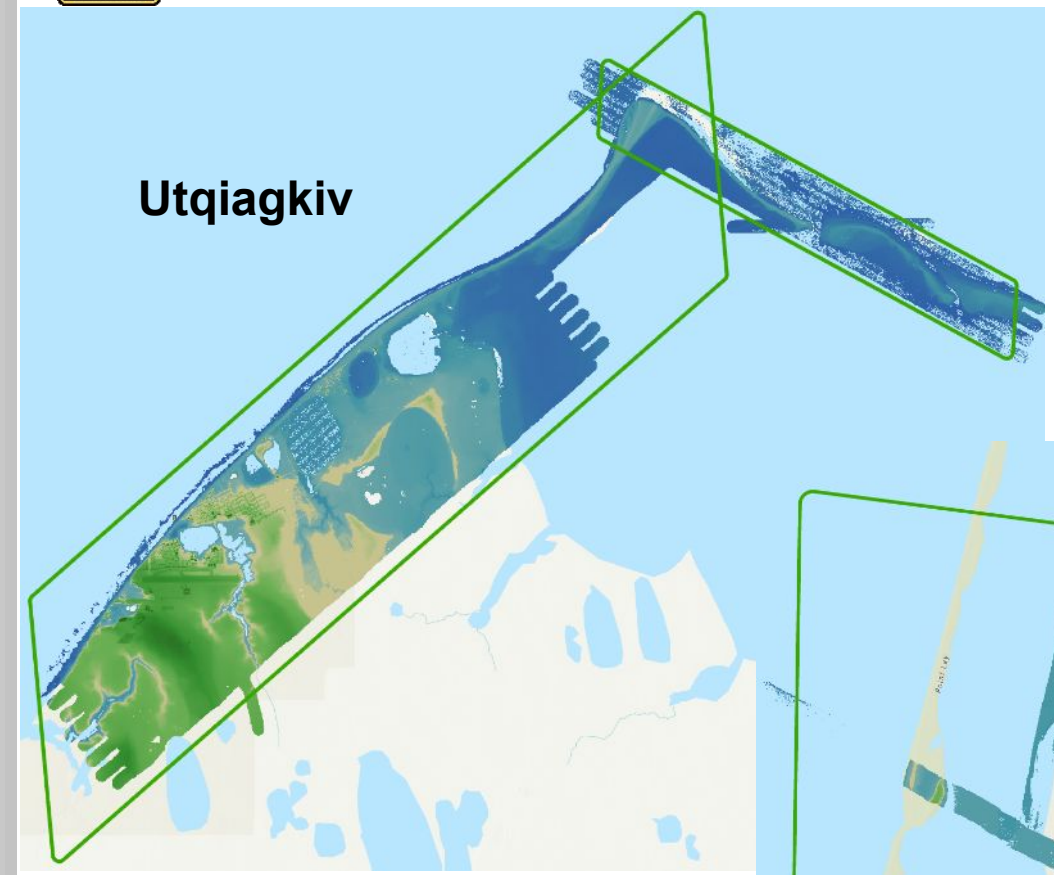
# 2021 JALBTCX Topo/Bathy Northwest AK






- Northwest North Slope had mixed returns
- Ocean side had no bathy
- Point Lay and Wainwright areas decreased in size due to poor water conditions

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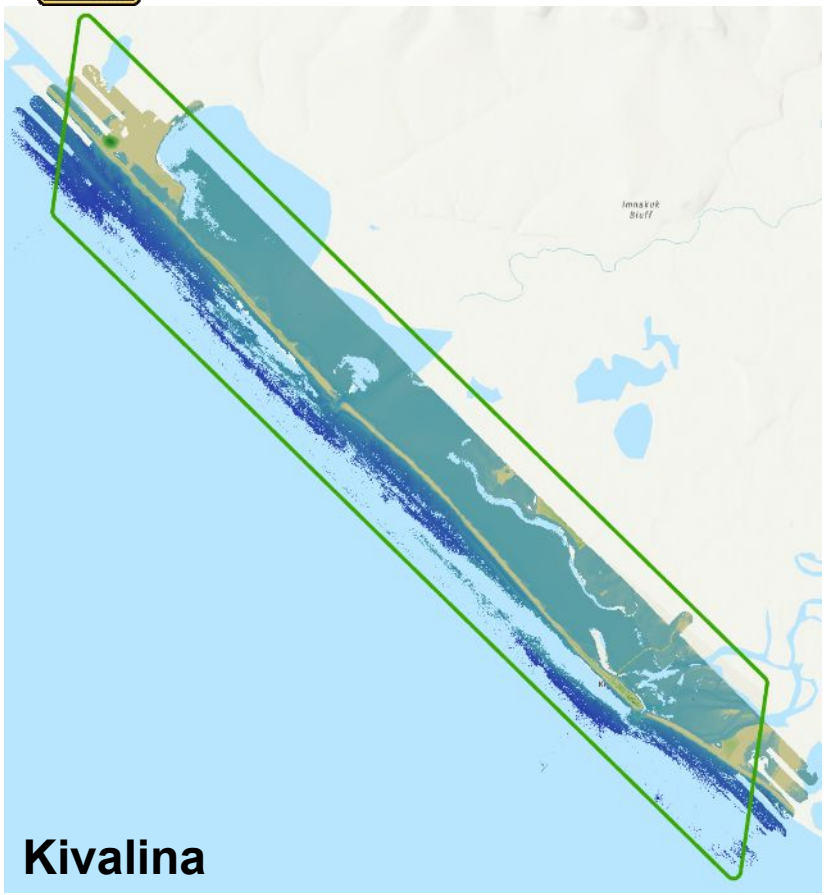
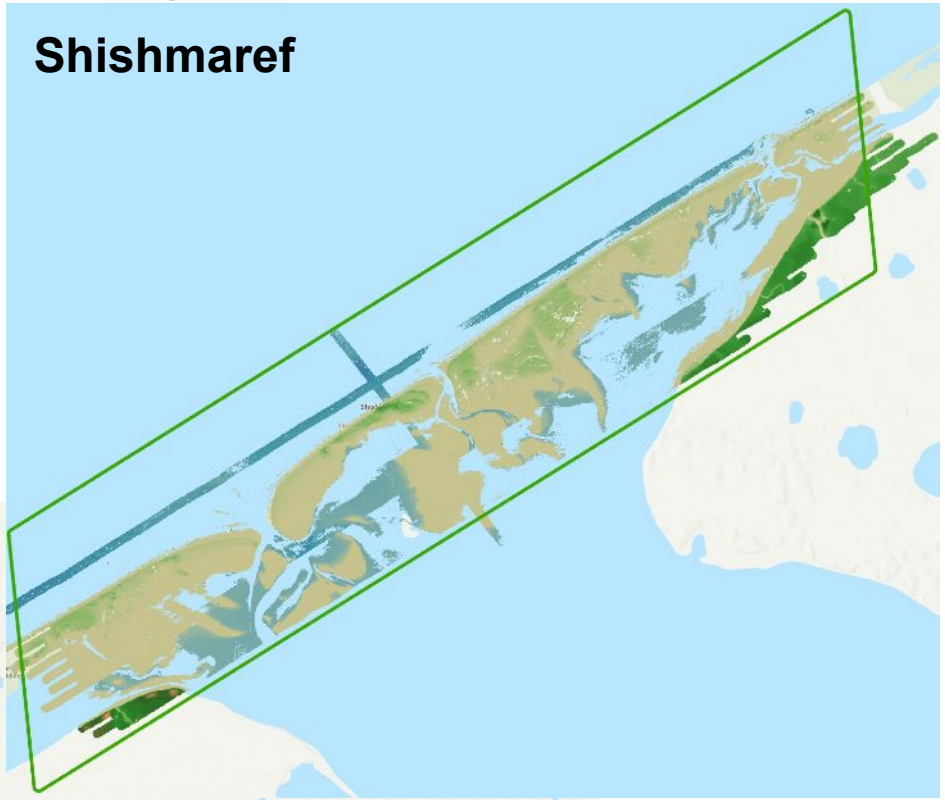
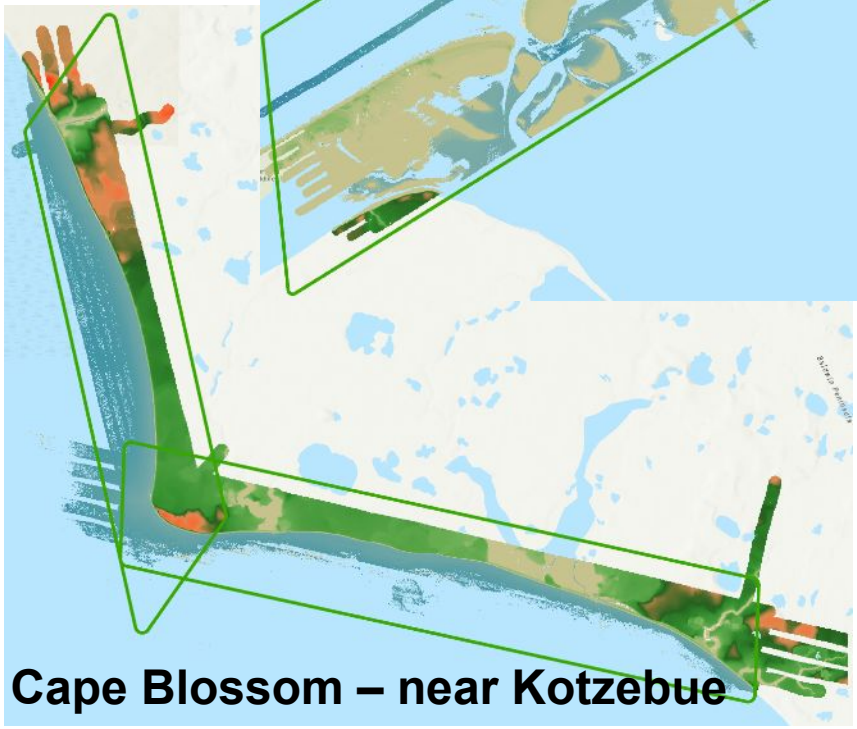
# 2021 JALBTCX Topo/Bathy Kotzebue Sound




- Kotzebue Sound had mixed returns
- Shishmaref was highly variable with minimal bathy
- Cape Blossom had decent returns with ice pack on the shoreline
- Kivalina also had sea ice with mixed returns

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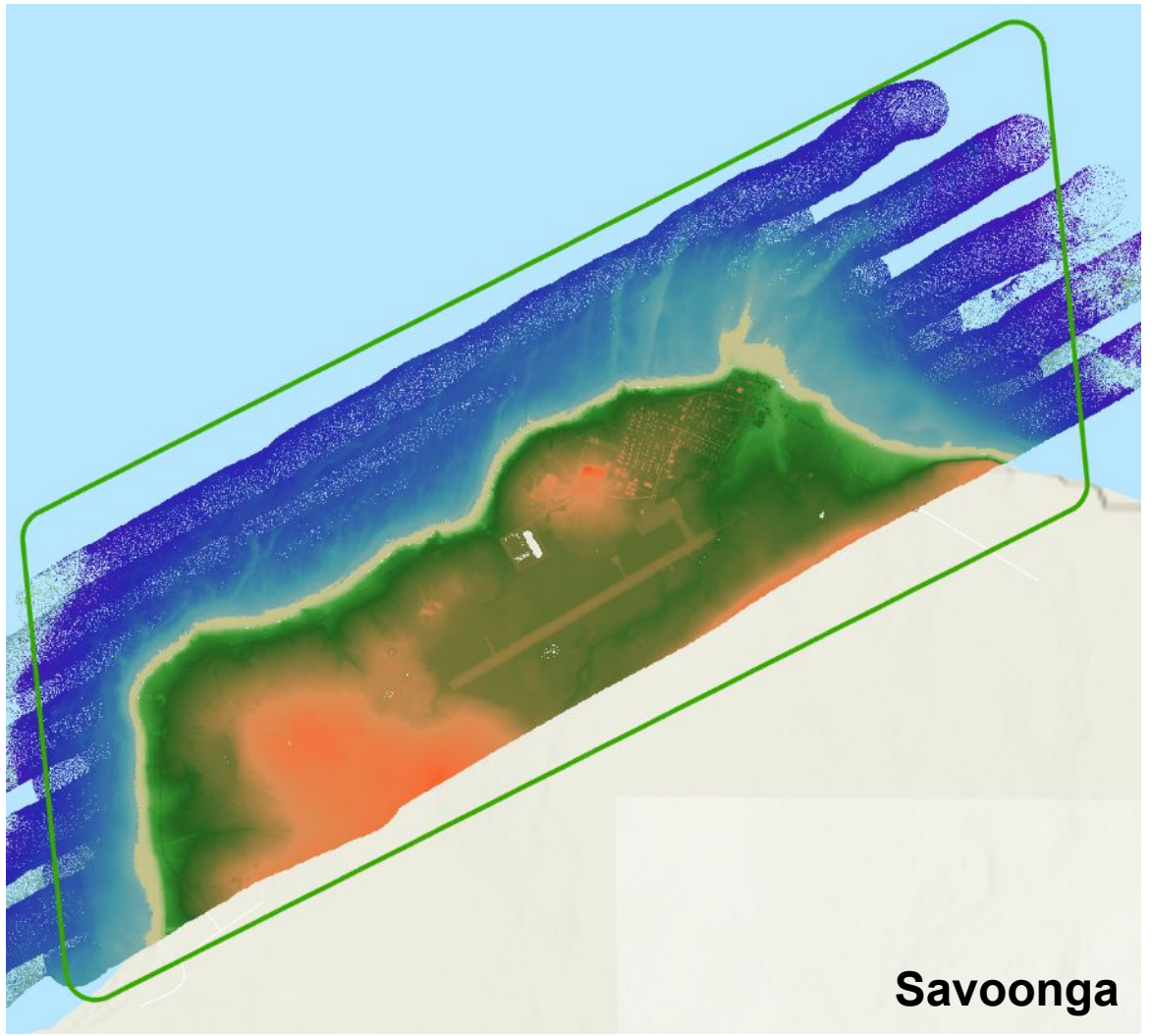
# 2021 JALBTCX Topo/Bathy St Lawrence Island


- Good bathy data around St Lawrence Island
- Very difficult location to fly with persistent low clouds and limited weather forecast
- Terrain did not help either
- Good area to expand coverage area to maximize collection.

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Christopher.l.macon@usace.army.mil

US Army Corps of Engineers

Finger Glacier, Glacier Bay National Park, 2019

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# U.S. Fish & Wildlife Service

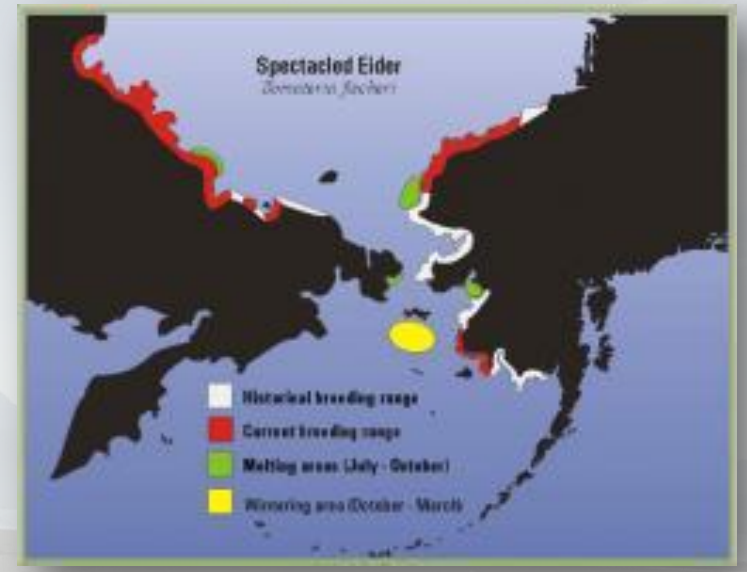
Sydney Thielke and Lew Coggins

**December 1st, 2021 | Virtual**

# USFWS Coastal Mapping Update

Sydney Thielke, Regional Wetlands Coordinator
USFWS, Alaska Region
Sydney_Thielke@fws.gov

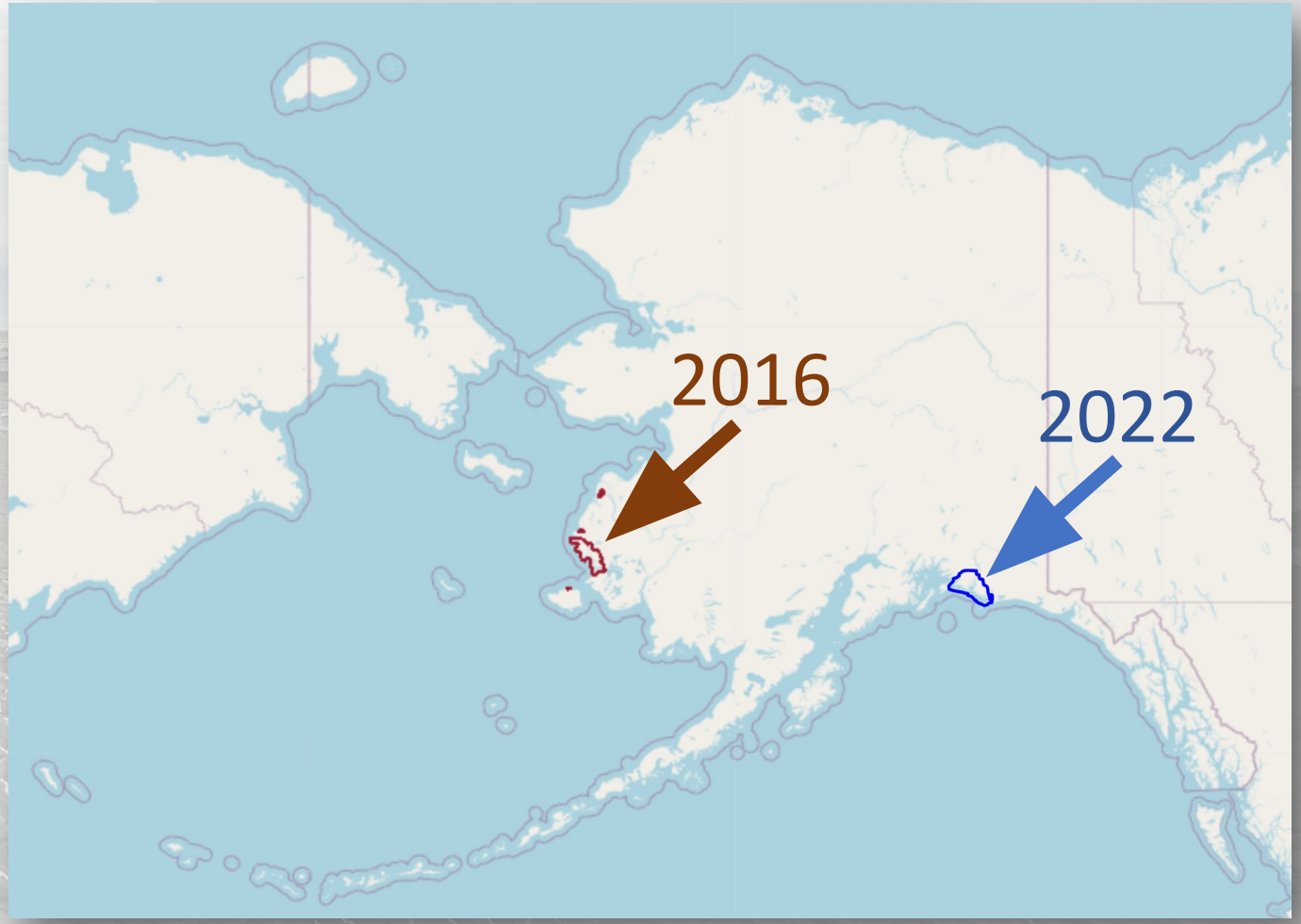
# USFWS Coastal Priorities




- 2020 solicitation for input across USFWS Alaska
  - Refuge administrative boundaries
  - Climate change and coastal erosion
  - Intertidal fish habitat
  - Shipping routes and infrastructure/oil spill response
  - Trust resources and Endangered Species


# USFWS Existing and Future Contributions

- **Lidar**
  - 2015 Western AK
  - 2022 Copper River Delta
- **Imagery**
  - FWS has invested in an imagery platform for small collections



# USFWS capability to collect imagery

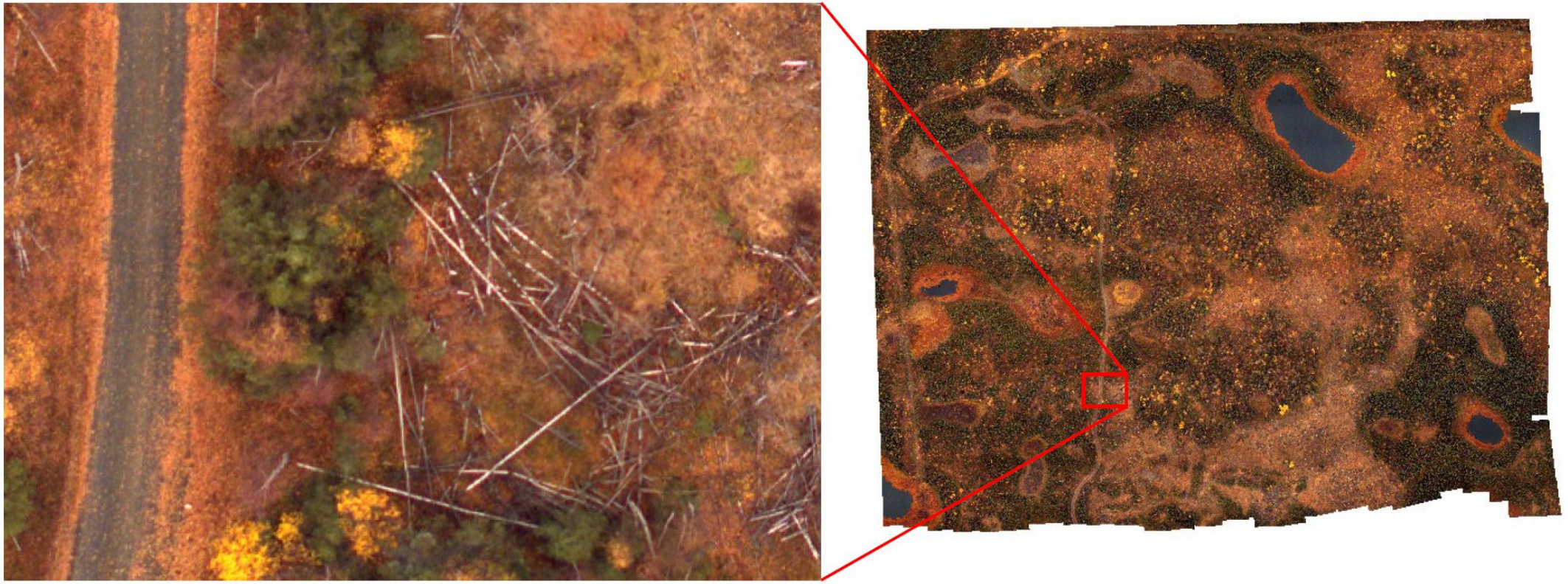
- Lucint12 Camera System
  - Nine Sensors
    - Bayer Color
    - Monochrome Red Edge
    - Monochrome NIR
    - Monochrome LWIR
- Lucint12 Camera System
  - Currently deployed on USFWS Cub Crafters CC-18
  - Future deployment on Cessna 206
  - Smaller sized collections <100,000 acres

# USFWS capability to collect imagery

Moose Pens: Overview, 1″ GSD, Color

HOOD TECH AERO

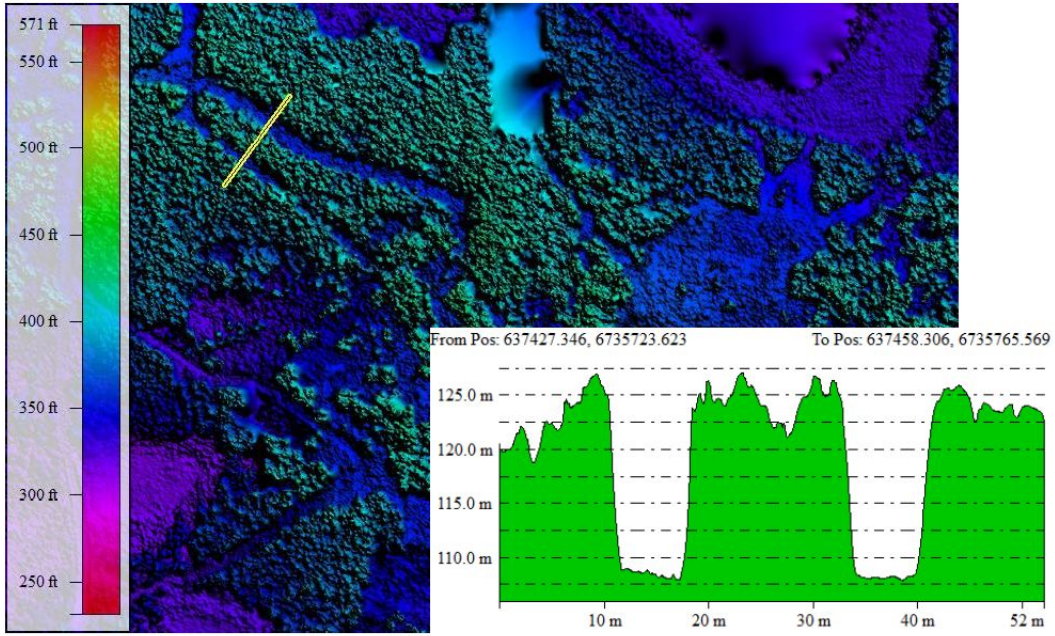
LUCINT
LUCINTSYSTEMS.COM



# USFWS capability to collect imagery

## Multispectral Products Delivered

Single Bands, NIR (+ Red Edge, NDVI Indices)




Digital Elevation Models (DEM)

# Session Q&A

Ask questions of our presenters by typing them into the question box, found in the menu bar to the right.  Click the triangle next to “Questions” to expand.

Poll Question:

# What other entities are mapping Alaska's coastal areas that we can collaborate with?

Please type your suggestions into the question box.

# 30 minute break