COASTAL COUPLING
COMMUNITY OF PRACTICE

ANNUAL MEETING

Coastal Coupling Community of Practice
May 24, 2023

Access to Meeting Materials
WiFi: Coastal Coupling
Password: co@$t2C0@$T!

Day 1 Highlights

1. Landscape was set for the need of water prediction, but what should we prioritize?
2. Need to engage within NOAA, other Feds, Univ., Private, and Public to ingest their science. (CoastGuard, SPEAR, CSTORM, STOFS, the COOS's, COMT, RPS, ...)
3. People that are connected to this community want to know how to:
    - Leverage this community.
    - Deliver on projects together in the next 1-3 years.
    - Access data and model outputs, OCEANSMAP, Pangeo, model testing Sandbox, AWS
    - National Water Model: NEXTGEN to drive multiple surface (ocean) models
4. Building relationships that help everyone understand the projects underway, by whom, and with what intended outcomes.
5. Capacity development - need new/qualified people.

Day 2 Look-Ahead

Today we will focus on information, best practices, and shared agreements through two breakout sessions, lightning talks, and additional subject matter presentations.

Coupled-Ocean-Atmosphere-Wave-Sediment Transport

JOHN WARNER
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Coastal Coupling Community of Practice Annual Meeting
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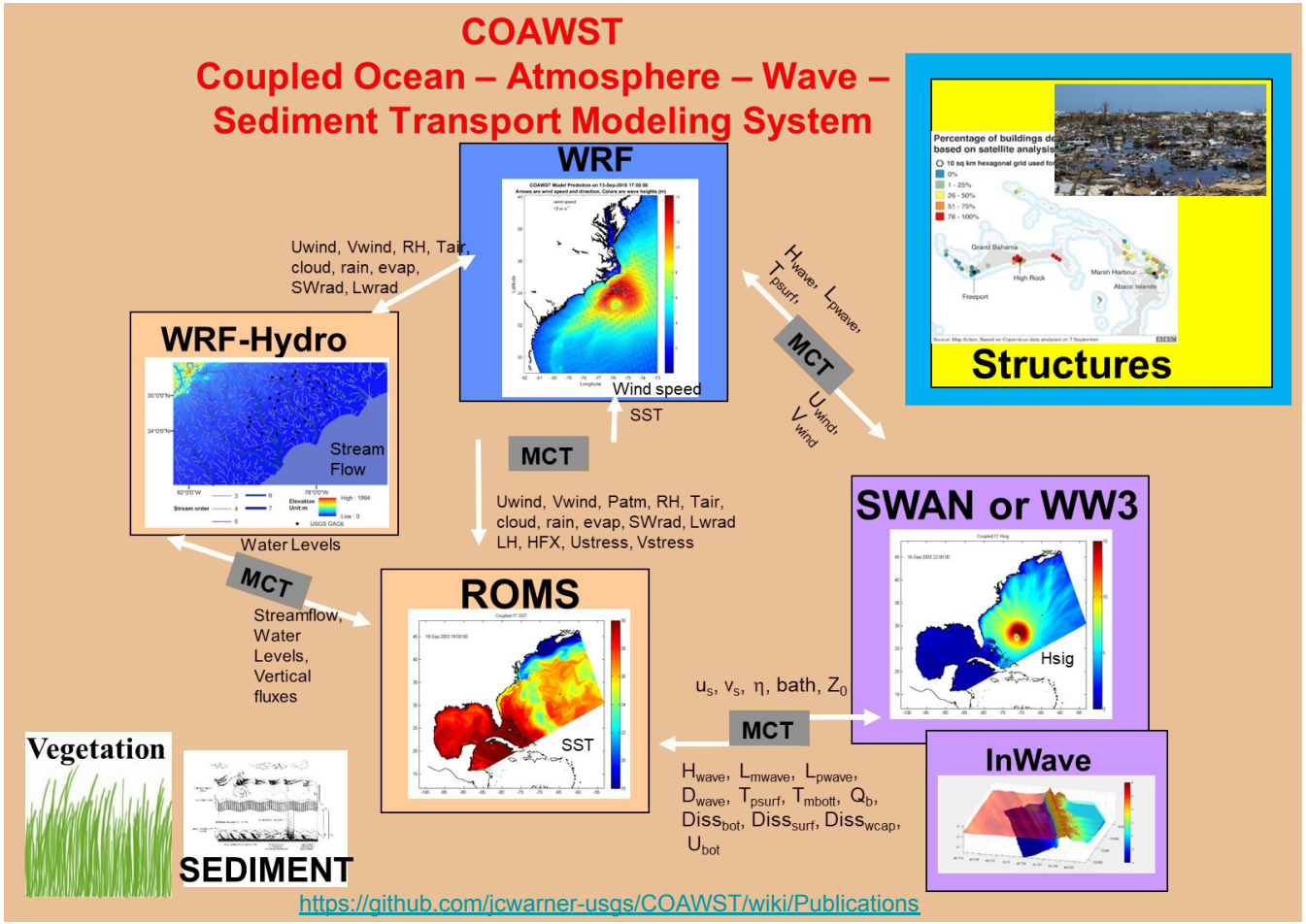
What is new?

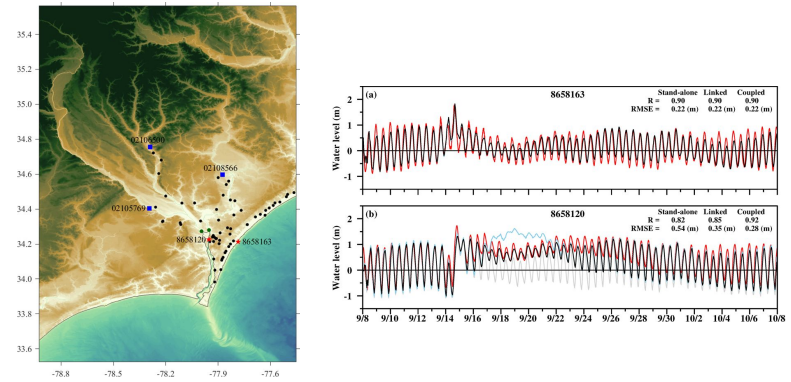
- Developed a coastal coupled modeling system
- Can be used to study impacts of storms on coastal systems.
- Explore processes relevant to surge, flooding, morphological change.



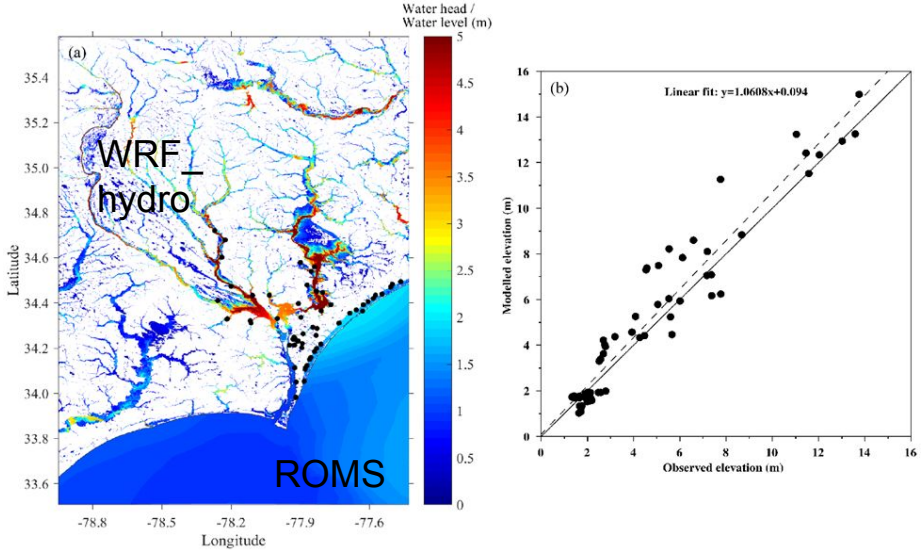
What is possible for coastal coupling with these new answers/inputs/etc.?

Hurricane Florence (2018) two-way dynamic coupling: WRF_hydro and ROMS.

Bao, D., Xue, Z. G., Warner, J. C., Moulton, M., Yin, D., Hegermiller, C. A., et al. (2022). A numerical investigation of Hurricane Florence-induced compound flooding in the Cape Fear Estuary using a dynamically coupled hydrological-ocean model. *Journal of Advances in Modeling Earth Systems*, 14, e2022MS003131. https://doi.org/10.1029/2022MS003131



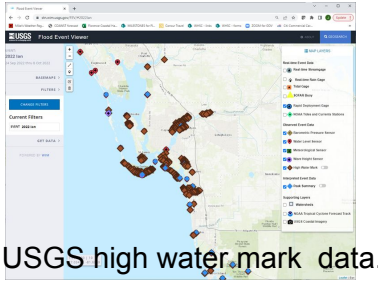
Comparison of water level between observed data (red), stand-alone model results (grey, exp1), linked model results (blue, exp2) and coupled model results (black, exp3) at two NOAA stations.



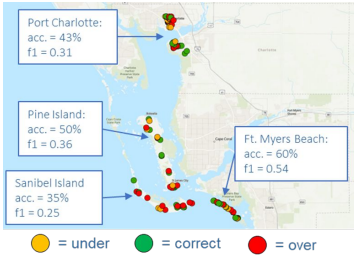
Comparison between observed and model-simulated high water marks. (a) Modeled highest water head in WRF-Hydro and highest water level in ROMS during Florence. (b) Regression between the observed and modeled elevation of high water marks.

What is needed next to take these efforts to the next level?

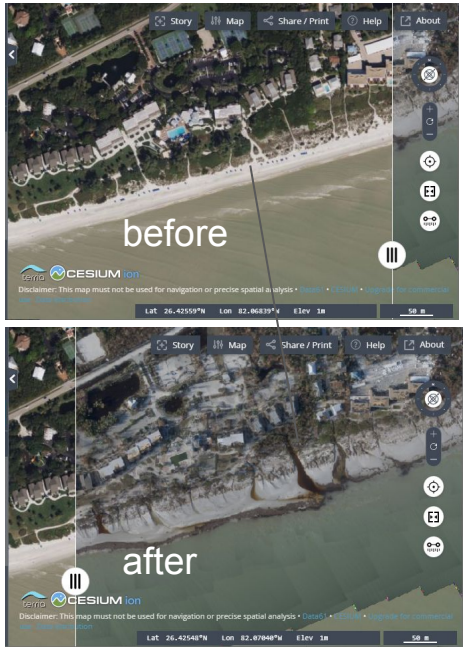
Hurricane Ian (2022) as an example.



USGS high water mark data.

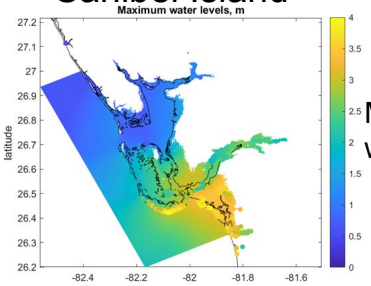


Predicted structures impacts.



Washout/erosive features coincide with walkways through the dune.

Sanibel Island



Modeled maximum water levels.

To simulate coastal flooding and change, modeling systems need to consider:

- riverine flooding
- urban storm drainage (sewershed)
- wave breaking and setup
- groundwater elevations
- hydrologic processes (precipitation, infiltration, runoff, and evapotranspiration)
- morphological change
- structures impacts
- small scale features can dominate the response!

USGS science for a changing world — Total Water Level and Coastal Change Forecast Viewer

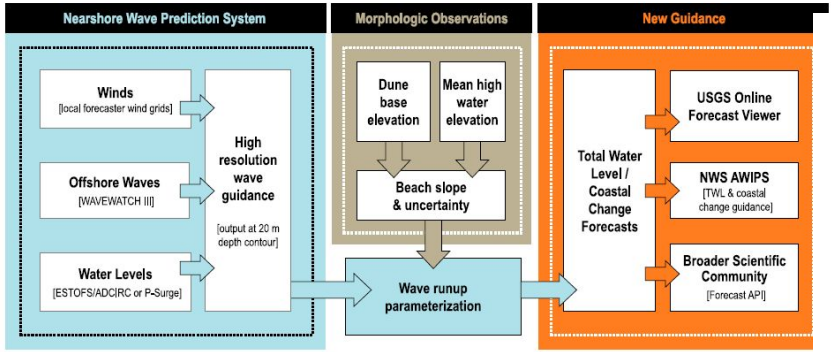


Fig. 5 Components of the total water level and coastal change modeling framework.

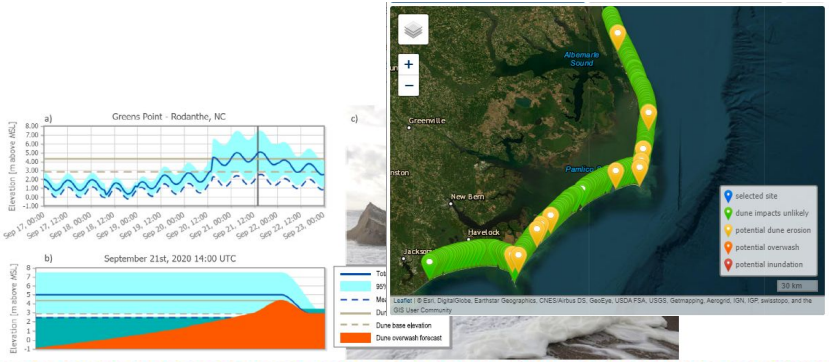


Fig. 4 Example total water level and coastal change guidance from USGS and NOAA NWS.

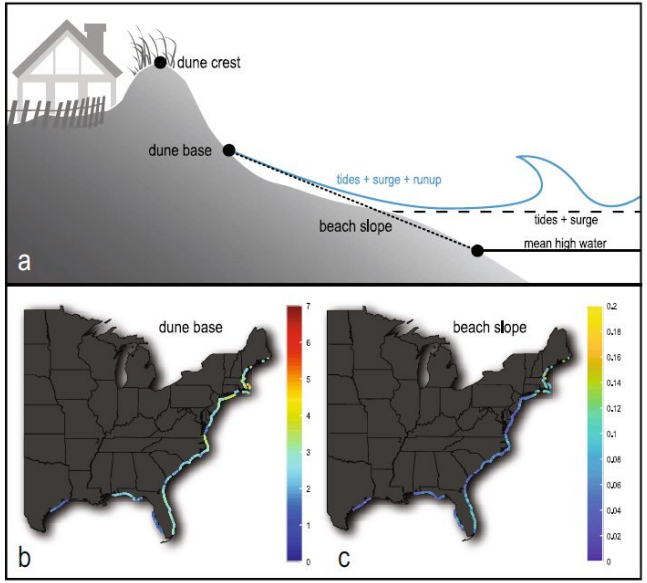


Fig. 1 Total water level components and geomorphic features used in predicting dune erosion events. Total water level (**a**) is modeled as the sum of tide, storm surge, and wave runup. Local morphology is represented by dune base elevations in meters (**b**) and beach slope (**c**), both derived from airborne lidar measurements.

Crossshore profiles every ~500m

THANK YOU

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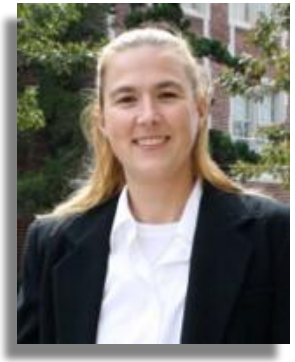
Development and Application of a Coupled Modeling System to Obtain Inland and Coastal Flooding for Coastal North Carolina Due to a Changing Climate for the NIST Community Resilience Project



KENDRA DRESBACK

Research Assistant Professor
University of Oklahoma
dresback@ou.edu

Coastal Coupling Community of Practice Annual Meeting
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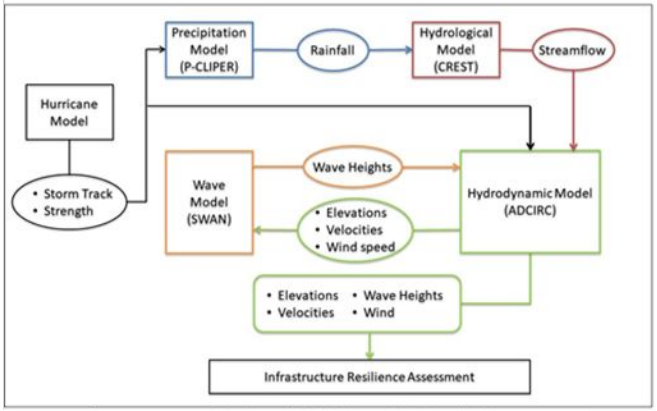
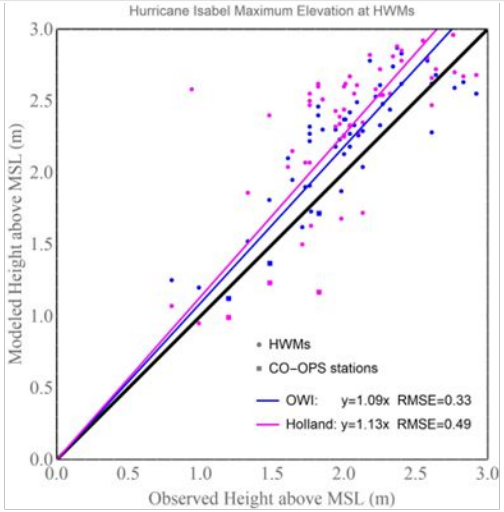
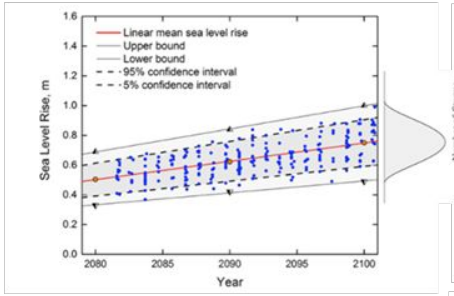
Community Resilience Planning for Coastal Flooding Under Climate Change

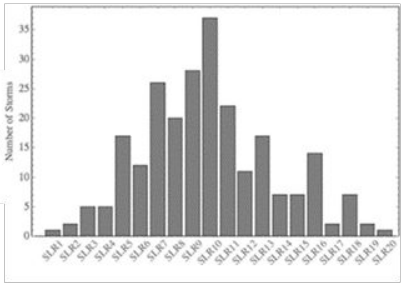
- NIST COE Center for Risk-Based Community Resilience Planning
- Development - STORM-CoRe Framework
  - The goal of this research was to increase community resilience against natural hazards through integrated hazard and infrastructure modeling. Hazards was for total water levels.
  - Framework brings together precipitation model (P-CLIPER), hydrological model (CREST/EF5), Hydrodynamic model (ADCIRC) and wave model (SWAN).
  - Verifications done by comparing the results from best-track information to the optimized wind fields and radar precipitation.
  - Results from validation showed good agreement between the best track and optimized information.

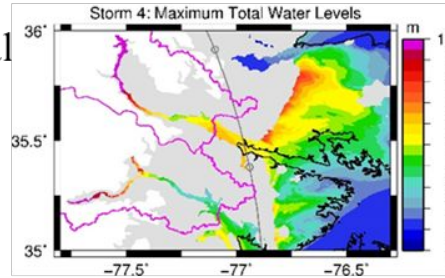


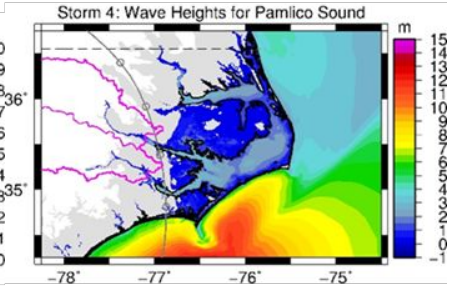


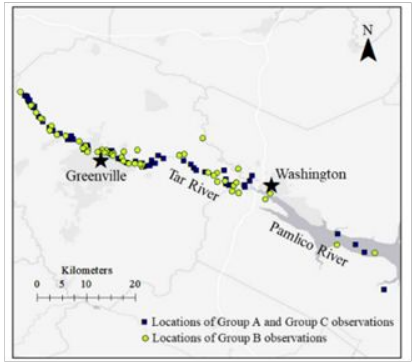
- STORM-CoRe used for Climate Change Studies
  - Framework used with different synthetic hurricane tracks for climate change and sea level rise scenarios (distributions of sea level rise shown – looked at 20 different levels).
  - Results included rainfall, winds, hydrologic streamflows and waves. Wave heights and total water levels in the North Carolina area are shown.
- Probabilistic formulation
  - Information developed in the above study was utilized to produce a probabilistic formulation for both storm surge and inland flooding – logistic model and non-stationary random field.
  - Three outcomes
    - Probability that a location is flooded
    - Spatial correlation
    - Predicts flooding at locations with the area and is not restricted

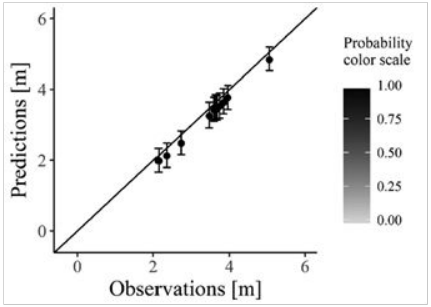












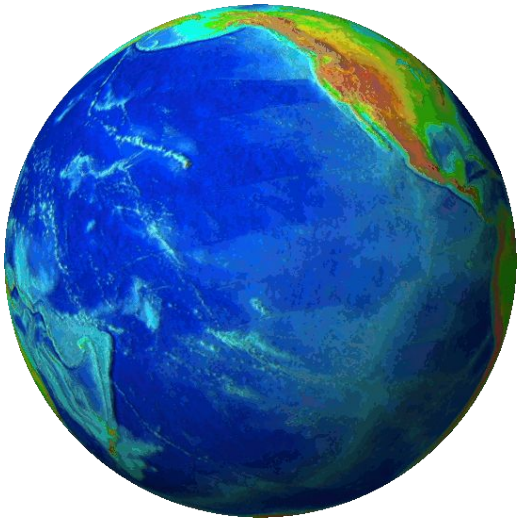
- What is needed next to take these efforts to the next level?
  - More accurate bathymetry in the upland rivers. Greatest sources for riverine data – FEMA and USACE river studies that have been done over the years.
  - More encompassing statistical or empirical precipitation models that can capture the physics to drive the hydrological responses for the climate change studies.
  - Moving connections for the hydrologic/hydrodynamic models.
- What is possible for coastal coupling with these new answers/inputs/etc?
  - Brings in the inland areas to the probabilistic formulations when looking to evaluate the coastal infrastructure.
  - Land use changes in coastal areas to guide nature-based solutions to flooding, as well as a guide to development.
  - Data, algorithms, & codes developed for the climate change studies can be optimized for efficiency and thus be used by NOAA to fill a service gap in these flat coastal plain areas.
  - Hazard work can be coupled to engineering models, like transportation, and social models, like who evacuates and why, to provide more systematic approach for evacuation orders.

THANK YOU

KENDRA DRESBACK (dresback@ou.edu)

Papers:

1) Dresback et al., Steps Towards Modeling Community Resilence Under Climate Change: Hazard Model Development, *Journal of Marine Science and Engineering*, 7, 225, 2019.
2) Contento et al., Probablistic Formulation for Storm Surge Predictions, *Structure and Infrastructure Engineering*, 16(4), 547-566, 2020.

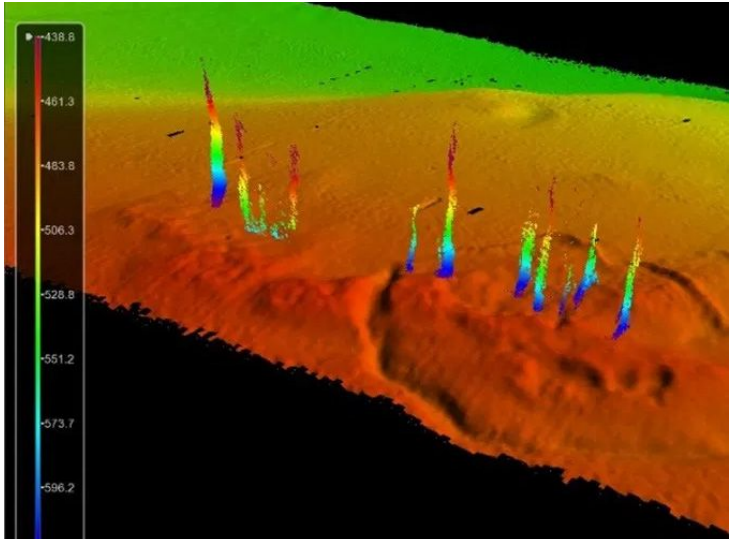


Topography and Bathymetry Data Synergies: CC CoP Annual Meeting 2023

Ashley Chappell
NOAA Integrated Ocean and Coastal Mapping
5.24.23

What is IOCM?

IOCM is *planning, acquiring, integrating, and managing* ocean and coastal geospatial data and derivative products for easy access and use by the greatest range of users.



Three primary activities:

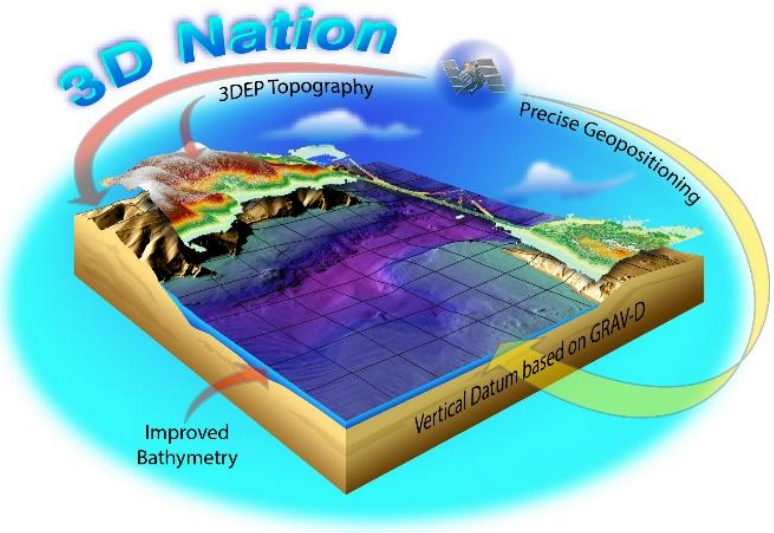
- **Data Acquisition**
- **End-to-End Data Management**
- **Maximum Use and Re-Use of Data**

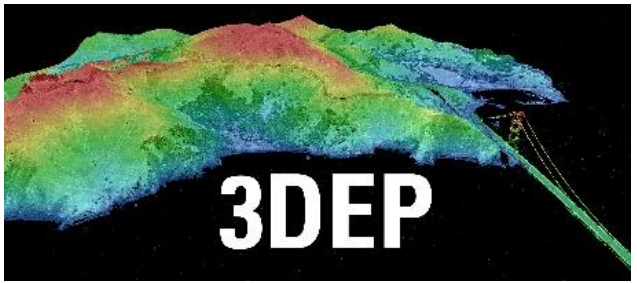
Coordination and Collaboration – Map Once, Use Many Times!

Topography and Bathymetry: A 3D Nation Vision

Seamless ELEVATION DATA…

A modern elevation foundation, from the peaks of our mountains to the depths of our waters for stronger, more resilient communities and U.S. economy.

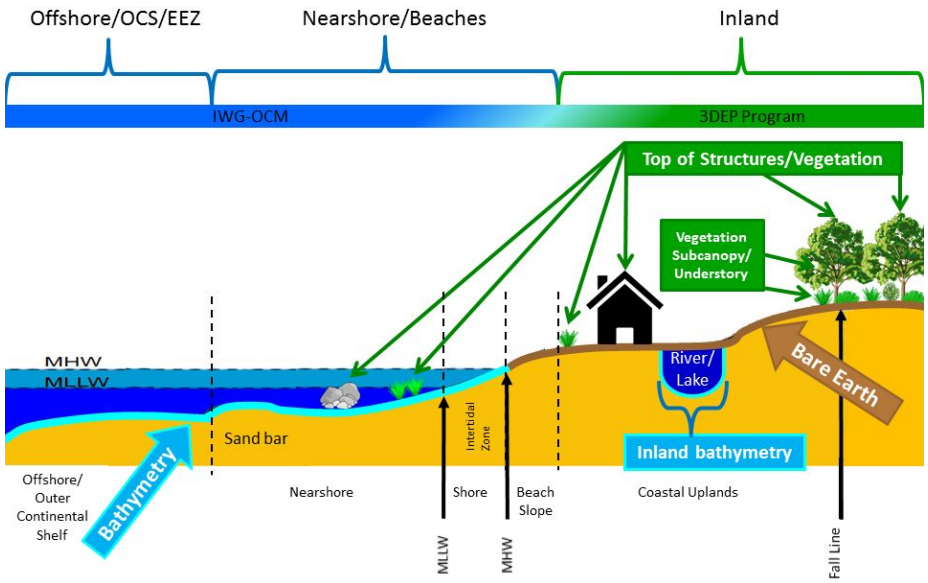




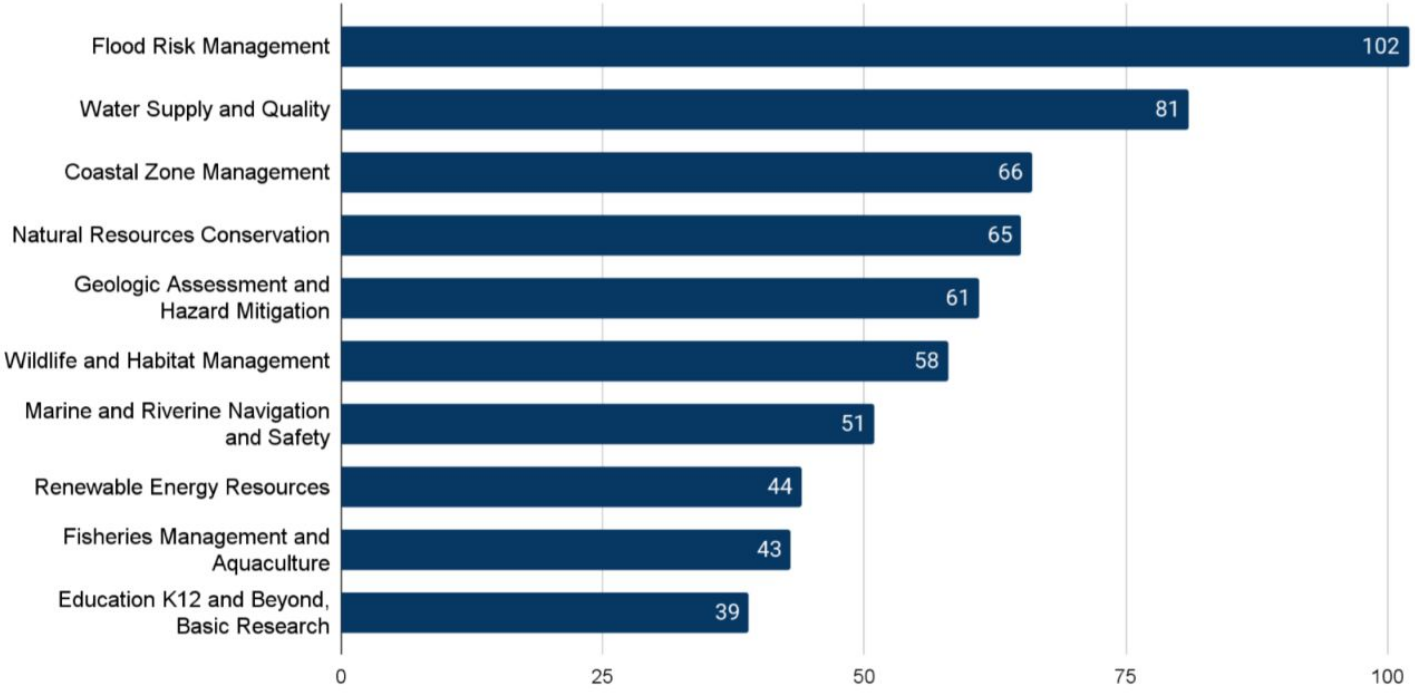
Mapping a 3D Nation: Study Goals

Understand 3D Elevation Data Requirements

- Understand inland, nearshore, and offshore elevation data requirements and benefits
- Understand how requirements and benefits dovetail in the coastal zone
- Improve understanding of needs to guide planning for NOAA and the next generation of 3DEP for USGS after completion of nationwide coverage
- Gather technology-agnostic user information to assess new technologies against requirements and tradeoffs between different approaches
- **RESULTS: $13.5B in benefits for 1352 mission critical requirements for topography and inland/ nearshore/offshore bathymetry**



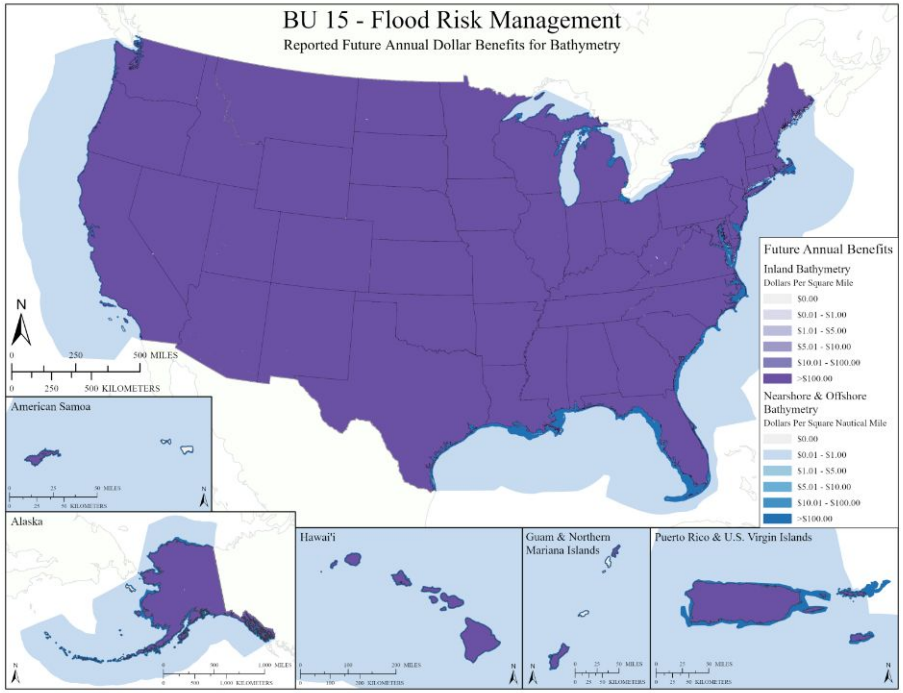
3D Nation Study: Top 10 Business Uses



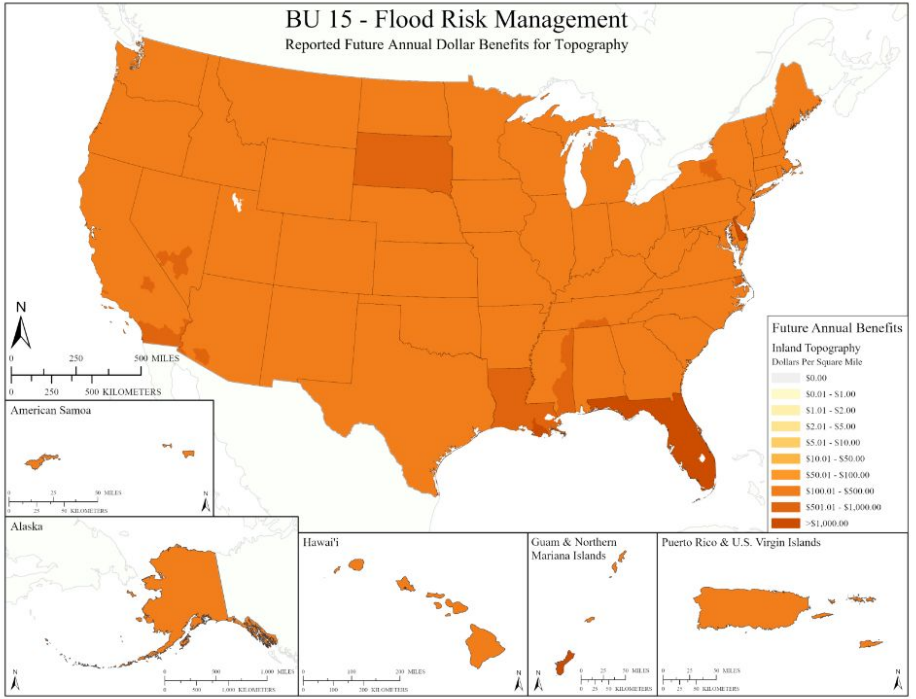
Some FRM MCAs:

- *Modeling water flow and drainage*
- *Flood inundation mapping*
- *Hydrologic forecasting*
- *3D flood visualizations*
- *Climate change analysis*
- *Hazard planning and mitigation*
- *Disaster recovery*

Flood Risk Mgmt: Benefits by Geography

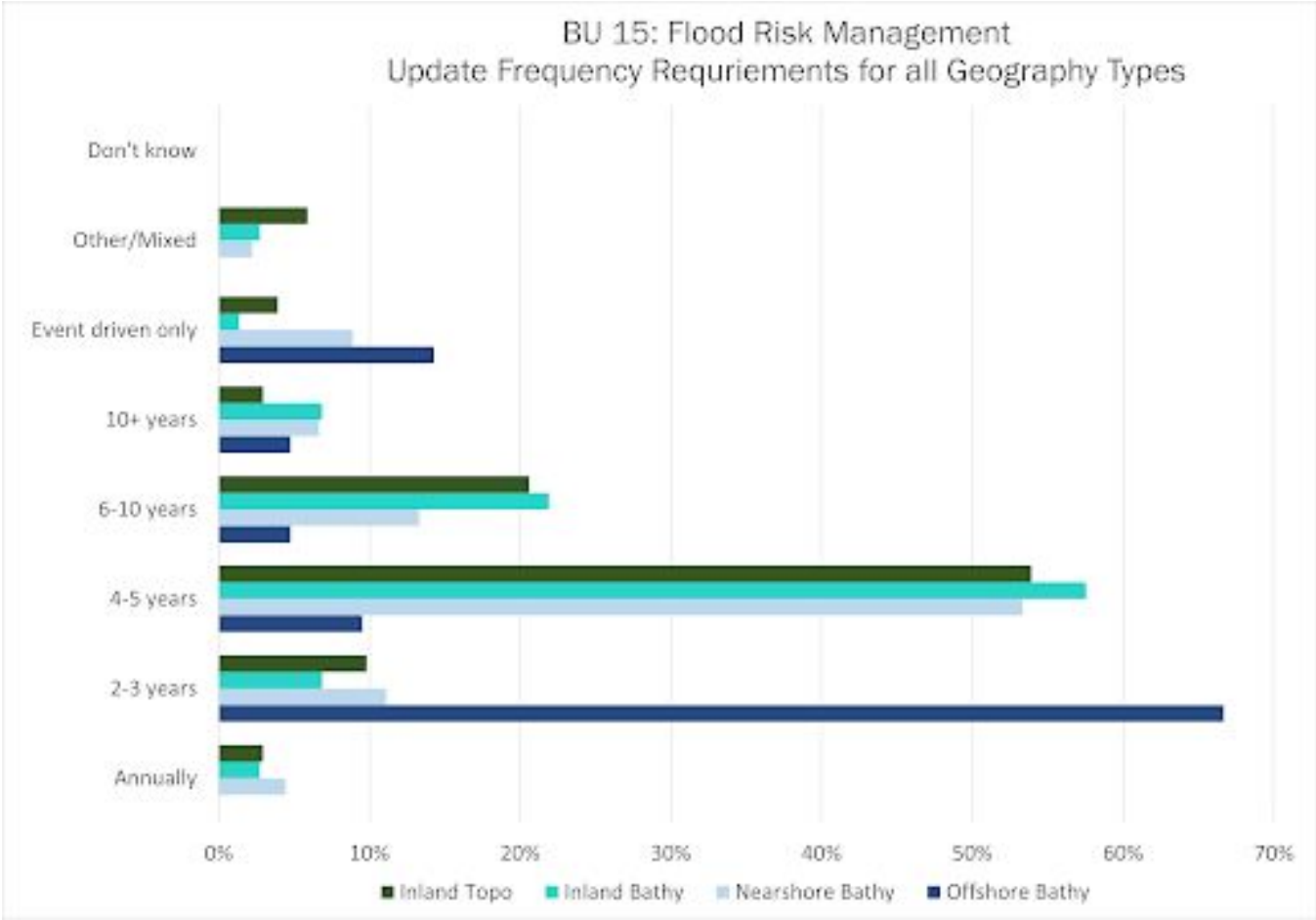


National distribution of BU 15 reported future annual dollar benefits for bathymetry. Right click and open image in a new tab to zoom into the map.



National distribution of BU 15 reported future annual dollar benefits for topography. Right click and open image in a new tab to zoom into the map.

Flood Risk Mgmt: Quality Levels and Frequencies



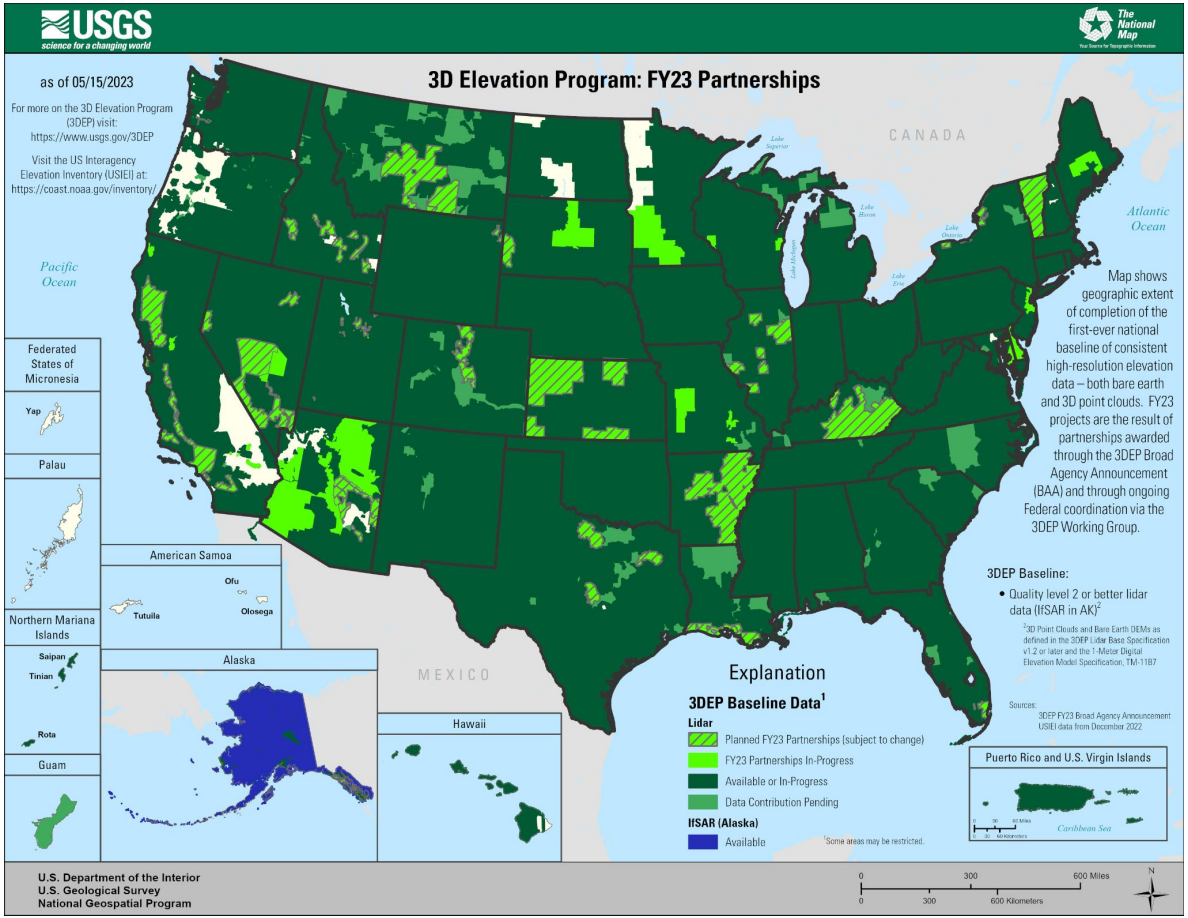
Topo and Bathy: Acquisition Status

Topo Lidar:

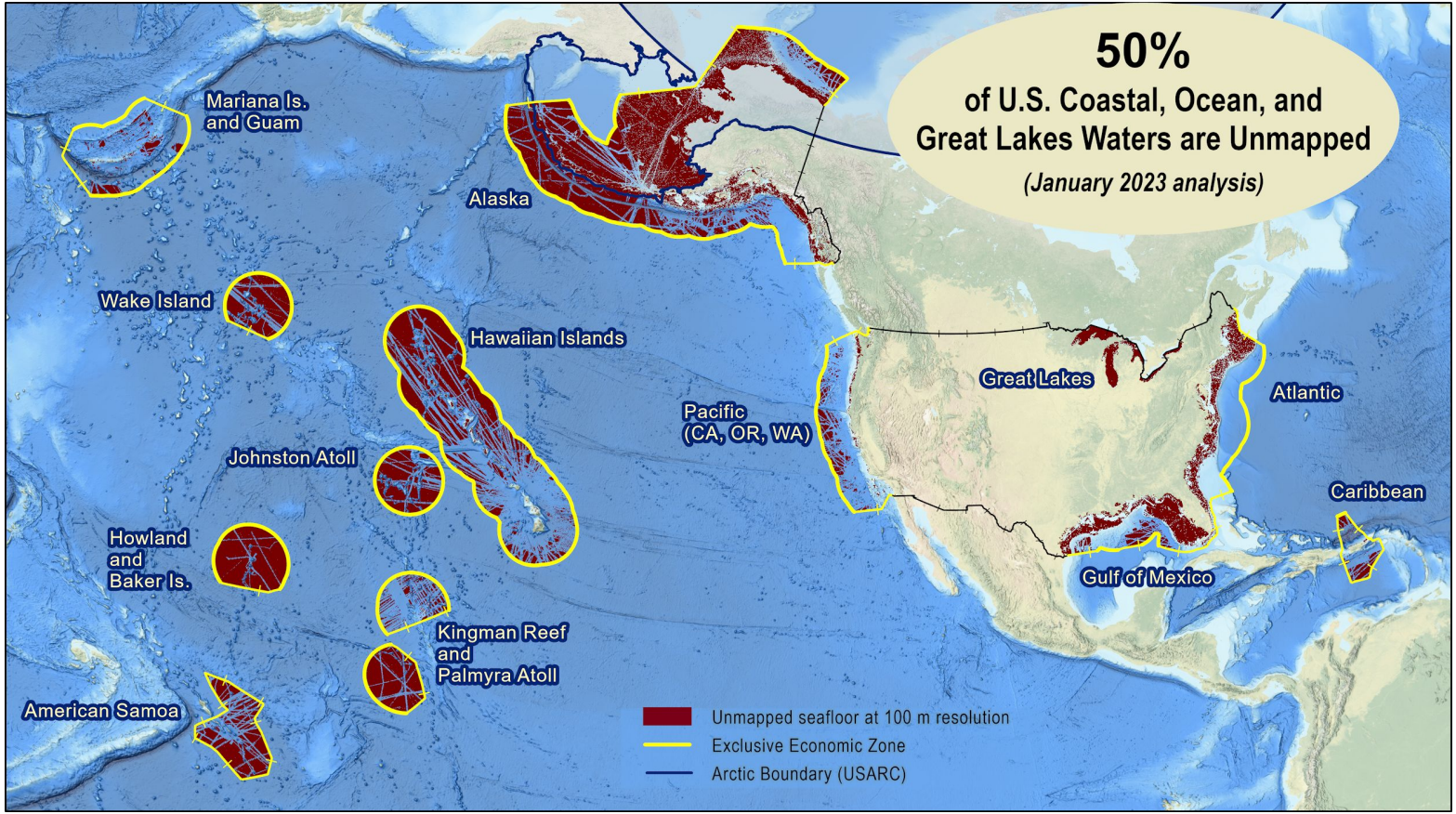
- Completed
- Planned
- Collaborative funding with agencies, states, other partners

3DEP/3DHP coordination and planning for Inland Bathymetry just getting started!

https://www.usgs.gov/3d-elevation-program

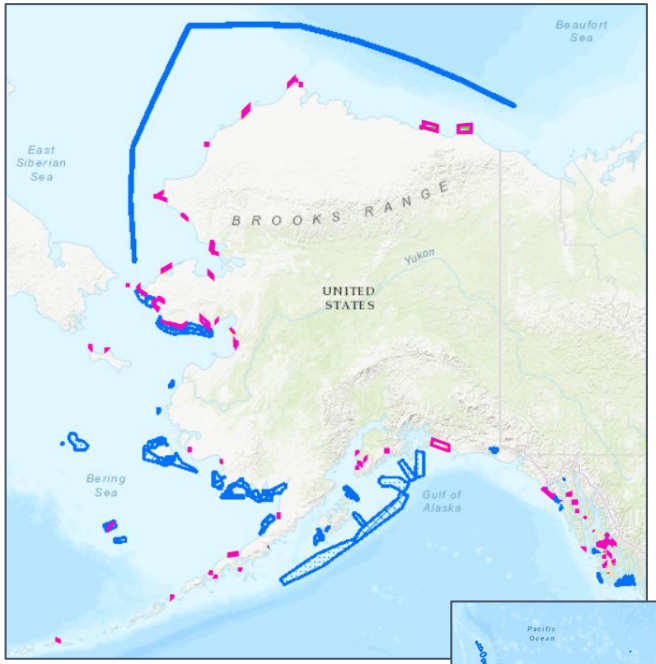


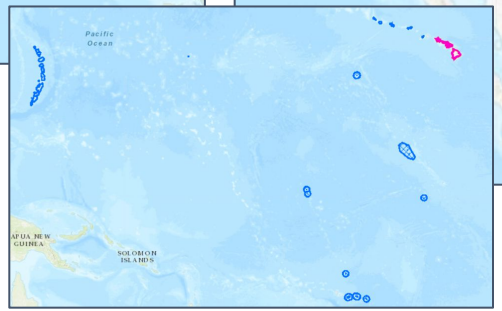
Topo and Bathy: Acquisition Status



https://iocm.noaa.gov/documents/mapping-progress-report2023.pdf

Bathy Lidar and Multibeam Planned Acquisitions





fedmap.seasketch.org

Topo and Bathy: All Hands on Deck

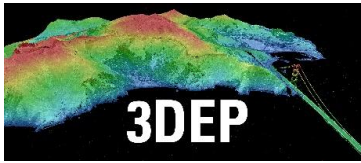
Requirements exceed resources but…
Leveraging lets us do more!

Share:

- Modeling community mapping priorities and plans at fedmap.seasketch.org
- $$ – Partner on projects (e.g. BIL/IRA, 3DEP BAA, Brennan Fund)
- Regional, National Mapping Campaigns
- EXISTING DATA DISCOVERY
- Elevation data to NBS, NCEI, Digital Coast

Seascape Alaska

3DHP



Thank You!

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Topography / Bathymetry Challenges where Inland and Coastal Waters Meet

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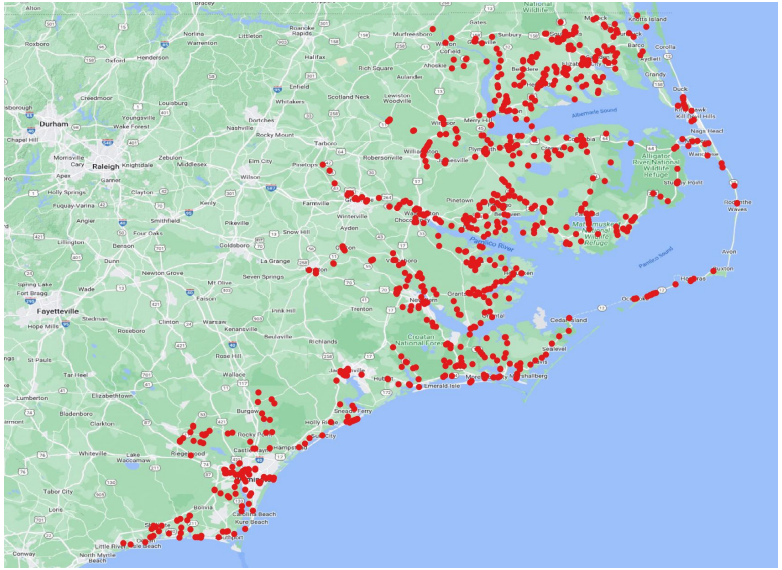
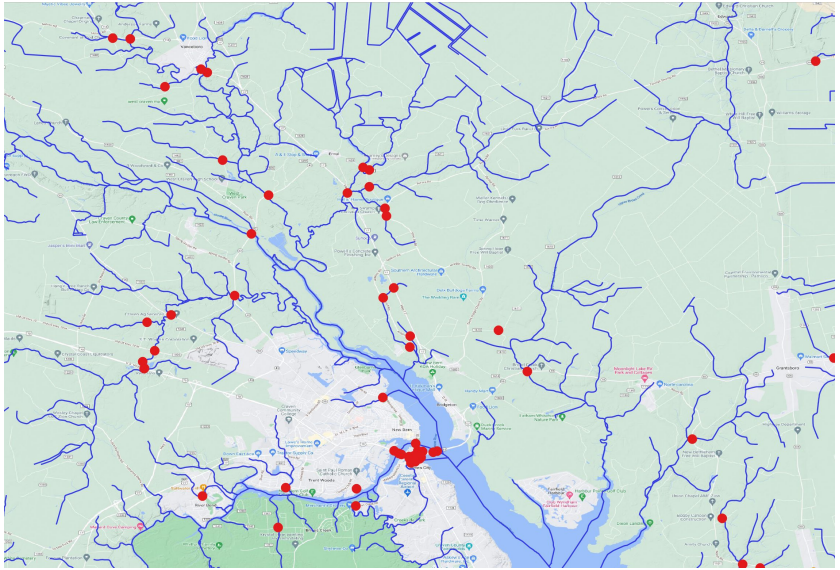
Problem:

- Low slope coastal regions (e.g., Southeast US & Gulf coasts)
- Flooding marine, hydrologic, or both
- Hydrodynamics – bi-directional, compound
- North Carolina DOT locations of interest for flooding

NCDOT locations of interest

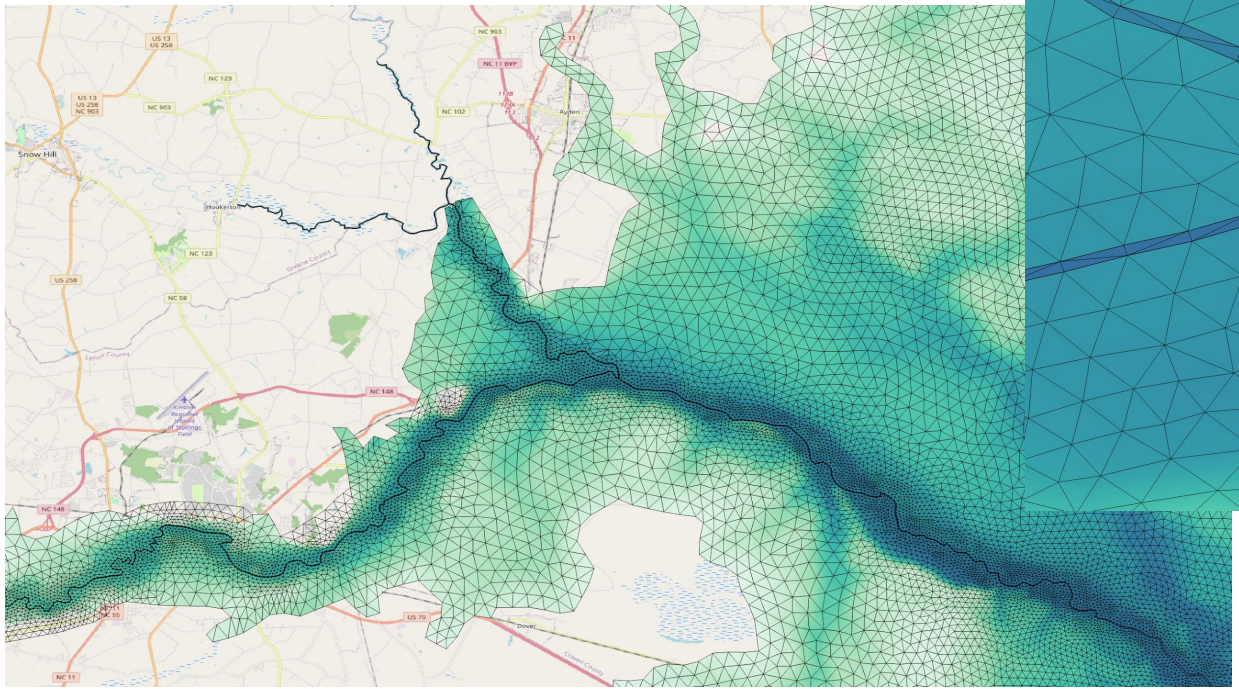
NWM hydrofabric

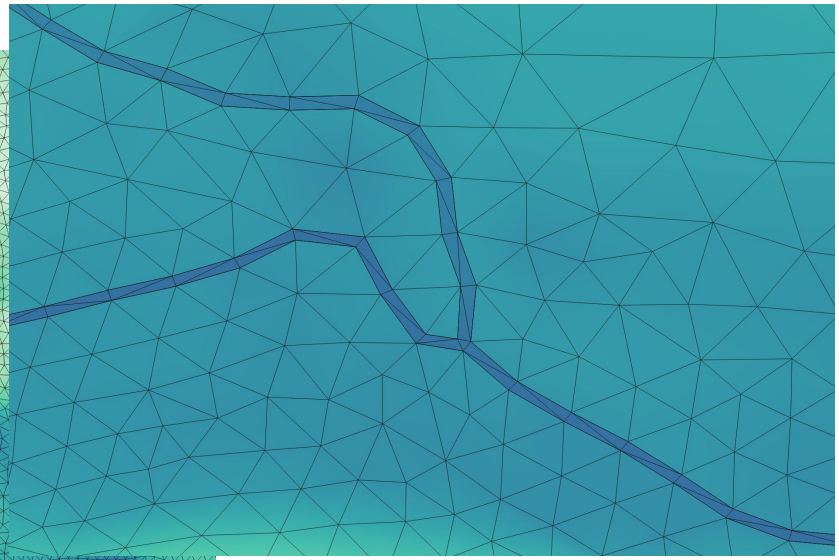




Model Technology

- ADCIRC unstructured triangular meshes
- NEW - seamlessly embedded channels



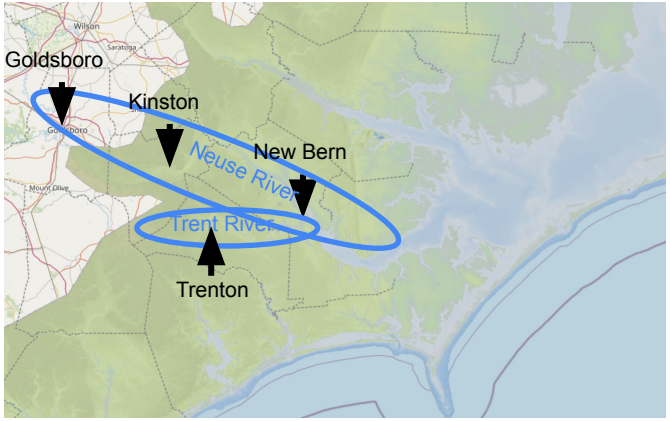


- NEW – subgrid models
  5/23 talk – J. Westerink

Example: Topo / Bathy Data Sources – eastern NC

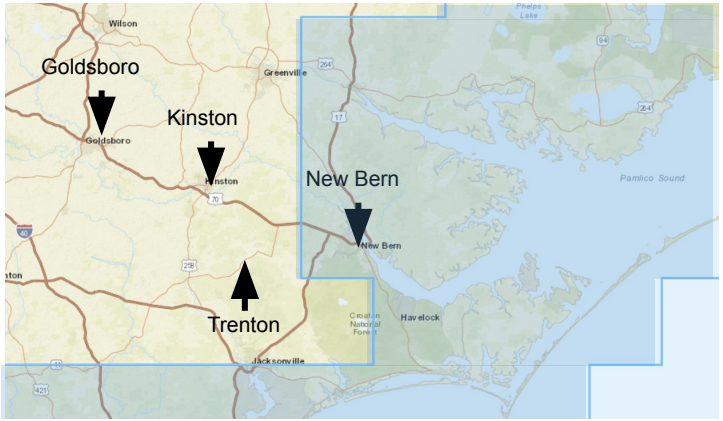
CoNED

DEM 1 m horizontal resolution



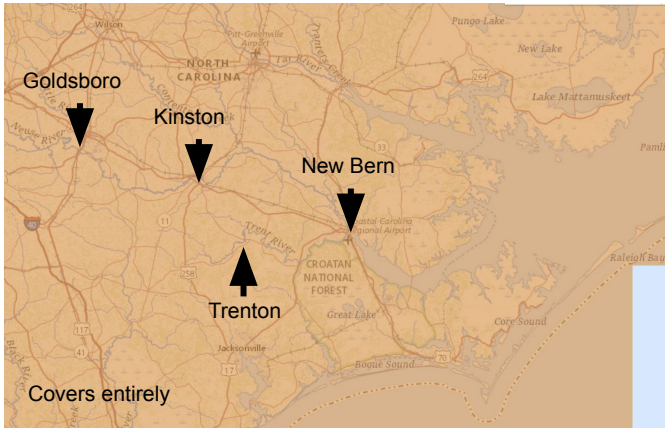
CUDEM

DEM 3 m horizontal resolution



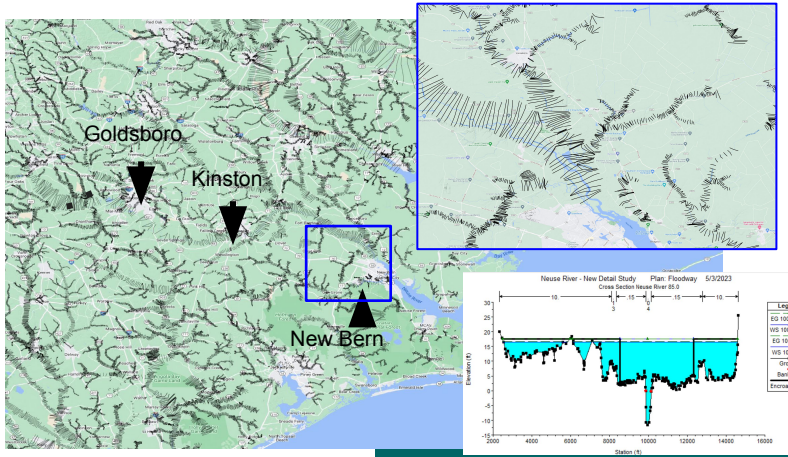
3DEP

DEM 10 m horizontal resolution



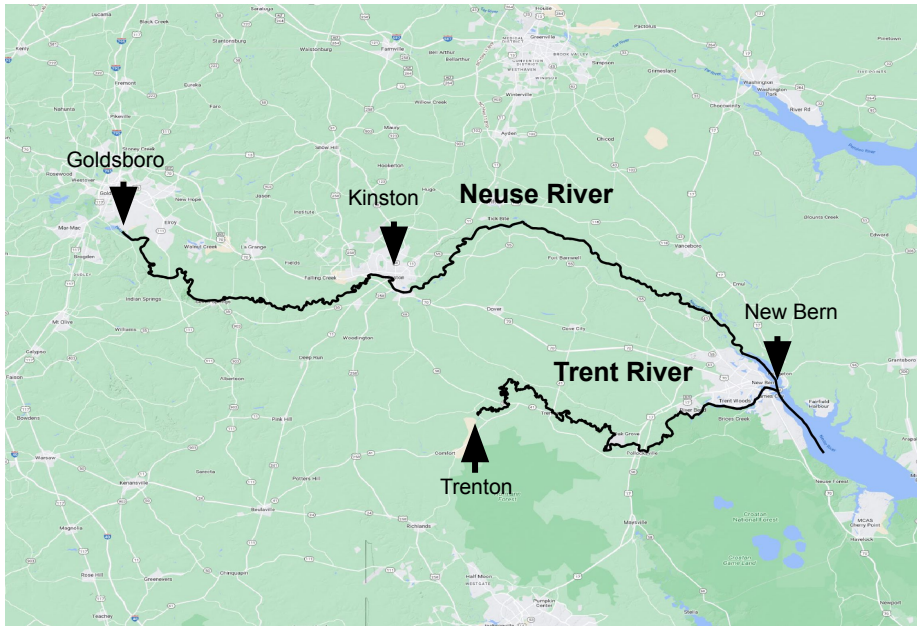
NC FRIS

HEC-RAS model cross-sections variable spacing (~500m)

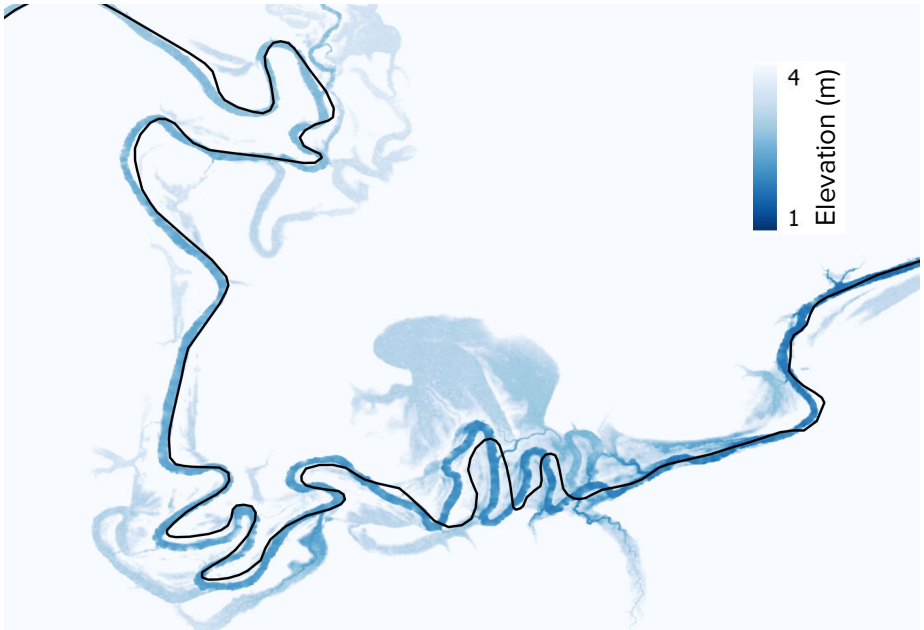


NHDPlus Centerline Alignment with CoNED DEM

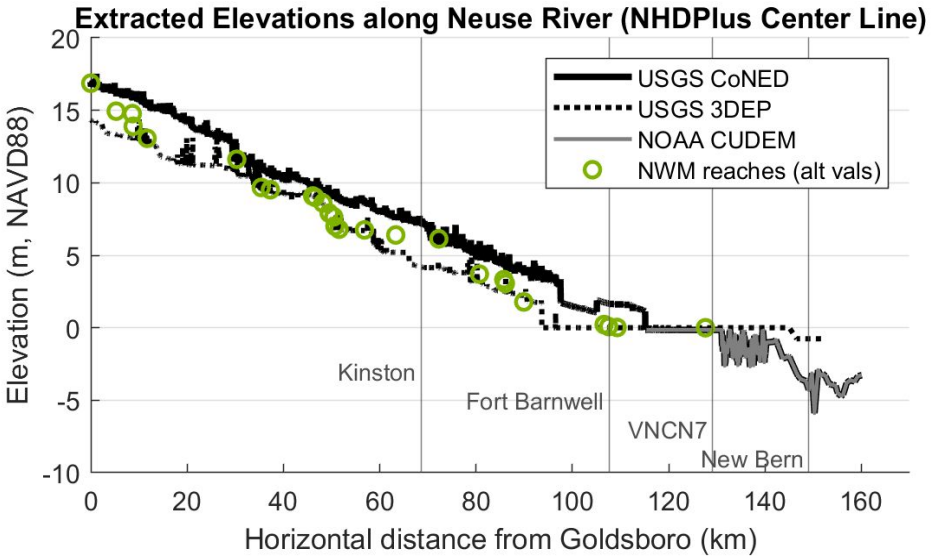
NHDPlus Centerlines

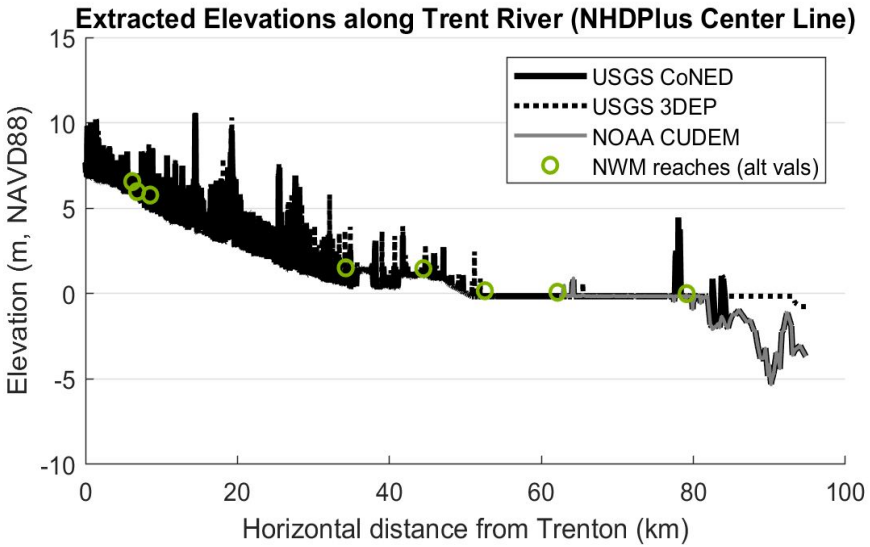


A Section of Trent River

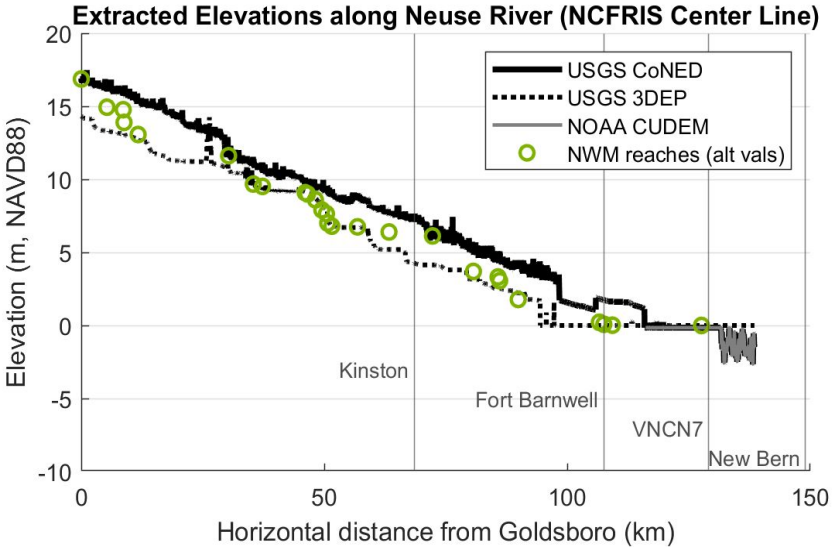


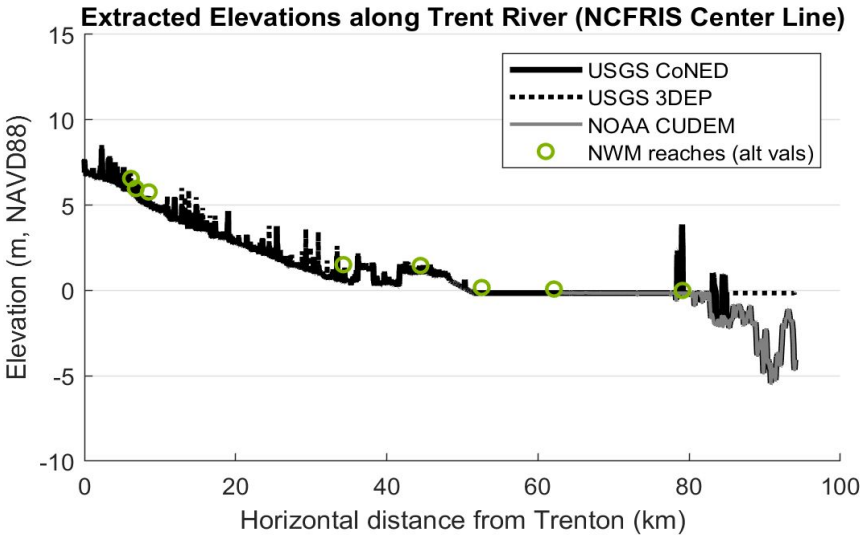
Bathymetry Profiles from Federal DEMS using NHDPlus Centerlines





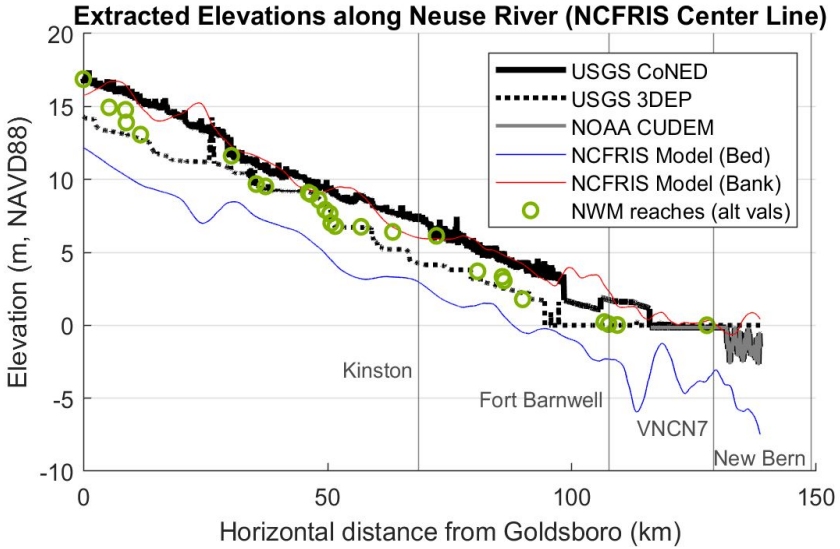
Bathymetry Profiles from Federal DEMS using NC FRIS Centerlines

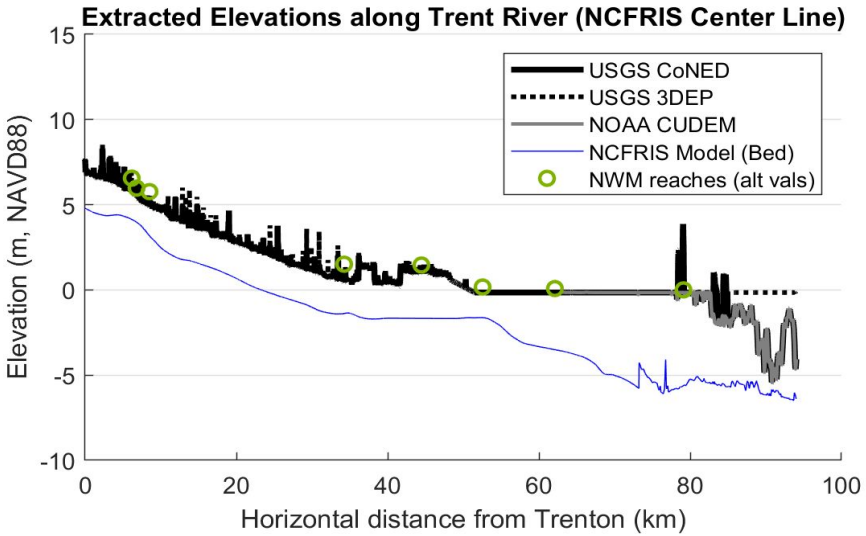




Bathymetry Profiles from Federal DEMS using NC FRIS Centerlines

with NC FRIS HEC-RAS depths





Summary:

- Models available / coming that can solve hydrodynamcis of low slope coastal regions
    - Flooding marine, hydrologic, or both
    - Hydrodynamics – bi-directional, compound
- High resolution topography DEMs seem reasonably accurate
- Delineation of water centerlines, e.g., NHDPlus, needs improvement
- Bathymetry often either flat or reflects water surface not bottom (hydroflattening)
    - Currently hydroflattened areas are not identified in combined DEMs
    - USGS CoNED group is working on shape file to identify hydroflattened areas
    - NWM bathymetry also has limited accuracy - must be affecting results in these areas
- States have bathymetry for river flood models that may provide help, should be integrated into DEMs
- Additional data collection in gap areas – *may not need bank to bank surveys*

THANK YOU

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Research Scientist
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sbunya@unc.edu

Coastal Ocean Modeling and Coupling at **NOS' Office of Coast Survey**

COREY ALLEN ▪ MAY 24, 2023
Chief (Acting), NOS/OCS/CSDL

Saeed Moghimi
NOS Storm Surge Modeling Team Lead

It takes a village to raise a child …

NOS Storm Surge Modeling Team

Saeed Moghimi, Greg Seroka, Panagiotis Velissariou, Soroosh Mani, Yuji Funakoshi, Georgios Britzolakis, Zizang Yang, Bahram Khazaei, Lei Shi, Fariborz Daneshvar, Edward Myers

Academic partners (>20 PIs, Scientists, Postdocs and PhD students)

- University of Notre Dame
- Virginia Institute of Marine Science
- Argonne National Laboratory
- National Center for Atmospheric Research
- Texas Advanced Computing Center
- Columbia River Inter-Tribal Fish Commission
- Louisiana State University
- Sandia National Laboratories
- University of Massachusetts – Dartmouth
- Rutgers University
- University of North Carolina at Chapel Hill
- Cooperative Institute for Great Lake Research
- Oregon State University

International partners

- European Commission Joint Research Centre (JRC)
- Helmholtz-Zentrum Hereon, Germany
- Laboratório Nacional de Engenharia Civil, Portugal
- International Hydrographic Organization
  - South-West Pacific Hydrographic Commission
- United Nations

NOAA and agency partners

- National Ocean Service
  - The U.S. Integrated Ocean Observing System
  - Center for Operational Oceanographic Products and Services
  - National Geodetic Survey
- National Weather Service
  - Office of Science and Technology Integration
  - National Hurricane Center
  - Environment Modeling Center
  - Office of Water Prediction
- Oceanic and Atmospheric Research
  - Great Lakes Environmental Research Laboratory
- U.S. Geological Survey
- …

Industrial and cooperative partners

- UCAR
- Spatial Front Inc
- ERT
- …

Table of Contents

- What do we do at OCS modeling?
- Who do we serve?
- How do we support our partners?
- OCS modeling:
  - Products and services
  - Ongoing and future projects (selected)

CCCoP Agenda

What do we do?

Bathymetry: from surveys and available source; it is the basis for earth system model development;

Coastal models: to provide our nation with authoritative and timely coastal ocean model guidances, data, maps and information services; to support safe and efficient navigation (resilient economy);

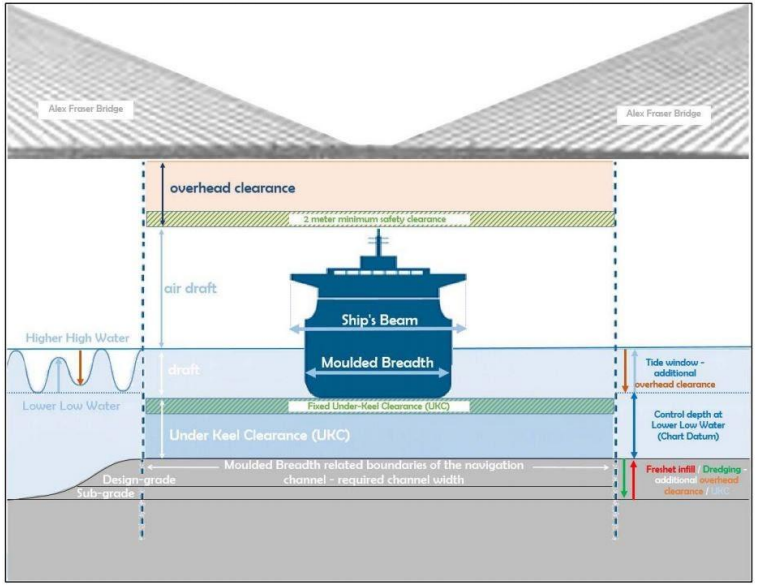
Coastal flooding and risk assessment: to provide products and services, targeted to end-user needs, that allow coastal communities across the U.S. to plan for coastal flood risk today, next year, and for decades to come;

Coastal Ocean Model Coupling: Following NOAA's Unified Forecast System best practices to couple coastal ocean models and other domains (Sea Ice, Atmosphere, Wave, Inland Hydrology, ...);

End users of ocean forecast guidance

Mariners, e.g.

- Pilots of ships to navigate into ports safely and efficiently based on tide, current forecasts



Under keel clearance management system

Storm surge forecasters, e.g.

- NOAA Weather Forecast Offices (WFOs) to generate flood forecasts during winter storms
- NOAA Ocean Prediction Center (OPC) for operational extratropical coastal storm surge forecasts

Coastal Flood Statement

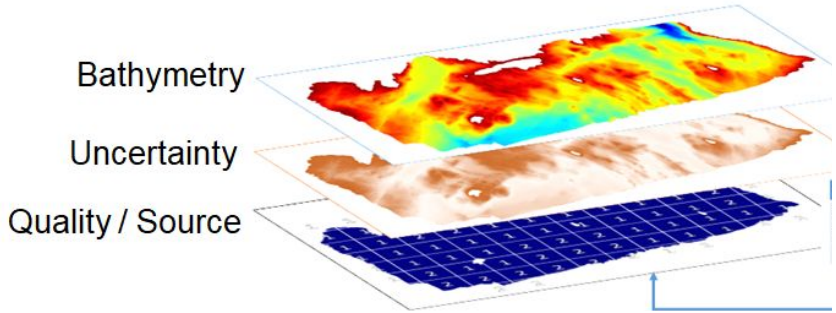
```
Coastal Hazard Message
National Weather Service Boston/Norton MA
1239 PM EST Fri Dec 18 2020

MAZ024-182200-
/O.NEW.KBOX.CF.S.0015.201218T1800Z-201218T2200Z/
Nantucket MA-
1239 PM EST Fri Dec 18 2020

* WHAT...1 foot or less of inundation above ground level expected
  in low-lying areas near shorelines and tidal waterways
  (4.6 to 5.1 feet Mean Lower Low Water).

* WHERE...Nantucket MA County.

* WHEN...Until 5 PM EST this afternoon.

* IMPACTS...Some water on low lying roads and property.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

Do not drive through flooded roadways.
```

NWS Coastal Flood Statement

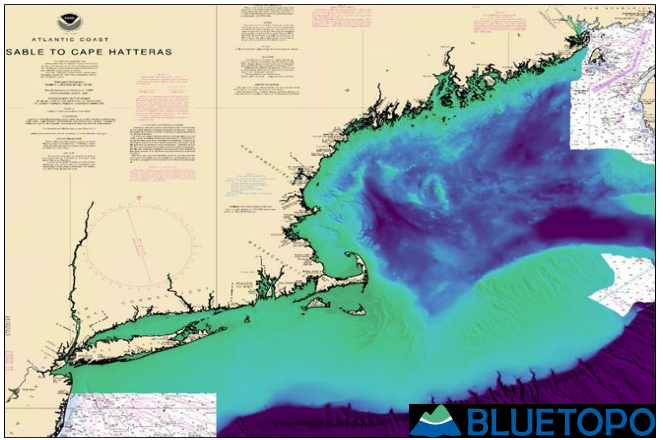
Supporting Modeling Applications Priorities

Bathymetry *from surveys and available source is basis for model development (boundary conditions) - First step to better assess information gaps and needs to improve coast and ocean models;*

Observations *(stations, field surveys, and satellite altimetry and imagery) to support and constraint the models. These observations are used for referencing and skill assessment.*

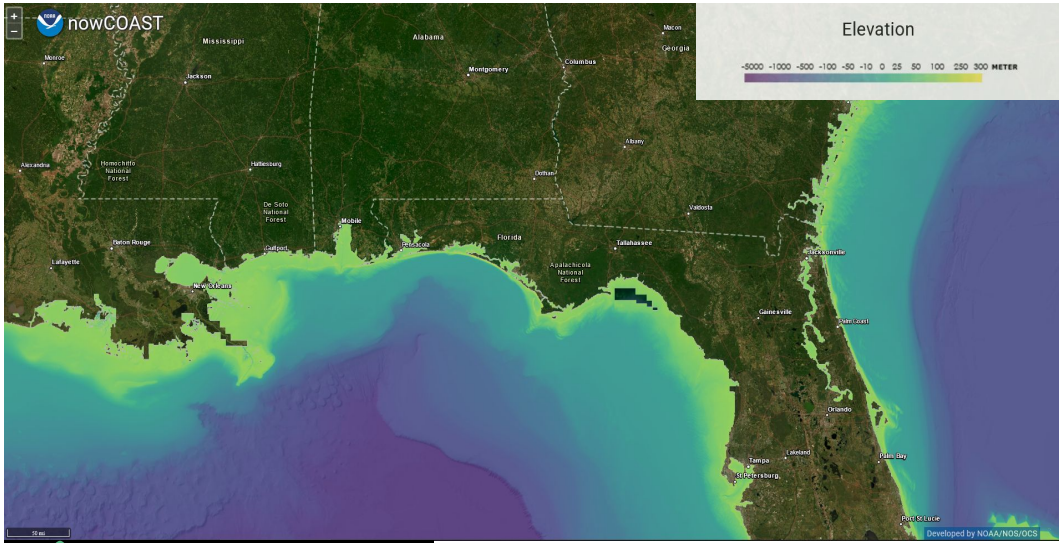


National Bathymetric Source



How do you access BlueTopo?

BlueTopo is the compilation of the nation's best available bathymetric data



BLUETOPO

https://nowcoast.noaa.gov/

NOAA National Bathymetric Source Data

bathymetry | earth observation | marine navigation | model | oceans | oceans

Description

The National Bathymetric Source (NBS) project creates and maintains high-resolution bathymetry composed of the best available data. This project enables the creation of next-generation nautical charts while also providing support for modeling, industry, science, regulation, and public curiosity. Primary sources of bathymetry include NOAA and U.S. Army Corps of Engineers hydrographic surveys and topographic bathymetric (topo-bathy) lidar (light detection and ranging) data. Data submitted through the NOAA Office of Coast Survey's external source data process are also included, with gaps in deep water filled through Global Multi-Resolution Topography, a merged model of bathymetry. Different vertical datums and file formats are made available to meet various uses. The BlueTopo folder includes multilayer floating point GeoTIFFs with associated Raster Attribute Tables (RAT) containing elevation, vertical uncertainty, with other quality metrics and source information. These files are arranged in a spatial tiling and resolution scheme corresponding to the Electronic Navigational Chart (ENC) but are not for navigation due to the inclusion of additional non-navigation data and non-navigation vertical datums. For navigational datasets please see the S-102 distribution portal. "nowCOAST" provides public access to BlueTopo through the nowCOAST viewer, web map tile services (WMTS), and links to individual datasets.

Update Frequency

Monthly where new data is available.

License

Creative Commons licenses are attached to each file and, where available, are attached to the consituent sources within the file. The compilation is provided as a government work under CC0, but the individual sources may have copyright and limitations on use.

Documentation

https://nauticalcharts.noaa.gov/data/bluetopo.html

Managed By

See all datasets managed by NOAA.

Resources on AWS

Description
NOAA National Bathymetric Source Data

Resource type
S3 Bucket

Amazon Resource Name (ARN)
`arn:aws:s3:::noaa-ocs-nationalbathymetry-pds`

AWS Region
`us-east-1`

AWS CLI Access (No AWS account required)
`aws s3 ls --no-sign-request s3://noaa-ocs-nationalbathymetry-pds/`

Explore
Browse Bucket

Description
NOAA National Bathymetry New Object Notification

Resource type
SNS Topic

Amazon Resource Name (ARN)
`arn:aws:sns:us-east-1:709902155096:NewNationalBathymetryObject`

AWS Region
`us-east-1`

https://registry.opendata.aws/noaa-bathymetry/

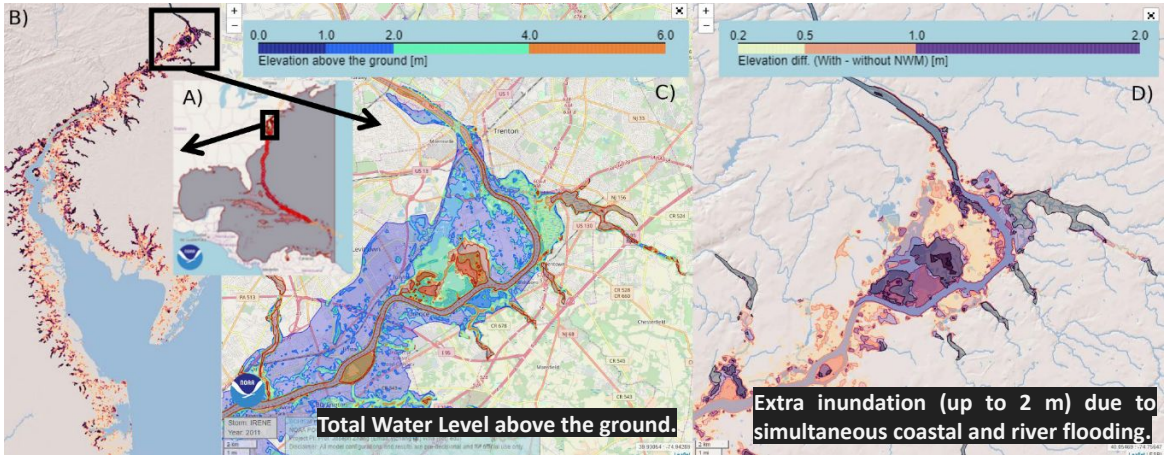
Support our NOAA partners:

Coastal ocean models & Inland-Hydrology Coupling

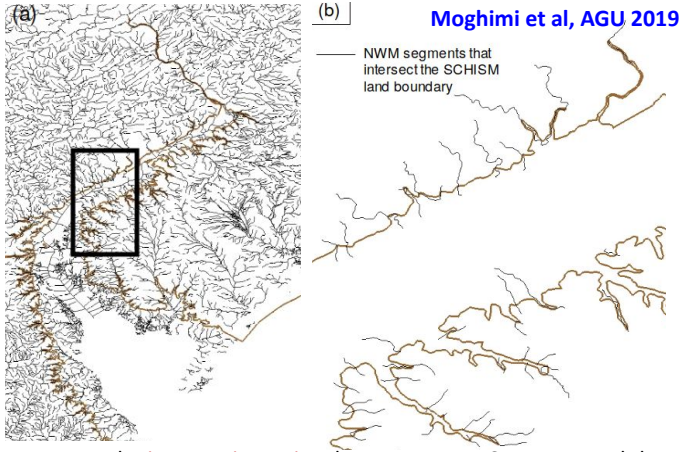
OCS' Coast Survey Development Lab:

- Initiated and advancing *the flexible Total Water Level solution (Storm surge + River discharge + precipitation)*, introduce the **ocean-to-creek 3D modeling system** using **SCHISM** and to **support our NOAA partners to utilize the OCS developed technology**
- Implement and upgrade the *highest resolution global tide and surge operational forecast system* using **ADCIRC** and **provide coastal boundary conditions to our NOAA partners**

Hurricane Irene, 2011 Delaware Bay region



An ocean-to-creek three-dimensional model results including river discharges and precipitation for predicting the impact of Hurricane Irene (2011) zoomed in Trenton, NJ region. (see Ye et al. 2019; Zhang et al. 2020 and here).



Moghimi et al, AGU 2019

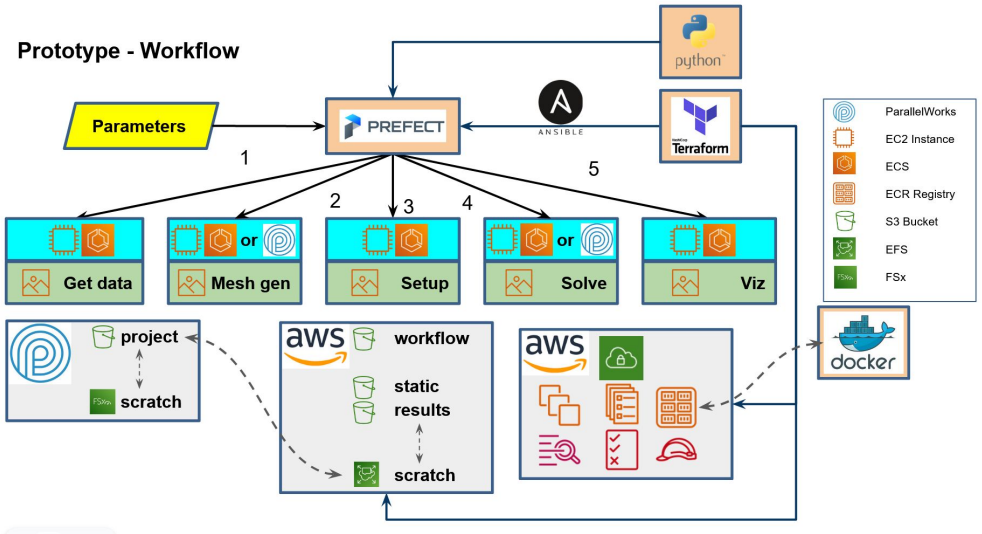
- The intersection points between NWM Segments and the SCHISM land boundary are determined.
- NWM flows are directly imposed based on the streamflow of the intersecting segments
- One-way coupling at the moment, from NWM to SCHISM

Support development of the next-generation NHC's PSurge

Project name: Develop next-generation dynamic, real-time wind-wave based, computationally efficient, probabilistic storm surge forecast

Kickoff of the Bipartisan Infrastructure Law Joint OCS/ NHC Project (Feb 2023)

Participant in-person from left: Liujuan Tang (NOS/OCS), Lisa Bucci (NWS/NHC), Saeed Moghimi (NOS/OCS), LTJG Alexandria Andonian (NWS/NHC), Heather Nepaul (NWS/NHC), Laura Alaka (NWS/NHC), Cody Fritz (NWS/NHC) and Soroosh Mani (NOS/OCS).



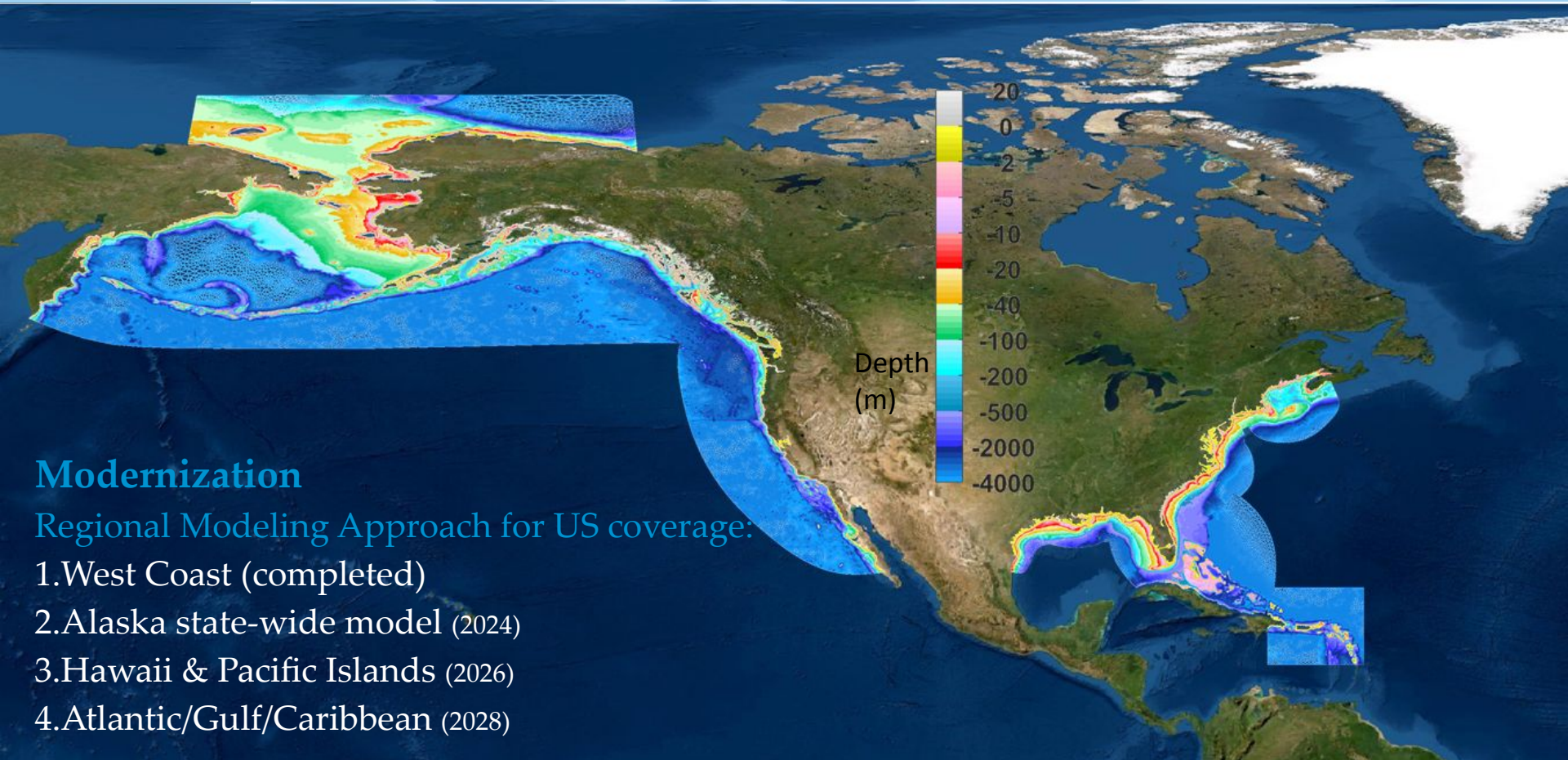
On-Cloud On-Demand Hurricane Surge Workflow - prototype developed at OCS

NOAA Coast Survey

Coastal Ocean Modeling at Coast Survey

Teams	Products and Services	Model	Geographic Domain
Operational Forecast System (OFS)	Hindcast, nowcast and forecast guidance of water levels, currents, salinity, and water temperature	Three Dimensional (3D)	Specific ports and bays
Storm surge modeling	Forecast guidance of total water levels, inundation, and currents	Three & two Dimensional (3D & 2D)	Global Ocean Basin
VDatum	Tidal datums and spatially varying uncertainty	Two Dimensional (2D)	Regional / Basin
Dissemination	Integrate data and information across NOAA and other federal agencies via web mapping services and map viewer		All of above

VDatum Models Coverage and Plans



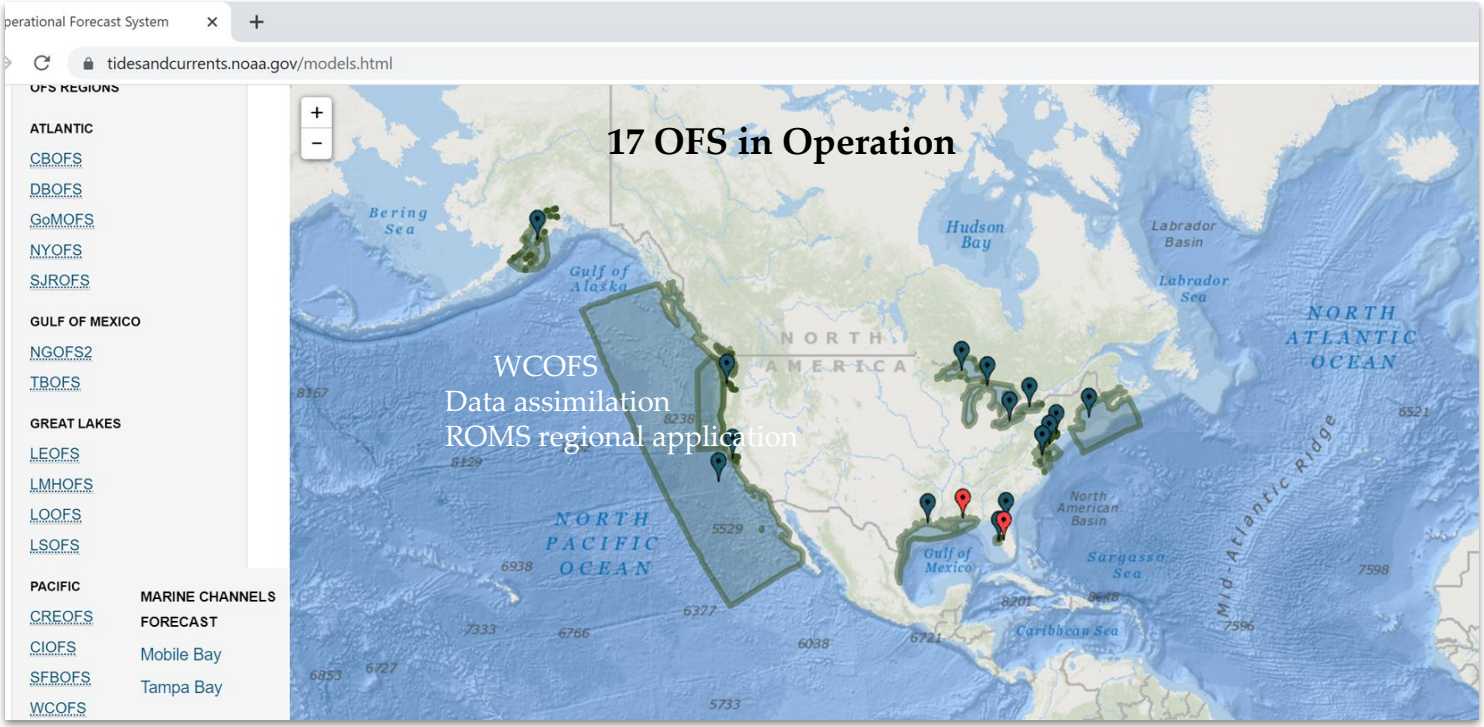
Modernization

Regional Modeling Approach for US coverage:

1. West Coast (completed)
2. Alaska state-wide model (2024)
3. Hawaii & Pacific Islands (2026)
4. Atlantic/Gulf/Caribbean (2028)

Operational Forecast Systems

NOAA operational models for U.S. coastal waters & Great Lakes



Procedure:
Definition
Model development
Operation
Enhancement

Hydrodynamic models:
FVCOM (unstructured)
ROMS (curvilinear)
SELFE (unstructured)

Model evaluation
Skill Assessment

2001- present

Storm Surge Modeling

Products and services

Operational

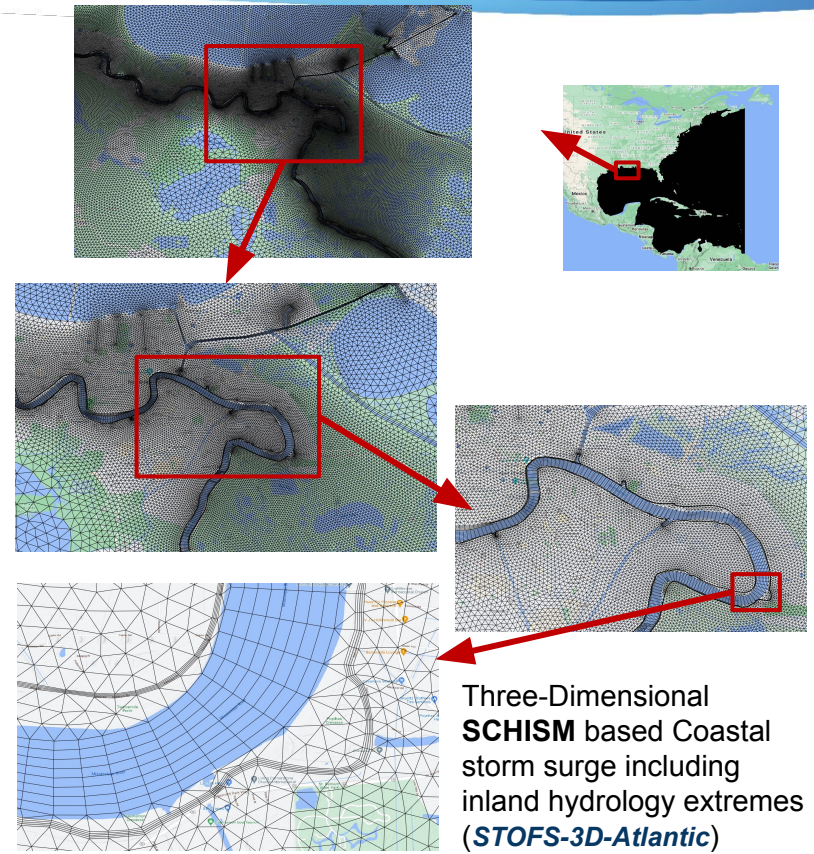
- **Surge & Tide Operational Forecast System (STOFS)**
  - Two-dimensional global ***(STOFS-2D-Global)***
  - Three-dimensional coastal storm surge including inland hydrology extremes ***(STOFS-3D-Atlantic)***

Pre-Operational

- **Surge & Tide Operational Forecast System**
  - Three-Dimensional Guidance System for Pacific Ocean ***(STOFS-3D-Pacific)***

Research and development

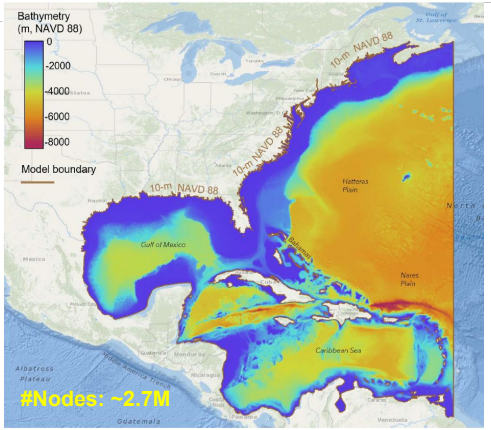
- Development of the next-generation NHC's PSurge
- Automated on-demand unstructured mesh generation (OCSMesh)
- UFS-Coastal Coupling Application
- Sensitivity of the coastal ocean to bathymetry



Three-Dimensional **SCHISM** based Coastal storm surge including inland hydrology extremes (***STOFS-3D-Atlantic***)

Surge & Tide Operational Forecast System (STOFS) -

Latest upgrade on WCOSS2 (Jan 2023)

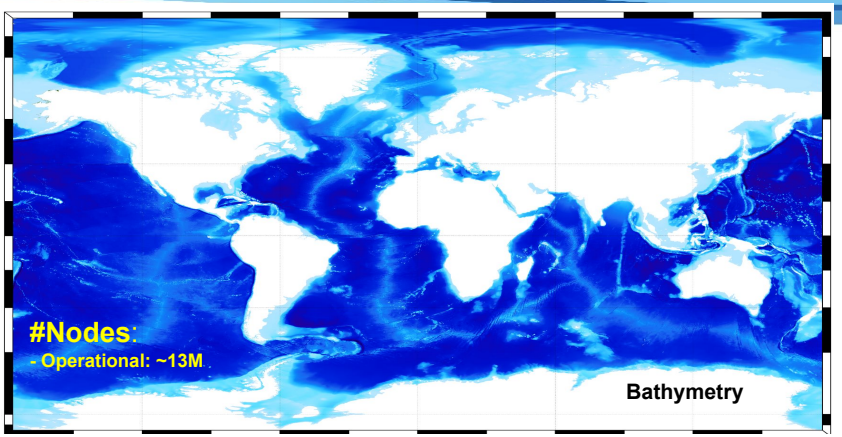


View output:

nowcoast.noaa.gov

https://polar.ncep.noaa.gov/estofs/

cera.coastalrisk.live



Model engine: SCHISM

- Driven by **GFS, HRRR** (Atm + precip) and **NWM**
- 1 cycle/day; 24 hr nowcast, **2 day forecast water levels, currents, temperature and salinity**
- **Grid resolution:** ~2-7 km in ocean; 50-200 m in main channels; down to <10 m in small streams & levees

https://registry.opendata.aws/noaa-nos-stofs3d/

STOFS-3D-Atlantic

In partnership with **Virginia Institute of Marine Science**

Model engine: ADCIRC

- Driven by **GFS**
- 4 cycles/day; 6 hour nowcast, **7.5 day forecast water levels**: **tides, surge, combination**
- **Grid resolution:** coastal resolution at least 1.5 km globally, up to ~30-120 m for US coasts, AK, HI

https://registry.opendata.aws/noaa-gestofs/

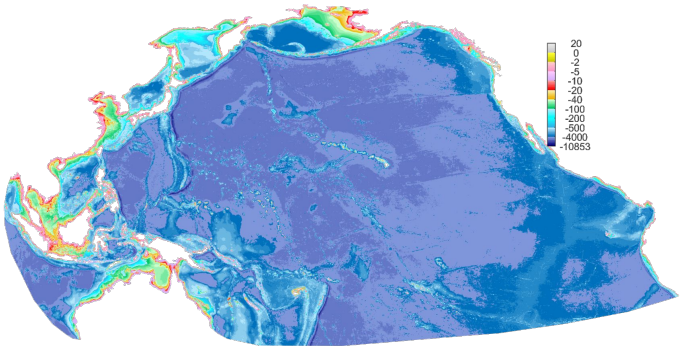
STOFS-2D-Global

In partnership with **University of Notre Dame**

Surge and Tide Operational Forecast System (STOFS)

STOFS-3D-Pacific (pre-operational)

The goal is to obtain **extended coverage** and **improved skill**, both at basin-scale and along the US coast and estuaries. Utilizing the unstructured **SCHISM**, to allow for **3D simulation** providing water surface elevation, surface current, temperature and salinity to users.



STOFS-3D-Pacific topobathy (graphic by Rachel Tang)

In partnership with **Virginia Institute of Marine Science** and **Columbia River Inter-Tribal Fish Commission**

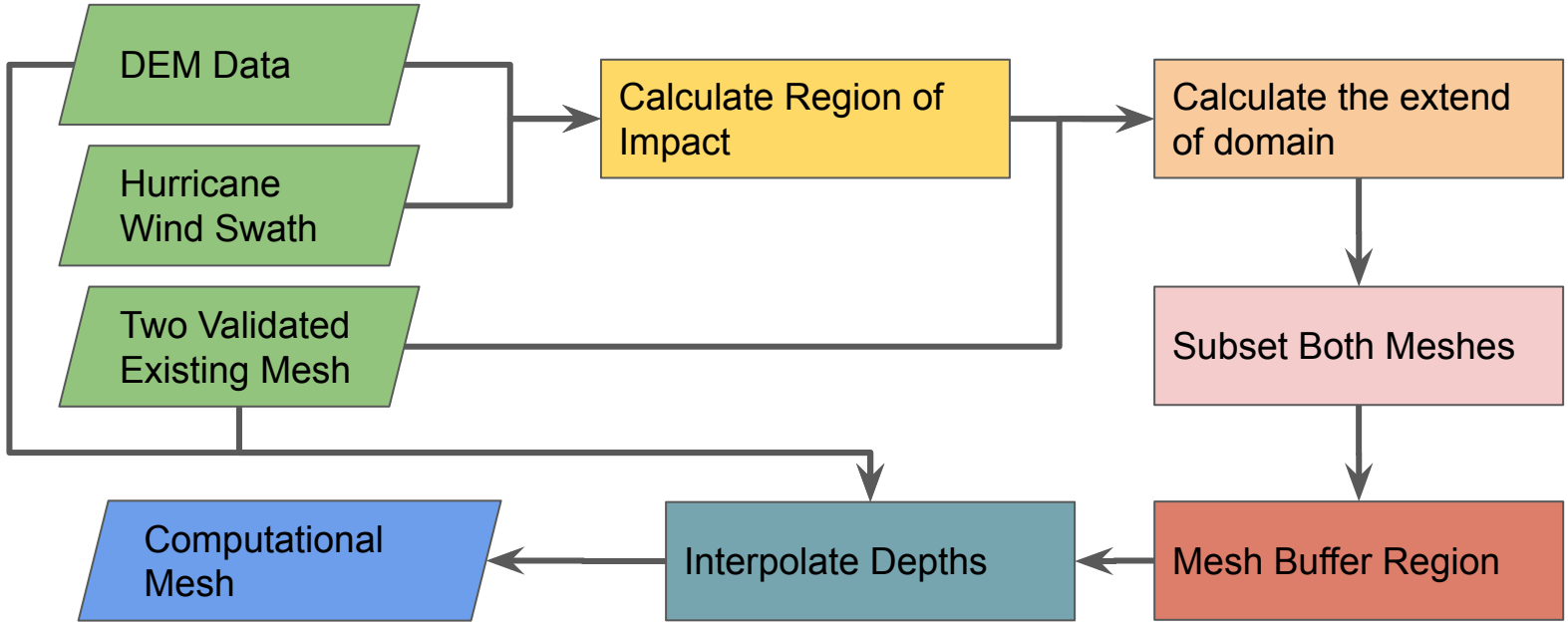
STOFS-3D-Alaska (research and development)

- Project team is being assembled
- The 1st version of the SCHISM model setup is being implemented.

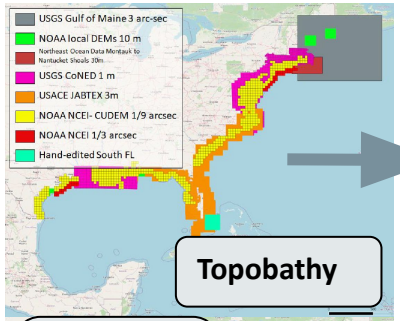
STOFS-3D-Alaska general area (graphic from NowCoast)

In partnership with **Virginia Institute of Marine Science, Columbia River Inter-Tribal Fish Commission** and **Oregon State University**

On-Demand Cloud-based Hurricane Surge Workflow

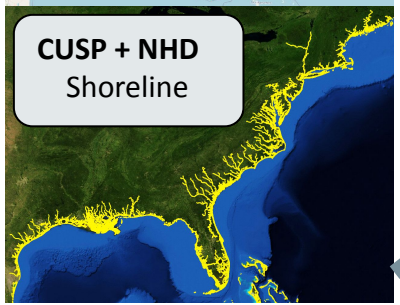


Data driven unstructured mesh generation

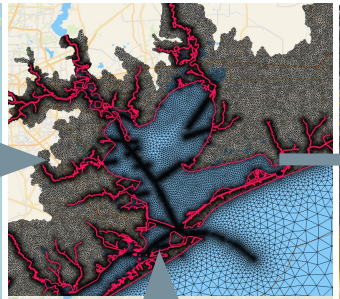


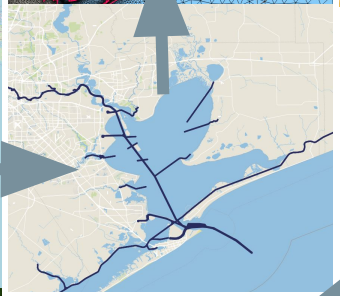
Topobathy

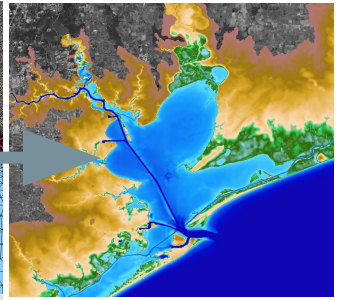
Levees and shoreline feature database

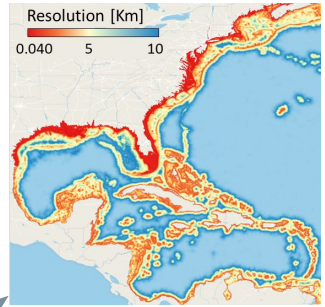


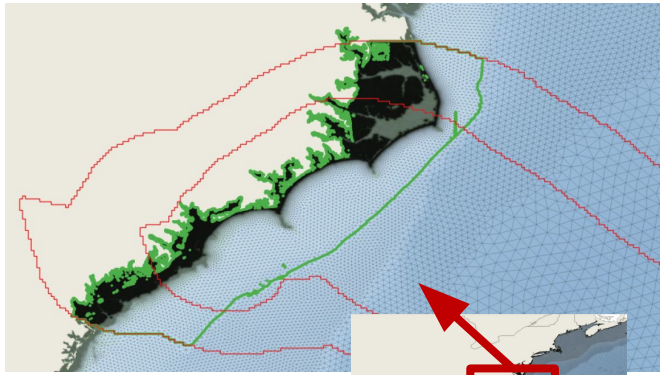
CUSP + NHD Shoreline





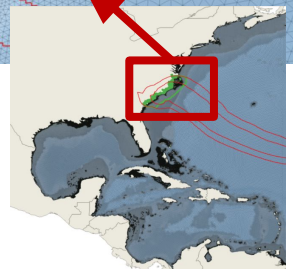






Florence 2018

- Wind swatch contours are in red
- Impacted area in green



Automated mesh subsetting from a validated mesh /or/ regenerate mesh

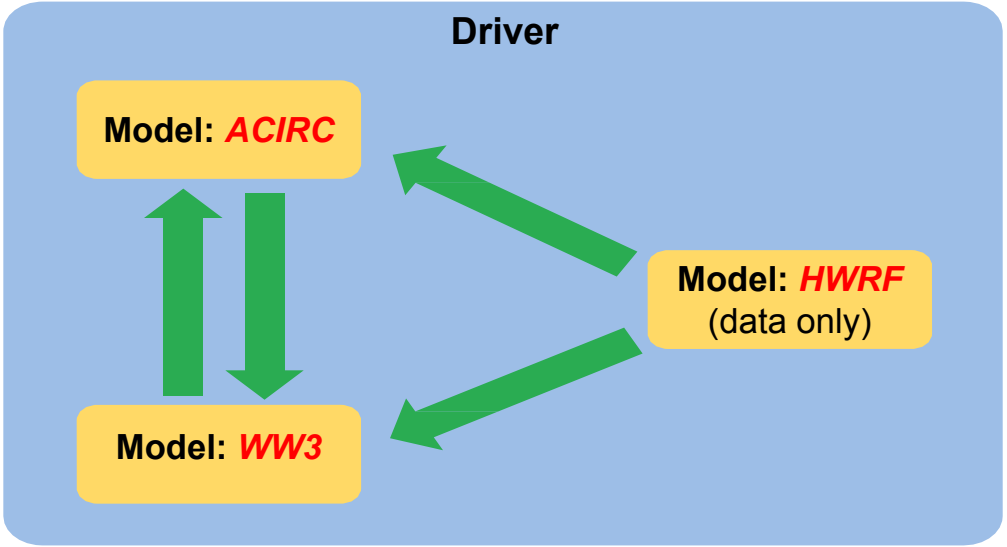
NSEModel development (COASTAL Act)

Original name of CoastalApp:

ADC-WW3-NWM-NEMS

Model components

- HWRF
- ADCIRC
- WW3



NUOPC components

1st iteration completed in 2018

Current status - CoastalApp

noaa-ocs-modeling / **CoastalApp** Public

pvelissariou1 NEMS: added the FVCOM component into the NEMS system ✕ ad067d3 2 days ago **275** commits

.github/workflows	create new GitHub Action to test submodule pointers (#72)	2 years ago
ADCIRC @ bd62a3c	updated ADCIRC on 02/13/2023	3 months ago
ATMESH @ a337c93	modified the ATMESH submodule pointer	6 months ago
BARDATA @ 8acb271	BARDATA: removed OC-GTSM/OGCM_DL-orig.f90	last year
FVCOM @ 7789b4b	FVCOM: initial commit	2 weeks ago
NEMS @ e4648bb	NEMS: added the FVCOM component into the NEMS system	2 days ago
NWM @ 3bc401d	update NWM and WW3 on linux file system	2 years ago
PAHM @ c1f3870	added the ParallelWorks platform into the system	2 months ago
SCHISM	updated tp latest SCHISM sources on 02/13/2023	3 months ago
WW3 @ de9a246	WW3: removed ParMETIS sources; fixed the GCC variable in cmplr.env	2 months ago
WW3DATA @ beda5f2	update submodules to point to new pull request commits	2 years ago
conf	CoastalApp build script and gitmodule changes to allow for WW3 com...	7 months ago

CoastalApp is a NUOPC application implemented following UFS best practices to couple coastal ocean models and other domains (Sea Ice, Atmosphere, Wave, Inland Hydrology, ...)

Readme

CC0-1.0 license

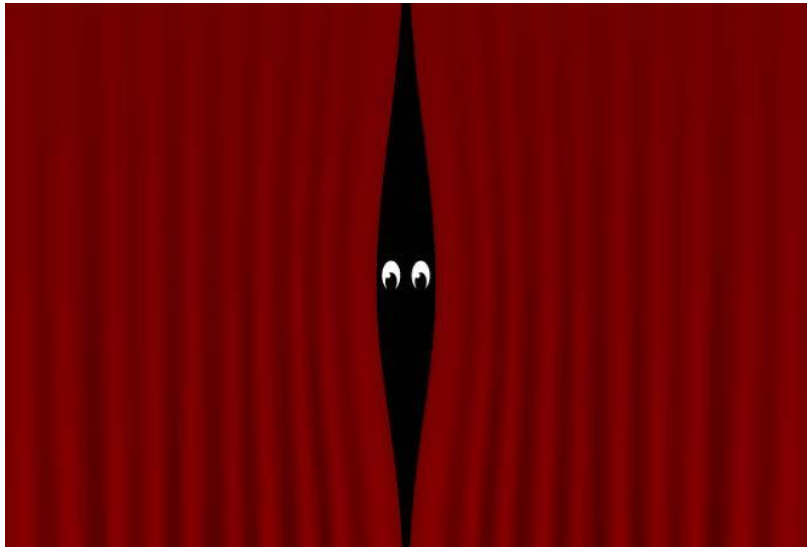
8 stars

8 watching

24 forks

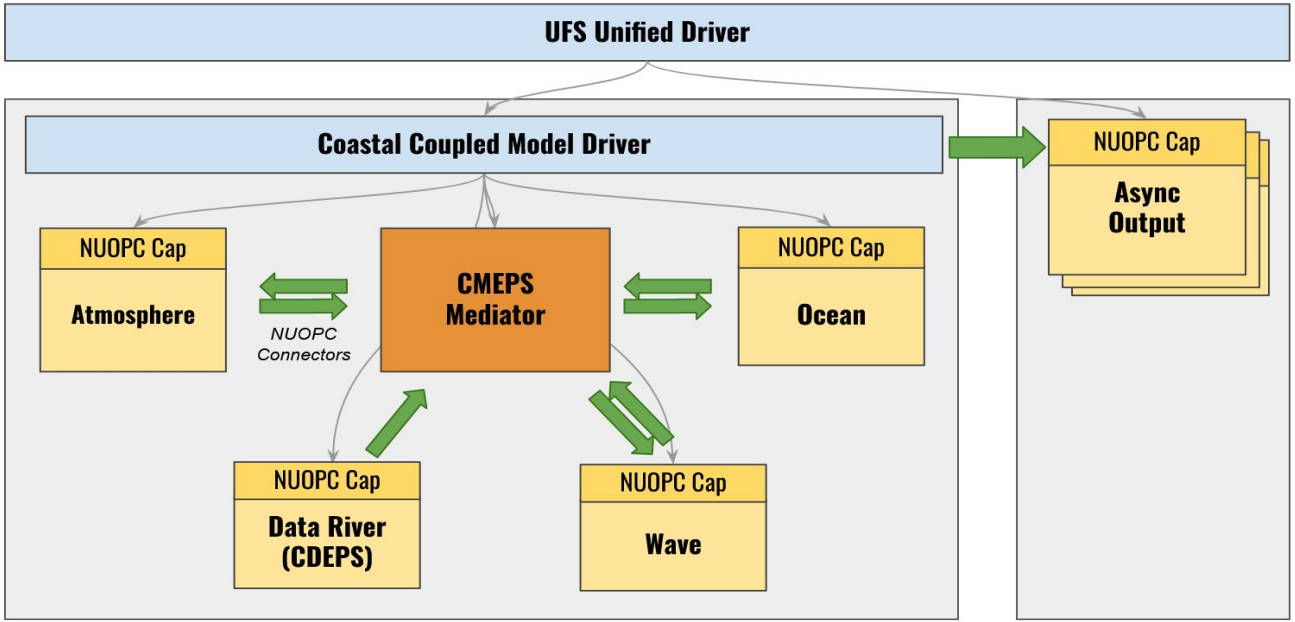
NOAA Coast Survey

Sneak Peek



Future - UFS-Coastal (IIJA/BIL partnerships)

OCS Leads the NOS/OAR/NWS partnership to develop the UFS-Coastal coupling Infrastructure

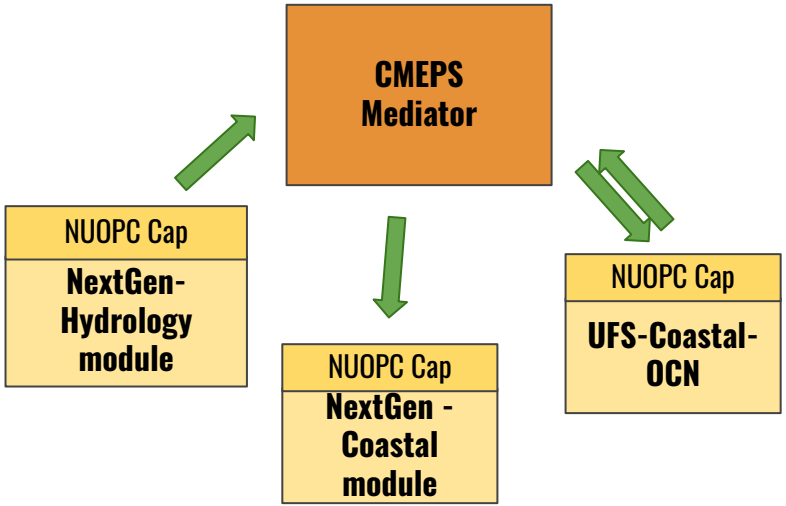


https://github.com/oceanmodeling/ufs-coastal/tree/feature/coastal_app

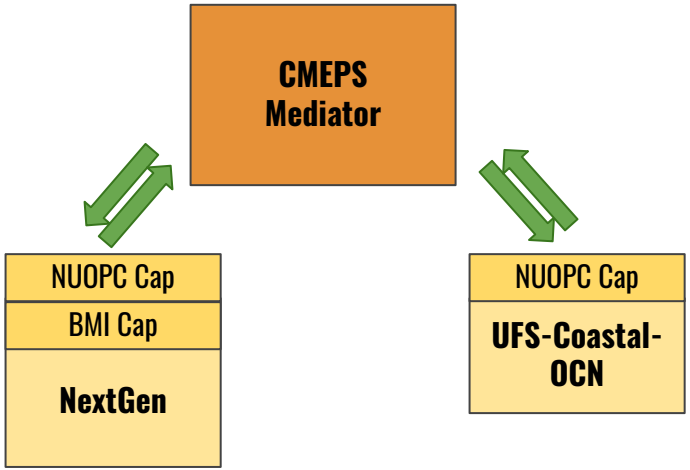
Courtesy to Rocky Dunlap (NCAR team)

UFS-Coastal and NextGen: Two-way coupling possible scenarios !?

Food for thought



1) UFS-Coastal to be connected to NextGen modules to exchange information *similar to Coastal Act project*.



2) UFS-Coastal and NextGen connection through NUOPC cap that wraps entire NextGen.

Thanks for your attention!

NOAA Office of Coast Survey has been the nation's nautical chart-maker since President Thomas Jefferson requested a hydrographic survey in 1807.

Questions!?

NOAA National Ocean Service
Office of Coast Survey

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Coastal ocean models and Inland-hydrology Coupling

(for BIL/CIFIM) - draft

Phases	Action items	Coupling modes	Expected time
Phase 1	1. OWP develop and validate the first version of NextGen 2. NOS develop and validate the first version of ufs-coastal	Stand alone model development	2024
Phase 2	1. NextGen developes BMI data models to import NOS coastal ocean models to enable one-way coupling from ufs-coastal to NextGen 2. The ufs-coastal to develop CDEPS NUOPC data wrapper to enable one-way coupling from NextGen to ufs-coastal 3. The ufs-coastal team to support NextGen team in designing NextGen NUOPC cap / BMI connection	One-way coupled	2025
Phase 3	1. NOS team will support OWP to start implementing NUOPC connectivity to BMI system 2. Basic testing of two way exchange among ufs-coastal and NextGen will be done 3. Prototype testing of the two-way coupled system 4. Preoperational testing of the two-way coupled system	Two-way coupled	2026 and beyond (in accordance with NextGen and ufs-coastal milestones)

NOAA Unified Forecast System

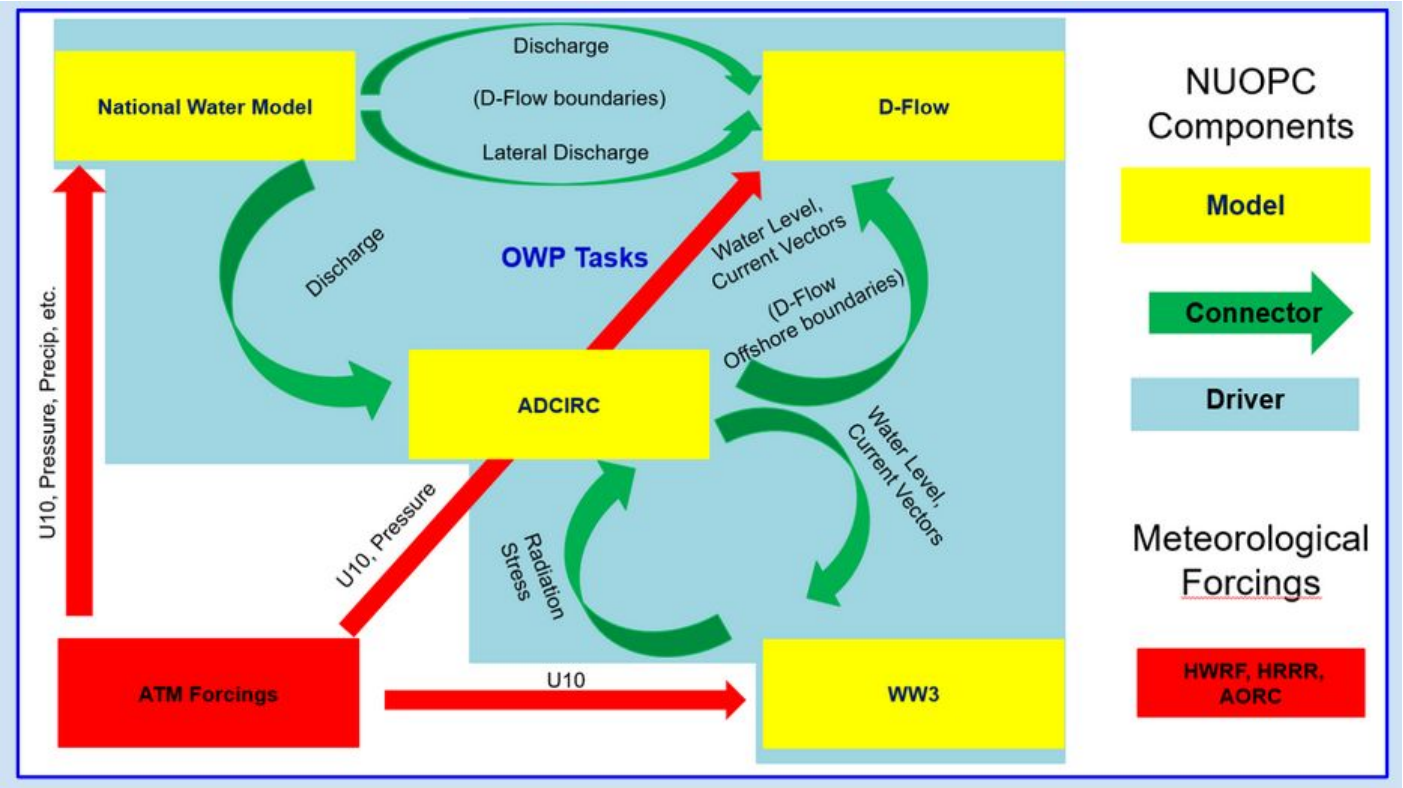
ESMF/NUOPC Coupling Elements

National Unified Operational Prediction Capability (NUOPC) Layer:

NUOPC GENERIC COMPONENTS	
Driver	Harness that initializes components according to an *Initialization Phase Definition*, and drives their Run() methods according to a customizable run sequence.
	Implements field matching based on standard metadata and executes simple transforms (e.g. grid remapping, redistribution). It can be plugged into a generic Driver component to connect Models and/or Mediators.
Model	Wraps model code so it is suitable to be plugged into a generic Driver component.
Mediator	Wraps custom coupling code (flux calculations, averaging, etc.) so it is suitable to be plugged into a generic Driver component.

Coastal Act

Coastal ocean models & Inland-Hydrology



Credit: OWP presentation on September 28, 2022, Coastal Act 2022 annual meeting


15:00

BREAK-OUT GROUPS

Priority Activities for Coastal Coupling

LUNCH BREAK

We will resume at 1:30 PM CT


90:00

BREAK-OUT GROUPS

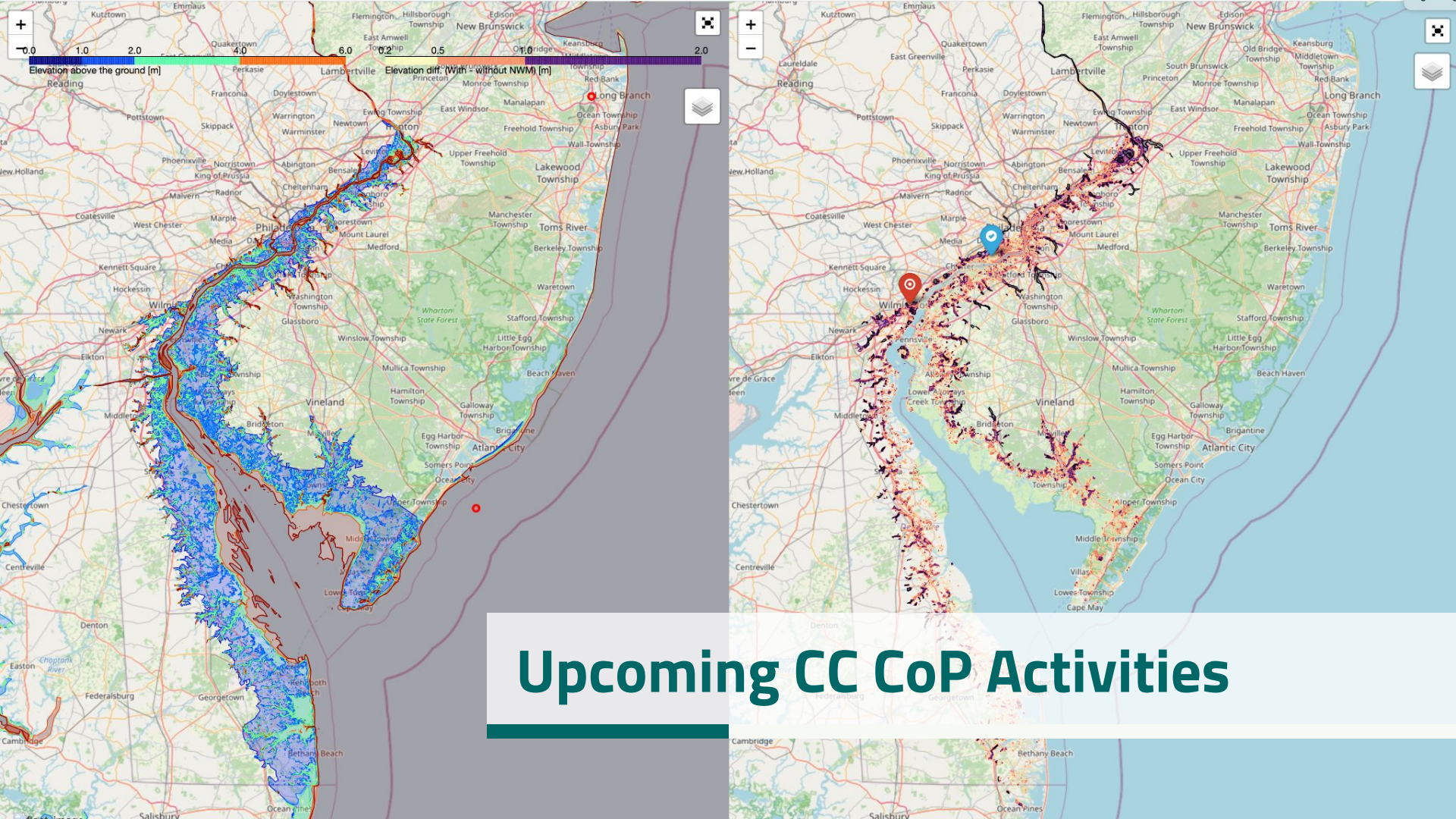
Best Practices and Opportunities for Transitions


20:00

FACILITATED DISCUSSION

The Year Ahead

LAURA REAR McLAUGHLIN ▪ MAY 24, 2023
Branch Chief, Stakeholder Services Branch, NOAA/NOS/CO-OPS



Upcoming CC CoP Activities

Upcoming Events

Opportunities for Action

Thank You!

LAURA REAR McLAUGHLIN ▪ MAY 24, 2023
Branch Chief, Stakeholder Services Branch, NOAA/NOS/CO-OPS

THANK YOU!

Join us again tomorrow at 9:00 AM CT