

# Setting the stage for IOOS Advisory Committee 2019

Carl Gouldman, U.S. IOOS Office Director  
August 21, 2019



- Program overview
- Observing, Data Management, Modeling and Prediction
- Stakeholder Driven Approach
- Recent Successes
  - Certification of IOOS Regional Associations
  - 15 year Budget story
  - FY19 Highlights
- FY19 & FY20 Draft Topics for IOOS Advisory Committee

# U.S. IOOS: Program Overview

*Partnership effort that leverages dispersed national investments to deliver ocean, coastal and Great Lakes data relevant to decision-makers.*

## Global Component

US contribution to Global Ocean Observing System (GOOS)

1 of 15 Regional Alliances of GOOS



The Global Ocean Observing System



## National Component

17 Federal agencies



## Regional Component

11 Regional Associations

Stakeholder driven

Academia, state/local/tribal government, private industry





# IOOS Observing Assets

Coastal Moorings



Shore Stations



HF Radar



Sub-surface gliders



Wave Buoys



Animal Telemetry,  
Marine Biodiversity



# Integrated Open Data → Prediction & Forecasts



*Regional Portals: 11 RA portals integrate data at a local level and provide tailored products for stakeholders*



**www.ioos.us**  
a central  
portal of portals



*Sensor Map: a 2 week cache of real-time observations from 108 providers*



Blizzard 2016: CBOFS winds at 1/23 17:00 EST. Time-series of model output and buoy observations (1/20 - 1/23)

*EDS: Visualize and access model hindcast/forecast information and compare to observations*

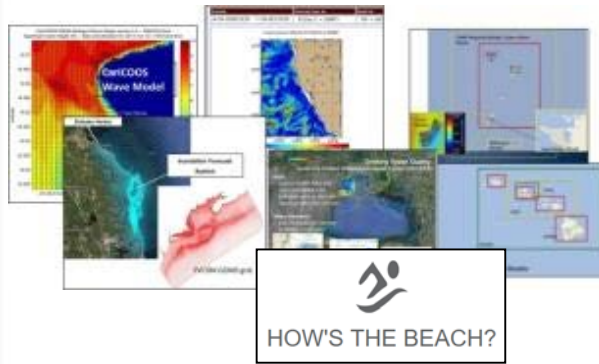


# IOOS Regions meet societal needs

Stakeholder  
outreach



Information products



Observations



Data Management



# IOOS Strategic Plan

**Vision** - Improve lives and livelihoods with ocean, coastal, and Great Lakes information

**Mission** - To produce, integrate, and communicate high quality ocean, coastal and Great Lakes information that meets the **safety, economic, and stewardship needs** of the nation.



## Five Strategic Goals:

- Goal 1:** Sustain long-term, high-quality observations of ocean, coastal, and Great Lakes environments to address local, regional and national needs.
- Goal 2:** Deliver standardized, reliable, and accessible data.
- Goal 3:** Support model predictions that address a wide range of user requirements.
- Goal 4:** Provide integrated, user-driven products and tools.
- Goal 5:** Increase the reach and effectiveness of IOOS through partnerships, stakeholder engagement, and Enterprise excellence.

# Certification of all non-federal IOOS Regions

## Integrated Coastal and Ocean Observation System Act of 2009 (ICOOS Act)

### All 11 IOOS Regions are now certified! (2018)

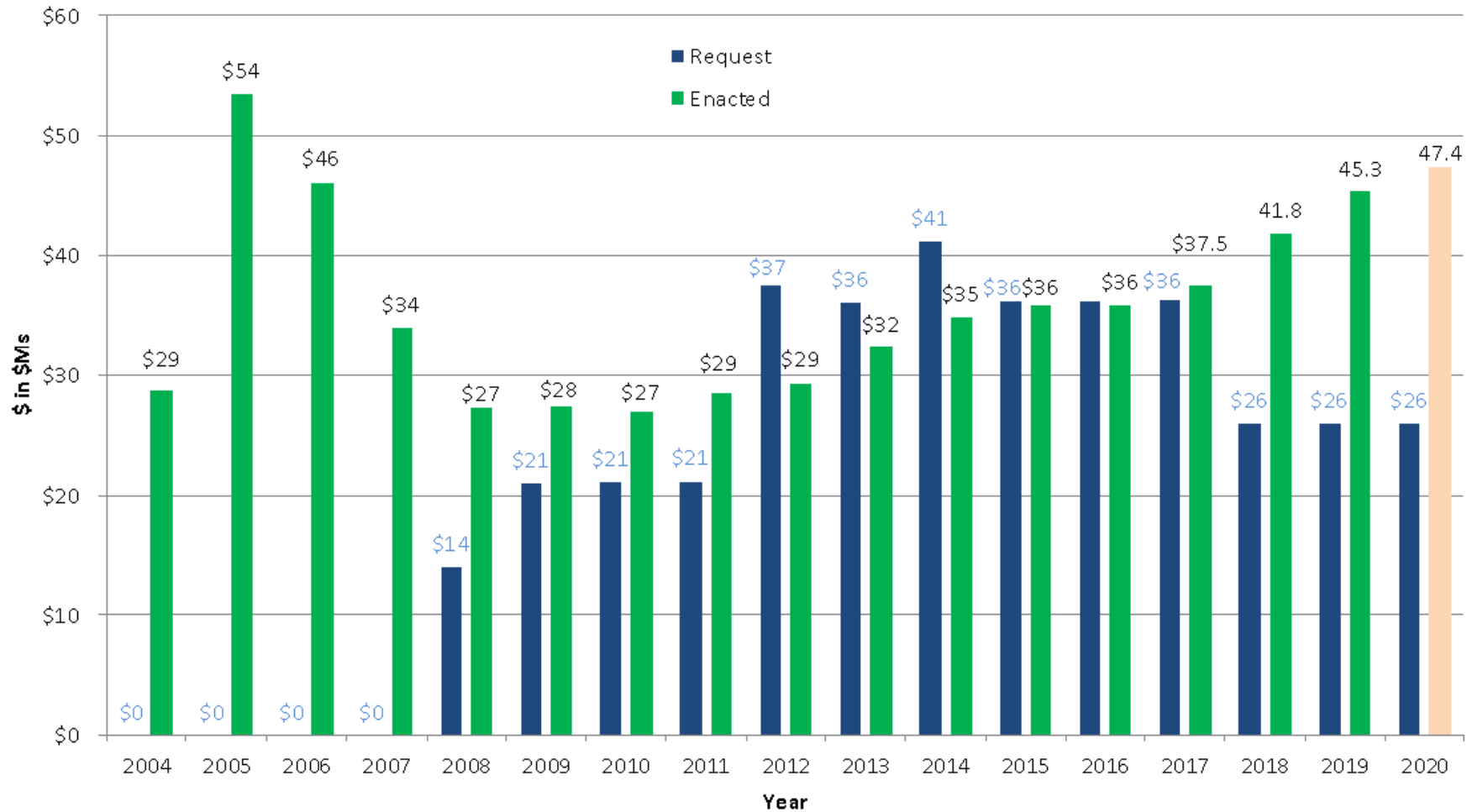
1. IOOC defined high level criteria
  2. Conveys formal recognition of IOOS Regional Associations
  3. Extends civil liability coverage for data use
  4. Establish minimum criteria for how a RICE operates
  5. Adherence to data management best practices
  6. Enhance delivery and quality of data and information
- Re-certification of regions will begin in 2020
  - Program Office developing process for recertification





# U.S. IOOS Enacted and President's Budgets FY12-20

## NOS IOOS Request & Appropriation History Part of the Story – not including 'backbone and global'



NOAA National Ocean Service IOOS

Navigation, Observations, and Positioning: 'National IOOS' component FY19 Omnibus \$6.8M & 'Regional IOOS Observations' \$38.5M [\$1.5M Reg. Ocean Partnerships]

Estimated Enacted levels are 'post rescission' totals for each year / 'Request' = the President's Budget Request

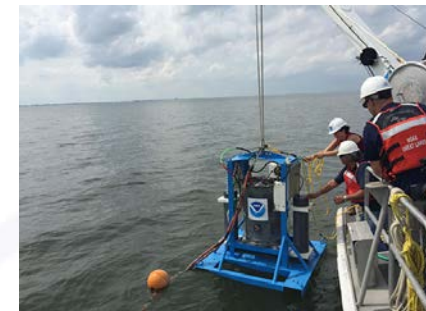
FY20 House Mark is first, next is Senate Mark, then Conference...

# FY2019 IOOS Highlights

- Blue Economy
  - Customer focus and stakeholder outreach
  - ICOOS Act reauthorization
  - NOAA Weather Act & NOAA Water Initiative
  - CENOTE Act 2018 (Commercial Engagement Through Ocean Technology Act of 2018)
  - IOOS Advisory Committee
- 
- **Filling gaps +\$7.5M:** Surface Currents, Gliders, Streamlined Access to observation information
  - Biology and Harmful Algal Bloom Observing
  - Interagency - ATN, MBON, Sound, etc.

## Research and Development

- **Ocean Technology Transition** – new FFO ~Sept. 2019 for award in FY2020
- **Coastal and Ocean Modeling Testbed COMT** - Coastal / Ocean /Water Modeling, Forecasting, and Prediction
- **ACT** workshops for IOOS RAs and OAR Labs and Cooperative Institutes
- **Department of Energy** Ocean Observing prize competition



# 2019/2020 topics for IOOS Advisory Committee

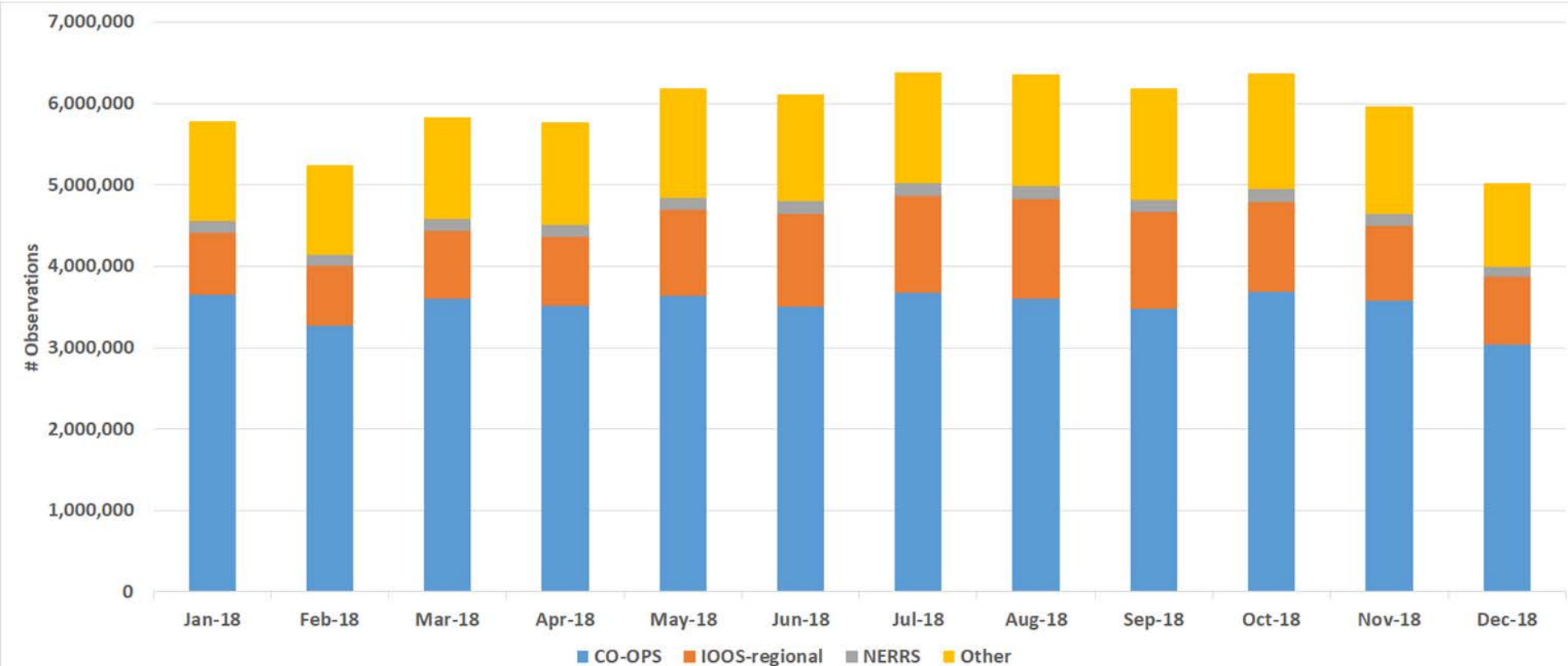
- Consider issues, challenges, and opportunities in feedback from questionnaire
- Advise us on how to strengthen the federal partnerships between agencies, and foster deeper engagement across agencies
- We have a huge mandate and limited resources: Where does the Committee see as biggest future priorities for ocean observing?



# Back up slides

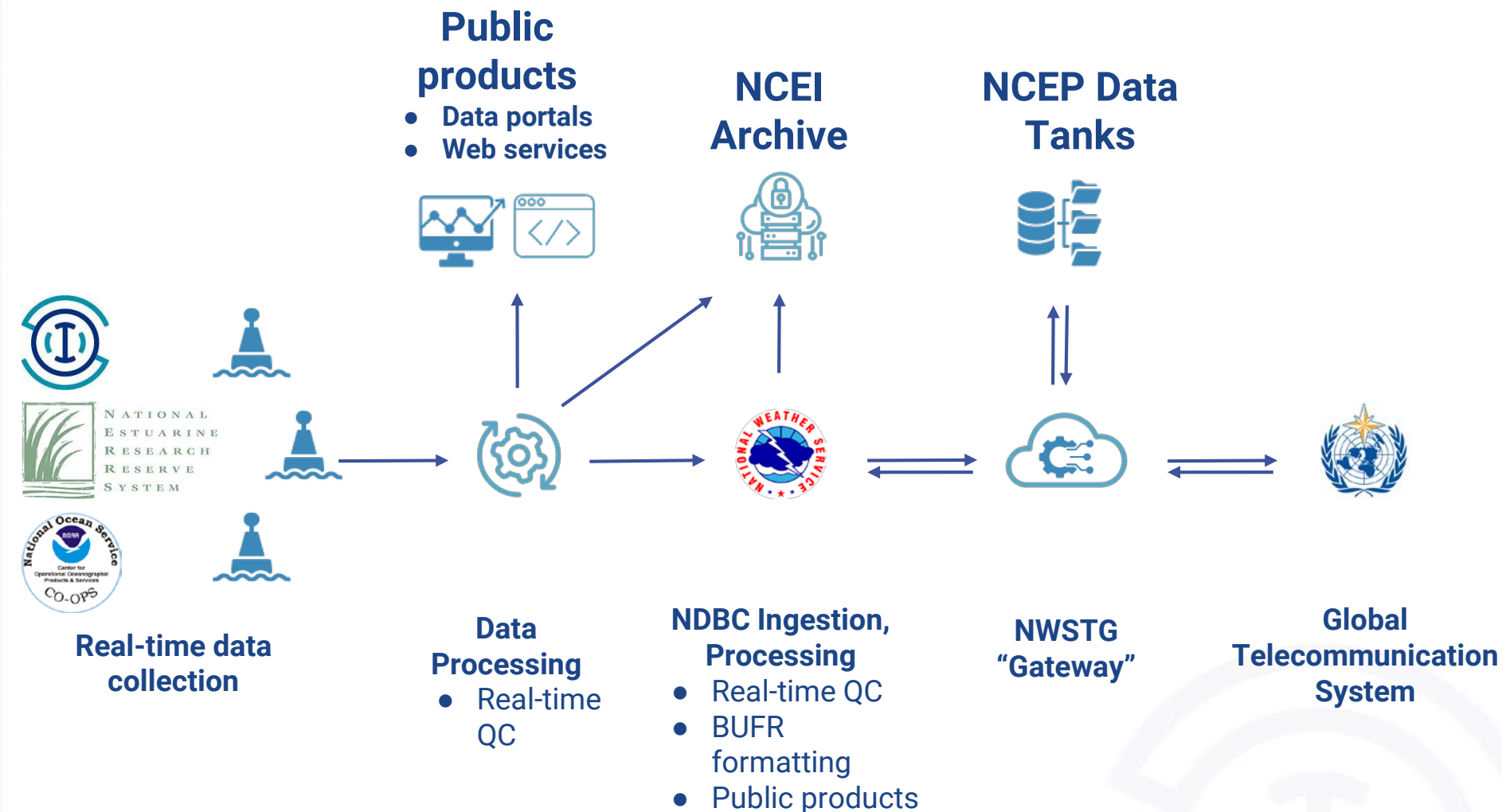


# NOS real-time marine observations delivered to GTS via NDBC



NOS accounts for 78% of all met-ocean observations going to the Global Telecommunications System (GTS) via National Data Buoy Center (NDBC)

# MetOcean Data Flows

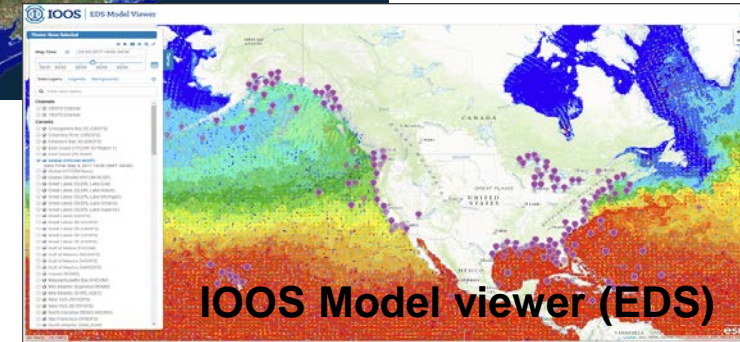
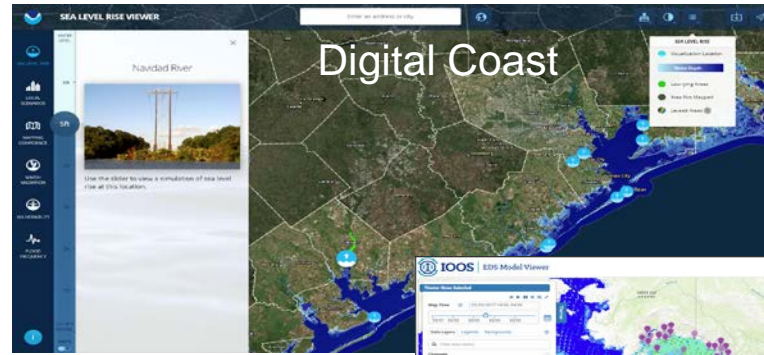
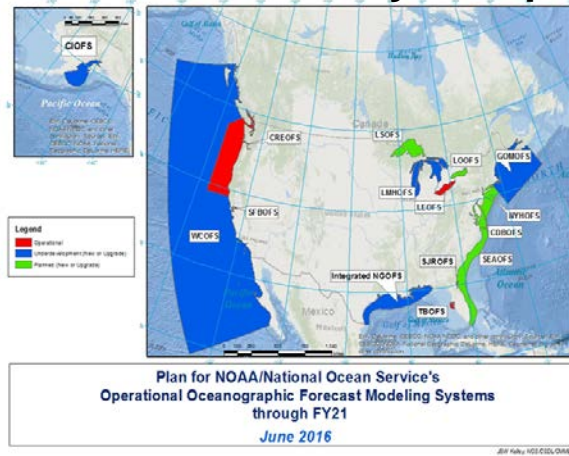


Met (winds/air temp/air pressure)  
Ocean (waves/water  
temp/salinity/currents)

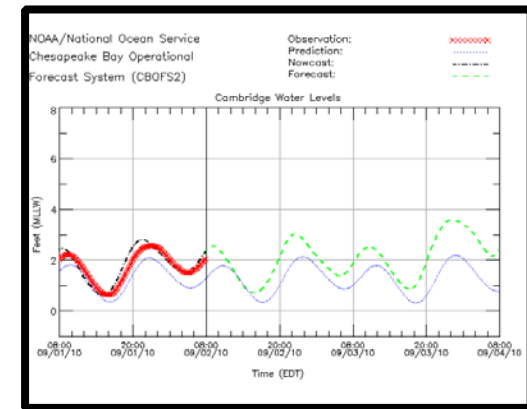


# Modeling and Decision Support Services

## Operational Forecast System plans



- Networks, experience, and processes to engage the public
- Core observations that characterize coastal water level and quality
- Coordinate with EPIC and provide model infrastructure and expertise to predict how the ocean will change
- Coastal and Ocean Modeling Testbed



CO-OPS Nowcast/Forecast

# Integrate NOS Model Development Process

## NOS Coastal Modeling Development Manager

### VDATUM

- ◆ Update & SVU: New York
- ◆ Update & SVU: Gulf of Mexico
- ◆ Update, SVU & Tides Assimilation: West Coast

### Surge & Inundation

- ◆ Database of Tides & Currents
- ◆ SCHISM Evaluation of HSOFS Grid
- Couple ADCIRC to NWM
- Couple FVCOM to WRF, NWM
- Coupled ADCIRC to WAVEWATCHIII & CICE
- Couple ROMS to WRF

### OFS Capability

- ◆ S-111 Surface Current Operationalization
- Test COMF (from NCO phase 1/2 machines to phase 3)
- NWM Coupling Capability for 3D OFS
- GoMOFS HAB (HAB module)
- FVCOM turbulence COMF testing (LE HAB)
- Transition EDS to CO-OPS
- A Unified Framework to Support Unstructured Grid Models
- WCOFS Enhancements
- GLOFS Ice Forecasts
- Waves in GLOFS

### OFS Implementation

- ◆ WCOFS with DA Impl.
- ◆ CIOFS Impl.
- ◆ Integrated NGOFS Impl.
- ◆ LM-HOFS Impl.
- Hur. Suppl.-funded work (evaluate external model for coupling with NWM & impl.)
- Salish Sea OFS
- NW Atlantic OFS
- GLOFS Upgrade to FVCOM
- HEC-OFS
- Lake Champlain OFS

◆ OCS    • GLERL  
→ CO-OPS   □ IOOS  
(OTT/COMT)

# Weather Research and Forecasting Innovation Act 2017

PUBLIC LAW 115-25—APR. 18, 2017  
Title III / Sec. 301(a)(2)

INTEGRATION OF OCEAN AND COASTAL DATA FROM THE INTEGRATED OCEAN OBSERVING SYSTEM.—In National Weather Service Regions where the Director of the National Weather Service determines that ocean and coastal data would improve forecasts, the Director, in consultation with the Assistant Administrator for Oceanic and Atmospheric Research and the Assistant Administrator of the National Ocean Service, shall—

(A) integrate additional coastal and ocean observations, and other data and research, from the Integrated Ocean Observing System (IOOS) into regional weather forecasts **to improve weather forecasts and forecasting decision support systems**; and

(B) support the development of real-time data sharing products and forecast products in collaboration with the regional associations of such system, including contributions from the private sector, academia, and research institutions to **ensure timely and accurate use of ocean and coastal data in regional forecasts**.

(C) support increasing use of autonomous, mobile surface, sub-surface, and submarine vehicle ocean and fresh water sensor systems and the infrastructure necessary to **share and analyze these data in real-time and feed them into predictive early warning systems**.

(C was added with NIDIS reauth. Act S2200 in 115th Cong.)

Also see ICOOS Act of 2009

[https://cdn.ioos.noaa.gov/media/2017/12/Public\\_LawNo111-11HR-146\\_-PassedSigned\\_033009.pdf](https://cdn.ioos.noaa.gov/media/2017/12/Public_LawNo111-11HR-146_-PassedSigned_033009.pdf)

Senate ICOOS Act Reauthorization Bill S. 914

<https://www.congress.gov/116/bills/s914/BILLS-116s914is.pdf>



# U.S. Glider Network

## FY18 (Increase to fill gaps +\$2M)

**Deployments:** Picket Line, HAB/Marine Mammal Monitoring, CalCOFI Lines, SAB Shelf work.

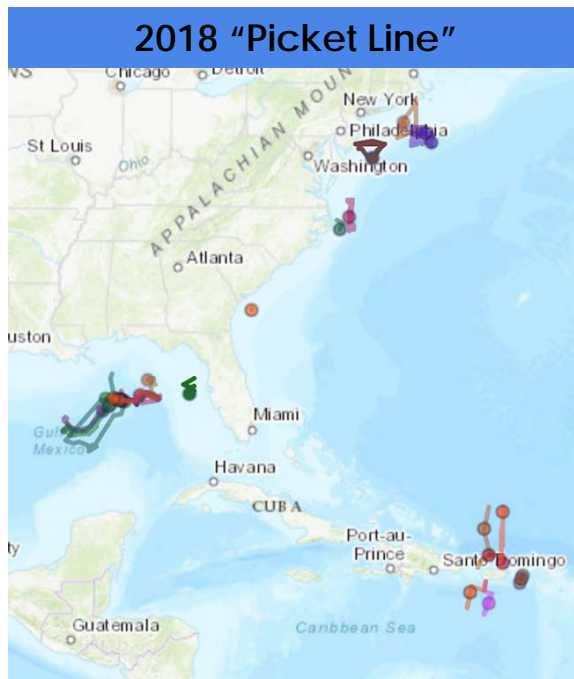
**Post-Doc:** Model comparisons for hurricane intensity work

**DAC:** Navy glider data made public, Improved QA/QC, IOOS \$\$

**7,047 Glider Days 137 Glider Deployments**

**Navy Partnership:** 30+ Gliders available to the nation. Navy gliders increased available ocean profile data 1,000 fold in USVI!!

**NOAA Navy MOU for glider support to hurricanes 2018-2023**



## FY19 (Increase to fill gaps + \$2.5M)

**International:** "Best Practices" Workshop, Global Data Synchronization

**National:** Glider coordination plan

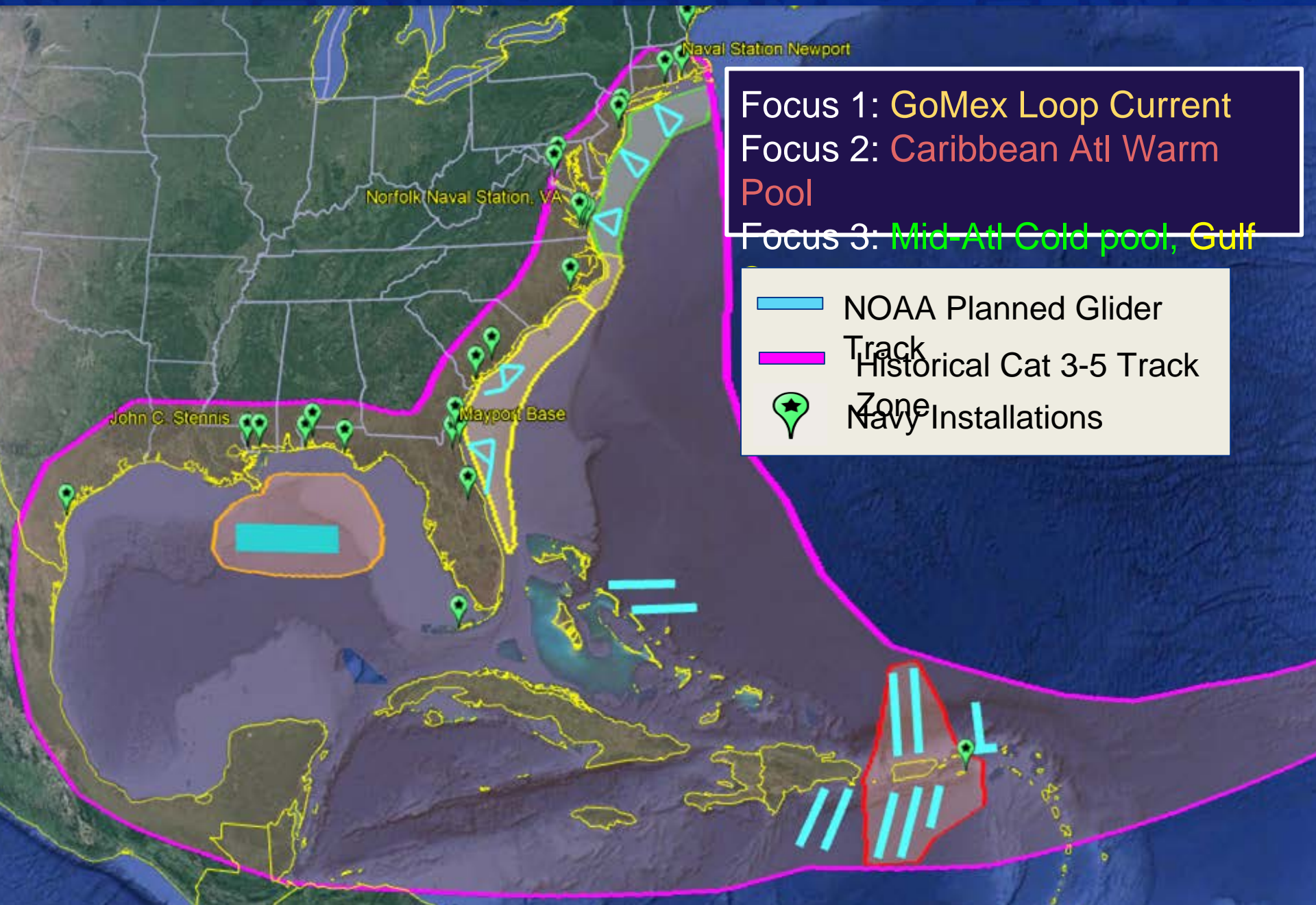
**DAC:** Support New Variables, Improve Data Flows

**Impact Assessments:** Investigate glider data impacts on operational models



<https://gliders.ioos.us/>

# 2019 Observing Scheme (Jul-Oct)





# U.S. Animal Telemetry Network (ATN)

## FY18 Accomplishments and Funding

Three Workshops: GCOOS, PACIOOS, West Coast (NANOOS/CeNCOOS/SCCOOS)



Transitioned ATN DAC from research environment to operational location  
- Axiom

Hired Data Coordinator to be the primary interface between telemetry community and ATN DAC; posted at CeNCOOS

Animal Telemetry Baseline infrastructure support: Two regional acoustic network Data Wranglers (FACT & ACT); Georgia Coastal Acoustic Receiver Array; Argos satellite fees payment program; Develop Next generation animal movement analysis tools; Satellite/Acoustic Telemetry Asset Inventory

\$1.35M Total investment from ONR, BOEM, NOAA



# U.S. Animal Telemetry Network (ATN)

## FY19 Plans and Funding

Greater stakeholder interaction and advocacy

Increase number of federal agencies supporting ATN and using DAC management capabilities for PARR compliance

Expand multi-agency collaborative baseline observations and infrastructure support

Expand and promote the use of animals as biological sensors

Innovative analytical and visualization tools & data products

Anticipated FY-19 total funds ~\$1.45M

## Next Steps

Complete Workshop reports; Distill & combine all workshop conclusions into actionable items

Maintain strong collaboration with MBON to implement a sustained IOOS Bio-observing component



# National Coastal Ecosystem Moorings

## FY18 Accomplishments

Workshop held March 2018

Community of experts from academia, private industry, and federal agencies (NOAA, EPA, BOEM)

Produced recommendations to define coastal ecosystem moorings

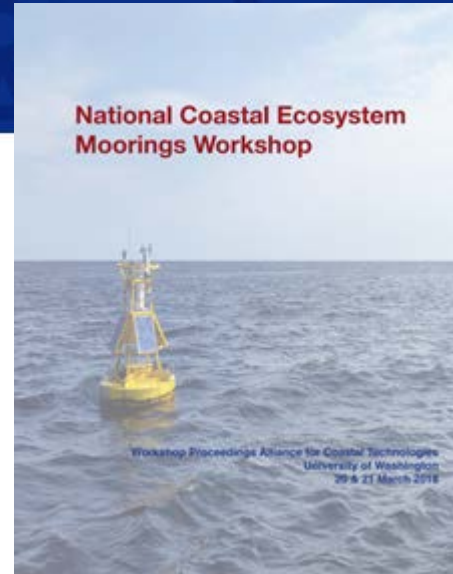
Three-tiered mooring approach outlining levels of measuring requirements

Discussed best practices for mooring deployments, operations and maintenance

Report available: [http://www.act-us.info/Download/Workshops/2018/Ecosystem\\_Mooring\\_Workshop\\_Report.pdf](http://www.act-us.info/Download/Workshops/2018/Ecosystem_Mooring_Workshop_Report.pdf)

## FY19 Next Steps

OceanObs'19 - CWP (*Coastal Mooring Observing Networks and their Data Products: Recommendations for the Next Decade*) and engagement with community to continue dialogue on moorings



# U.S. Marine Biodiversity Observation Network (MBON)

## FY18 Accomplishments and Funding

eDNA best practices and demonstrations, including in AUVs  
MBON remote sensing-based seascapes products launched at CoastWatch

Ongoing development of applications and 'infographics' for National Marine Sanctuary managers and regional Integrated Ecosystem Assessment (IEA) teams

\$2.7M total investment from NOAA, NASA and BOEM



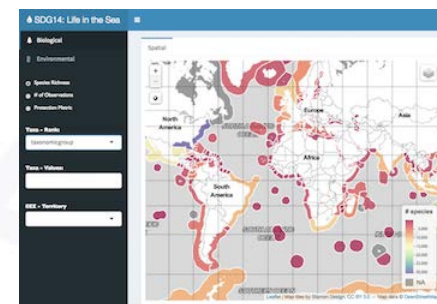
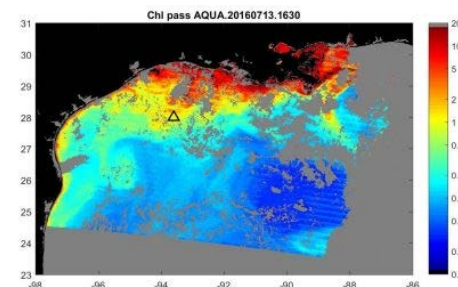
## FY19 Plans and Funding

New projects to be announced in Summer 2019

Partnership with NOAA, NASA, BOEM + new partner ONR;  
working towards a unified MBON-ATN and joint FFO in FY22

Anticipate \$1.5-2M per year for multiple projects

Oceanography special issue: MBON methods & technology



# FY2019 IOOS PO Highlights

**IOOS Advisory Committee** - new members and new chair

**NOAA Weather Act** – weather and water prediction

**Blue Economy** – innovation is boosting our **blue economy**

**Modeling:** through COMT - Revolutionize Water Modeling, Forecasting, and Prediction – Wx Act 2017 = NOAA priority! IOOS in key role for community approaches.

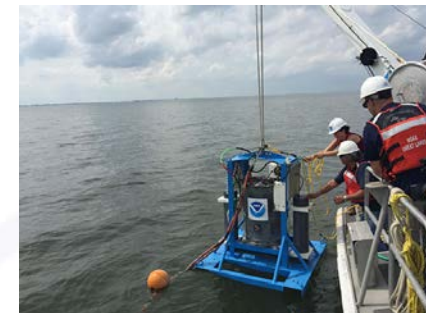
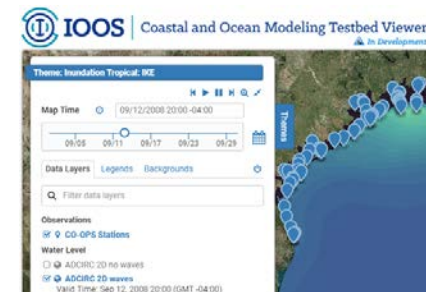
**Ocean Technology Transition** – 2 new projects – geographic balance – late summer 2019 for next FFO for award in FY2020

**IOOS partnering and leveraging** – Ocean Acidification Program, Marine Biodiversity Observation Network, Animal Telemetry Network, National Weather Service, National Ocean Service, Regional Ocean Partnerships

**Filling IOOS gaps**

FY19 \$7.5M gap filling

**ICOOS Act reauthorization**





# Ocean Technology Transition Program

## FY18 (\$2.5M)

### 3 ongoing projects

- Lake Erie HABs/Hypoxia (GLOS)
- West Coast HABs (UCSC/  
SCCOOS/CeNCOOS)
- Gulf of Maine Lobster Industry  
(NERACOOOS)

### 2 new projects

- MARACOOOS/U of Delaware [*Data Integration and Web-based Model Validation Tool for NOAA CO-OPS*]
- U of Notre Dame [*Building Coupled Storm Surge and Wave Operational Forecasting Capacity for Western Alaska*]

### Bio data pilot 'seed' projects

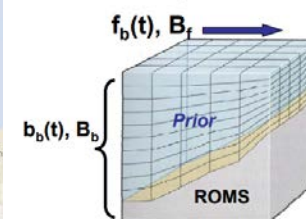
### Submaran ASV/UUV deployment



## FY19 (~\$2.6M)

### 4 ongoing projects & new call for proposals

- Lake Erie HABs/Hypoxia,
- West Coast HABs
- MARACOOOS/U of Del,
- U of Notre Dame/Alaska



# Functional Data Assembly Center Activities



- **Underwater Profiling Gliders**
  - ~ 3 national formats for web dissemination → 1
  - Community building (Canada, IMOS, EGO, IOOS, others?)
  - Native ingest tools for 3 glider types – standardize at the point of collection
  - Sort out GTS distribution



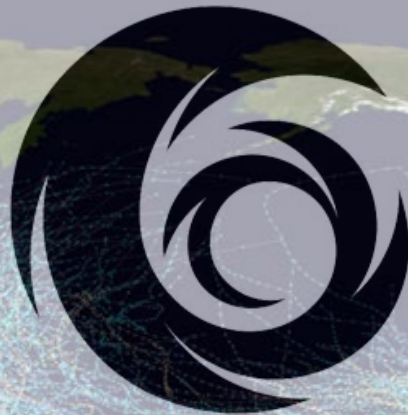
- **High Frequency radar (HFR)**
  - Sort out GTS distribution
  - Standard netCDF format for radials
  - Continue to expand global HFR



- **Animal Telemetry Network**
  - Acoustic and Satellite Tag standard
  - Encourage data sharing
  - Regional to national network with global extensions



# Storms are coming



STORMS GATHER  
AND THE WATCH BEGINS



hurricane intensity forecasting team

# Storms gather and now our watch begins...

Hear my words and bear witness to my vow

It shall not end until batteries fail

I bring ocean data through darkness

I am a watcher under waves

I am a drone that guards the realm

I bring our ocean to models for this season  
and seasons to come.



Adapted from adaptation by HBO Game of Thrones (Song of Fire and Ice: George R. R. Martin)