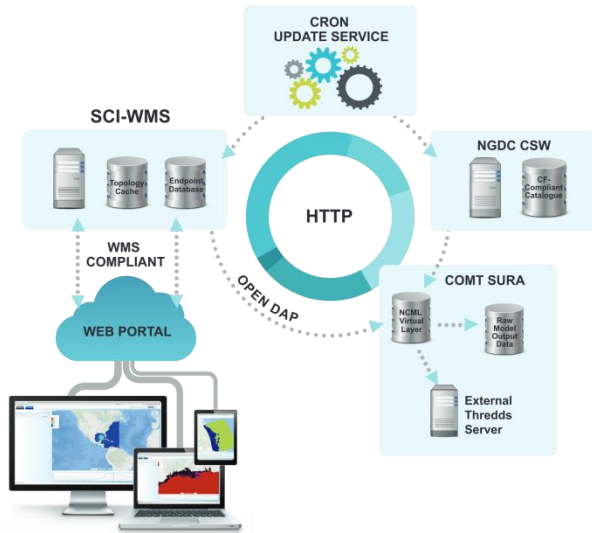


COMT CI: Y3 in Review & Goals for Y4  
Kelly Knee & Brian McKenna  
RPS ASA



# COMT Cyber-Infrastructure



## Motivation

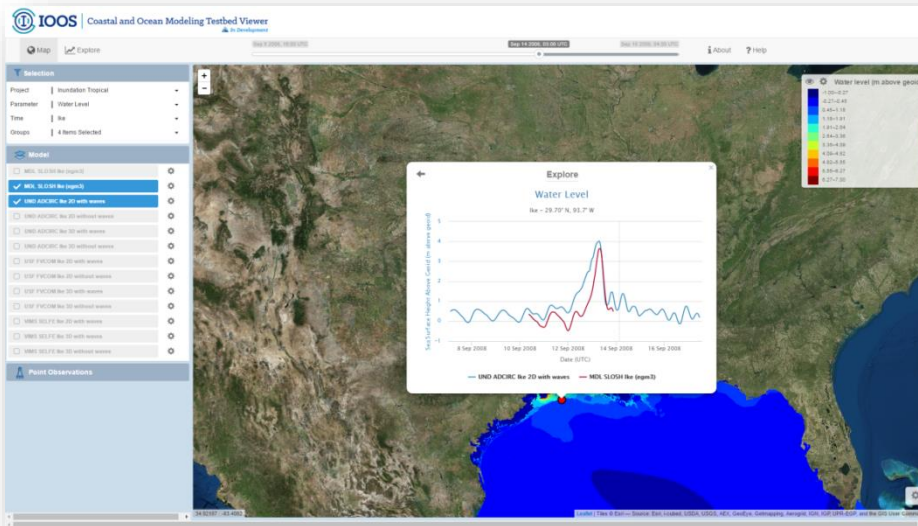
- facilitate **collaboration** across various institutions and models
- enable **exploration**, presentation and archive of research results
- provide **community** access and tools to the COMT research

## Implementation/Tools

- modelers upload data via FTP to central server
- CI works with modelers to make all data CF-compliant
- direct data access available via TDS (OPeNDAP and HTTP)
- visualization via Python based SCI-WMS for graphic display of data
  - handles structured, staggered and unstructured GRIDS
- user interface enables exploration of catalog and graphics for all projects

	TOPOLOGY	OPEN DAP ENDPOINT
C-GRID		HTTP://...
		HTTP://...
	⋮	⋮
U-GRID		HTTP://...
		HTTP://...

## Presentation/User Interface



## Services

sci-wms (1.6.0-dev) @ Python WMS service for geospatial gridded data

[datasets](#) [defaults](#) [documentation](#) [demo \(Leaflet WMS client\)](#) [login](#)

Description	Preview	Info	Actions
<a href="#">cb_hypoxia.CHEROMS_1term...</a>	n/a	<a href="#">GetCaps</a> <a href="#">Data (DAP)</a> Updated: 1 week, 1 day ago Keep up to date: <input checked="" type="checkbox"/>	<a href="#">Update</a>
<a href="#">cb_hypoxia.CHEROMS_1termDO</a>	n/a	<a href="#">GetCaps</a> <a href="#">Data (DAP)</a> Updated: 1 week, 1 day ago Keep up to date: <input checked="" type="checkbox"/>	<a href="#">Update</a>
<a href="#">usw_integration.exp16</a>	n/a	<a href="#">GetCaps</a> <a href="#">Data (DAP)</a> Updated: 1 week, 1 day ago	<a href="#">Update</a>

## Data Access (eg. OPeNDAP)

```

OPeNDAP
-----
Tested on Netscape 4.01 and Internet Explorer 5.00.

ASRON: GetASCII | GetBinary | Show Help
Data URL: http://comt.sura.org/thredds/dodsC/iod2/pr_
Global Attributes:
  _FillValue: -99999.0
  model: ADCIRC
  version: 51.28
  grid_type: Triangular
  description: PRU1 TIDAL
Variables:
  time: Array of 64 bit Reals [time = 0.47][node = 0.2733257]
    long_name: model time
    standard_name: time
    units: seconds since 1988-09-28 00:00:00
    base_date: 1988-09-28 00:00:00 UTC
  X: Array of 64 bit Reals [node = 0.2733257]
    long_name: longitude
    standard_name: longitude
    units: degree_east
    positive: east
  Y: Array of 64 bit Reals [node = 0.2733257]
    long_name: latitude
    standard_name: latitude
    units: degree_north
    positive: north
  element: Array of 32 bit Integers [node = 0.2733257]
    long_name: element
    cf_role: face_node_connectivity
    start_index: 1
    units: nondimensional
  zeta: Array of 64 bit Reals [time = 0.47][node = 0.2733257]
    time: [ ] [node: ]
    long_name: water surface elevation above geoid
    standard_name: sea_surface_height_above_geoid
    coordinates: time y x
    location: node
    mesh: adcirc_mesh
  u-vel: Array of 64 bit Reals [time = 0.47][node = 0.2733257]
    time: [ ] [node: ]
    long_name: water column vertically averaged east/west velocity
    standard_name: eastward_water_velocity
    positive: east
    units: m s-2
    _FillValue: -99999.0
  v-vel: Array of 64 bit Reals [time = 0.47][node = 0.2733257]
    time: [ ] [node: ]
    long_name: water column vertically averaged north/south velocity
    standard_name: northward_water_velocity
    positive: north
    units: m s-2
  pressure: Array of 64 bit Reals [time = 0.47][node = 0.2733257]
    time: [ ] [node: ]
    long_name: air pressure at sea level
    standard_name: air_pressure_at_sea_level
    units: meters of water
    _FillValue: -99999.0
    coordinates: time y x
  windx: Array of 64 bit Reals [time = 0.47][node = 0.2733257]
    time: [ ] [node: ]
    long_name: e/w wind velocity
    standard_name: eastward_wind
    positive: east
    units: m s-2
    _FillValue: -99999.0
  neta: 32 bit Integer [node = 0.2733257]
    neta = [ ]
    long_name: total number of elevation
    units: nondimensional
  windy: Array of 64 bit Reals [time = 0.47][node = 0.2733257]
    time: [ ] [node: ]
    long_name: n/s wind velocity
    standard_name: northward_wind
    positive: north
    units: m s-2
    _FillValue: -99999.0
  swan_HS: Array of 64 bit Reals [time = 0.47][node = 0.2733257]
    time: [ ] [node: ]
    long_name: significant wave height
    standard_name: sea_surface_wave_significant_height
    units: m
    _FillValue: -99999.0
    coordinates: time y x
    
```

# Year 3 In Review

- Deployment of comt.ioos.us
- Addition of <http://comt.sura.org/thredds> to RPA ASA's operational service monitoring system
- Model Viewer Improvements

The image displays two overlapping screenshots from the IOOS website. The top screenshot shows the main IOOS homepage with a navigation bar and several content tiles. The bottom screenshot shows a detailed view of the 'Coastal and Ocean Modeling Testbed Viewer' interface, which includes a map of the United States with a highlighted region in the Gulf of Mexico, a legend for water level data, and a sidebar with selection options.

**IOOS | Integrated Ocean Observing System**

Navigation: DATA - VIEWERS - DACS - REGIONAL ASSOCIATIONS - ABOUT -

Content Tiles:

- EDS Model Viewer
- IOOS By The Numbers
- Profiling Gliders
- Data Discovery
- Coastal and Ocean Modeling Testbed
- Marine Biodiversity (MBON) Data
- Regional Associations
- Enviro

**Coastal and Ocean Modeling Testbed Viewer**

Map | Explore

Map: 2/20/16 15:26:00 UTC | Date: 11/20/16 04:00 UTC | View: 17/20/16 15:26:00 UTC | About | Help

Selection:

- Project: Inundation Tropical
- Parameter: Water Level
- Time: 1hr
- Groups: UND ADCIRC

Model:

- UND ADCIRC 30 with waves
- UND ADCIRC 30 without waves
- UND ADCIRC 30 with waves
- UND ADCIRC 30 without waves

Point Observations

Water level (m above geoid):

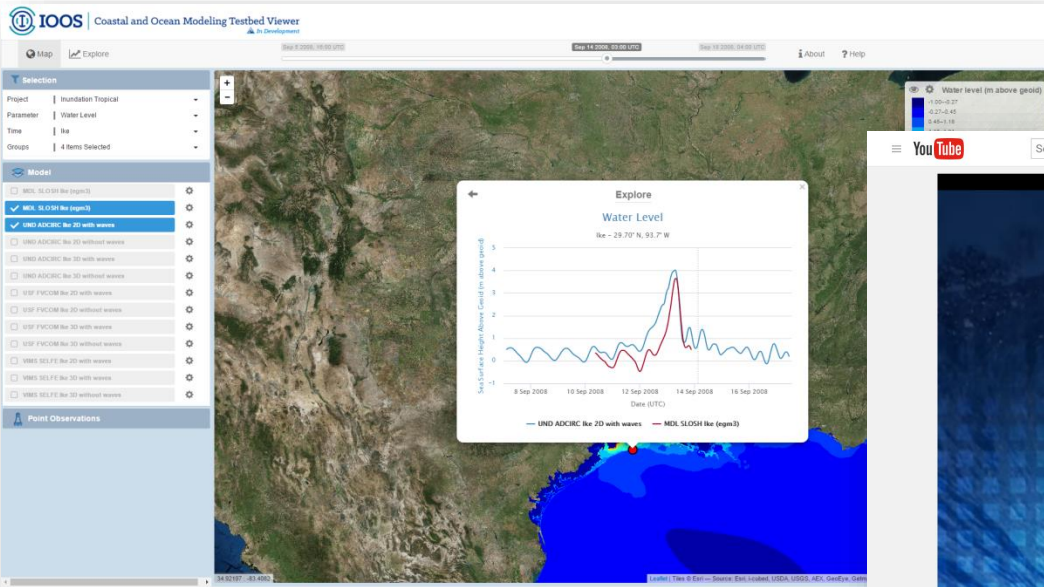
- 1.00 to -0.27
- 0.27 to 0.46
- 0.46 to 0.78
- 0.78 to 1.01
- 1.01 to 1.24
- 1.24 to 1.56
- 1.56 to 1.89
- 1.89 to 2.21
- 2.21 to 2.54
- 2.54 to 2.87
- 2.87 to 3.20
- 3.20 to 3.53
- 3.53 to 3.85
- 3.85 to 4.18
- 4.18 to 4.51
- 4.51 to 4.84
- 4.84 to 5.17
- 5.17 to 5.50

Tweets by @usioosgov

Like Page

# Year 3 In Review

- Coordination with modeling teams & participation on team calls
- Demos and [tutorials](#)
- **Development of Data Upload Tool**
- Review of draft Data Management Plan




# Year 3 In Review: CB Hypoxia

## Challenge: Downloadable Publication Archives

- Create unique and stable (and now branded!) TDS catalog location for archiving publication model runs & related observations
  - [http://comt.sura.org/thredds/catalog/comt\\_2\\_full/cb\\_hypoxia/2004-2005/catalog.html](http://comt.sura.org/thredds/catalog/comt_2_full/cb_hypoxia/2004-2005/catalog.html)
  - [http://thredds.comt.ioos.us/thredds/projects/cb\\_hypoxia/papers/irbyetal2016.html](http://thredds.comt.ioos.us/thredds/projects/cb_hypoxia/papers/irbyetal2016.html)



 Catalog [http://thredds.comt.ioos.us/thredds/projects/cb\\_hypoxia/papers/irbyetal2016.html](http://thredds.comt.ioos.us/thredds/projects/cb_hypoxia/papers/irbyetal2016.html)

Dataset	Size	Last Modified
 Irby et al. 2016		--
 VIMS ChesROMS 1-term DO surfsat/		--
 NOAA CSDL CROFS2 (ROMS) development Synoptic Hindcast/		--
 UMCES ROMS RCA/		--

COMT TDS at RPS ASA see [Info](#)  
THREDDS Data Server [Version 4.6.6 - 2016-06-13T15:13:41-0600] [Documentation](#)

# Year 3 In Review: CB Hypoxia

- Added new model runs
  - ChesROMS
  - CBOFS
  - ROMS\_RCA
- Organized model runs by project period
  - 2004-2005
  - 1984-2013
  - 2014-2015
- Re-organization of Model Viewer filters to allow multiple time periods per project
- Enabled water temperature variable in the model viewer
- Integrated the Chesapeake Bay Program observation data with the TDS catalog and Model Viewer
- Added CBIBS buoy data to the Model Viewer

# Year 3 In Review: CB Hypoxia

## Outstanding Requests:

- Process observation data
- Enable model-observation comparisons
- Enable inter-comparison of models with sigma coordinates at various depths
- Add additional biogeochemical variables (chlorophyll and nitrate)
- Integration of 'Station' data from simulations
- Allow Model Viewer to generate longer (2-yr) time-series
- Calculation of hypoxic volume



# Year 3 In Review: GoM Hypoxia

## Challenge: Calculation of bottom boundary layer

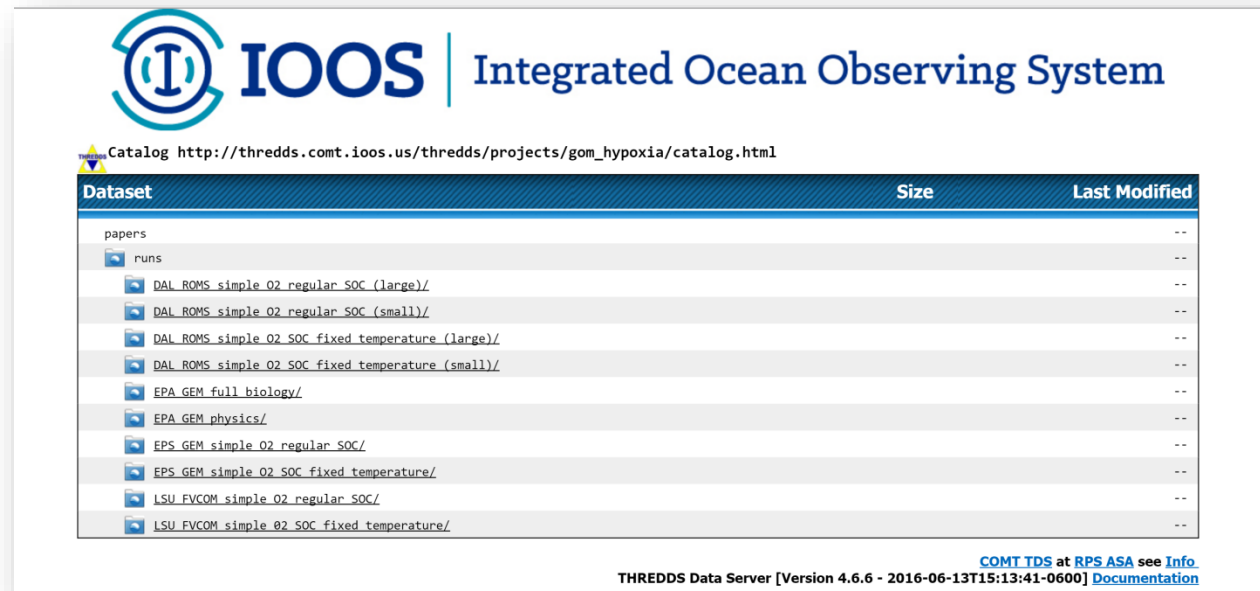
- Boundary layer thickness, as compared to NGOFS, is a key diagnostic for inclusion of new models.
- Review existing Matlab code for boundary layer calculation provided by modeling team
- Convert to Python and performed test integration with data ingest process as a post-processing step

## Potential Next Steps

- Testing!
- Add boundary layer thickness as 2D variable to model output files;
  - Requires discussion of CF convention for new variable
- Determine best practices for visualization, color scheme, etc
- Comparison with NGOFS

# Year 3 In Review: GoM Hypoxia

- Defined the model data expectations for Y3 and Y4 for all three models (ROMS, GEM, FVCOM)
  - Y3: (1) simple oxygen model and (2) the diagnostic run
  - Y4: full biogeochemical model results
- Created a [stable TDS catalog link](#) for use in publications
- Continued coordination with FVCOM group to work through topology and time variable issues
- Added first round of simple O2 models to the TDS catalog



The screenshot displays the IOOS Integrated Ocean Observing System interface. At the top, the IOOS logo is followed by the text "IOOS | Integrated Ocean Observing System". Below this, the URL "Catalog http://thredds.comt.ioos.us/thredds/projects/gom\_hypoxia/catalog.html" is shown. The main content is a table with three columns: "Dataset", "Size", and "Last Modified". The table lists various datasets, including folders for "papers" and "runs", and specific model runs for ROMS, GEM, and FVCOM. At the bottom right, there is a link for "COMT TDS at RPS ASA see Info" and "Documentation". The footer of the screenshot reads "THREDDS Data Server [Version 4.6.6 - 2016-06-13T15:13:41-0600] Documentation".

Dataset	Size	Last Modified
papers		--
runs		--
DAL_ROMS_simple_O2_regular_SOC_(large)/		--
DAL_ROMS_simple_O2_regular_SOC_(small)/		--
DAL_ROMS_simple_O2_SOC_fixed_temperature_(large)/		--
DAL_ROMS_simple_O2_SOC_fixed_temperature_(small)/		--
EPA_GEM_full_biology/		--
EPA_GEM_physics/		--
EPS_GEM_simple_O2_regular_SOC/		--
EPS_GEM_simple_O2_SOC_fixed_temperature/		--
LSU_FVCOM_simple_O2_regular_SOC/		--
LSU_FVCOM_simple_O2_SOC_fixed_temperature/		--

# Year 3 In Review: GoM Hypoxia

## Outstanding Requests:

- Process observation data
- Enable model-observation comparisons
- Add full biogeochemical model output
- Add bottom boundary layer thickness to UI
  - Perform a simple difference calculation between NGOFS and the testbed runs

# Year 3 In Review: USWC Integration

## Challenge: Integration of real-time simulations

- Primarily leveraging remotely served ongoing forecast products
- A single case study dataset has been added to the COMT TDS catalog: full aggregation available at [http://comt.sura.org/thredds/dodsC/comt2/usw\\_integration/Exp16/roms.xml.html](http://comt.sura.org/thredds/dodsC/comt2/usw_integration/Exp16/roms.xml.html)

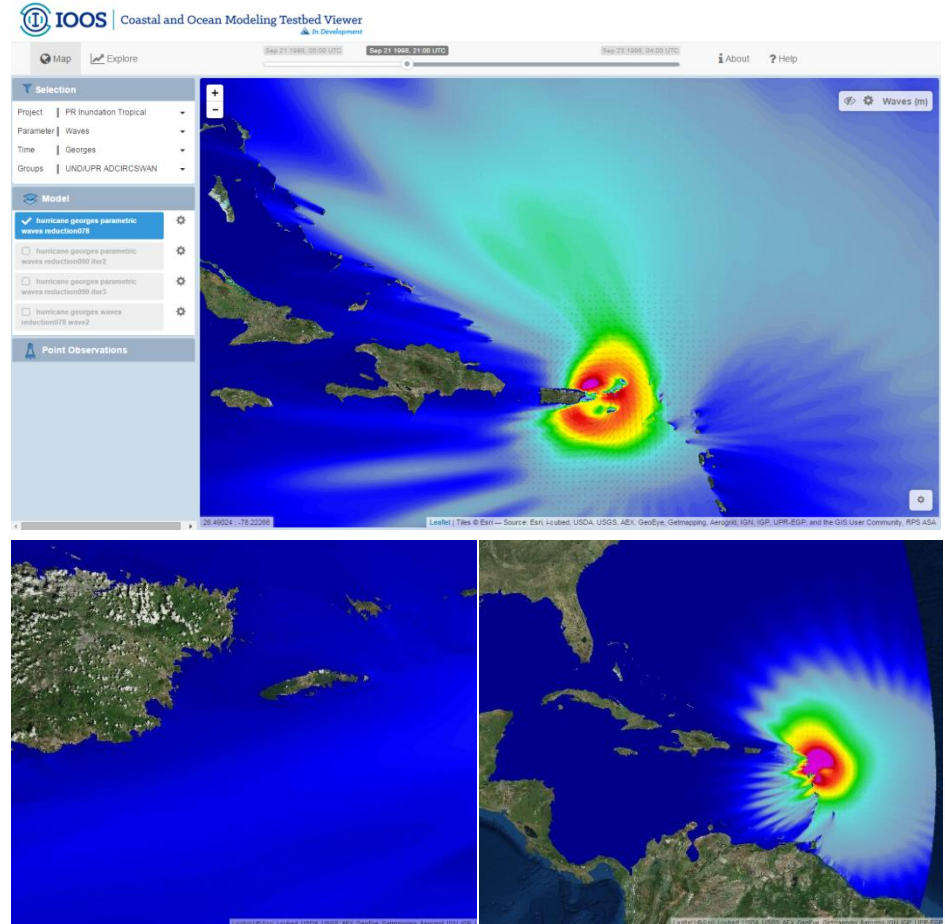
## Outstanding Requests:

- Add time-series of public buoys to compare with model
- Mechanism for analyzing past month of model performance

# Year 3 In Review: PR Inundation

## Challenge: Many, massive, model runs

- Pushing boundaries of fast & efficient integration of new model runs
- Datasets with millions of nodes too slow to draw in Model Viewer
- Leveraged a python-based tile cache for key model results



# Year 3 In Review: PR Inundation

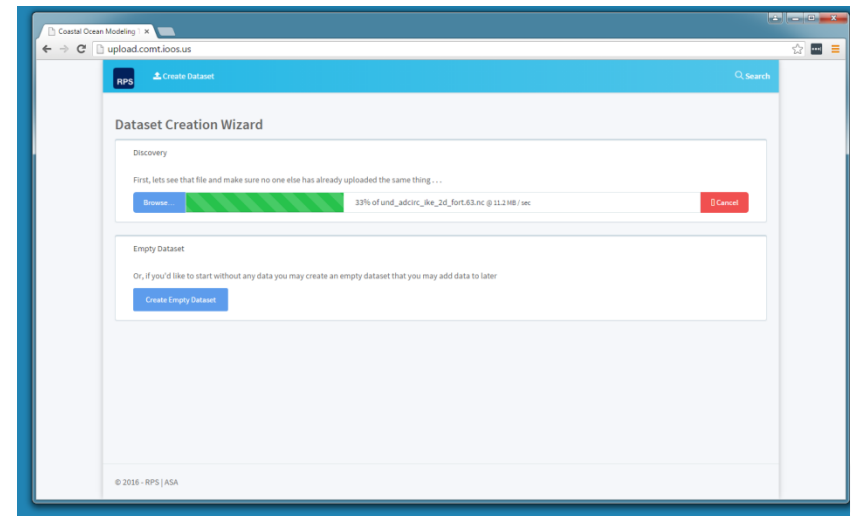
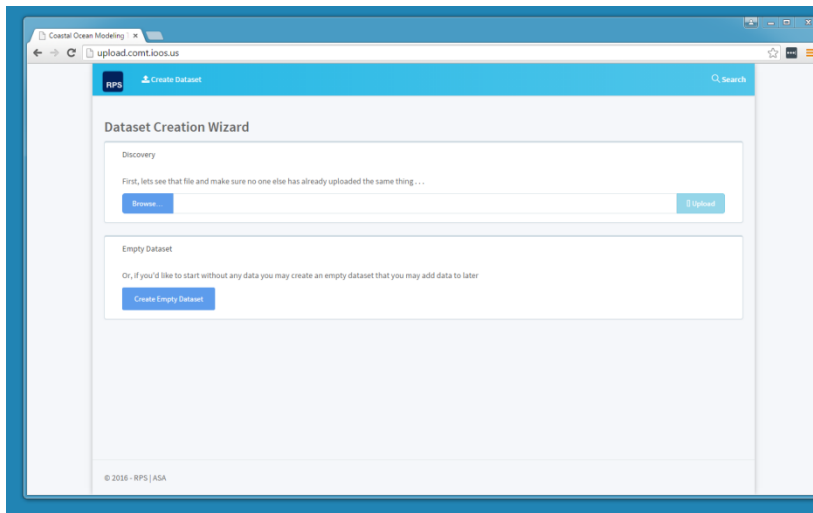
- Addition of Georges, Irene, and Sandy ADCIRC runs to the TDS Catalog
- Addition of Georges observation data to the TDS catalog
- Support of NOAA Testbed Conference abstract and presentation
- Continued coordination with PR team to work through SLOSH basin issues

## **Outstanding Requests:**

- Integration of observation data
- Enable model-observation comparisons
- Continued coordination with NHC on SLOSH integration
- Difference calculation

# Data Upload Tool

Upload View/Creation Wizard allows local files to be uploaded  
*(checks file hash before upload to see if this file has been processed)*



# Data Upload Tool

Once uploaded, metadata is used to fill in initial dataset profile  
(standards such as ACDD and CF are initial targets)

The screenshot shows a web browser window with the URL `upload.comt.ioos.us/nc-inspector/98hfeDBZNfkTeBjMb`. The page title is "RPS" and it has a "Create Dataset" button. The form is for a dataset titled "Ike 2D".

**Discovery - ACDD**  
This discovery cannot be scored without the ID and Naming Authority.

ID:

Naming Authority:

Conventions:

Program:

Description:

Project:

Institution:

Source:

Keywords:

Summary:

**CF**  
This CF data cannot be scored without first finishing the ACDD discovery.

Time Varying Variables | Dimension Variables | Non Time Varying Variables | All

File Variable Name	Long Name	Standard Name	Units	Location
zeta	water surface elevation above geoid	<a href="#">sea_surface_height_above_geoid</a>	metric	node

**NcML**

Dimension Variables:



# Data Upload Tool

Additional conventions/standards such as UGRID are presented

The screenshot shows a web browser window titled "Coastal Ocean Modeling" with the URL "upload.comt.ioos.us/nc-inspector/98hfeDBZNfkTeBjMb". The main content is a table of variables with the following data:

ibtype	type of normal flow (discharge) boundary	Empty	nondimensional
ibtypee	elevation boundary type	Empty	nondimensional
nbdv	node numbers on each elevation specified boundary segment	Empty	nondimensional
nbvv	node numbers on normal flow boundary segment	Empty	nondimensional
neta	total number of elevation specified boundary nodes	Empty	nondimensional
mdli	number of nodes in each elevation specified boundary segment	Empty	nondimensional
mvcl	total number of normal flow specified boundary nodes including both the front and back nodes on internal barrier boundaries	Empty	nondimensional
mvll	number of nodes in each normal flow specified boundary segment	Empty	nondimensional
x	longitude	longitude	degrees_east
y	latitude	latitude	degrees_north
zeta	water surface elevation above geoid	sea surface height above geoid	metric node

Below the table, there are two configuration sections:

- NcML**: Dimension Variables dropdown menu set to "time".
- UGRID**: Node Coordinates dropdown menu set to "x" and "y"; Face Node Connectivity dropdown menu set to "element".

# Data Upload Tool

When required metadata is provided (e.g., *id* and *naming\_authority*) OPeNDAP endpoint is dynamically created using provided metadata and IOOS compliance checker is run using DAP

**IOOS | Integrated Ocean Observing System**

**OPeNDAP Dataset Access Form**

Action: [Get ASCII](#) | [Get Binary](#) | [Show Help](#)

Data URL:

**Global Attributes:**

id: example\_ike2d  
naming\_authority: noaa.ioos.comt  
Conventions: OPeNDAP  
summary: Name  
keywords: GOCIC  
group: tropical\_inundation

**Variables:**

depth: Array of 64 bit Reals [node = 0.417641]  
node:  
long\_name: distance below geoid  
standard\_name: depth below geoid  
coordinates: x, y  
location: node  
mesh: mesh\_topology

element: Array of 32 bit Integers [nele = 0.826865][nvertex = 0.2]  
node:  
long\_name: element  
standard\_name: face\_node\_connectivity  
start\_index: 1  
units: nondimensional

**upload.comt.ioos.us/nc-inspector/98hfeDBZNR1e8jMb**

Title:

Discovery - ACDD: This discovery scored 45 out of 100 points for completeness.

ID:

Naming Authority:

Conventions	OPeNDAP	Program	Example
Description	Tropical_Ike_2d_Time_Avrg_1D_Connectivity	Project	Example
Institution	NOAA/CIOMS/CIOMS	Source	Example
Keywords	OPeNDAP	Summary	Example

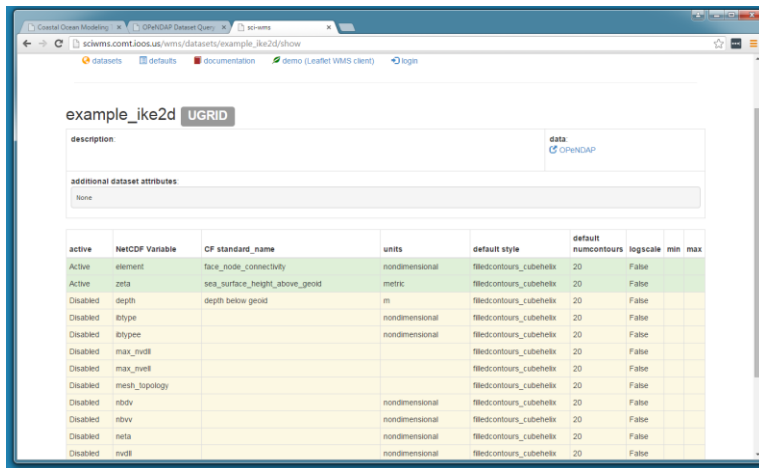
CF: This CF score set scored 100 out of 100 points for completeness.

File Variable Name	Long Name	Standard Name	Units	Location
data	water surface elevation above geoid	sea_surface_height_above_geoid	metric	node

compliance  
checker  
scores

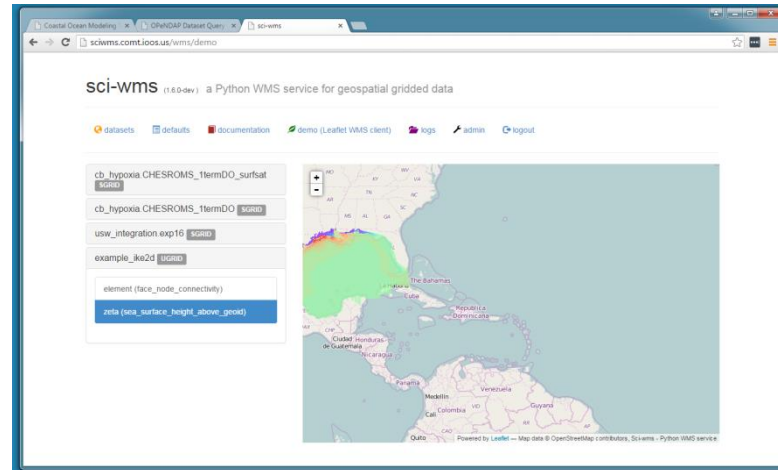
# Data Upload Tool

If sufficient metadata is provided (eg. CF + UGRID) a **sci-wms** dataset is created automatically allowing visual access to the data via WMS



The screenshot shows the 'example\_ike2d' dataset configuration page in the sci-wms interface. The page includes a description field, a 'data' dropdown set to 'CF UGRID', and a table of dataset attributes.

active	NetCDF Variable	CF standard_name	units	default style	default numcontours	logscale	min	max
Active	element	face_node_connectivity	nondimensional	filled:contours_cubehelix	20	False		
Active	zeta	sea_surface_height_above_geoid	metric	filled:contours_cubehelix	20	False		
Disabled	depth	depth below geoid	m	filled:contours_cubehelix	20	False		
Disabled	btype		nondimensional	filled:contours_cubehelix	20	False		
Disabled	btypee		nondimensional	filled:contours_cubehelix	20	False		
Disabled	max_rvdl			filled:contours_cubehelix	20	False		
Disabled	max_rvdl			filled:contours_cubehelix	20	False		
Disabled	mesh_topology			filled:contours_cubehelix	20	False		
Disabled	rbdv		nondimensional	filled:contours_cubehelix	20	False		
Disabled	rbdv		nondimensional	filled:contours_cubehelix	20	False		
Disabled	net		nondimensional	filled:contours_cubehelix	20	False		
Disabled	rvdl		nondimensional	filled:contours_cubehelix	20	False		



The screenshot shows the 'sci-wms' demo page, which is a Python WMS service for geospatial gridded data. The page includes a list of datasets and a map of the Caribbean region. The 'example\_ike2d' dataset is selected, and the 'zeta (sea\_surface\_height\_above\_geoid)' variable is highlighted in the map legend.

sci-wms (1.6.0-dev) a Python WMS service for geospatial gridded data

- datasets
- defaults
- documentation
- demo (Leaflet WMS client)
- logs
- admin
- logout

cb\_hypoxia CHESROMS\_1termDO\_surfbat [toggle]

cb\_hypoxia CHESROMS\_1termDO [toggle]

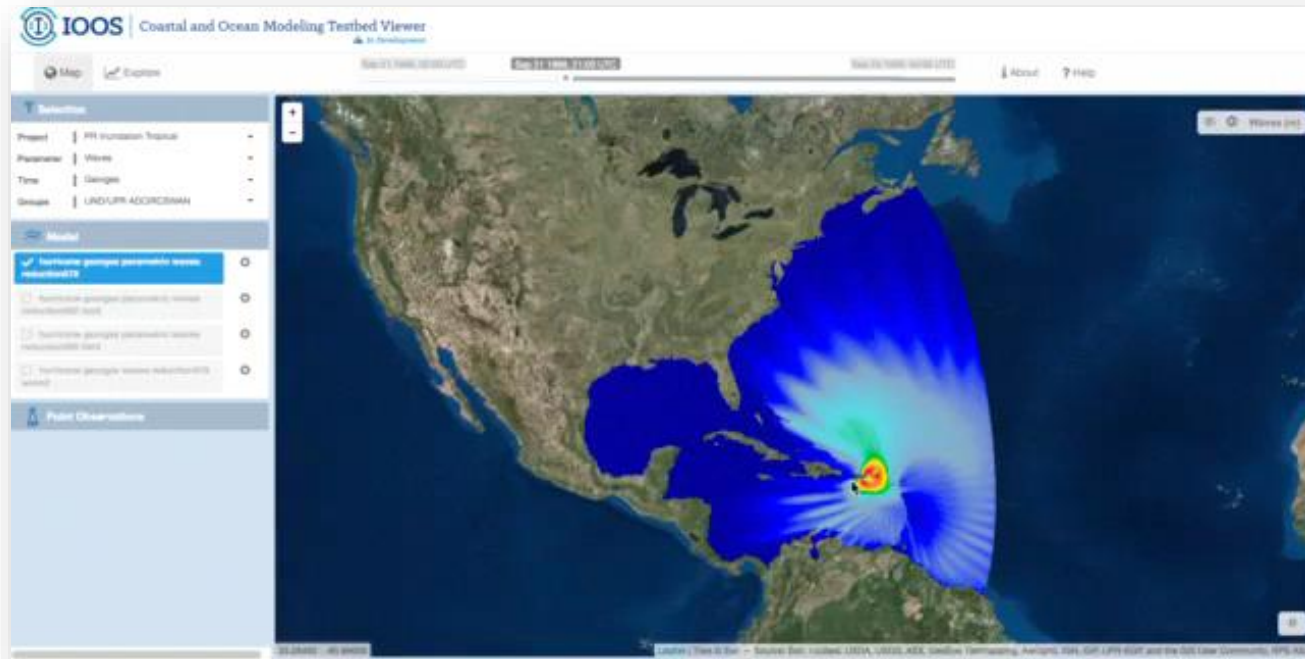
usw\_integration.exp16 [toggle]

example\_ike2d [toggle]

element (face\_node\_connectivity)

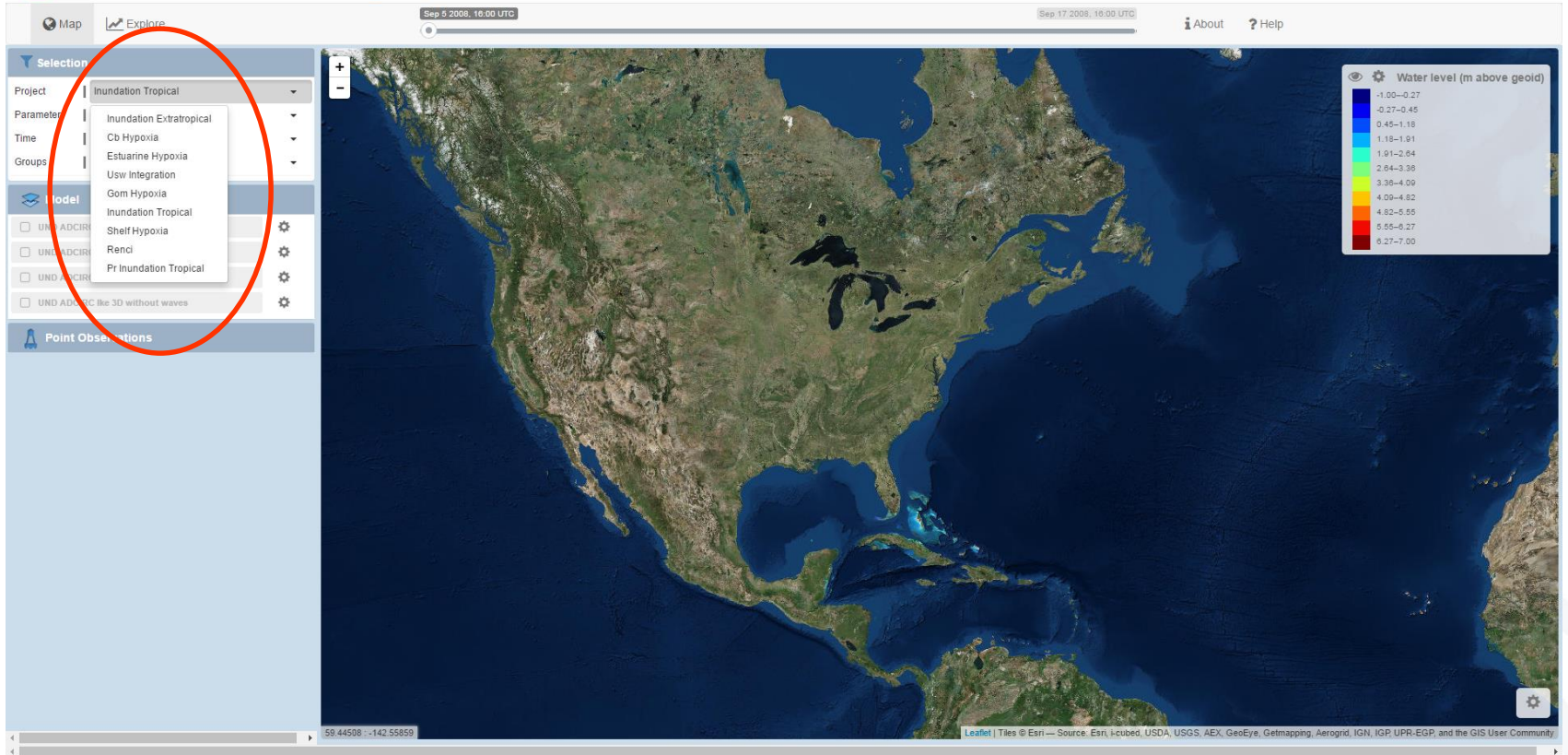
zeta (sea\_surface\_height\_above\_geoid)

# Model Viewer

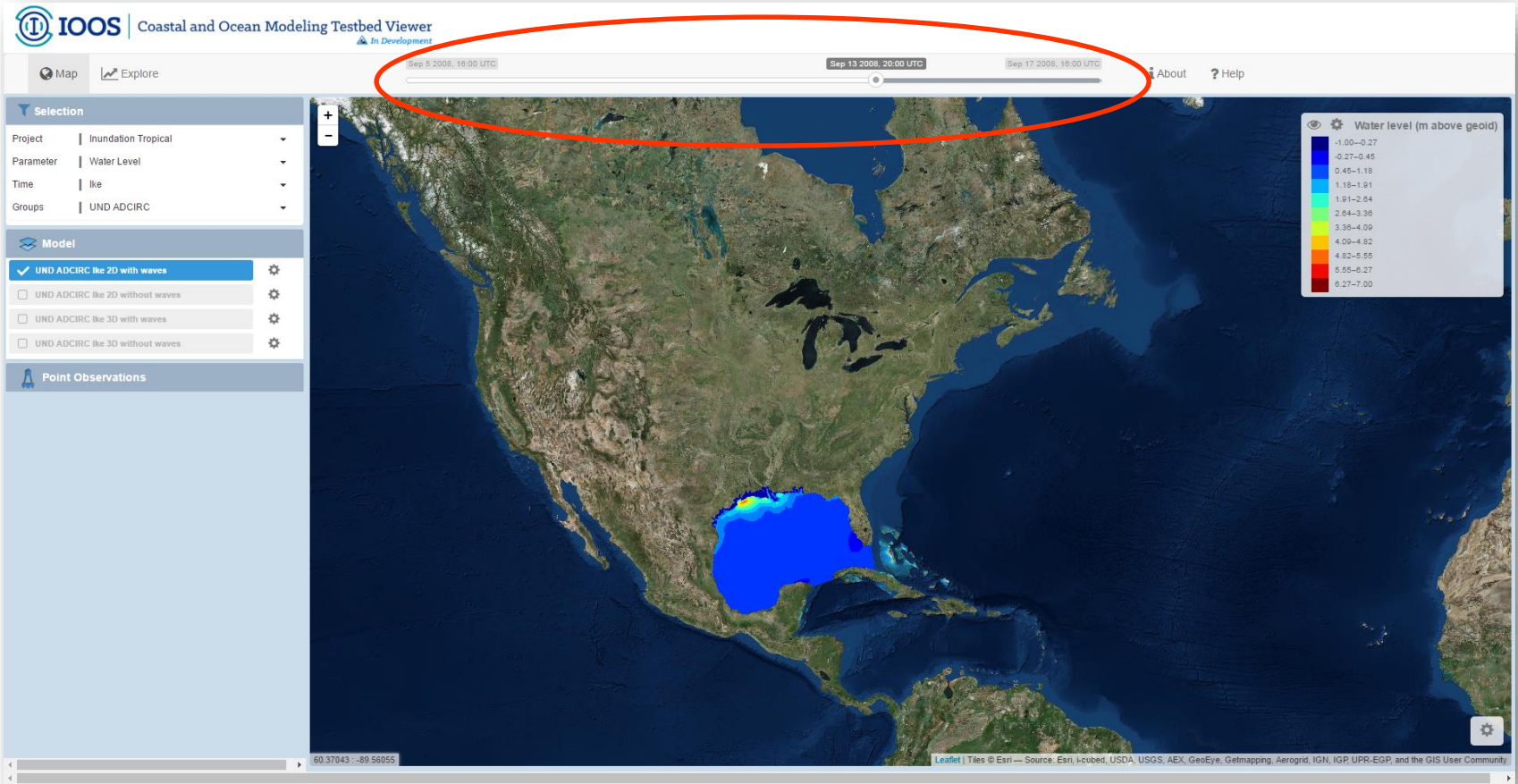


- Web-based map view enabled rapid exploration of model output from large scale to local
- Inter-comparison of models regardless of grid or domain
- Time-series comparison across models available for any point within domain via OGC WMS GetFeatureInfo requests

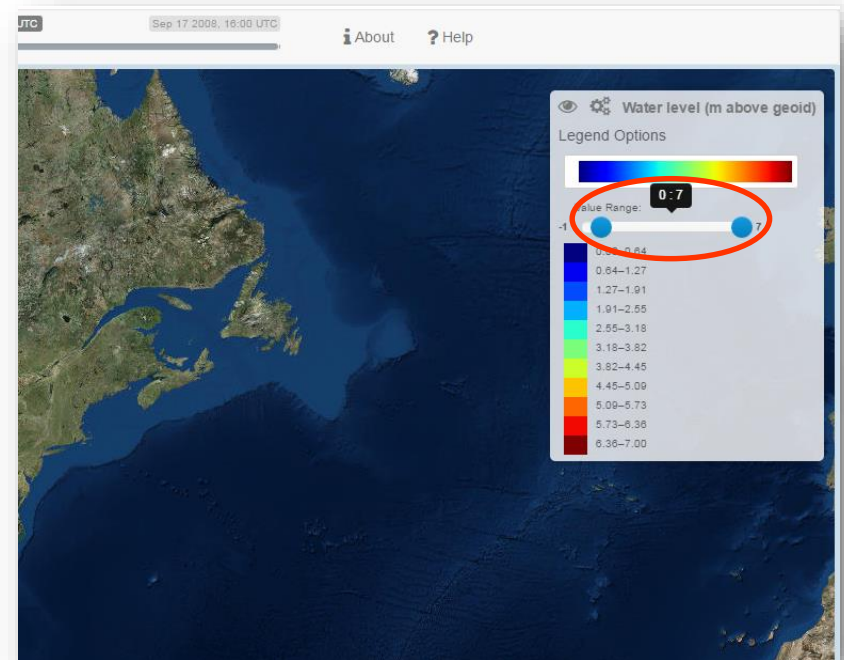
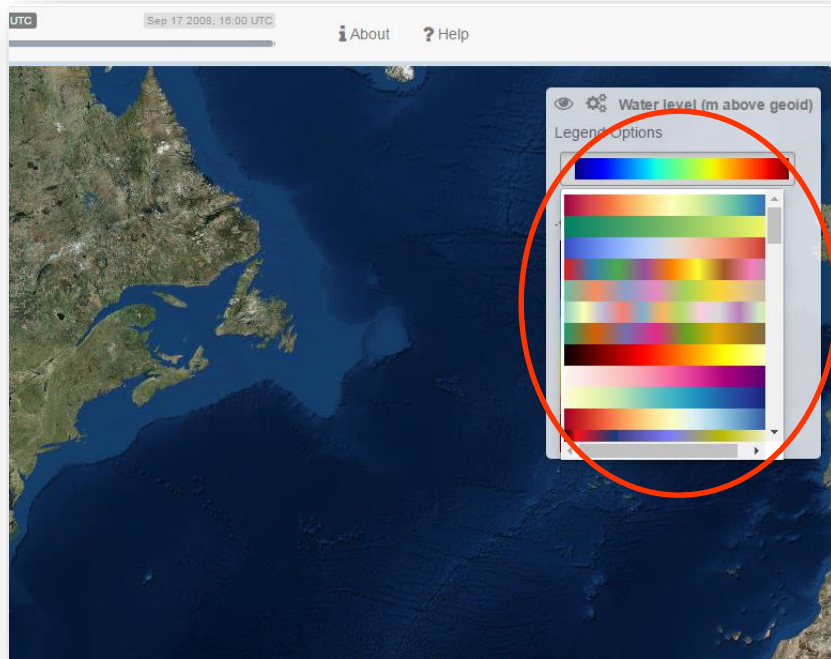
# Model Viewer



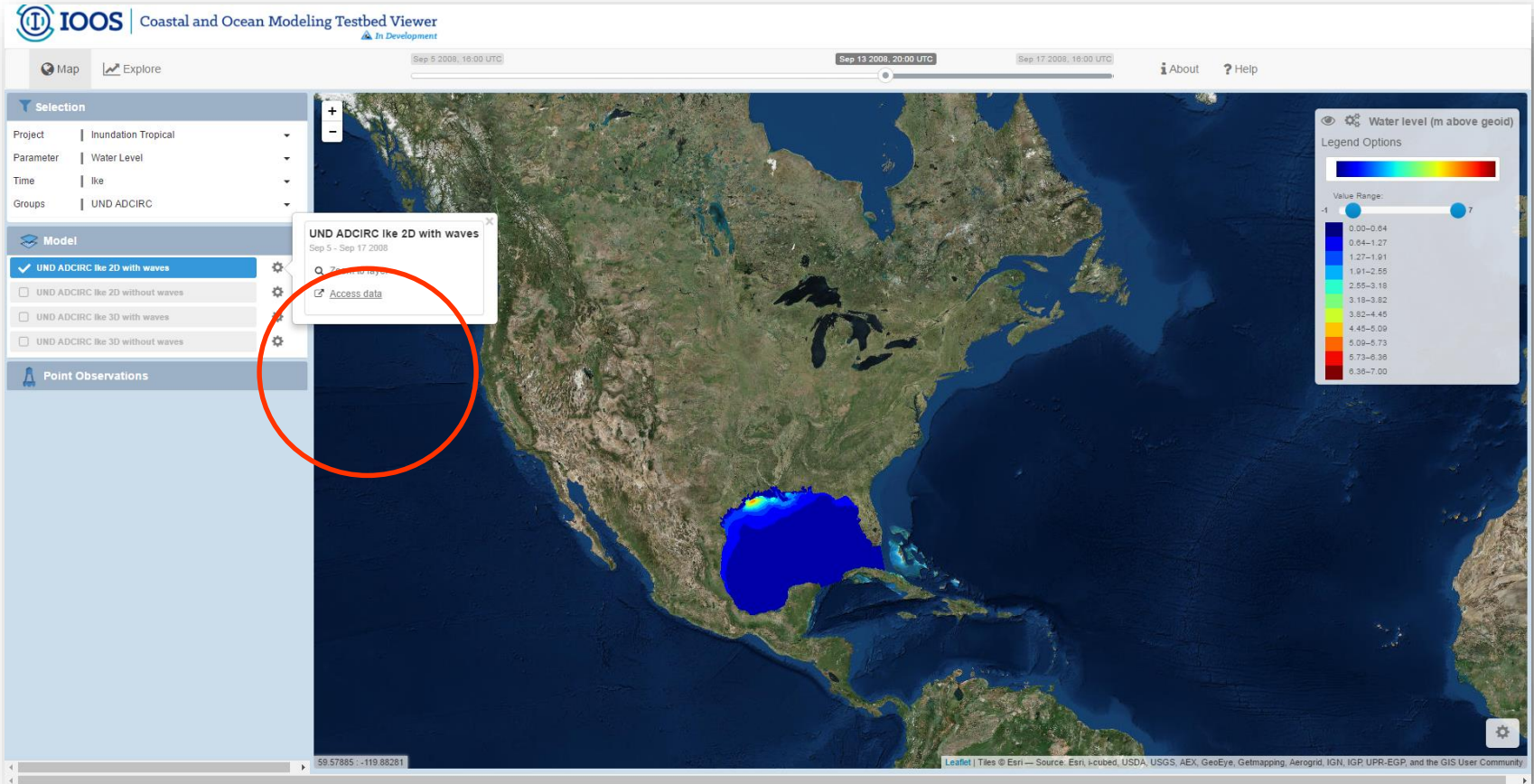
# Model Viewer



# Model Viewer

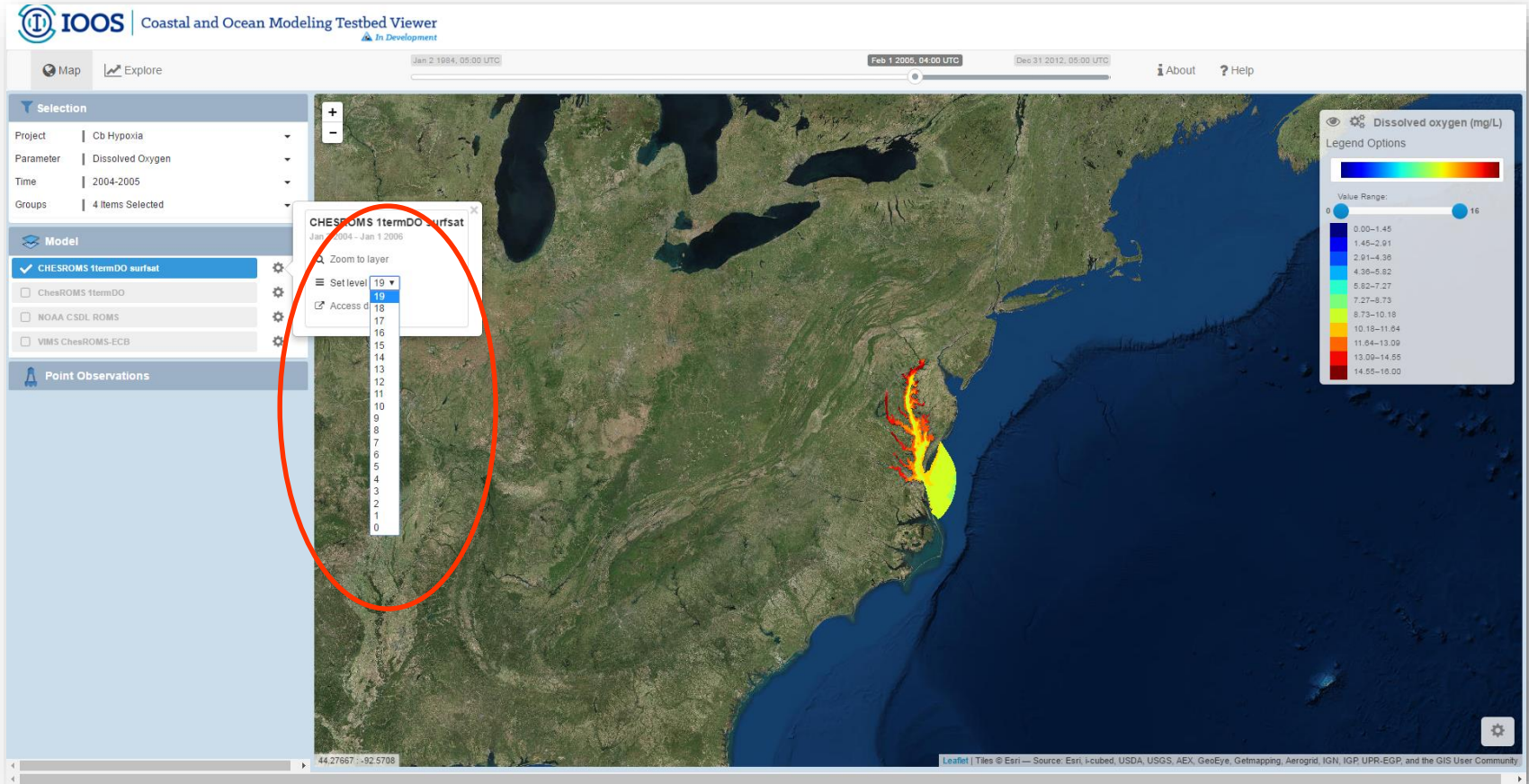


# Model Viewer

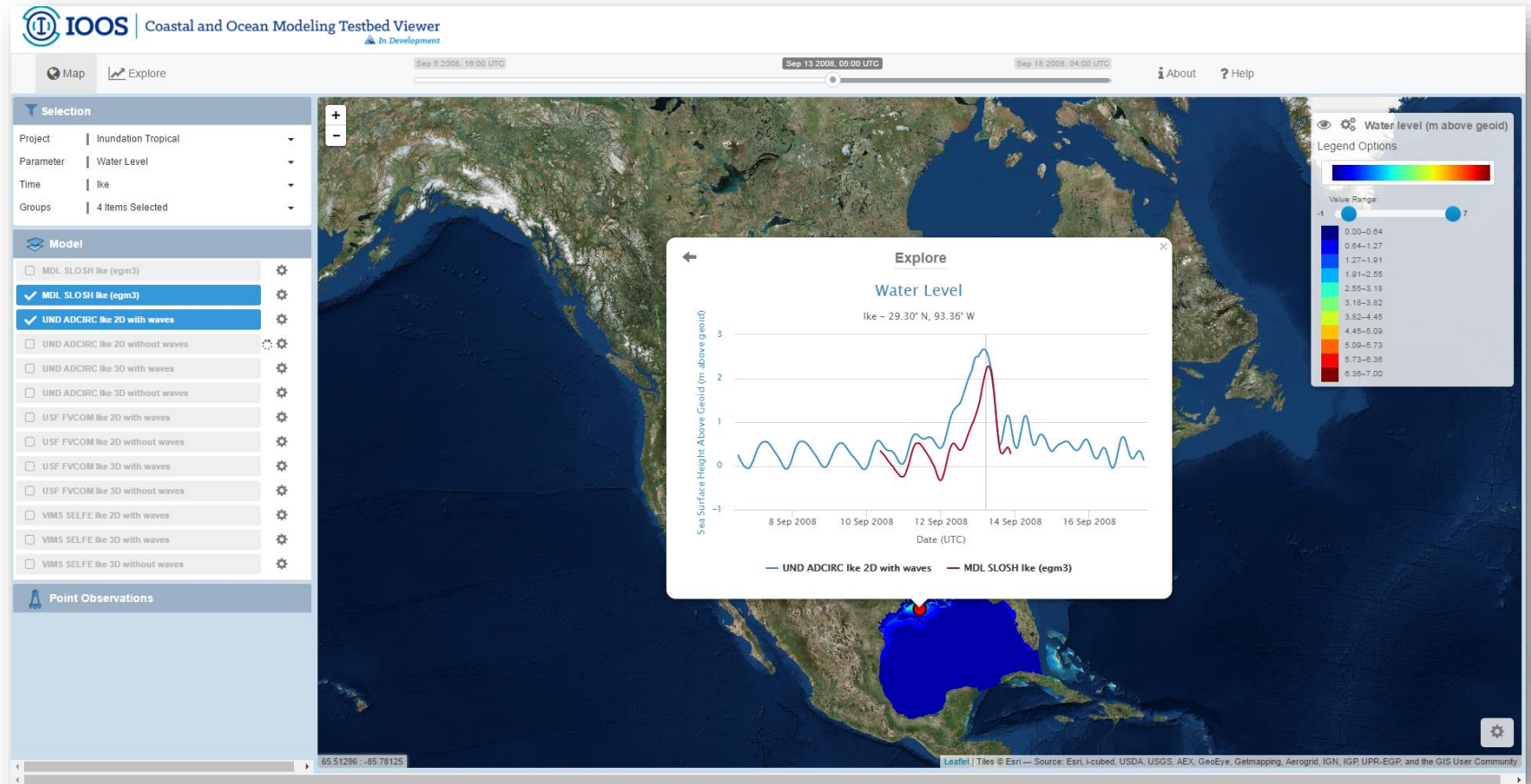




# Model Viewer



# Model Viewer



# Model Viewer Updates

## Simplified Project Filters & Addition of Search

The screenshot shows the Model Viewer interface with a search filter applied. The search bar contains the text "Filter data layers" and "Inundation Tropical". A dropdown menu is open, listing the following options:

- Inundation Tropical: IKE
- CB hypoxia: 1984-2013
- CB hypoxia: 2014-2015
- CB hypoxia: 2004-2005
- USWC Integration
- GOM Hypoxia: 2004-2007
- PR Inundation Tropical: SANDY
- PR Inundation Tropical: IRENE
- PR Inundation Tropical: GEORGES

The interface also includes a timeline slider for the period 09/01 to 09/29, with a selected date of 09/15. Below the timeline, there are fields for "Slider Range" (09/01/2008 - 10/01/2008) and "Map Time" (09/12/2008 20:00 -04:00). Navigation tabs include "Data Layers", "Legends", "Backgrounds", and "Zoom To".

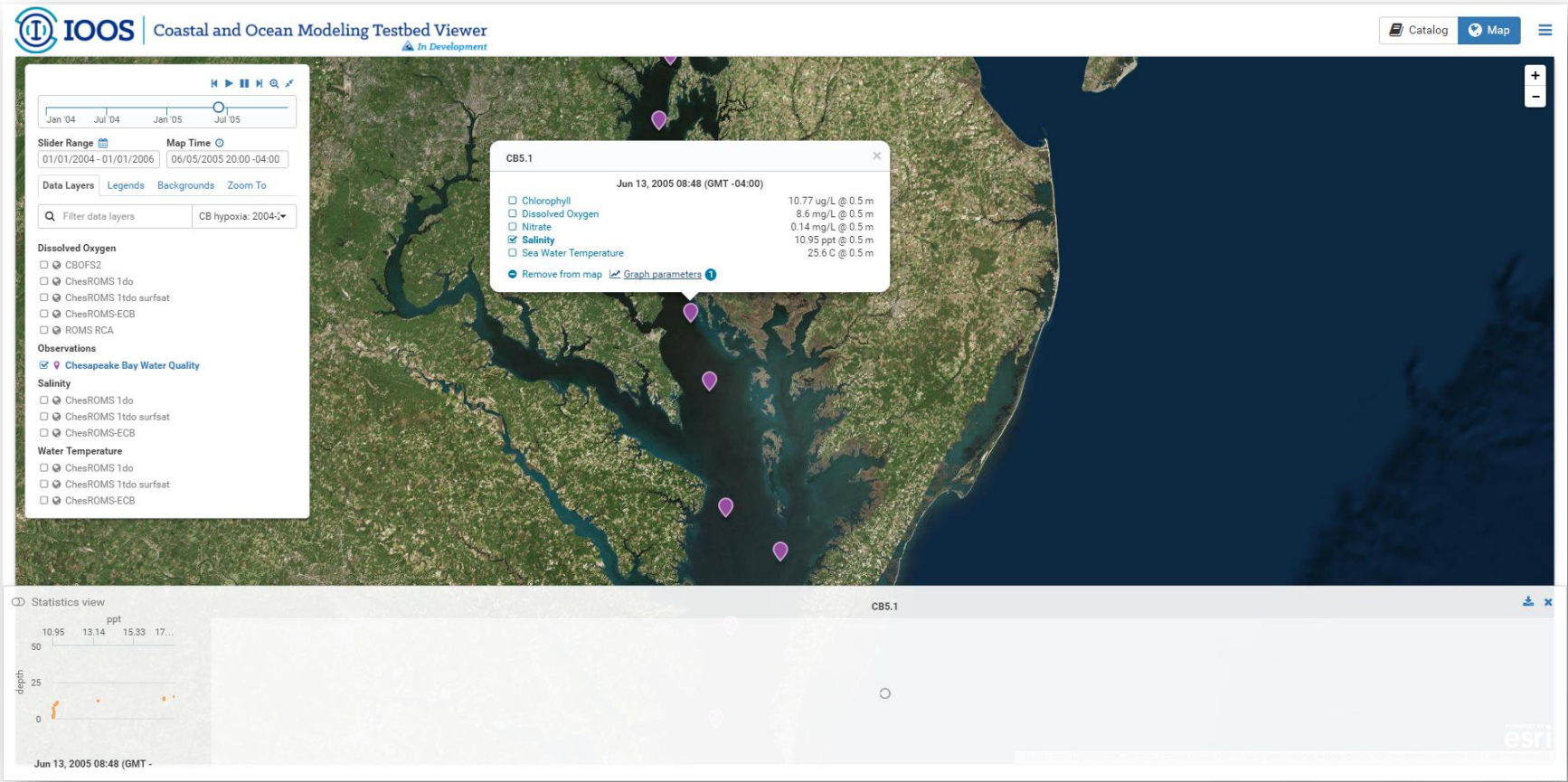
The screenshot shows the Model Viewer interface with a search filter applied. The search bar contains the text "Filter data layers" and "CB hypoxia: 2004-2005". A dropdown menu is open, listing the following options:

- Inundation Tropical: IKE
- CB hypoxia: 1984-2013
- CB hypoxia: 2014-2015
- CB hypoxia: 2004-2005
- USWC Integration
- GOM Hypoxia: 2004-2007
- PR Inundation Tropical: SANDY
- PR Inundation Tropical: IRENE
- PR Inundation Tropical: GEORGES

The interface also includes a timeline slider for the period Jan '04 to Jul '05, with a selected date of Jul '05. Below the timeline, there are fields for "Slider Range" (01/01/2004 - 01/01/2006) and "Map Time" (06/05/2005 20:00 -04:00). Navigation tabs include "Data Layers", "Legends", "Backgrounds", and "Zoom To".

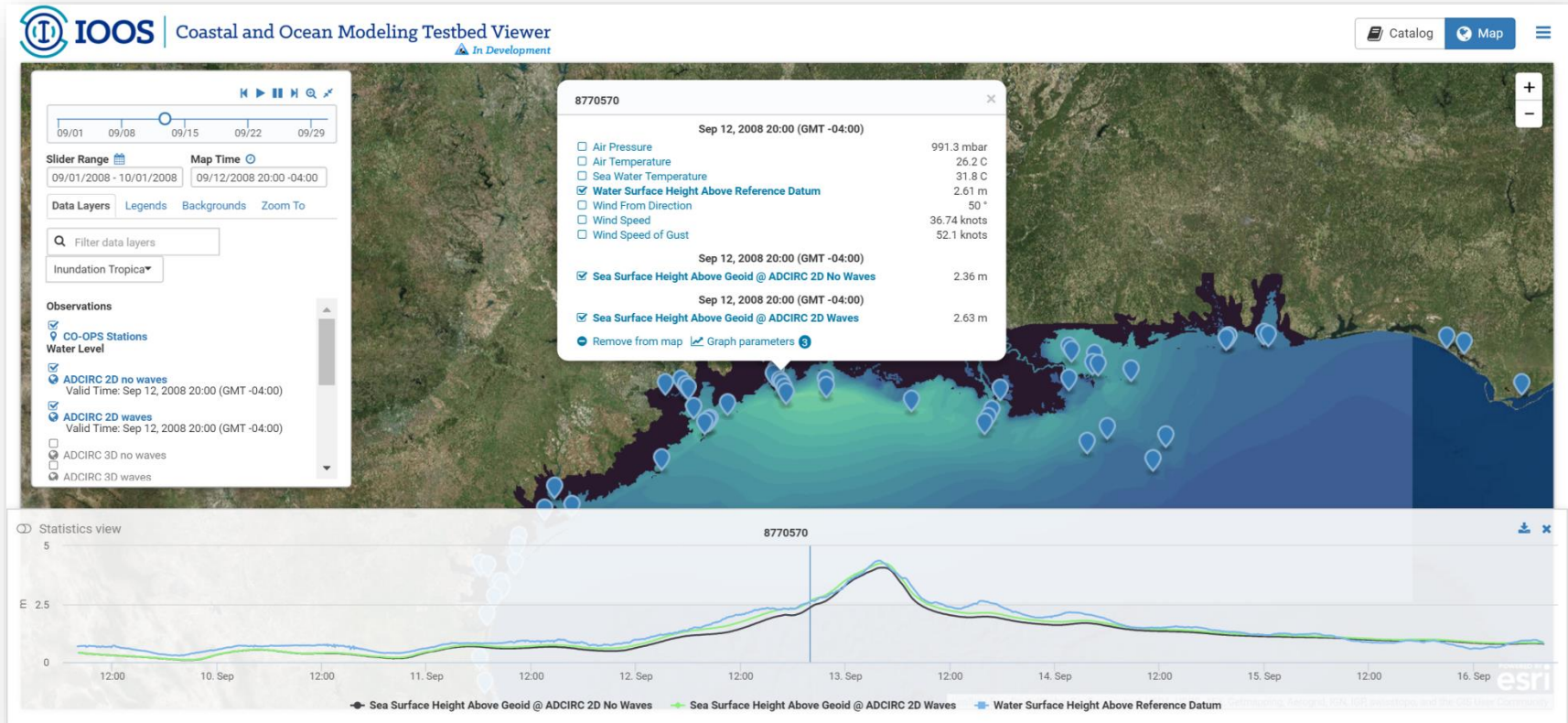
# Model Viewer Updates

## Addition of Observations




# Model Viewer Updates

## Addition of Observations



# Model Viewer Updates



## Web-based Catalog



**IOOS** | Coastal and Ocean Modeling Testbed Viewer [In Development](#)

[Catalog](#) [Map](#) ☰

Showing 1 to 10 of 25 entries

Category		
All		<p><b>ADCIRC 2D no waves</b> <a href="#">Find on map</a> <b>title:</b>ADCIRC 2D no waves <b>institution:</b>UND <b>Conventions:</b>UGRID <b>group:</b>pr_inundation <b>model:</b>ADCIRC <b>uuid:</b>5a549f38-282f-44f7-bca5-81b8bd2cad47</p>
Observations		<p><b>ADCIRC parametric wave reduction 078 wave2</b> <b>title:</b>ADCIRC parametric wave reduction 078 wave2 <b>institution:</b>UND <b>Conventions:</b>UGRID <b>group:</b>pr_inundation <b>model:</b>ADCIRC <b>uuid:</b>7712b49a-f48d-41e3-aba3-15b5213144c8</p>
Dissolved Oxygen		<p><b>ADCIRC parametric wave reduction 078 wave2</b></p>
Salinity		
Water Temperature		
Water Level		
Wave Height		
Water Level		
Other		

# Y4 Draft Workplan

## Landing Page/Catalog

- Intuitive & self-explanatory
- Discoverability & accessibility

The image displays a collage of screenshots from the IOOS (Integrated Ocean Observing System) website and its various data viewers. At the top, the IOOS logo and navigation menu are visible. Below this, several key features are highlighted:

- EDS Model Viewer:** A map of the United States showing data points and model results.
- IOOS by the Numbers:** A bar chart showing various statistics.
- Profiling Gliders:** A photograph of a glider being deployed from a boat.
- Data Discovery:** A search bar and filters for data exploration.
- Coastal and Ocean Modeling Testbed Viewer:** A detailed view of a specific data set, showing a search bar, category filters (Observations, Dissolved Oxygen, Salinity, Water Temperature, Wave Level, Wave Height, Water Level, Other), and a list of results with details like title, institution, group, and model.
- Underwater Glider Network Map:** A map showing the locations of various gliders across the Atlantic and Pacific Oceans.

The IOOS logo and tagline "EYES ON THE OCEAN" are prominently displayed in the bottom right corner of the collage.

# Y4 Draft Workplan

## sciWMS Enhancements

- Improved color schemes/scales

## Modeling Team Support

- Identify key datasets for Y4
- Launch data upload tool and provide training
- Hands on facilitation of data ingest
- Maintenance and oversight of TDS catalog
- Finalize data management plan
- Approach/Tools for deriving new parameters (e.g. BBL, Hypoxic Volume, Difference)

## Model Viewer

- Continued integration of observation data
- Enhanced data comparison tools
- Animations
- Landing page/catalog view
- Balance between sciWMS & tile services
- Additional 3D visualization tools



# Y4 Draft Workplan

### Data Comparison Tool



### Slider Range

08/18/2016 - 08/25/2016

### Map Time

08/18/2016 00:00 -04:00

Data Layers | Legends | Backgrounds

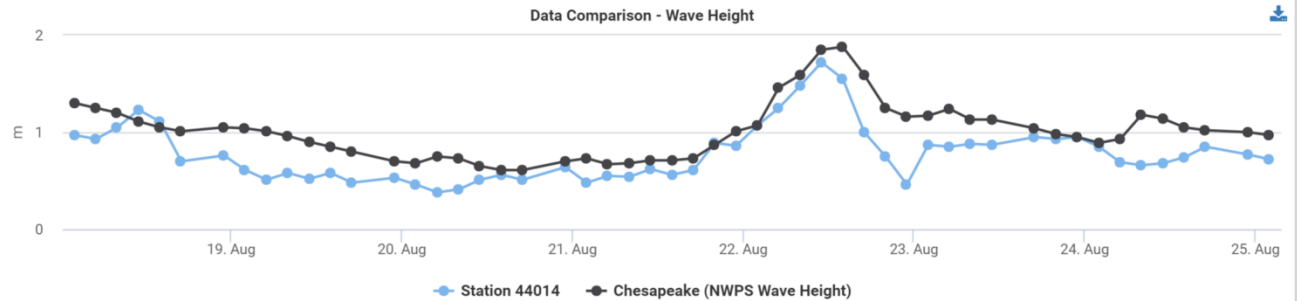
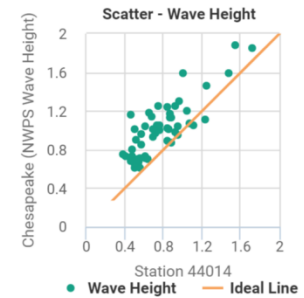
### Parameter

Wave Height

### Station/Model

- Station 44014
- Chesapeake (NWPS Wave Hei...

Error Statistics Table	
Bias (m)	0.231
Num Points	52
R2	0.689
RMS (m)	0.286
Scatter Index	0.218



# Questions

***Enables decision making  
Fosters Advances in Science and Technology***

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