

NROC Resilient Shorelines Grant Program NACCS Modeling Integration

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RPS ASA

**NROC Winter Meeting
16 February 2017**





RFP Statement of Purpose

The Northeast Regional Ocean Council

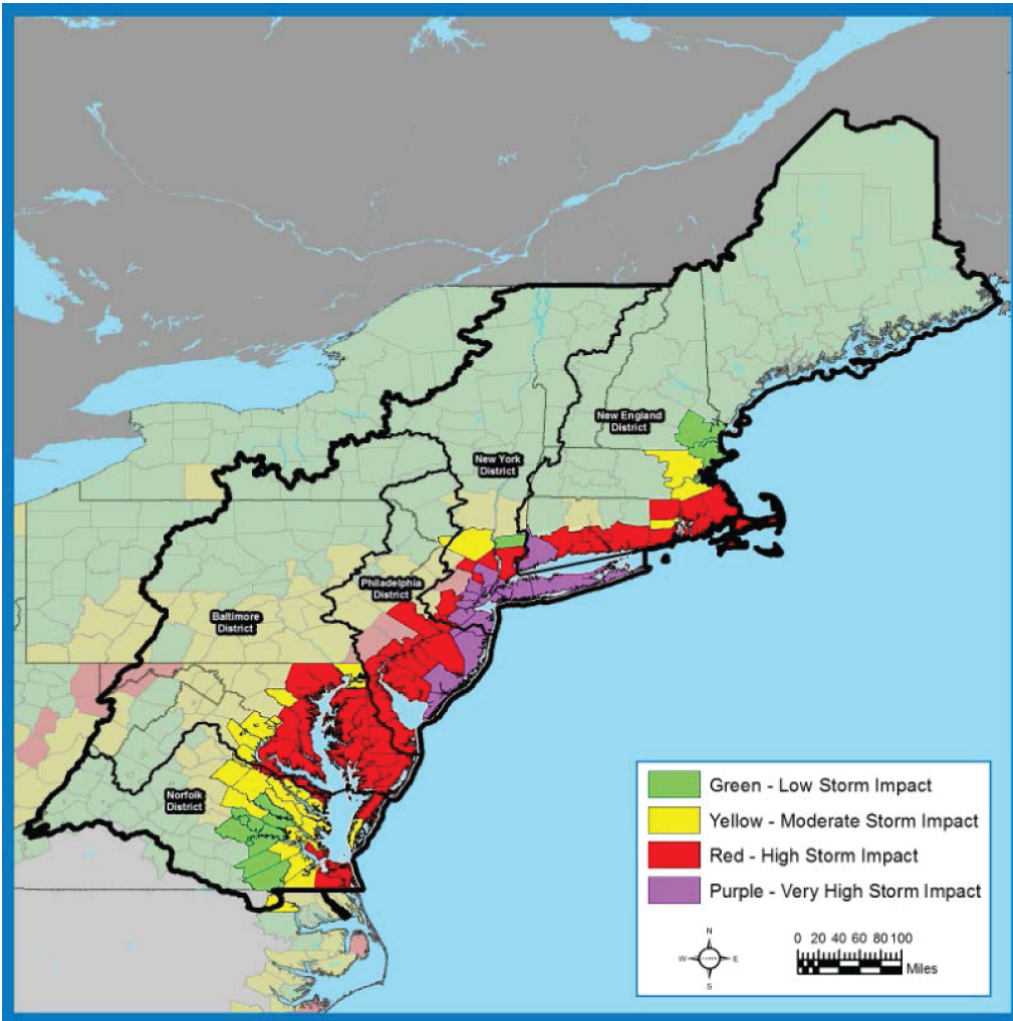
(NROC) is seeking project proposals to support advancement of shared Northeast state priorities for resilient



shorelines. NROC will fund 2-5 proposals that **deliver data products, tools, information, and processes for shoreline resilience planning and management to coastal decision makers.** Proposals should focus on increasing the delivery of scientific information and adaptation tools to coastal communities and decision-makers in Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut.

RPS ASA Submission – Connecting States to NACCS Results

1. Outreach to NROC state representatives
2. Develop database of NACCS model output
3. Facilitate long term hosting of data
4. Develop web services to connect to the database



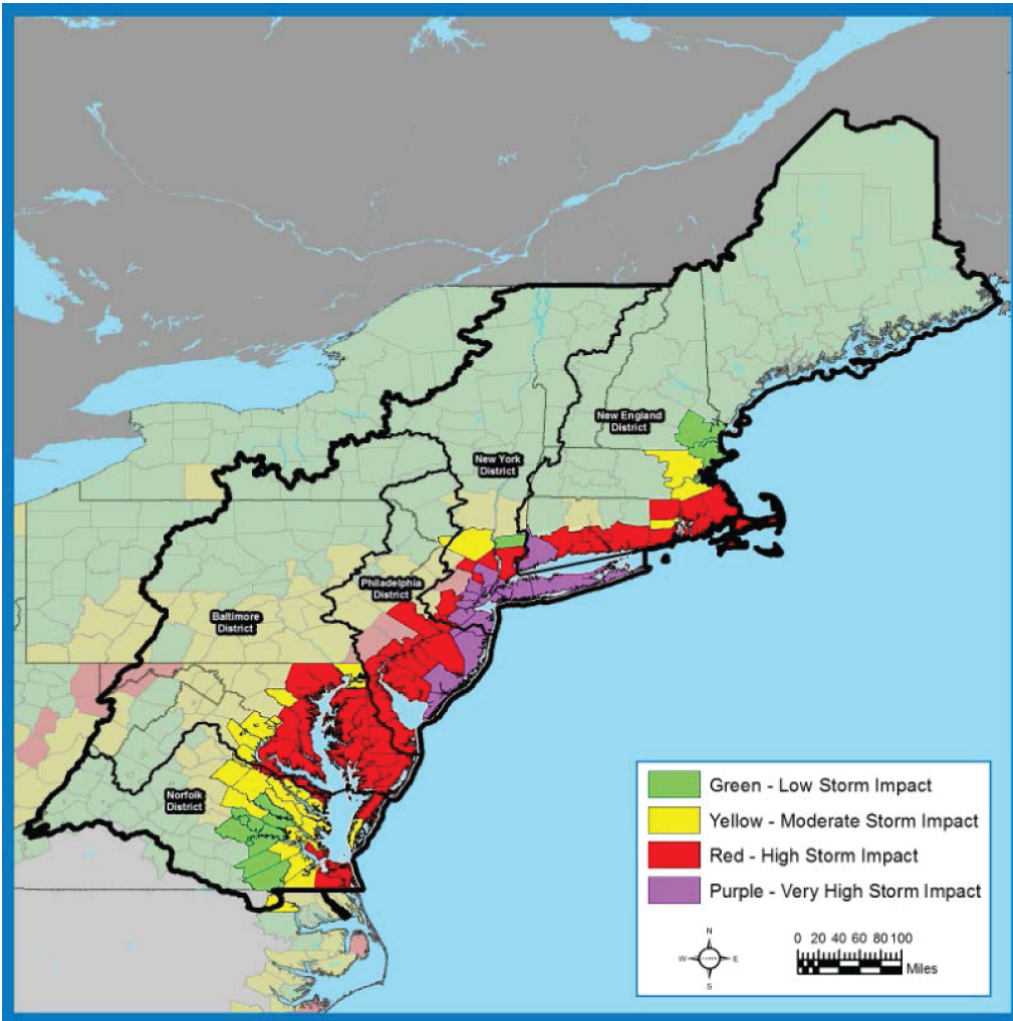
Study Goals

- **Provide a risk management framework**, consistent with the National Oceanic and Atmospheric Administration (NOAA)/USACE Infrastructure Systems Rebuilding Principles; and
- **Support resilient coastal communities** and robust, sustainable coastal landscape systems, considering future sea level and climate change scenarios, to manage risk to vulnerable populations, property, ecosystems, and infrastructure.

NACCS Coastal Storm Risk Management Framework

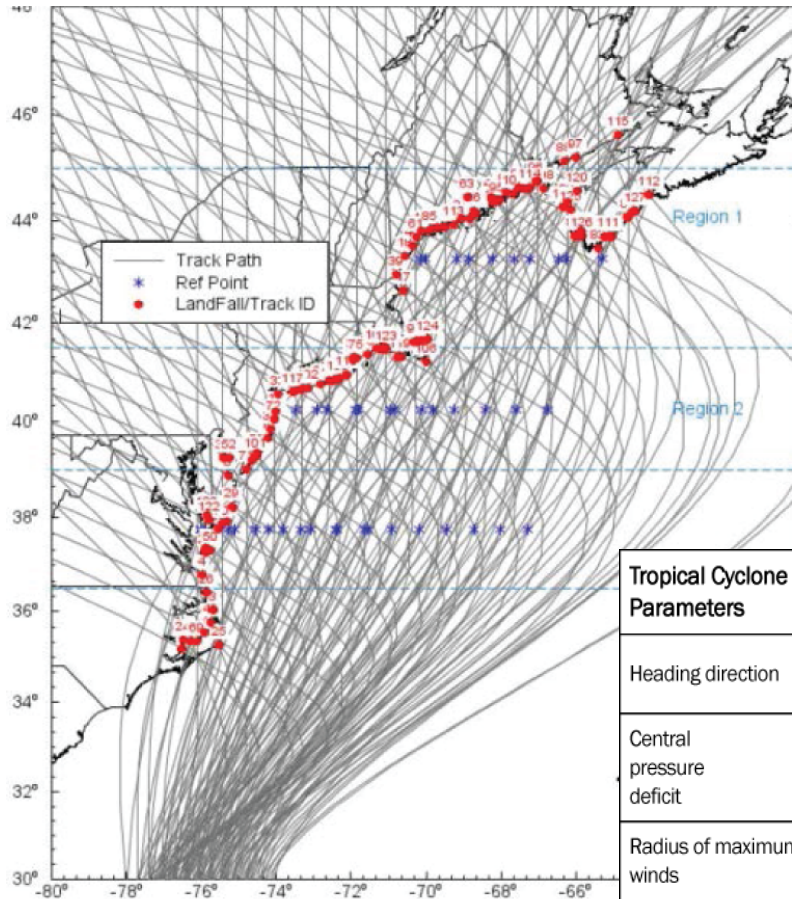


Several products, planning tools, and models were developed to assist decision makers in going through the Coastal Storm Risk Management Framework



Goals of Modeling Effort

- Compute the joint probability of coastal storm forcing parameters for the North Atlantic Coast
- Simulate storm processes (winds, waves, and water levels) along the coast using a suite of coupled numerical models
- Quantify probability of storm response at discrete locations along the coast based on simulation results

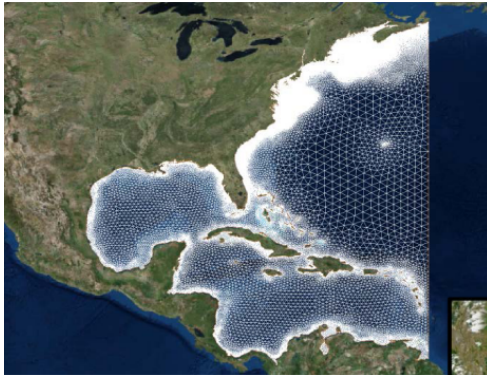


Composite Storm Set

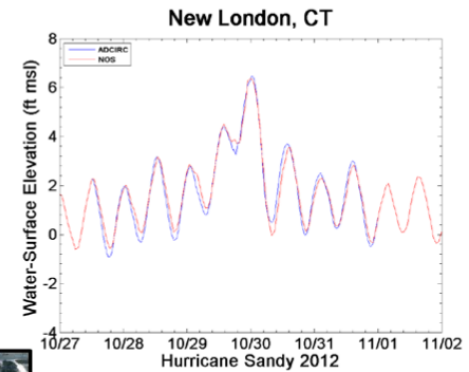
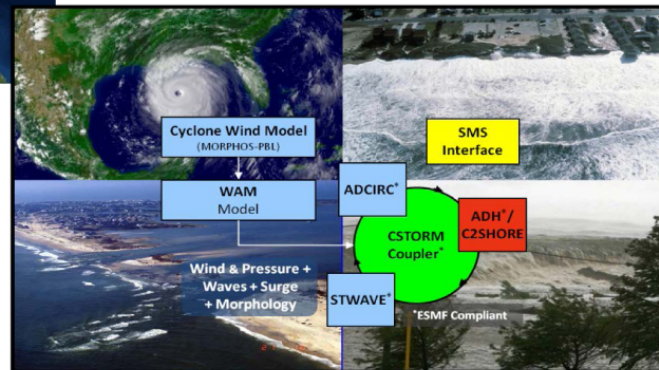
- 1050 Tropical Storms (TS)
 - synthetic record
 - joint probability method (optimized sampling)
- 100 Extratropical Storms (XH)
 - historical record
 - peaks-over-threshold

Tropical Cyclone Parameters	NACCS Subregion 3	NACCS Subregion 2	NACCS Subregion 1
Heading direction	-60°, -40°, -20°, 0°, +20°, +40°	-60°, -40°, -20°, 0°, +20°, +40°	-60°, -40°, -20°, 0°, +20°, +40°
Central pressure deficit	From 28 to 98 hPa at 5 hPa intervals	From 28 to 88 hPa at 5 hPa intervals	From 28 to 78 hPa at 5 hPa intervals
Radius of maximum winds	From 25 to 145 km, median of 54 km	From 25 to 158 km, median of 62 km	From 26 to 174 km, median of 74 km
Translation speed	From 12 to 59 km/h, median of 27 km	From 14 to 88 km, median of 45 km	From 16 to 83 km, median of 49 km
Holland <i>B</i>	From 0.45 to 1.32	From 0.56 to 1.35	From 0.66 to 1.37

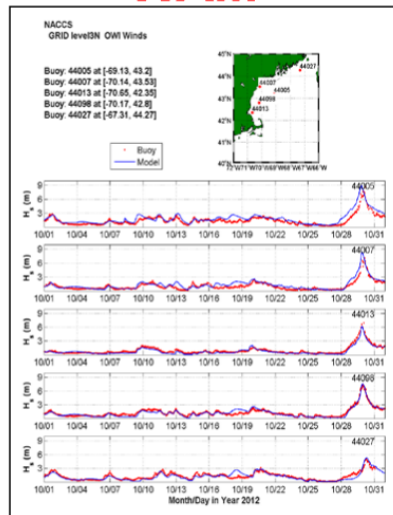
ADCIRC



CSTORM-MS High Fidelity Modeling



WAM



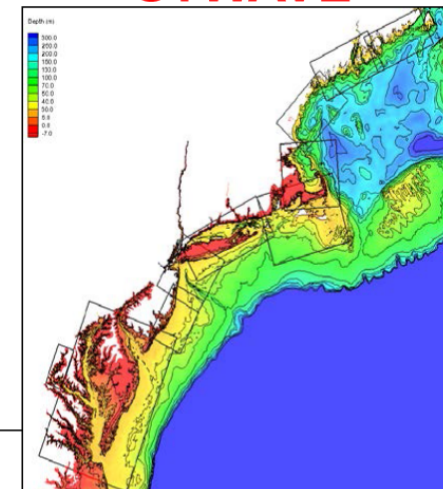
CSTORM-MS: Coastal **STORM** Modeling System

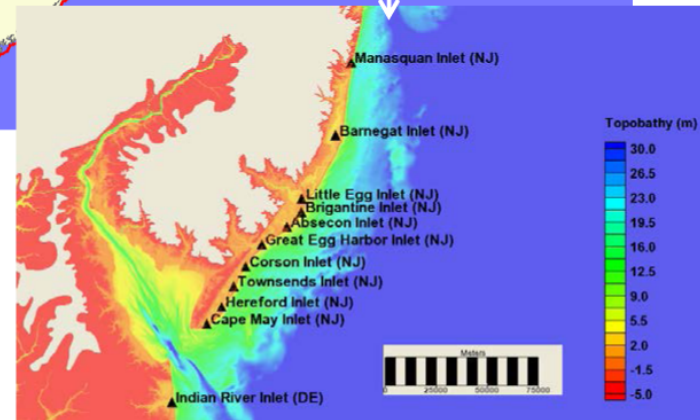
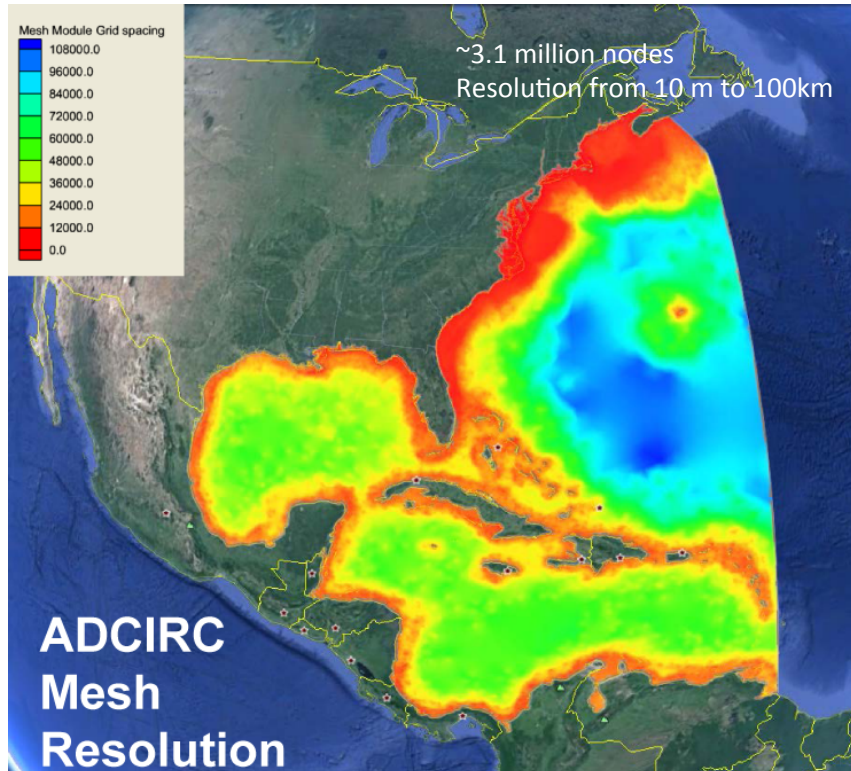
WAM: **W**AVE Prediction **M**odel

STWAVE: **ST**eady-State Spectral **W**AVE model

ADCIRC: **AD**vance **CIRC**ulation Model

STWAVE





1150 storms (TS+XH) simulated for 3 conditions:

- Surge and wave only (base)*
- Surge and wave with (1) dynamic tide
- Surge and wave and tide and sea level change

*additional set of results developed by linear superposition of 96 random tide phases to the base condition set



NACCS Save Point ID:	9419
Latitude:	41.126000
Longitude:	-70.036000
Depth (NAVD88):	13.4086 meters
Conversion factor (NAVD88 to MSL):	-0.1048

ARI* (yrs)	Water Level (m)		Wave Height (m)	
	Mean	Upper 98% CI	Mean	Upper 98% CI
1	0.77	1.67	5.44	7.01
2	0.90	1.86	6.57	8.11
5	1.07	2.02	7.43	8.94
10	1.20	2.15	7.81	9.31
20	1.33	2.32	8.07	9.57
50	1.52	2.60	8.34	9.82
100	1.67	2.81	8.55	9.97
200	1.86	3.02	8.74	10.15
500	2.16	3.33	8.96	10.38
1,000	2.41	3.58	9.12	10.53
2,000	2.65	3.82	9.26	10.68
5,000	2.92	4.09	9.44	10.86
10,000	3.09	4.25	9.57	10.99

*ARI = Annual Recurrence Interval

Save Points

ADCIRC model (18,977)

- Peak water levels from
 - 1050 TS simulations
 - 100 XH simulations
- Water level (surge) ARI and associated confidence intervals

STWAVE model (20,817)

- Peak wave height from
 - 1050 TS simulations
 - 100 XH simulations
- Significant wave height ARI and associated confidence intervals

Storm Data

- Storm Recurrence Rates
- Synthetic Storm Tracks & Parameters

Participants: NROC, RICRMC, CT DEEP, MA CZM, NERACOOS, ME Geol. Survey, ME Coastal Program, NHDES, UNH

Purpose: Provide more streamlined access to NACCS data products that may be of interest to NROC community

Target Audiences:

- Coastal managers
- Engineers & consultants
- Emergency management
- Restoration community

Project Deliverables:

- Database of 1050 TS storms: storm parameters, storm tracks
- Save points: max water level for each event from ADCIRC*, max water level for all events, controlling event, return period for water levels
- Visualization – tracks, water level return period (for each save point)
- Services to connect state websites to above datasets

*Water levels converted to NAVD88 during database build.

NACCSapi
Brian McKenna • naccs

Documentation Inspector ?

Apiary Powered Documentation
Sign in with Apiary account.

Download
API Blueprint

INTRODUCTION

Useful Links

JSON and JSONP
Formatting

Status Codes

REFERENCE

NACCS

NACCSapi

INTRODUCTION

NACCSapi is a simple REST API allowing consumers to view US Army Corps of Engineers' North Atlantic Coast Comprehensive Study (NACCS) storm and save point data.

Useful Links

- Coastal Hazards System
- North Atlantic Coast Comprehensive Study Report

JSON and JSONP Formatting

NACCSapi only supports a single format, JSON/GeoJSON. JSONP is also supported by adding a callback parameter to your request.

Status Codes

A full table of status codes will be added during development

REFERENCE

NACCS

/points

GET

/points/id

GET

Switch to Console

GET http://naccs.apiblackprint.org/points?bbox=-67.44,-66.45

Parameters

bbox Bounding box (xmin,ymin,xmax,ymax) to find points within Example: [-67.44,-66.45] String

Request

Production Python

Raw
cURL
Java
JavaScript
Node.js
Perl
Python
PHP
Ruby

Try

```
01 from urllib2 import  
02 request = Request('http://naccs.apiblackprint.org/points')  
03 response_body = url  
04 print response_body
```

Response

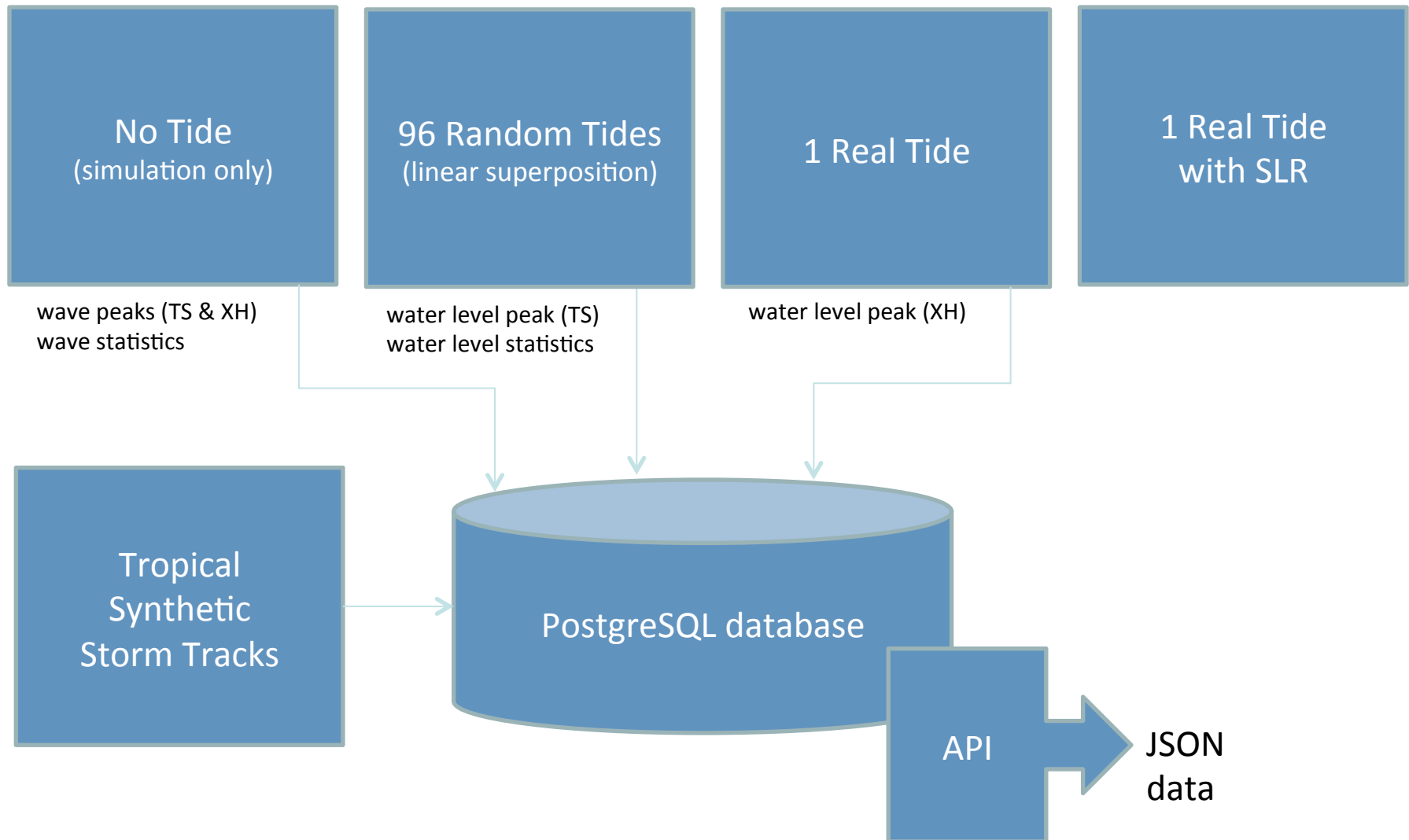
200

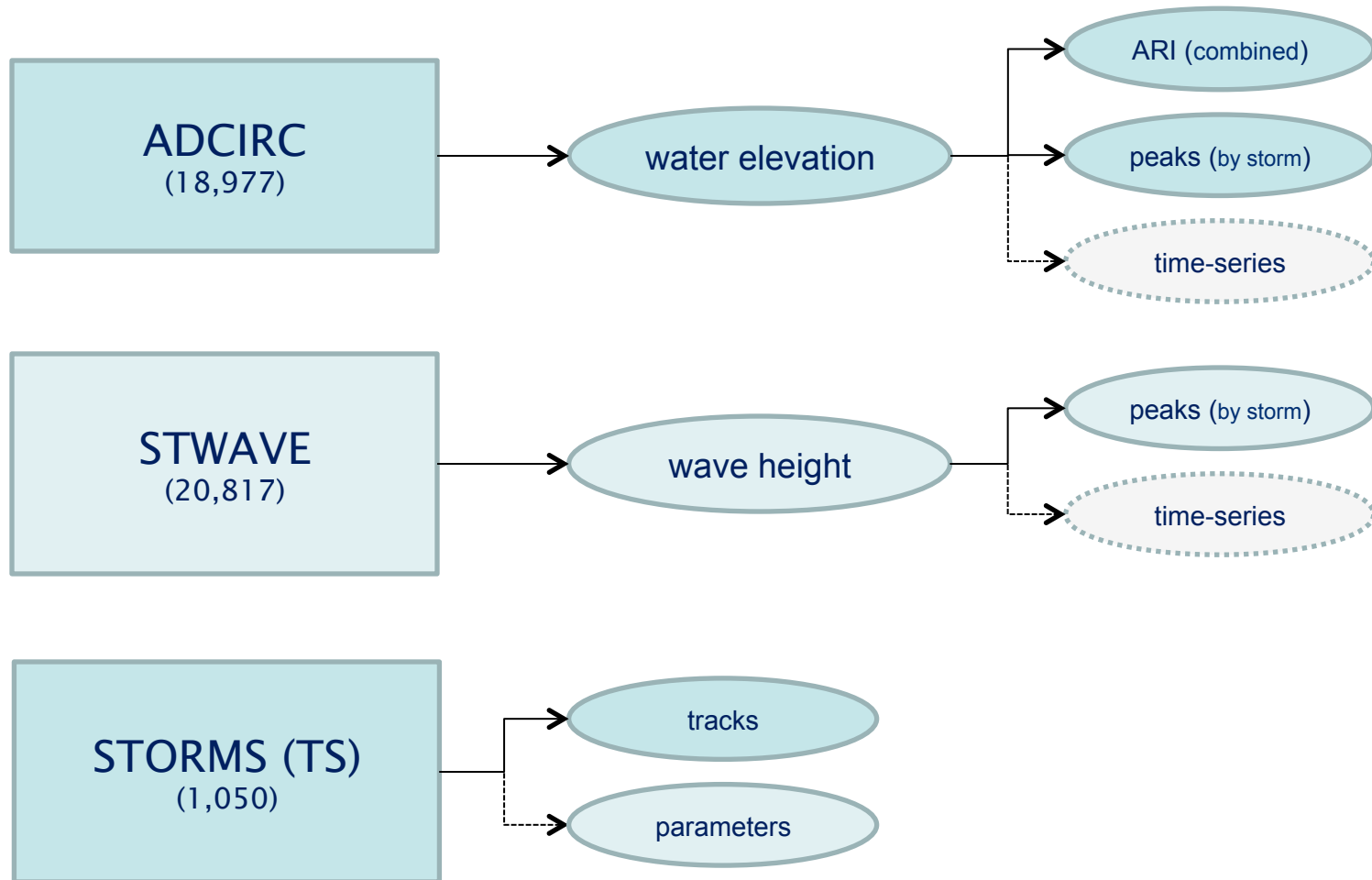
HEADERS

Content-Type: application/json

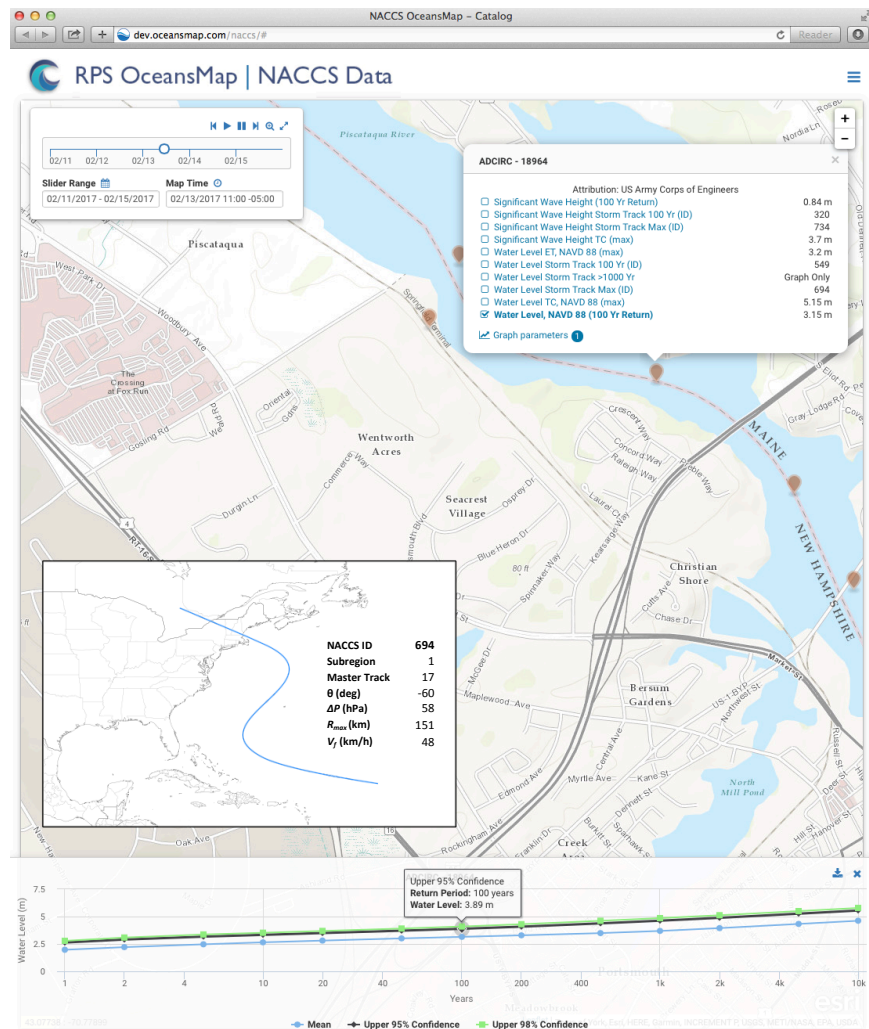
BODY

```
01 [  
02 {  
03   "point": 1,  
04   "longitude": -66.980909,  
05   "latitude": 44.867685  
06 },  
07 {  
08   "point": 2,  
09   "longitude": -66.975575,  
10   "latitude": 44.846528  
11 },  
12 {  
13   "point": 10345,  
14   "longitude": -71.33653,  
15   "latitude": 41.5991
```

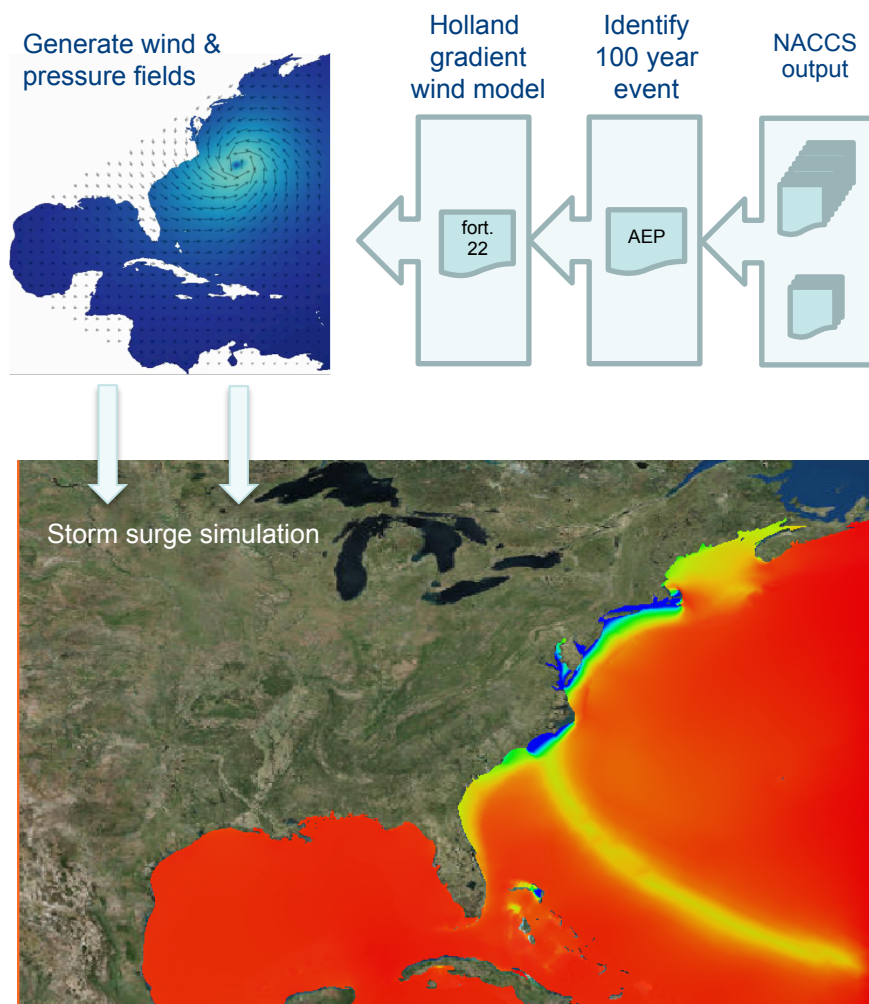


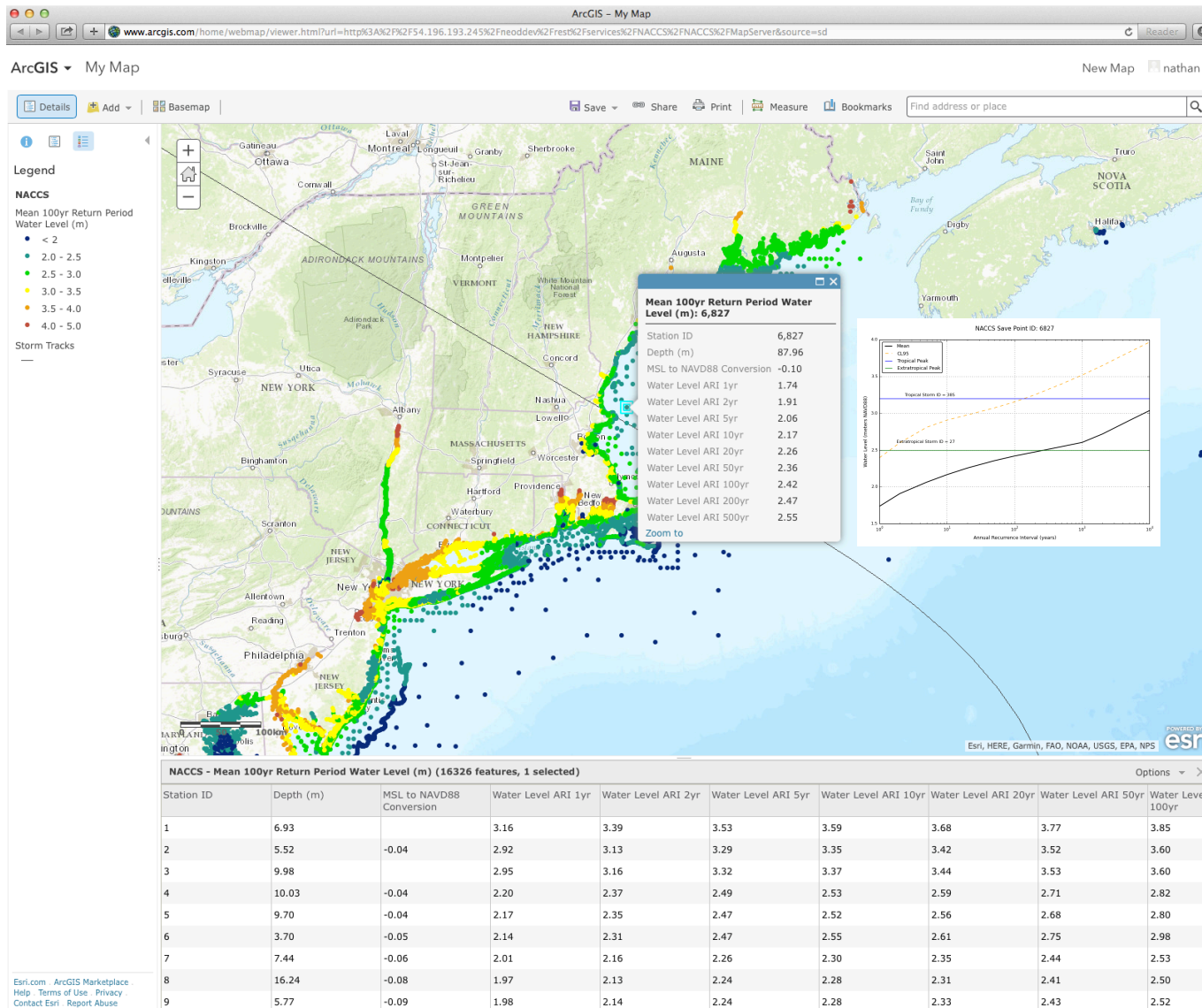


OceansMap NACCS Viewer

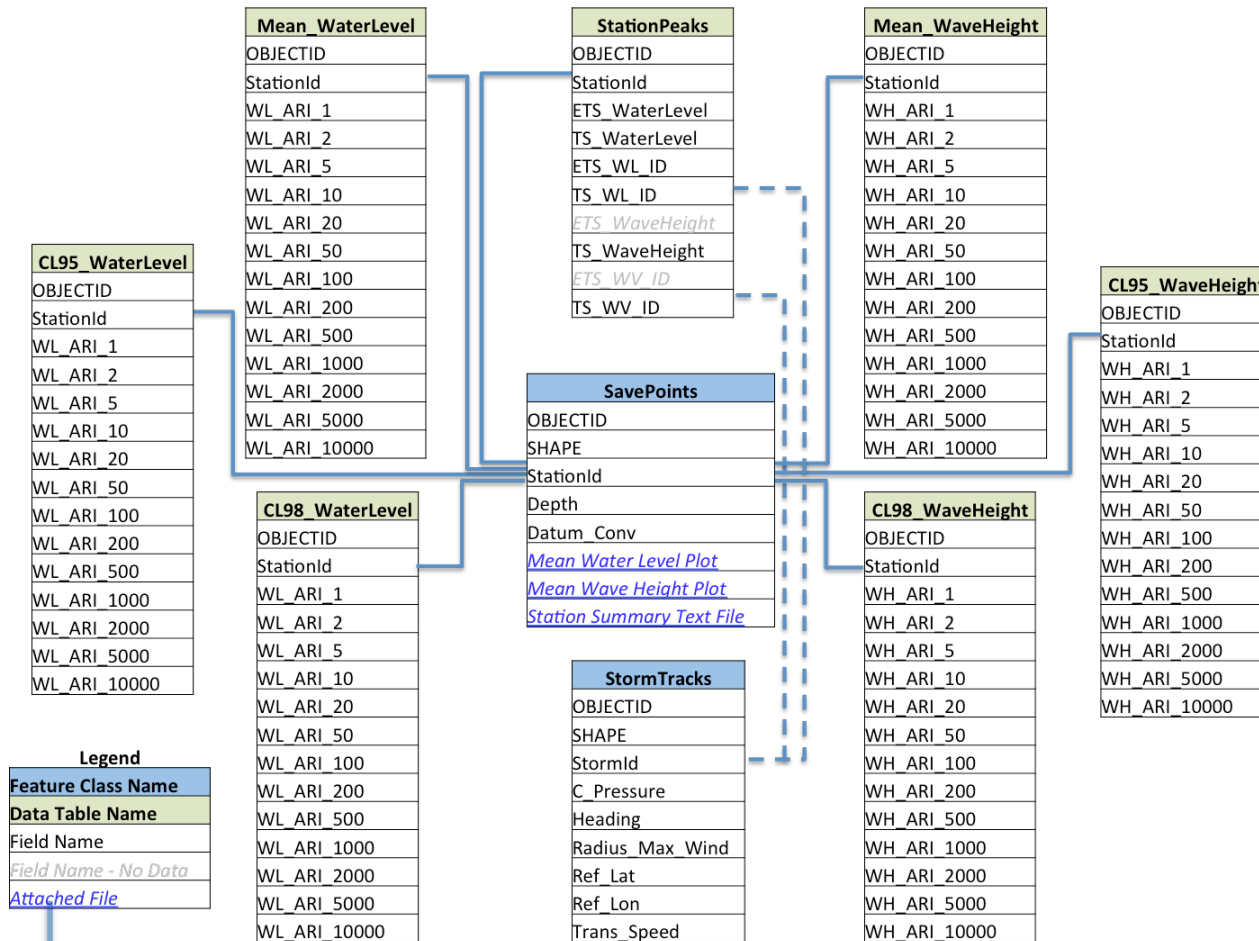


ADCIRC modeling for NPS

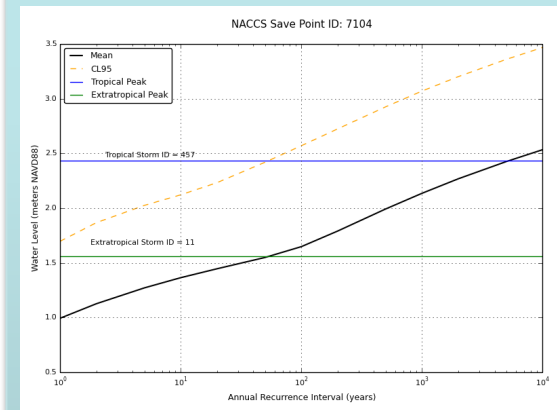




- Summary statistics (ADCIRC, STWAVE) at save points
 - Mean and peak values
- Embedded plots and tables of ARI statistics
- Tropical storm tracks and storm forcing parameters
- File geodatabase for bulk download



Attached Files



NACCS Save Point ID: 7104
 Latitude: 40.980000
 Longitude: -71.120000
 Depth (NAVD88): 48.8725 meters
 Conversion factor (NAVD88 to MSL): -0.1195

ARI* (yrs)	Water Level (m)			Wave Height (m)		
	Mean	Upper 98% CI		Mean	Upper 98% CI	
1	0.99	1.87		5.41	7.01	
2	1.13	2.07		6.82	8.38	
5	1.27	2.24		8.70	10.19	
10	1.36	2.35		10.31	11.78	
20	1.45	2.47		11.75	13.19	
50	1.55	2.65		13.27	14.70	
100	1.65	2.80		14.48	16.06	
200	1.79	2.96		15.17	17.42	
500	1.99	3.16		16.00	19.21	
1,000	2.14	3.30		16.63	20.57	
2,000	2.27	3.44		17.25	21.93	
5,000	2.43	3.59		18.08	23.72	
10,000	2.54	3.70		18.71	25.08	

*ARI = Annual Recurrence Interval

1. Finalize database with updated XH peak wave information
2. Update and republish AGS services
3. Transfer data services and metadata for hosting
 - GMRI – PostgreSQL / API
 - NEOD - AGS host
4. Coordinate development of project data landing page

USACE North Atlantic Coast Comprehensive Study
<http://www.nad.usace.army.mil/CompStudy/>

North Atlantic Coast Comprehensive Study (NACCS)
Coastal Storm Model Simulations: Waves and Water
Levels (ERDC/CHL TR-15-14)
http://acwc.sdp.sirsi.net/client/en_US/search/asset/1045666

Coastal Storm Hazards from Virginia to Maine (ERDC/CHL
TR-15-5)
http://acwc.sdp.sirsi.net/client/en_US/search/asset/1047351

USACE Coastal Hazards System <https://chs.erdcdren.mil/>

NACCSapi
<http://docs.naccs.apiary.io>

OceansMap Implementation
<http://dev.oceansmap.com/naccs/>

ArcGIS Services
<http://54.196.193.245/neoddev/rest/services/NACCS/NACCS/MapServer>

