NACCS Geodatabase
North Atlantic Coast
February 28, 2017

1. INTRODUCTION

The North Atlantic Coast Comprehensive Study (NACCS) was a two-year initiative of the US Army Corps of Engineers (USACE) to help address coastal storm and flood risk to vulnerable populations, systems, and infrastructure affected by Hurricane Sandy (2012). The NACCS provides a risk management framework – a planning process – designed for use by coastal communities to better understand and manage their short-term and long-term flood risk. The framework is supported by technical products that were developed by the USACE for use in each stage of the process, including robust storm surge and wave modeling for the Northeast U.S. states. This involved application of high-fidelity, coupled, atmospheric and hydrodynamic numerical models to simulate wind, waves, and water levels from thousands of historical and synthetic storm events. The result of this effort is a catalog of storm surge, wave heights, and extremal statistics derived from each model run and stored at high resolution stations ("save points") along the coast, and storm forcing parameters (tracks).

This geodatabase contains the annual recurrence interval (ARI) statistics for wave height and water level for all save points (~19,000) along the coast. At each point, storm surge and significant wave height was computed for a combined set of 1,150 storm events (1,050 synthetic tropical storms and 100 historical extratropical storms) using the coupled ADCIRC/STWAVE models[1]. Extremal analysis techniques were then applied to develop estimates of mean water level and mean significant wave height at 1-year through 10,0000-year return periods for each point, as well as the 95% and 98% confidence limits around the mean. Also included are the peak (or maximum) water level and wave height from all storm events at each save point. Peaks are provided for both synthetic tropical storms (1,050 events) and extratropical events (100) at each station, and the corresponding storm leading the peak water level is also identified. The geodatabase also includes storm tracks and forcing parameters from the synthetic tropical event set. This information can be used to develop pressure and wind fields needed for storm surge models using the Holland B (or similar) method of parameterization.

Download URL: http://www.northeastoceandata.org/files/metadata/NACCS/NACCS.zip

[1] USACE developed 4 sets of coupled ADCIRC/STWAVE model runs using this storm set on various base water levels (MSL, MSL plus dynamic tide, MSL plus The 96 random tides, MSL plus 1 m SLR). Return period statistics were developed for 2 sets of ADCIRC runs (MSL and MSL plus 96 random tides) and 1 STWAVE run (which applies to both ADCIRC models). Results are presented for the MSL plus 96 random tides simulations to account for the combined effect of storm surge and tide on water levels.

Water levels presented are in meters and relative to NAVD88.

2. PURPOSE

This dataset is intended to support coastal resilience initiatives by providing actionable information on coastal flood risk to the planning and management communities.

3. SOURCES AND AUTHORITIES

- 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.erdc.dren.mil/default.aspx

4. MAP SERVICE LAYER DESIGN AND CONTENT

Native storage format: ArcGIS File Geodatabase – feature classes, data tables, file attachments

Data Dictionary:

Feature Class Name: **SavePoints**				
Feature Type:	Point			
Description:	NACCS save point locations			
Total Number of Unique Features:	16,326			
Data Status:	Complete			
Line	Name	Definition	Type	Size
1	OBJECTID	Uniquely identifies a feature	OBJECTID	*
2	Shape	Geometric representation of the feature	geometry	*
3	StationId	NACCS identifier	long	6
4	Depth	Depth of seafloor at save point location	double	12, 6
5	Datum_Conv	Value used to convert from Mean Sea Level datum to NAVD88	double	12, 6
6	(attachment)	Text file with all water level and wave height data	.txt	*
7	(attachment)	Plot of water level by return period with confidence intervals and peak	.png	*
8	(attachment)	Plot of wave height by return period with	.png	*

confidence intervals and peak

Feature Class Name: **StormTracks**				
Feature Type:	Polyline			
Description:	Synthetic tropical storm tracks			
Total Number of Unique Features:	1,050			
Data Status:	Complete			
Line	Name	Definition	Type	Size
1	OBJECTID	Uniquely identifies a feature	OBJECTID	*
2	Shape	Geometric representation of the feature	geometry	*
3	StormId	Original numerical storm identifier from source material	long	6
4	C_Pressure	Central Pressure Deficit (hPa) - difference between the central pressure of the storm and peripheral barometric pressure (controls the intensity of hurricanes)	double	8, 1
5	Heading	Heading Direction - track direction (degrees clockwise from north) at the point of landfall	double	6, 1
6	Radius_Max_Wind	Radius of Maximum Wind – distance (km) from the center of a tropical cyclone to the location of the cyclone's maximum winds (generally found at the inner edge of the eyewall)	double	8, 1
7	Ref_Lat	Reference Latitude (deg) – latitude of storm landfall point (for landfalling storms) or latitude where the storm exits the impact region (for bypassing storms)	double	6, 2
8	Ref_Lon	Reference Longitude (deg) - longitude of storm landfall point (for landfalling storms) or longitude where the storm exits the impact region (for bypassing storms)	double	6, 2
9	Trans_Speed	Translational Speed - storm forward speed (km/h) as it approaches the coast	double	6, 1

Table Name: **StationPeaks**				
Description:	NACCS save point locations			
Total Number of Unique Features:	16,326			
Data Status:	Complete			
Line	Name	Definition	Type	Size
1	OBJECTID	Uniquely identifies a record	OBJECTID	*
2	StationId	NACCS identifier	long	6
3	ETS_WaterLevel	Extra tropical storm max water level	double	12, 6
4	TS_WaterLevel	Tropical storm max water level	double	12, 6

5	ETS_WL_ID	Extra tropical storm identifier for the extra tropical storm max water level	long	6
6	TS_WL_ID	Tropical storm identifier for the tropical storm max water level	long	6
7	ETS_WaveHeight	Extra tropical storm max wave height	double	12, 6
8	TS_WaveHeight	Tropical storm max wave height	double	12, 6
9	ETS_WV_ID	Extra tropical storm identifier the extra tropical storm max wave height	long	6
10	TS_WV_ID	Tropical storm identifier for the tropical storm max wave height	long	6

Table Names: **Mean_WaterLevel, CL95_WaterLevel, CL98_WaterLevel**

Description: Water level annual recurrence interval statistics for each NACCS save point. There are 3 tables with the identical structure as shown below. One table contains the mean water levels (Mean_WaterLevel), another contains the 95th percentile confidence level water levels (CL95_WaterLevel), and the third contains the 98th percentile confidence level water levels (CL98_WaterLevel).

Total Number of Unique Features: 16,326

Data Status: Complete

Line	Name	Definition	Type	Size
1	OBJECTID	Uniquely identifies a record	OBJECTID	*
2	StationId	NACCS identifier	long	6
3	WL_ARI_1	Water level, annual recurrence interval (ARI) of 1 year	double	12, 6
4	WL_ARI_2	Water level, ARI of 2 years	double	12, 6
5	WL_ARI_5	Water level, ARI of 5 years	double	12, 6
6	WL_ARI_10	Water level, ARI of 10 years	double	12, 6
7	WL_ARI_20	Water level, ARI of 20 years	double	12, 6
8	WL_ARI_50	Water level, ARI of 50 years	double	12, 6
9	WL_ARI_100	Water level, ARI of 100 years	double	12, 6
10	WL_ARI_200	Water level, ARI of 200 years	double	12, 6
11	WL_ARI_500	Water level, ARI of 500 years	double	12, 6
12	WL_ARI_1000	Water level, ARI of 1000 years	double	12, 6
13	WL_ARI_2000	Water level, ARI of 2000 years	double	12, 6
14	WL_ARI_5000	Water level, ARI of 5000 years	double	12, 6
15	WL_ARI_10000	Water level, ARI of 10000 years	double	12, 6

Table Names: **Mean_WaveHeight, CL95_ WaveHeight, CL98_ WaveHeight**

Description: Wave height annual recurrence interval statistics for each NACCS save point. There are 3 tables with the identical structure as shown below. One table contains the mean wave heights (Mean_ WaveHeight), another contains the 95th percentile confidence level wave heights (CL95_ WaveHeight), and the third contains the 98th percentile confidence level wave heights (CL98_ WaveHeight).

Total Number of 16,326

Unique Features:

Data Status: Complete

Line	Name	Definition	Type	Size
1	OBJECTID	Uniquely identifies a record	OBJECTID	*
2	StationId	NACCS identifier	long	6
3	WH_ARI_1	Wave height, annual recurrence interval (ARI) of 1 year	double	12, 6
4	WH_ARI_2	Wave height, ARI of 2 years	double	12, 6
5	WH_ARI_5	Wave height, ARI of 5 years	double	12, 6
6	WH_ARI_10	Wave height, ARI of 10 years	double	12, 6
7	WH_ARI_20	Wave height, ARI of 20 years	double	12, 6
8	WH_ARI_50	Wave height, ARI of 50 years	double	12, 6
9	WH_ARI_100	Wave height, ARI of 100 years	double	12, 6
10	WH_ARI_200	Wave height, ARI of 200 years	double	12, 6
11	WH_ARI_500	Wave height, ARI of 500 years	double	12, 6
12	WH_ARI_1000	Wave height, ARI of 1000 years	double	12, 6
13	WH_ARI_2000	Wave height, ARI of 2000 years	double	12, 6
14	WH_ARI_5000	Wave height, ARI of 5000 years	double	12, 6
15	WH_ARI_10000	Wave height, ARI of 10000 years	double	12, 6

5. SPATIAL REPRESENTATION

Water levels presented are in meters and relative to NAVD88.

Geometry Type: vector polyline, vector point
Reference System: GCS_WGS 1984
Horizontal Datum: D_WGS_1984
Ellipsoid: WGS 1984

XY Resolution: 0.000000001
Tolerance: 0.000000008983153

Geographic extent: -78.50 to -62.00, 33.86 to 45.13

IS0 19115 Topic Category: environment, oceans, climatologyMeteorologyAtmosphere

Place Names:

Atlantic Ocean, Chesapeake Bay, Connecticut, Delaware, Hudson River, Long Island Sound, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Rhode Island, Virginia

6. DATA PROCESSING

Processing environment: ArcGIS 10.3, Python 2.7, Windows 7 Professional,

	Process Steps Description
1	Data downloaded from USACE servers in hdf format
2	Developed custom python scripts to: (i) parse combined ARI statistics by point, (ii) parse water elevation peaks (tropical and extratropical) by point for peak of peaks and nearest ARI peak, (iii) parse wave height peaks (tropical and extratropical) by point for peak of peaks and nearest ARI peak, (iv) parse tropical storm tracks and convert to GeoJSON LINESTRING
3	Aggregated all data into JSON format
4	Data was imported into an ArcGIS FileGeodatabase using a custom Python script.
5	Plots and text files of the water level and wave height statistics were created using Python scripts. These files were attached to the geodatabase SavePoints feature class.

7. QUALITY PROCESS

Accuracy: All information is based upon US Army Corps of Engineers source data.

Timeliness: Data was most recently downloaded from the Army Corps of Engineers Engineering Research & Development Center (ERDC) in January 2017

Use restrictions: NOT FOR NAVIGATION

Distribution Liability: Data are provided as is. The Northeast Regional Ocean Council (NROC) and RPS Applied Science Associates are not liable for any interpretations, assumptions, or conclusions based on these data.