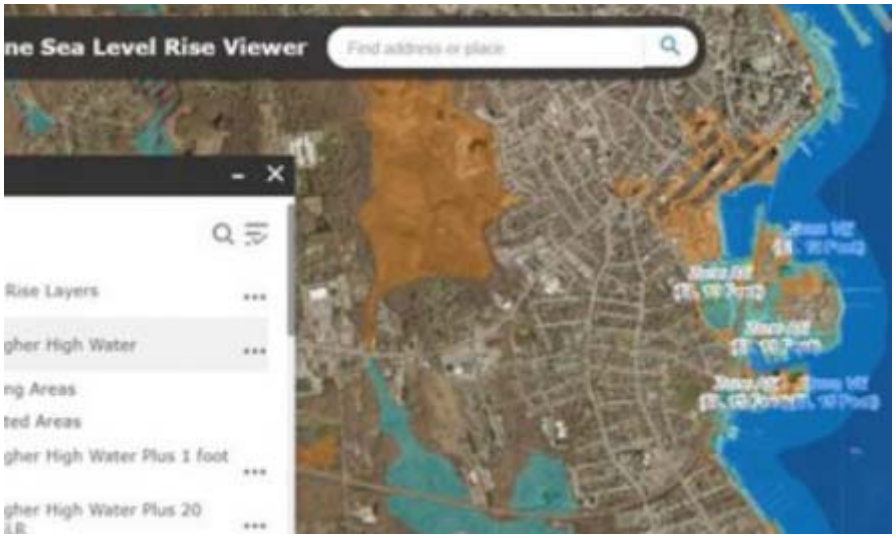
Resilient Connecticut Tools:

Exploring CIRCA's Latest Products



May 26, 2020

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CONNECTICUT ENERGY ENVIRONMENT

Outline

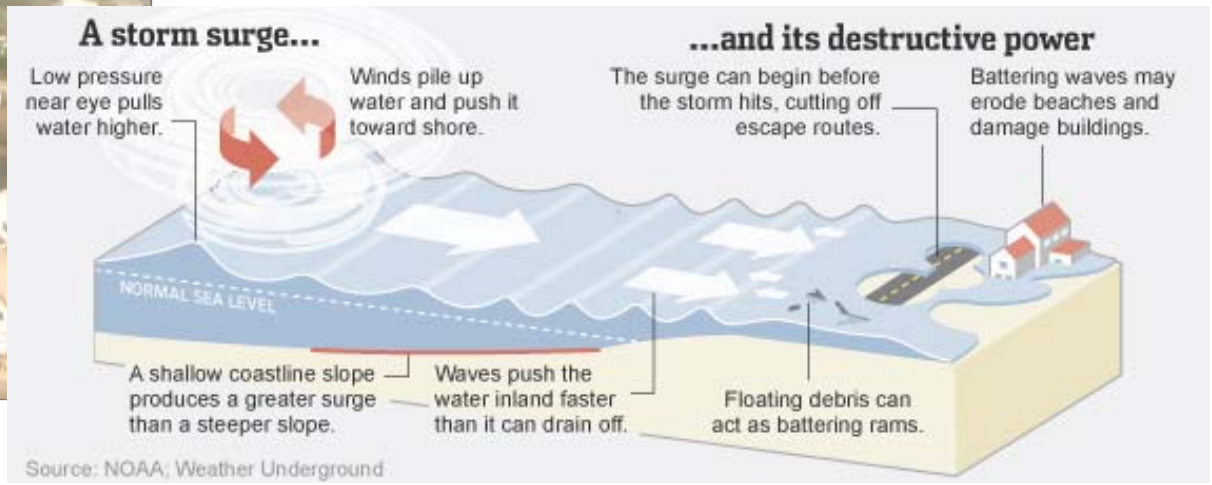
- Storm Return Interval Estimates and Town Data packages
- Sea Level Rise GIS layers
- Coastal Vulnerability Index
- What to expect in the coming months

Planning for Storms

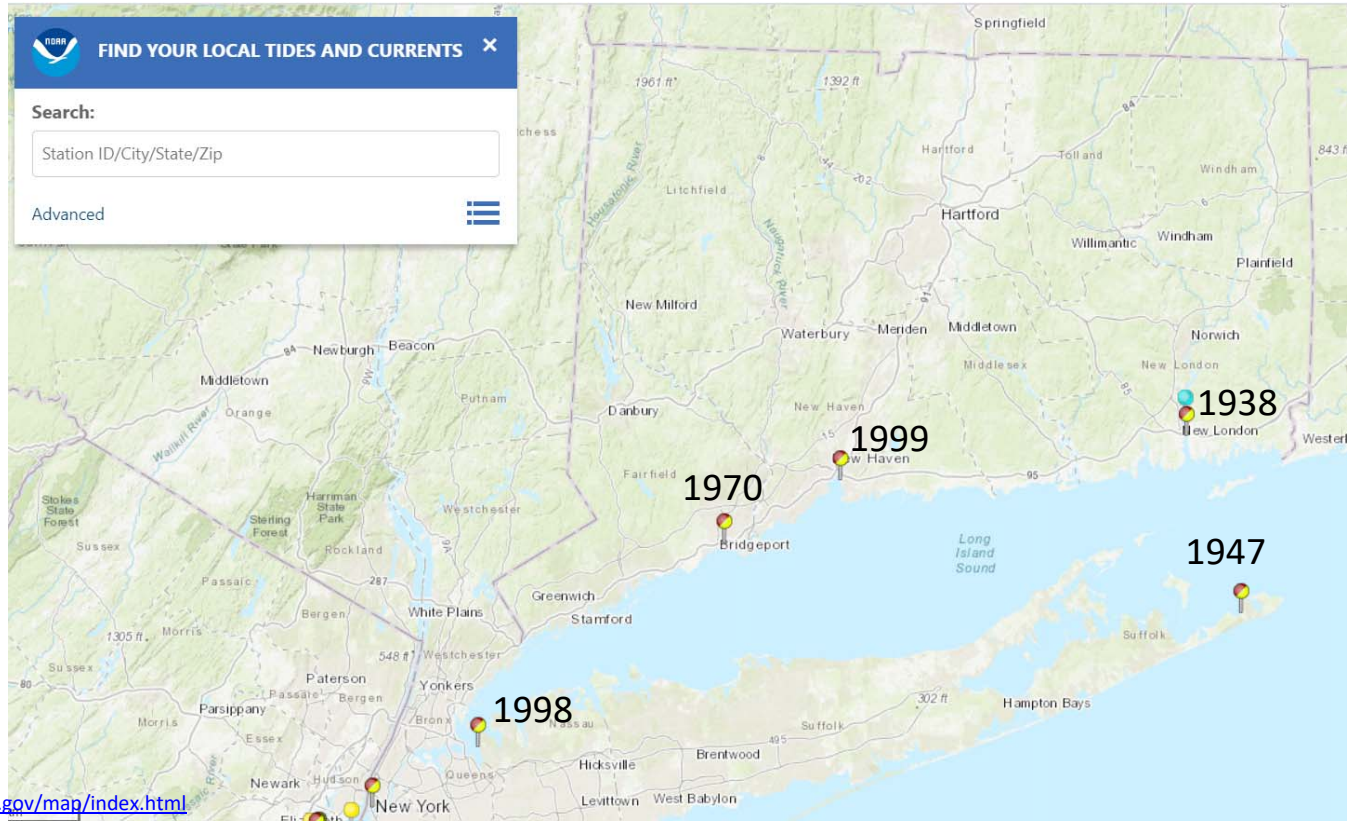
Total Water Level=

Storm surge + Waves + Tides + River flow

CT National Guard Aerial View of Hurricane Sandy Damage in Connecticut



Planning for Storms



https://tidesandcurrents.noaa.gov/map/index.html

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Long Island Sound Model

- The airport winds interpolated with 0.02° resolution and calibrated with buoys.
- Four buoy stations (EXRX, WLIS, CLIS, and LDLC3) in the LIS were used covering a period from 2004 to 2019.
- The Finite Volume Community Ocean Model (FVCOM) was coupled to an adapted Simulating Wave Nearshore (SWAN) model.
- The horizontal resolution is 500 m along the coast and 5 km in open water.
- The eight astronomical tidal constituents are extracted from a northwest Atlantic regional FVCOM.

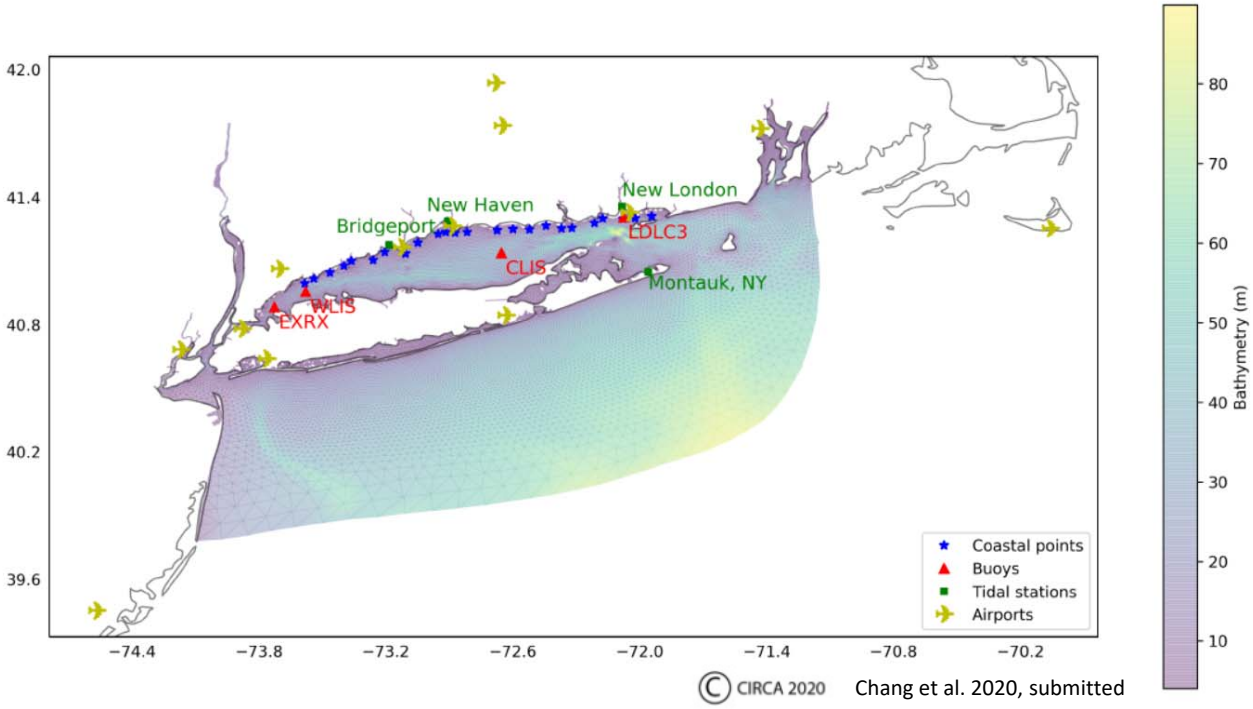


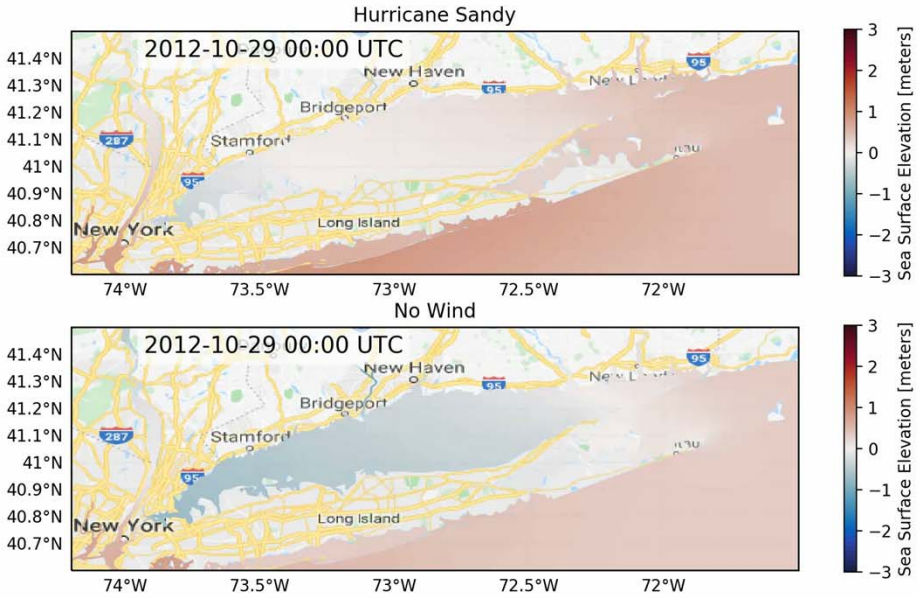
Figure: Model domain, mesh, and bathymetry (color ramp) of the Long Island Sound FVCOM-SWAVE model, and locations of NOAA tide gauge stations (green squares), buoys (red triangles), airports (yellow airplane symbols) and coastal points (blue stars) where model results are evaluated.

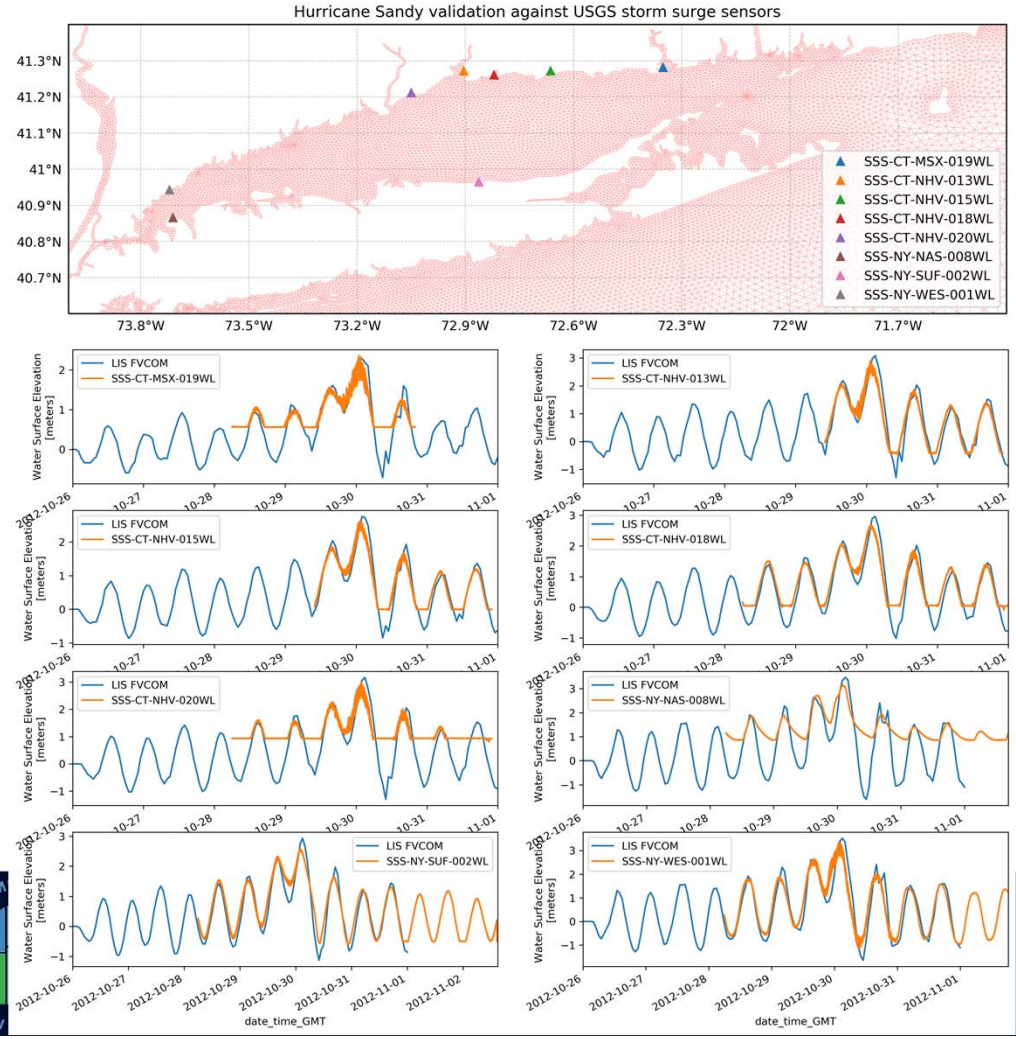
The highest 44 storms between 1950-2018

No.	Date	Storm type and name
1	25 Nov 1950	Extratropical
2	7 Nov 1953	Extratropical
3	31 Aug 1954	Tropical (Hurricane Carol)
4	16 Feb 1958	Extratropical
5	19 Feb 1960	Extratropical
6	12 Sep 1960	Tropical (Hurricane Donna)
7	12 Nov 1968	Extratropical
8	5 Apr 1973	Extratropical
9	10 Jan 1977	Extratropical
10	9 Jan 1978	Extratropical
11	7 Feb 1978	Extratropical
12	25 Dec 1978	Extratropical
13	25 Oct 1980	Extratropical
14	29 Mar 1984	Extratropical
15	27 Sep 1985	Tropical (Hurricane Gloria)
16	23 Jan 1987	Extratropical
17	22 Oct 1988	Extratropical
18	19 Aug 1991	Tropical (Hurricane Bob)
19	31 Oct 1991	Extratropical
20	11 Dec 1992	Extratropical
21	13 Mar 1993	Extratropical
22	24 Dec 1994	Extratropical

No.	Date	Storm type and name
23	4 Feb 1995	Extratropical
24	20 Mar 1996	Extratropical
25	19 Oct 1996	Extratropical
26	21 Aug 1997	Extratropical
27	6 Nov 2002	Extratropical
28	16 Dec 2005	Extratropical
29	28 Oct 2006	Extratropical
30	16 Apr 2007	Extratropical
31	12 Dec 2008	Extratropical
32	14 Mar 2010	Extratropical
33	27 Dec 2010	Extratropical
34	17 Apr 2011	Extratropical
35	28 Aug 2011	Tropical (Hurricane Irene)
36	12 Jan 2012	Extratropical
37	5 Jun 2012	Extratropical
38	30 Oct 2012	Tropical (Hurricane Sandy)
39	27 Dec 2012	Extratropical
40	14 Mar 2017	Extratropical
41	30 Oct 2017	Extratropical
42	2 Mar 2018	Extratropical
43	27 Oct 2018	Extratropical
44	16 Nov 2018	Extratropical

Validation with Buoys and USGS sensors





Annual Exceedance Probability

Storm	Water Elevation (ft)	Rank	Probability (%)	Return Interval (years)
11/1/1950	7.2			
11/1/1953	7.4			
8/1/1954	8.6			
…				
…				
Gloria-9/1/1985	4.7			
1/1/1987	4.9			
…				
Sandy-10/1/2012	8.5			
11/1/2018	6.3			

Storm	Water Elevation (ft)	Rank	Probability (%)	Return Interval (years)
11/1/1950	7.2	8		
11/1/1953	7.4	5		
8/1/1954	8.6	1		
…				
…				
Gloria-9/1/1985	4.7	42		
1/1/1987	4.9	41		
…				
Sandy-10/1/2012	8.5	2		
11/1/2018	6.3	16		

Annual Exceedance Probability

Probability = $\frac{Rank}{n+1} \times 100$, n = total number of events

Storm	Water Elevation (ft)	Rank	Probability (%)	Return Interval (years)
11/1/1950	7.2	8	11.1	
11/1/1953	7.4	5	6.70	
8/1/1954	8.6	1	0.82	
…				
…				
Gloria-9/1/1985	4.7	42	61.10	
1/1/1987	4.9	41	59.63	
…				
Sandy-10/1/2012	8.5	2	2.29	
11/1/2018	6.3	16	22.89	

Annual Exceedance Probability (AEP)

Probability = $\frac{Rank}{n+1} \times 100$, n = total number of events

Return interval = $^{1}/_{Probability}$

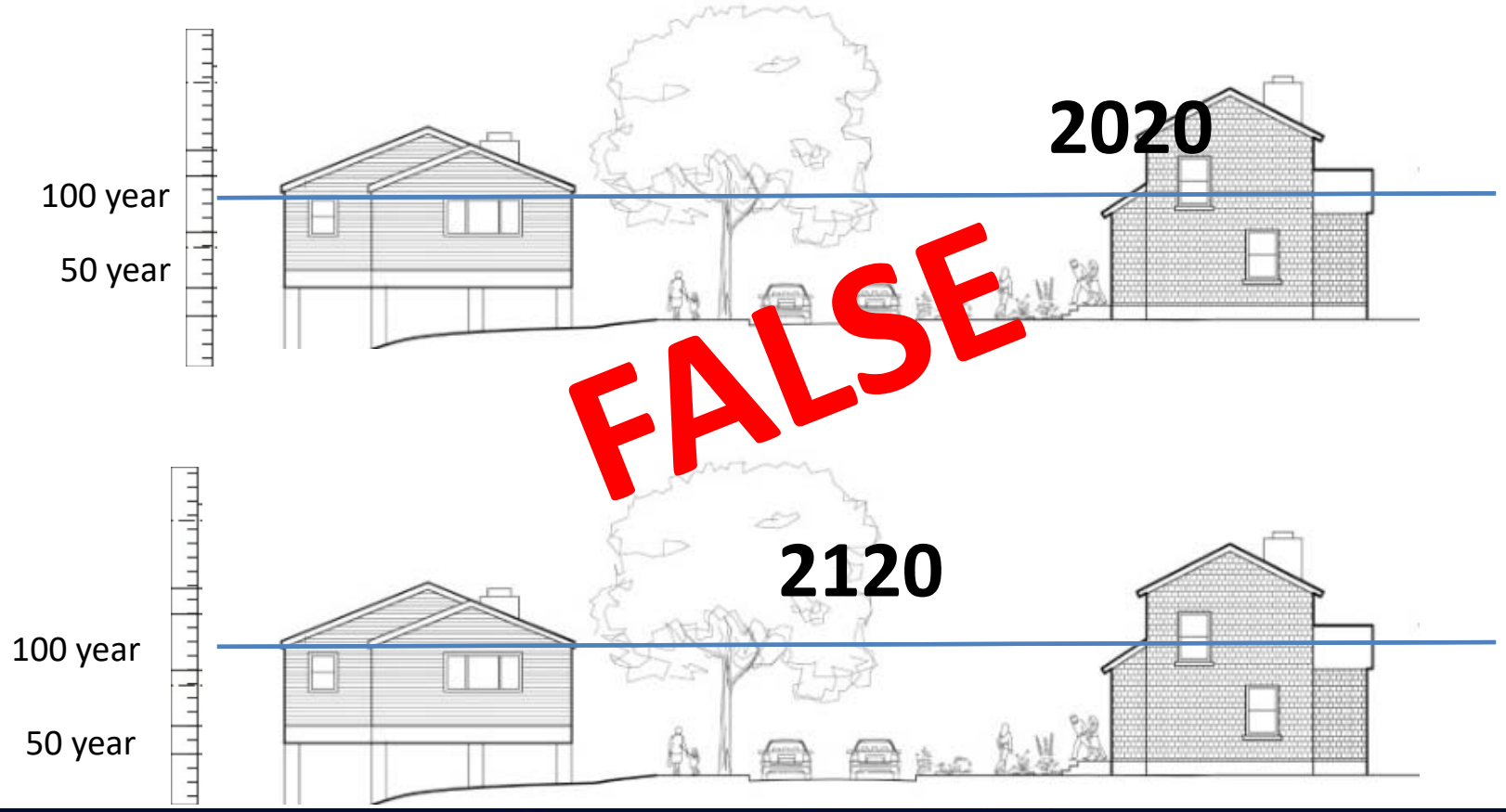
Storm	Water Elevation (ft)	Rank	Probability (%)	Return Interval (years)
11/1/1950	7.2	8	11.1	9
11/1/1953	7.4	5	6.70	15
8/1/1954	8.6	1	0.82	121
…				
…				
Gloria-9/1/1985	4.7	42	61.10	61
1/1/1987	4.9	41	59.63	60
…				
Sandy-10/1/2012	8.5	2	2.29	2.3
11/1/2018	6.3	16	22.89	23

Annual Exceedance Probability (AEP)

Probability = $\frac{Rank}{n+1} \times 100$, n = total number of events

Return interval = $^{1}/_{Probability}$

Annual Exceedance Probability and Return Interval



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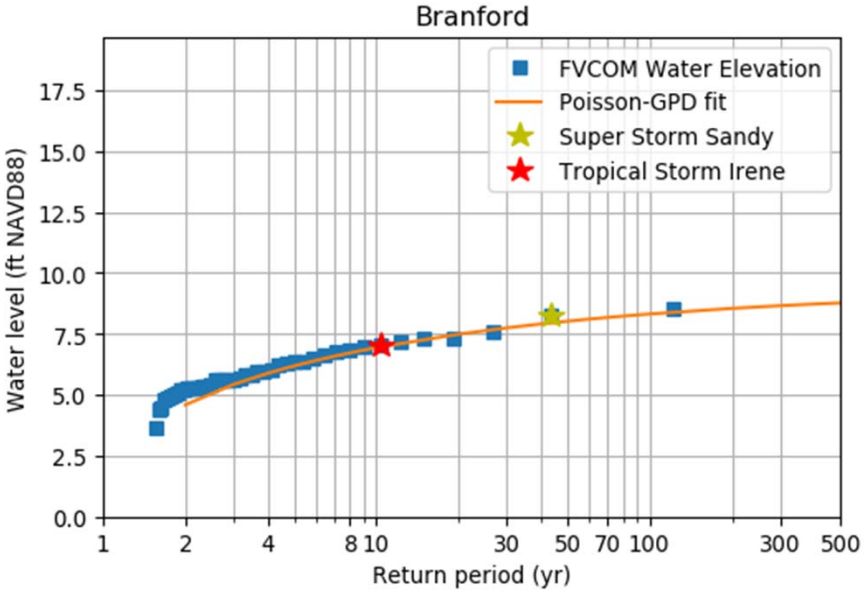
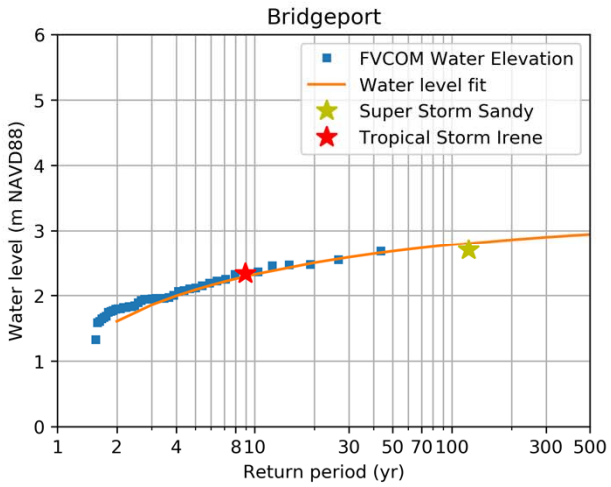
AEP for Connecticut Coastal Towns

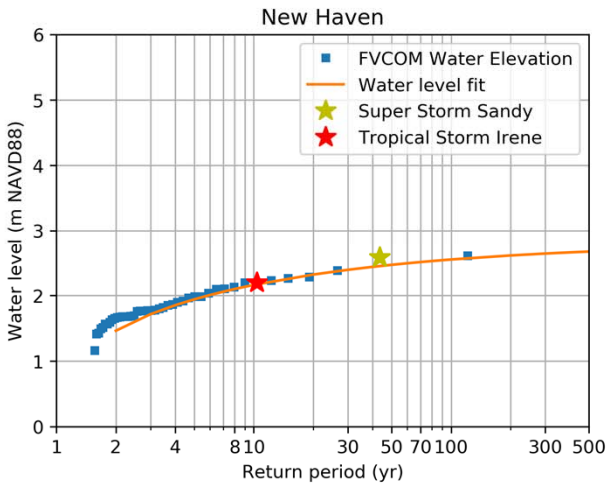
Poisson-Generalized Pareto Distribution method to model peak water level and significant wave heights from 44 modeled extreme storm.

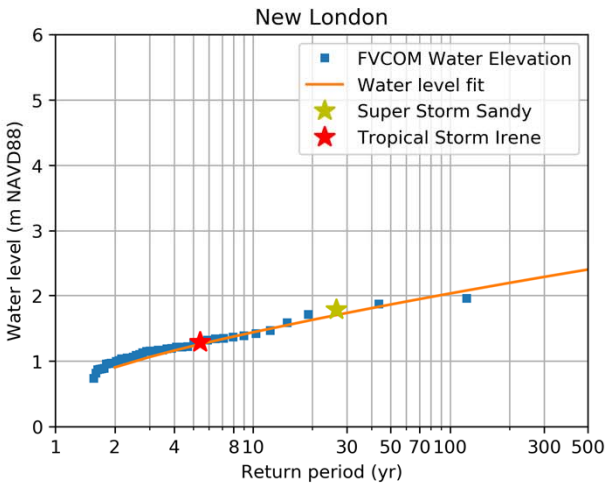


Empirical model results and probability fit

Connecticut Coastal Towns Storm Surge Return Interval







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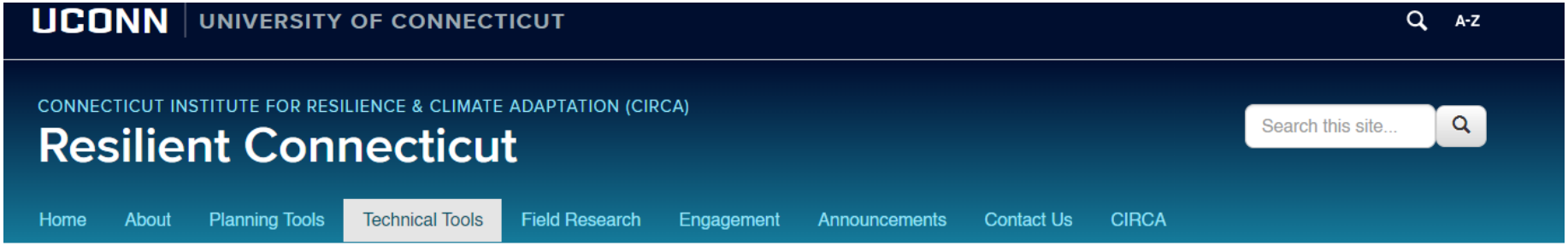


Technical Tools

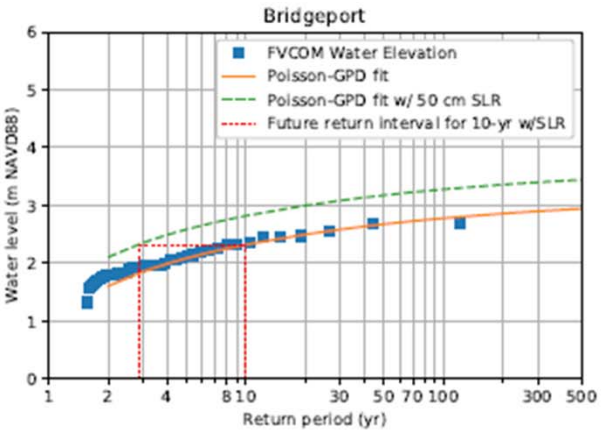
Projects

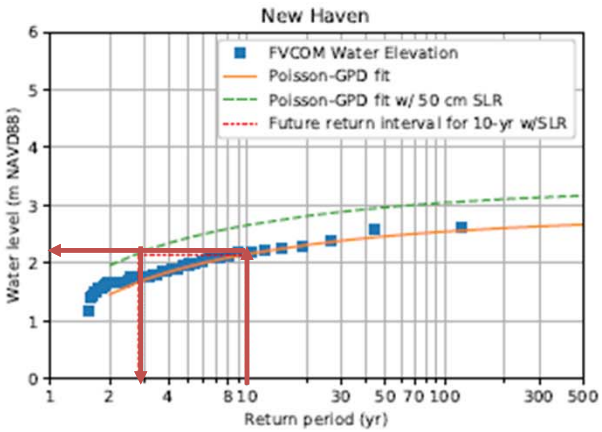
Connecticut Coastal Towns Storm Annual Exceedance Probability/Return Interval

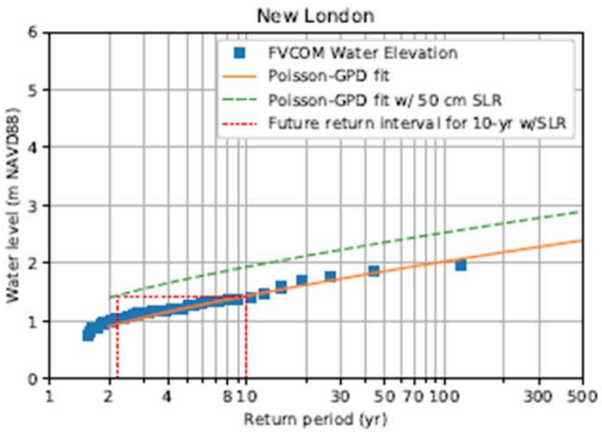
In this work, we reproduced the highest 44 storms between 1950-2018 using a coupled circulation and wave model. The modeled events are fit to a probability distribution to statistically estimate the annual exceedance probabilities (AEP) and return periods for expected storms. The results presented here are to highlight the storm surge water levels and significant wave heights, which may contribute to a better understanding of extreme storms and guide decision-makers.

GO TO AEP VIEWER | GO TO STORM SURGE MAPS | GO TO DOCUMENT | GO TO AEP DATASET | GO TO STORM MAP DATASET

Connecticut Sea Level Rise and Storm Surge Viewer







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Connecticut Sea Level Rise and Storm Surge Viewer

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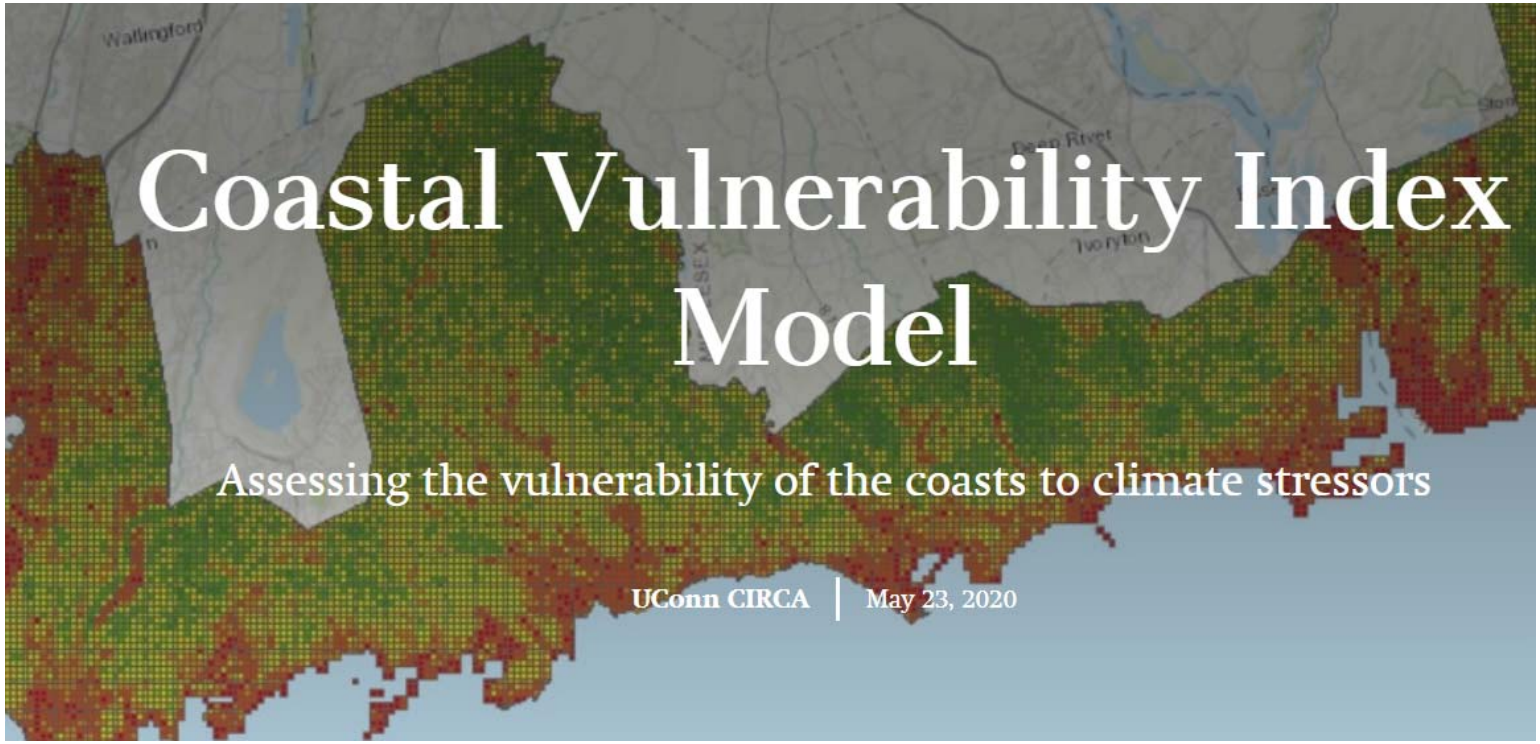

Coastal Vulnerability Index Model

Assessing the vulnerability of the coasts to climate stressors

UConn CIRCA | May 23, 2020

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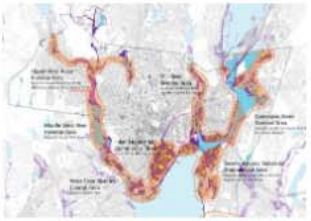
Coming Soon – Zones of shared risk



Zones of Shared Risk Viewer

This viewer shows the identified zones of shared risk maps considering the elevation and topography, projected flood extend, ecological systems, structures, and roadways, land uses, and social characteristics for coastal towns of New Haven and Fairfield County.

Coming Soon

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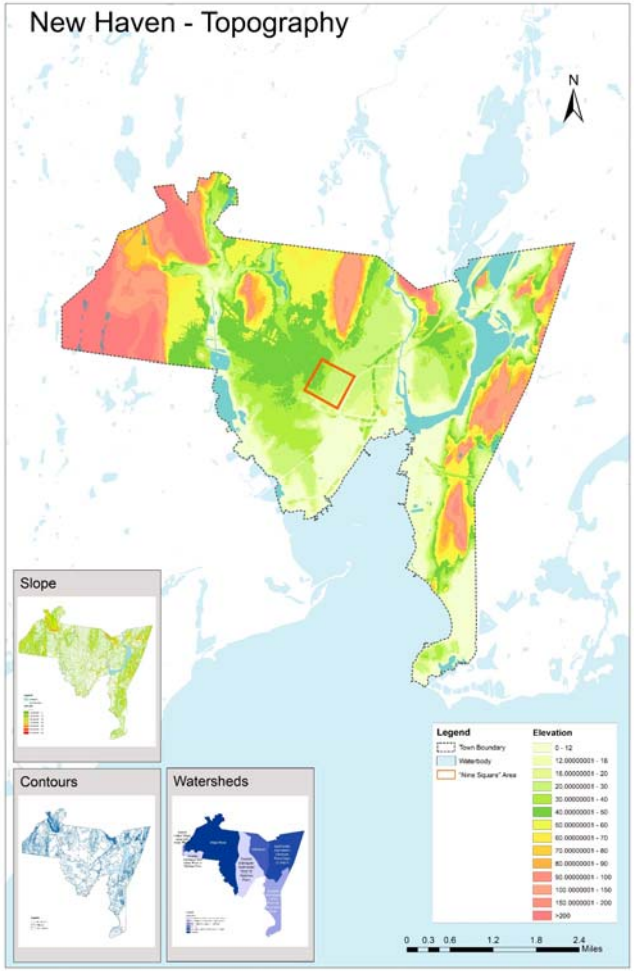

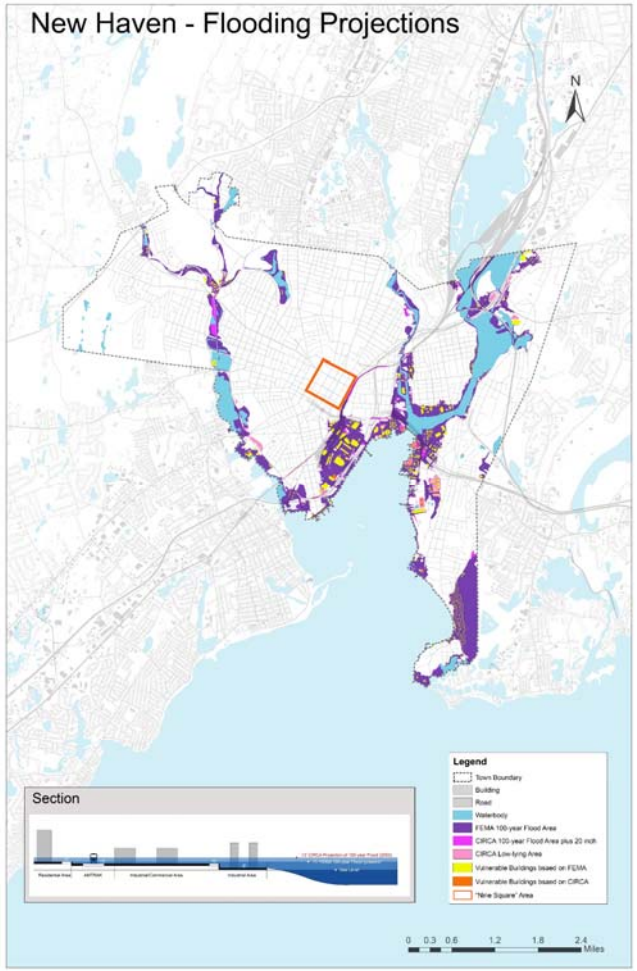

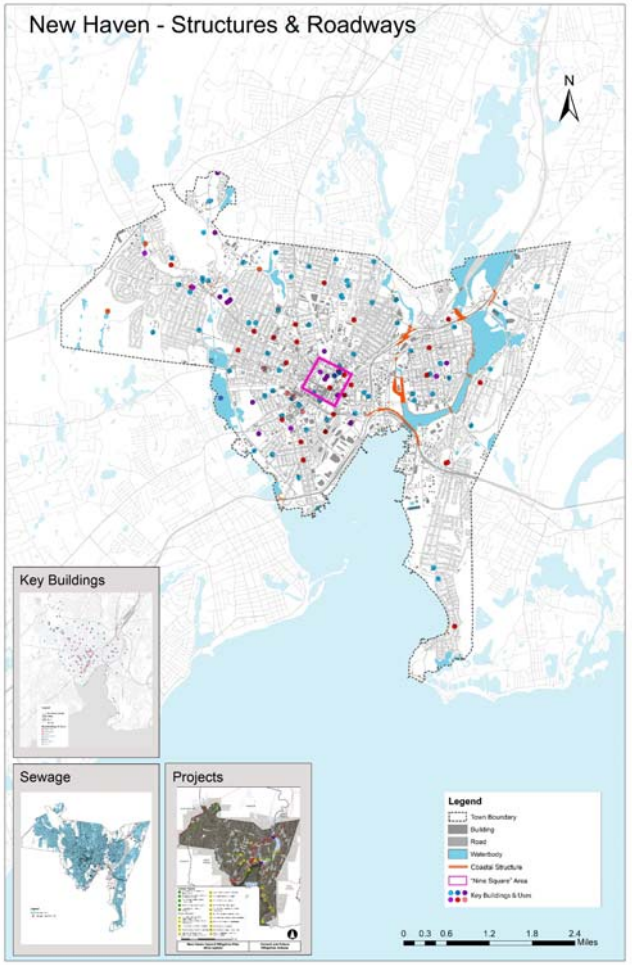

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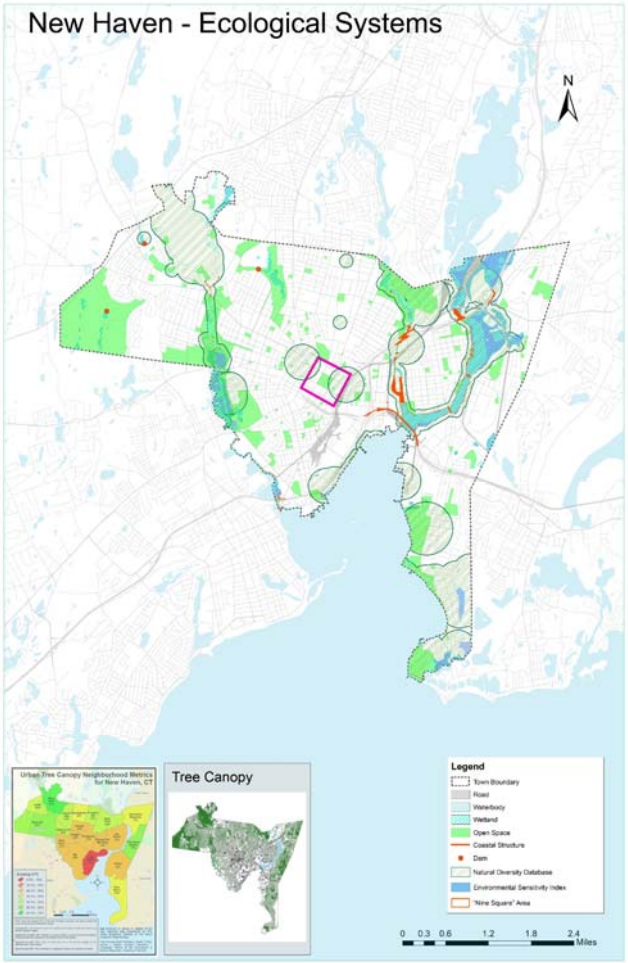

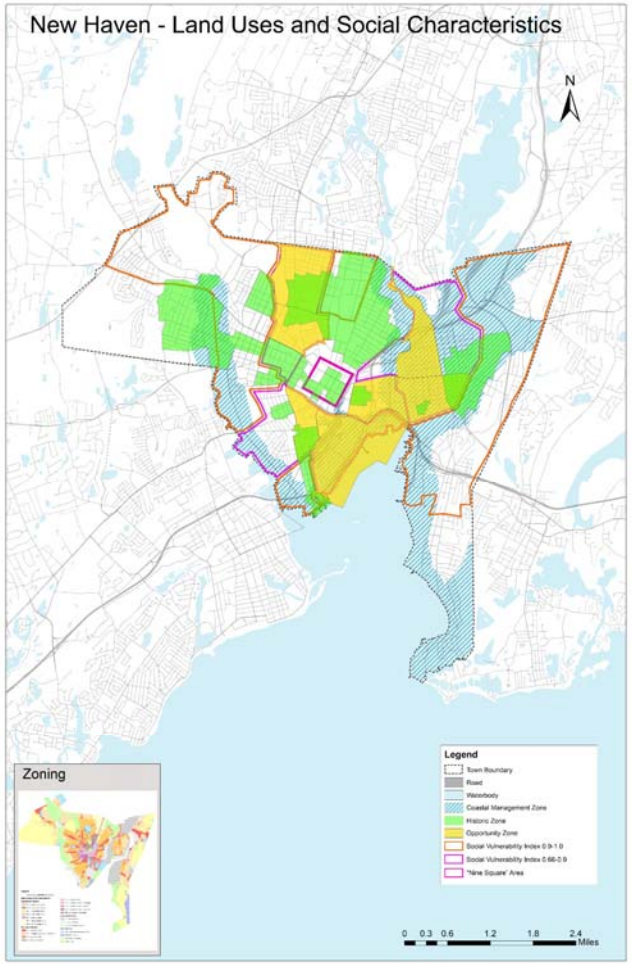

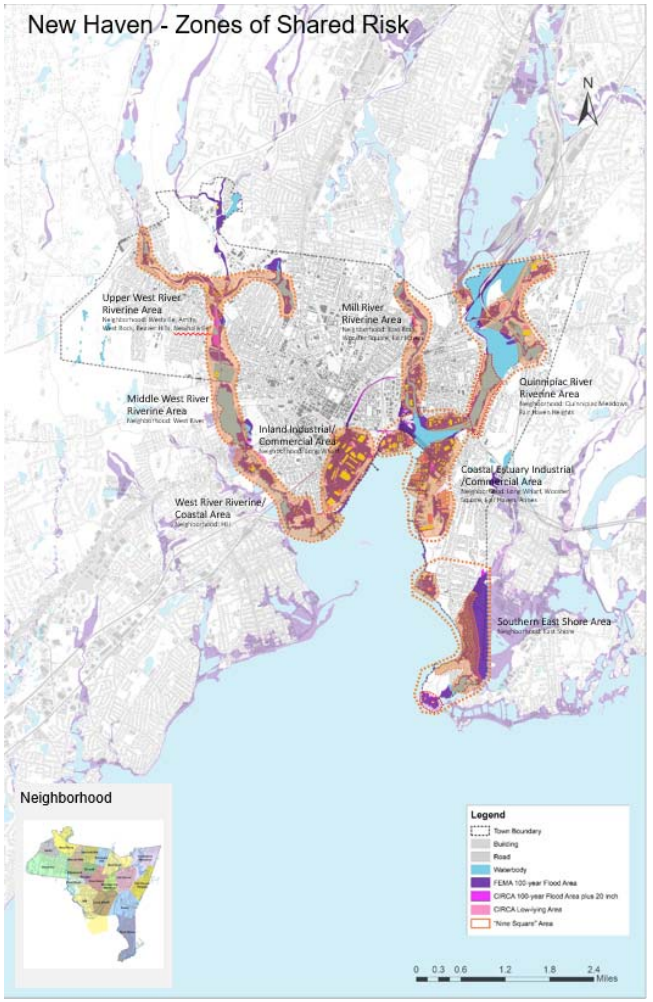

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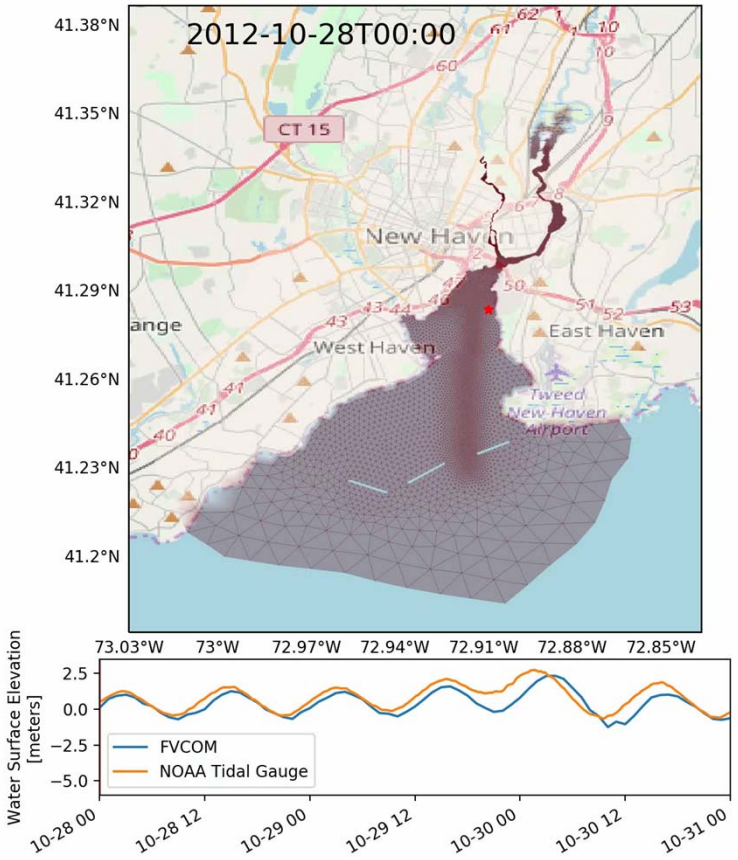
Nearshore model

- Higher Resolution model
- Uses FVCOM-SWAVE open boundary
- ADCIRC&SWAN coupling
- Includes river flow upstream



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Questions?

Enter your questions in the chat box.

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