Integrated Flood Risk Planning

Resilient Connecticut 2019
Annual Summit

Panelists:

Emmanouil Anagnostou, *Professor, UConn Department of Civil and Environmental Engineering*

James O'Donnell, *Professor, UConn Department of Marine Sciences and CIRCA Executive Director*

Jeff Caiola, *Assistant Director of Land and Water Resources Division, CT DEEP*

Sheila Warren, *USACE New England District (NAE) Planning Division - NAE Silver Jackets Coordinator*

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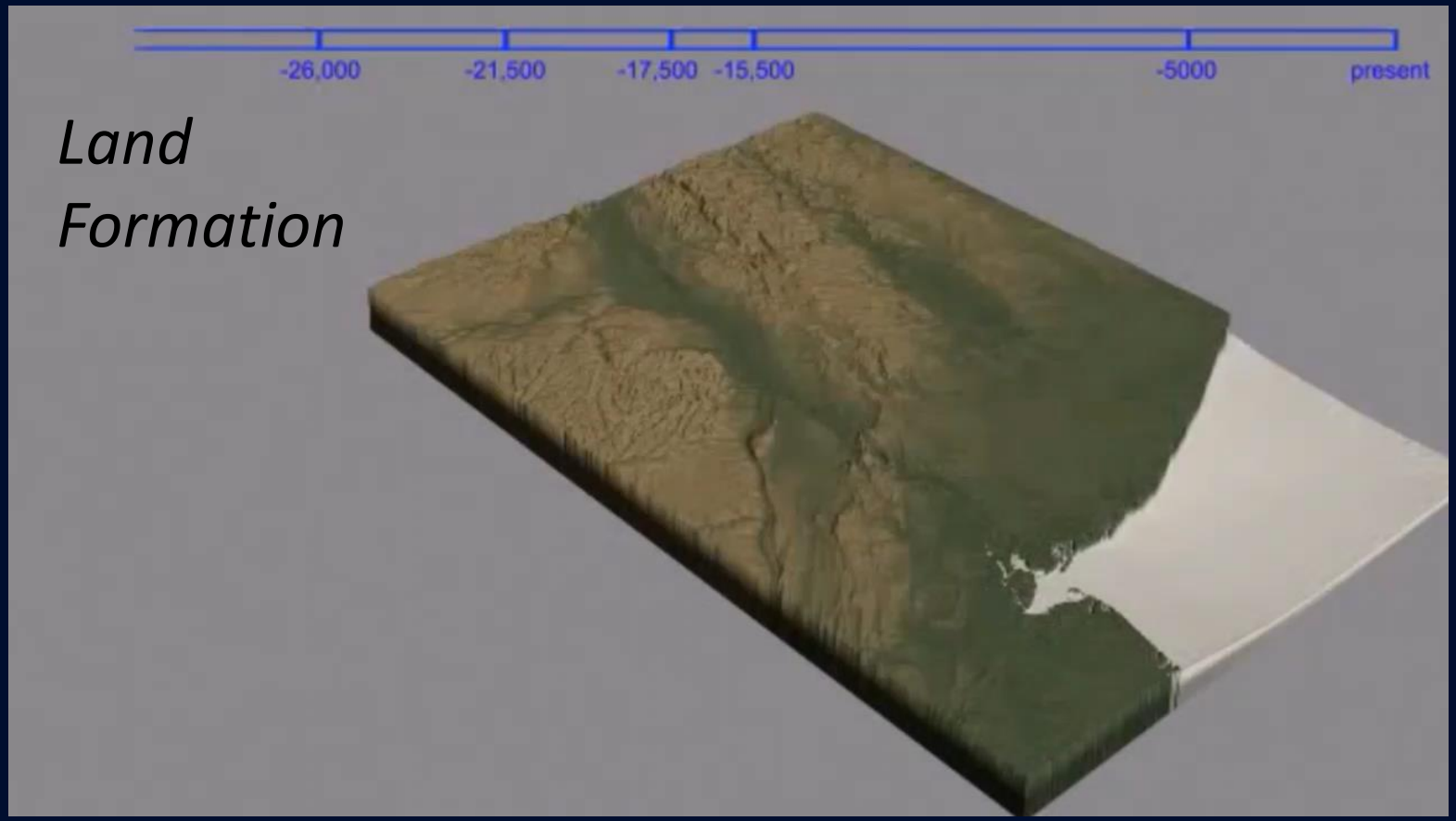
CONNECTICUT ENERGY ENVIRONMENT

The need for integrated flood planning



https://www.youtube.com/watch?v=VqobxUJQ5xk

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The need for integrated flood planning

Land Formation

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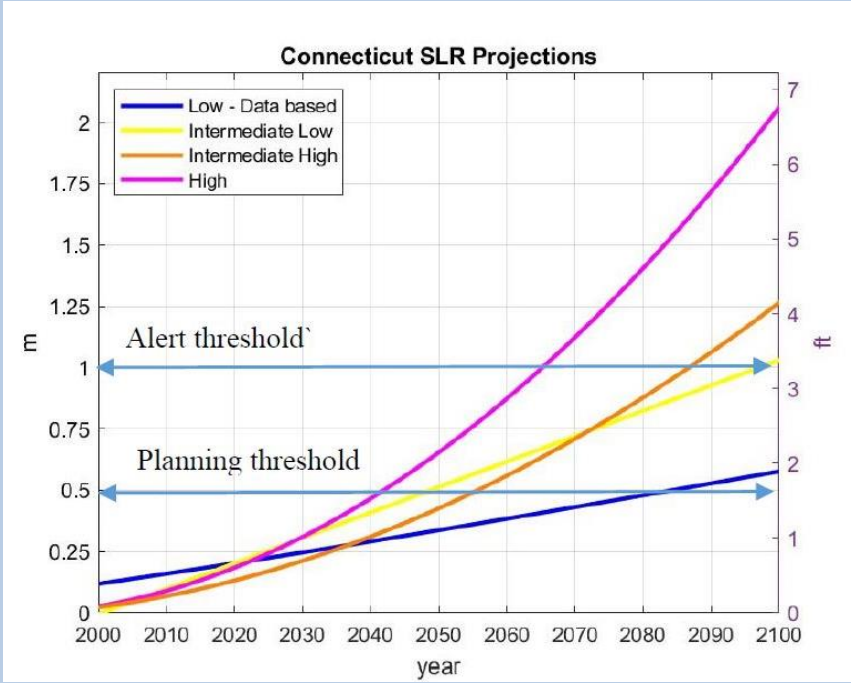
CONNECTICUT ENERGY ENVIRONMENT

The need for integrated flood planning

Factors contributing to flooding

- Sea Level Rise
  - 20 inches by 2050



Sea level rise projections for Connecticut based on local tide gage observations (blue), the IPCC (2013) RPC 4.5 model simulations near Long Island Sound (yellow line), the semi-empirical models (orange line) and ice budgets (magenta line) as in CPO-1. *(O'Donnell, 2015)*

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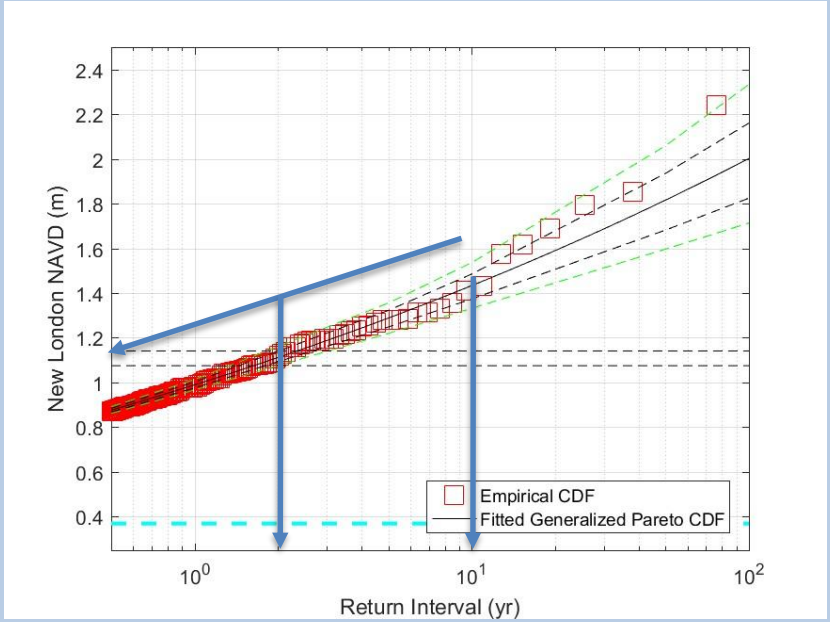
The need for integrated flood planning

Factors contributing to flooding

- Sea Level Rise
- Storm Surge
  - Frequent flooding

Tweed Airport, (after super storm Sandy)



Return period diagram of the highest storm events plotted in log scale from New London tide gauge station. With increased sea level rise, 100-year storm's return period changes to every 2 years. (New London Return interval - O'Donnell, 2018)

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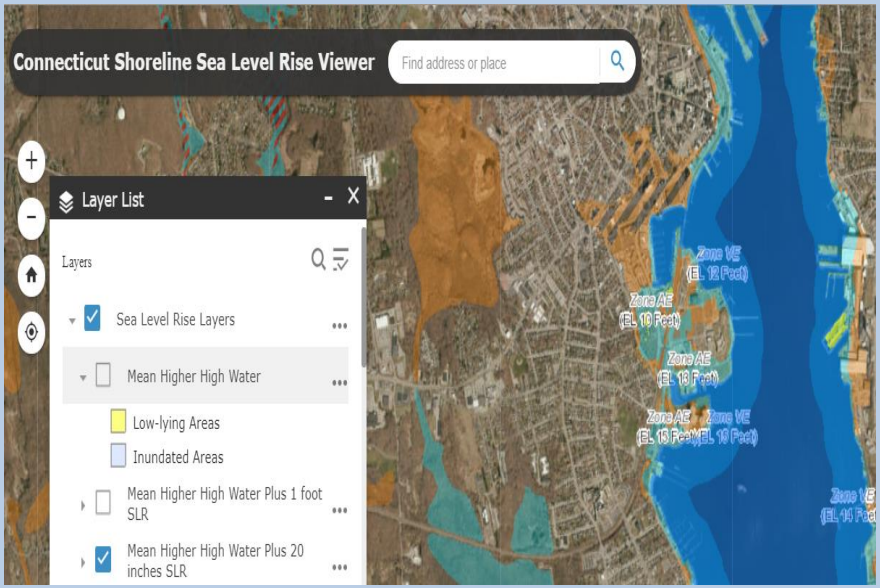
The need for integrated flood planning

Factors contributing to flooding

- Sea Level Rise
- Storm Surge
- Tides



CIRCA's viewer demonstrating the mean high high water level inundation on shorelines

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The need for integrated flood planning

Factors contributing to flooding

- Sea Level Rise
- Storm Surge
- Tides
- Waves

Wave overtopping increases the flooding effect on low shoreline areas. (Clinton – Hurricane Irene)

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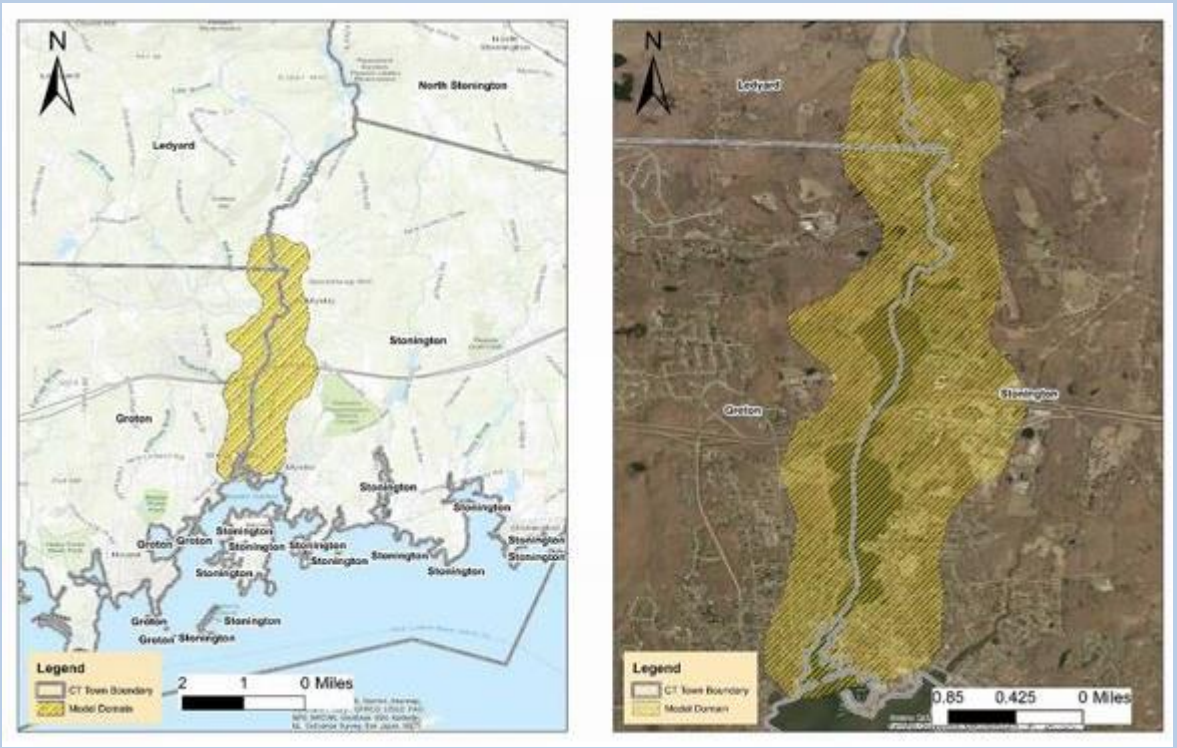
The need for integrated flood planning

Factors contributing to flooding

- Sea Level Rise
- Storm Surge
- Tides
- Waves
- Precipitation



Precipitation due to storms contributes to riverine flooding
(Anagnostou 2018 – Mystic)

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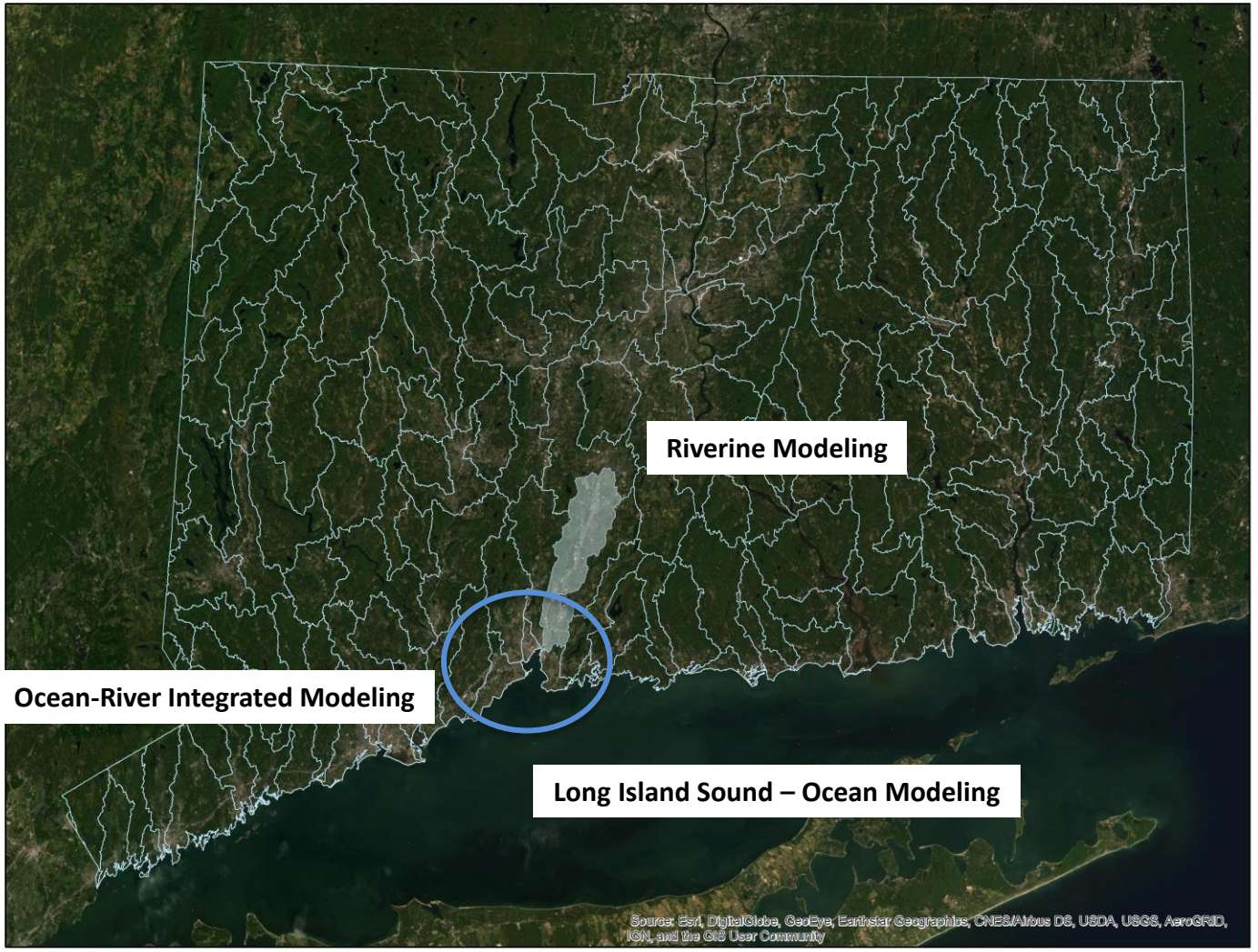
Integrated Flood Modeling



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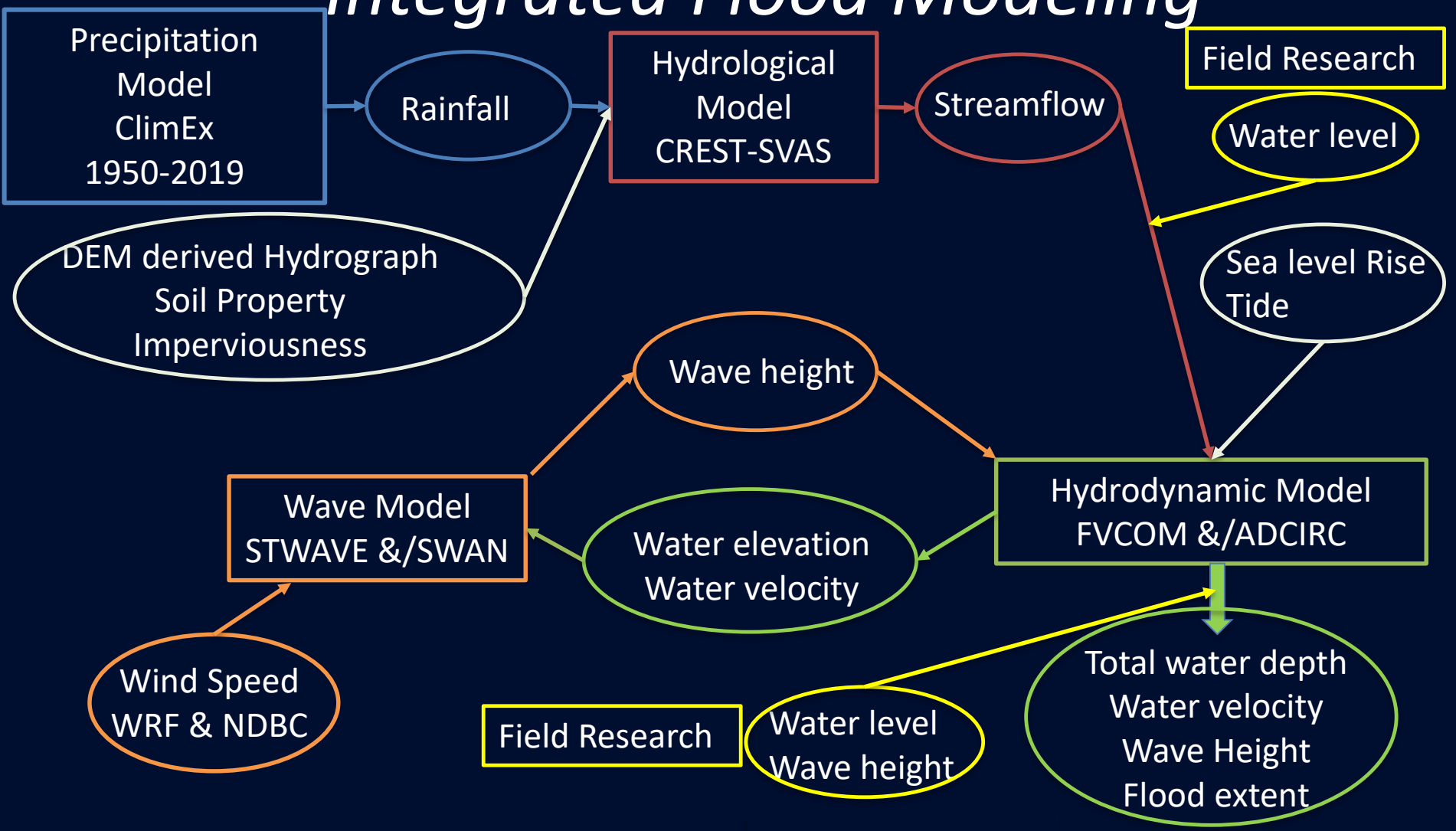
Integrated Flood Modeling



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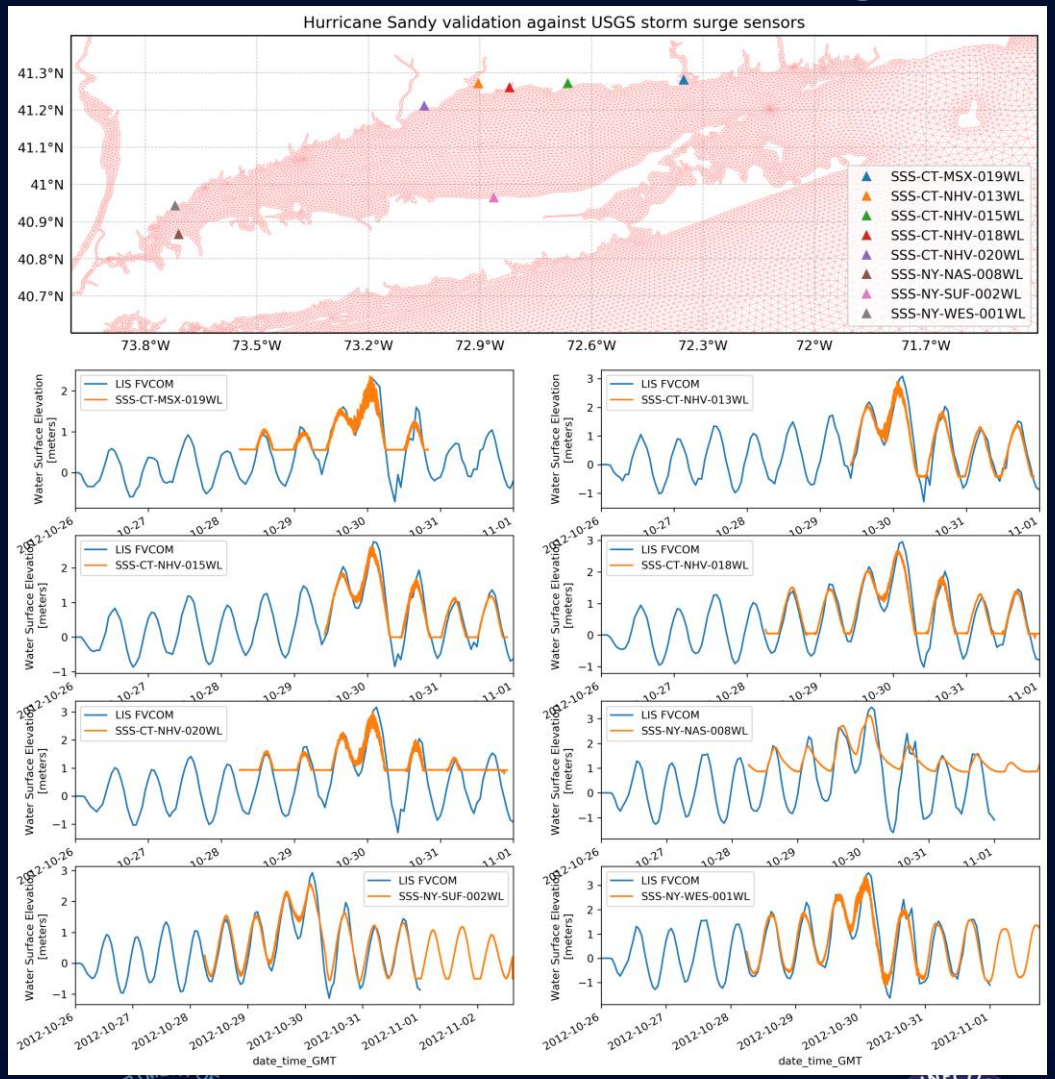
Assets of Integrated Flood Modeling

- Hurricane Model



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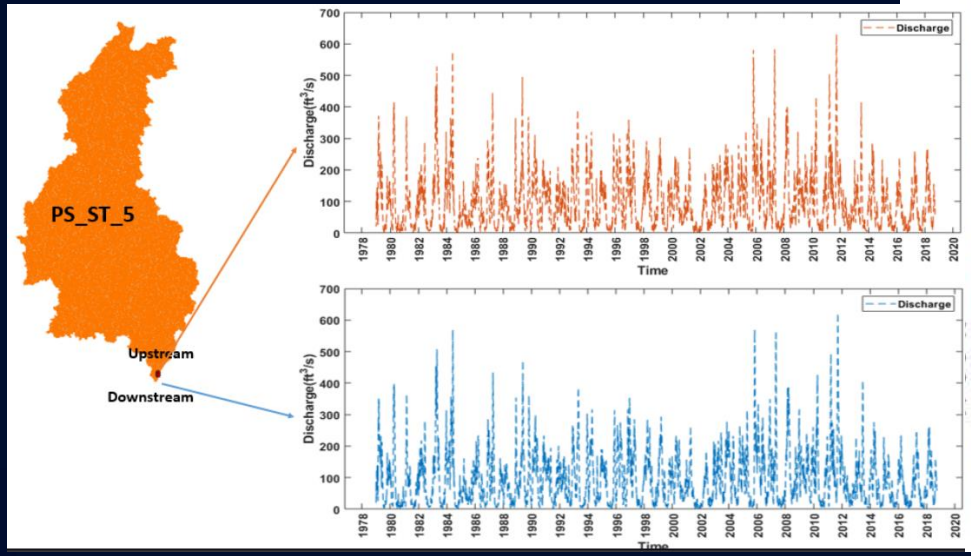
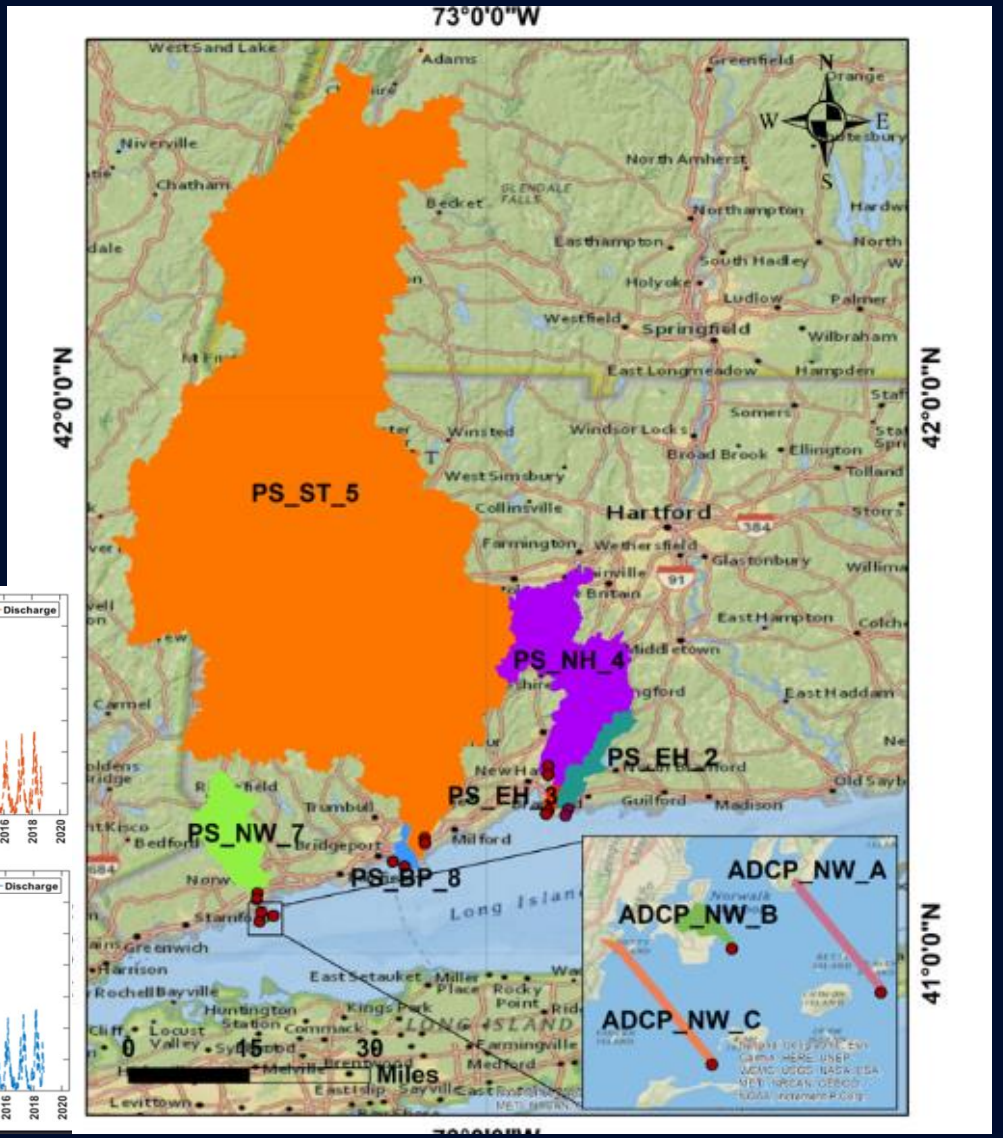
Advantages of Integrated Flood Modeling

- Hurricane Model
- Precipitation Model
  - The return interval of flow rates

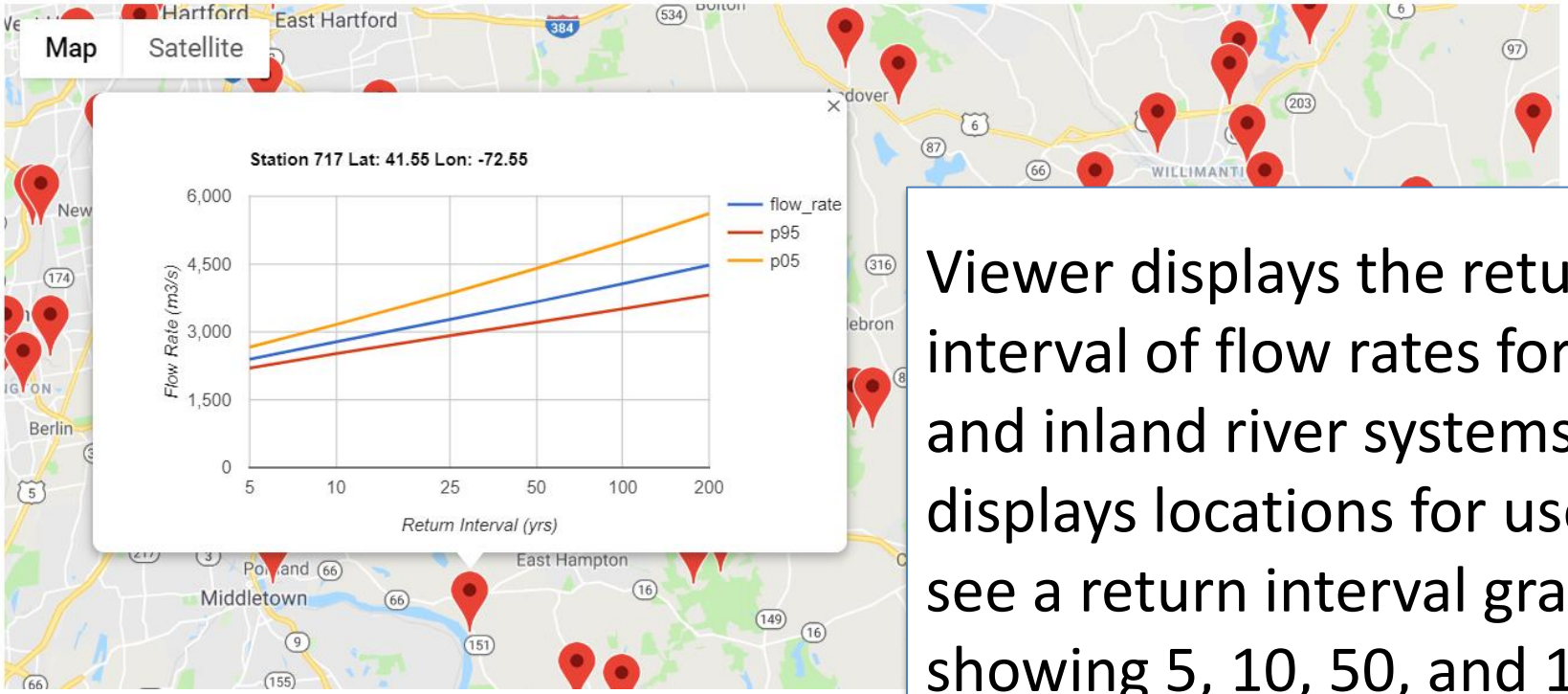




(Shen, 2019)

Connecticut River Flow Viewer

This map tool displays the return interval of flow rates for points along CT river networks. A google map interface is used to display locations where flow rate data exists. Users can zoom to a location of interest and click on a specific point to view a graph displaying flow rates over different return intervals. These graphs show the upper and lower boundary for return intervals of 1, 5, 10, 50 and 100 years at specific river locations. To view the data, click on a point of interest to activate a graph of river flow rates for different storm events.



Viewer displays the return interval of flow rates for coastal and inland river systems. Map displays locations for users to see a return interval graph showing 5, 10, 50, and 100 years along specific river networks.

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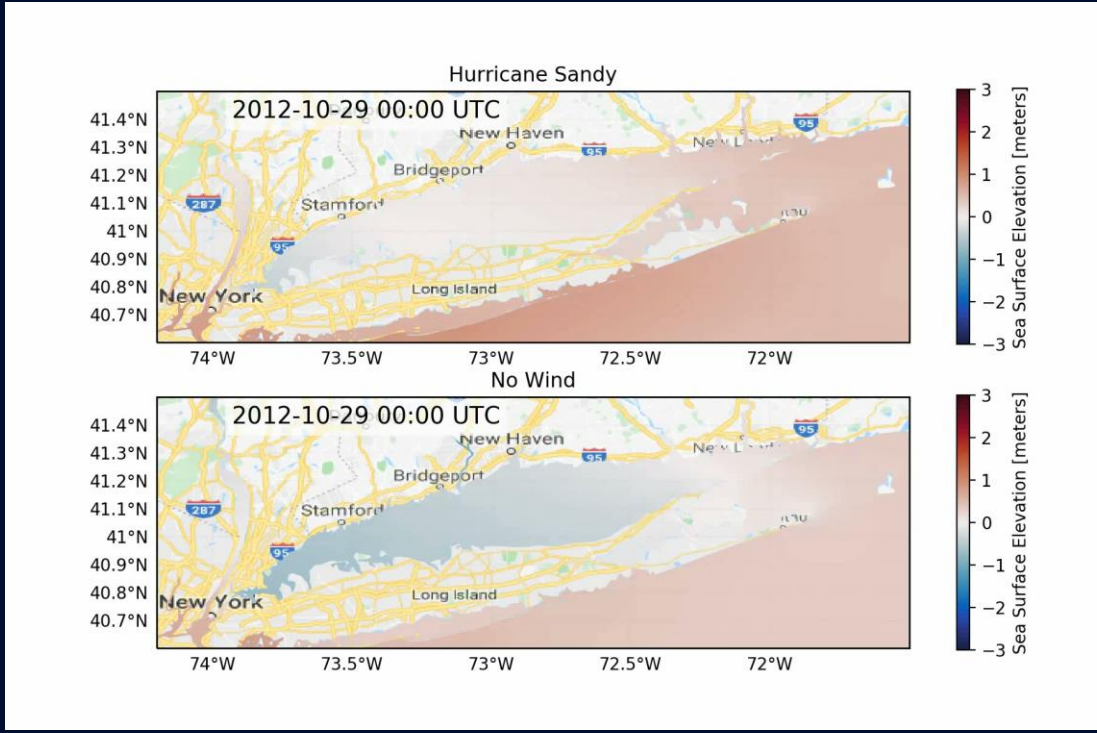
Assets of Integrated Flood Modeling

- Hurricane Model
- Precipitation Model
- Coupled Model
  - Wave, surge, tide coupling
  - Wave, surge, tide, streamflow coupling



(CIRCA, 2019)

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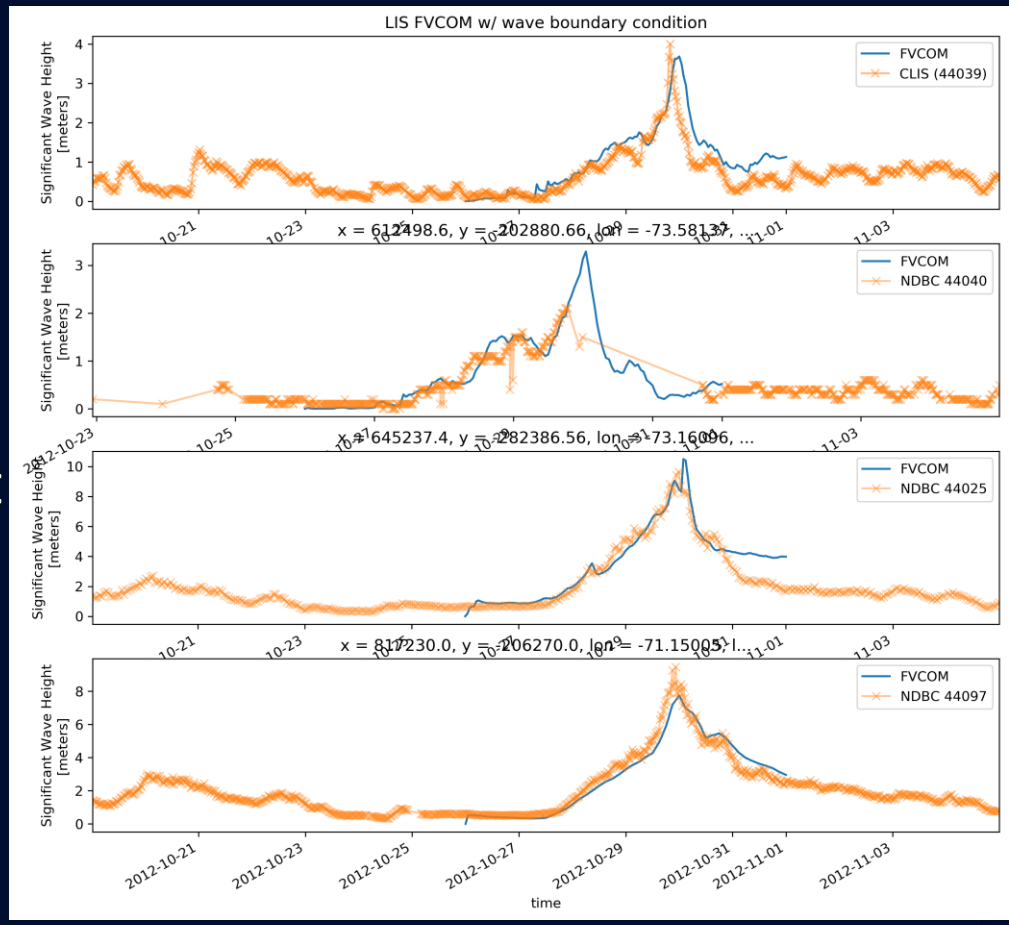
Assets of Integrated Flood Modeling

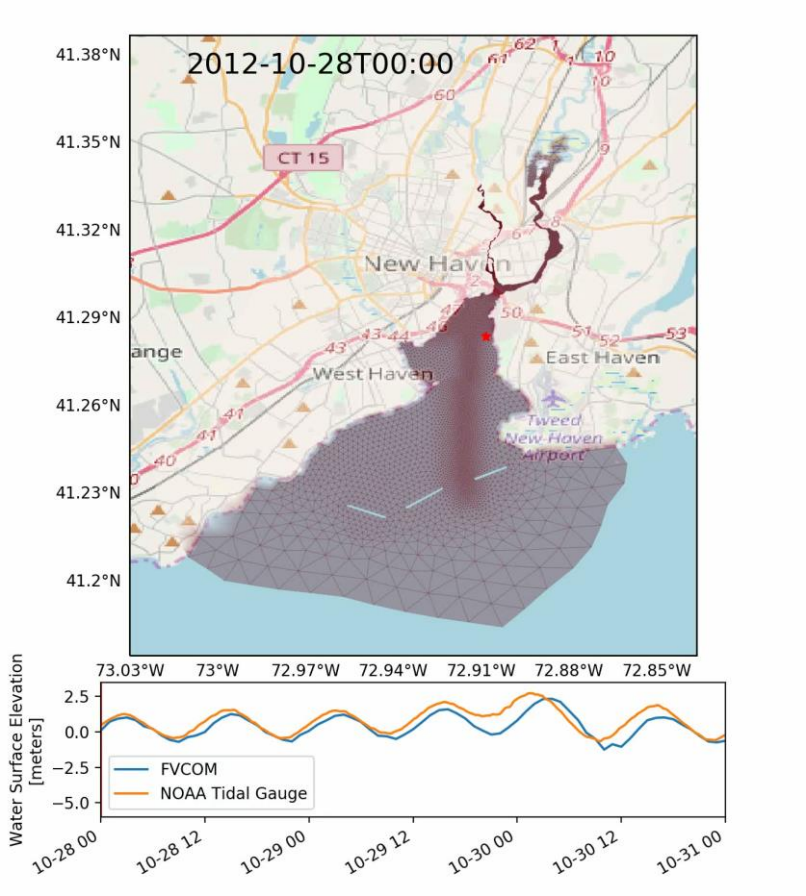
- Hurricane Model
- Precipitation Model
- Coupled Model
- Data Accuracy
  - Digital Elevation Model
  - Wind forcing adjustment from Weather Research and Forecasting Model (WRF)



(CIRCA, 2019)

Assets of Integrated Flood Modeling

- Hurricane Model
- Precipitation Model
- Coupled Model
- Data Accuracy
- Wave Model
  - Boundary condition
  - Diffraction



(CIRCA, 2019)

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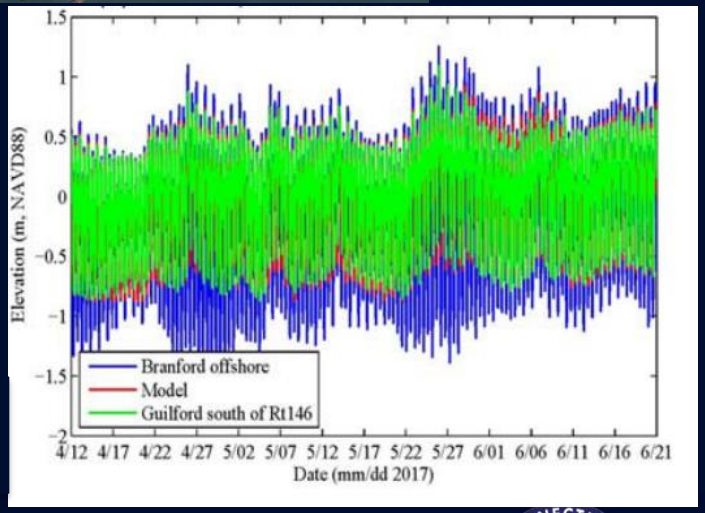
Assets of Integrated Flood Modeling

- Hurricane Model
- Precipitation Model
- Coupled Model
- Data Accuracy
- Wave Model
- Hydraulic Model
  - Existing of flood control structures
  - Marsh effect

(O'Donnell, 2018)



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Assets of Integrated Flood Modeling

- Hurricane Model
- Precipitation Model
- Coupled Model
- Data Accuracy
- Wave Model
- Hydraulic Model
- Field Research
  - Water level and wave height validation

(Howard-Strobell, 2019)

(O'Donnell, 2019)

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Products of Integrated Flood Modeling

- Water levels
- Return interval of wave heights
- Maps of extended flood plains in variety of year return periods
- Viewer for dynamic visualization

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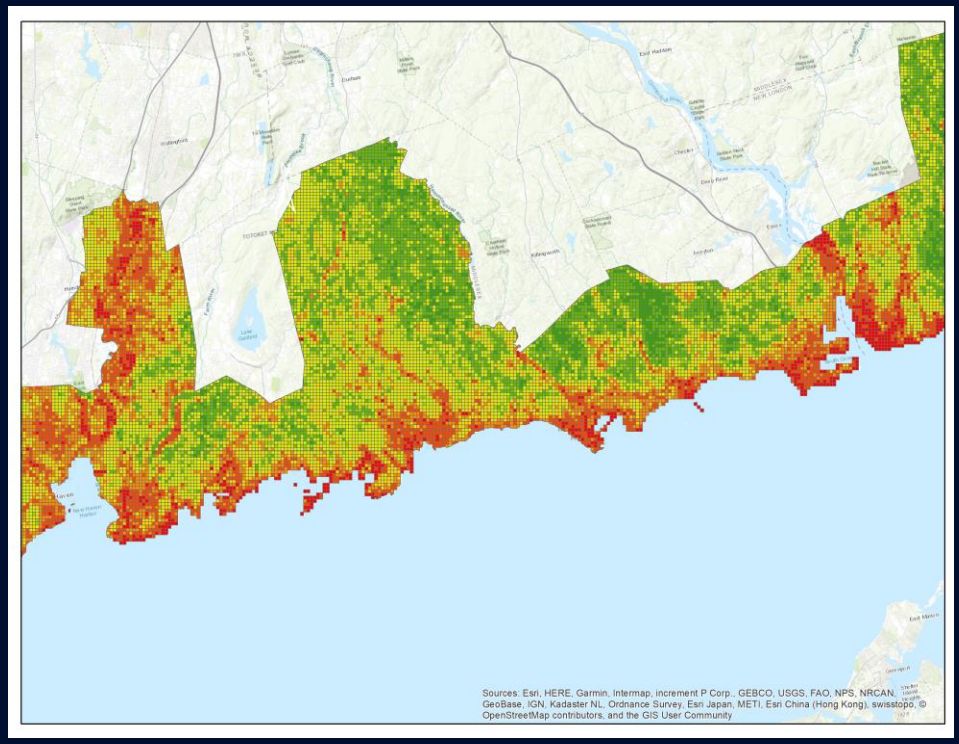
Integration of Flood Modeling into Planning

- Vulnerability Assessment



(CIRCA, 2019)

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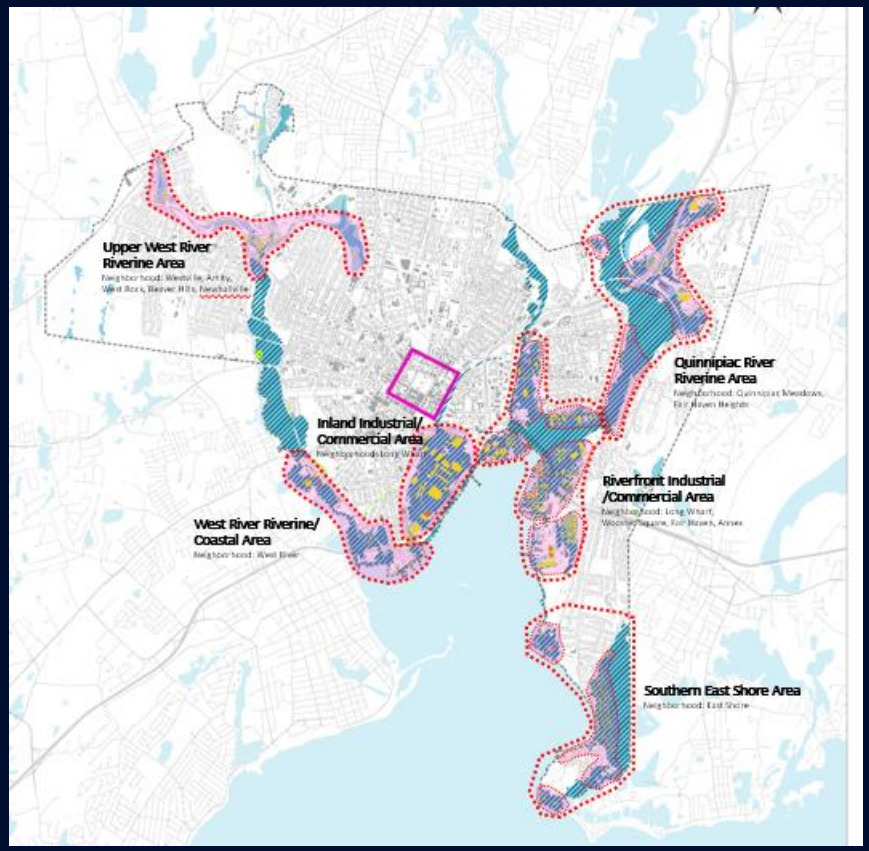
Integration of Flood Modeling into Planning

- Vulnerability Assessment
- Zones of Shared Risk



(Minutti, 2019)

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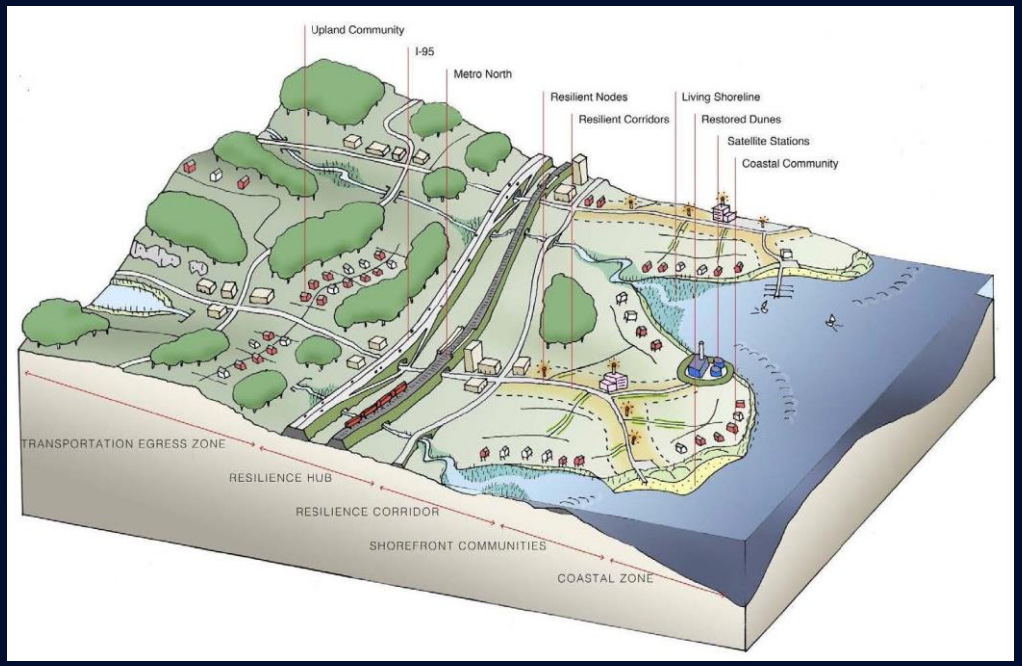
CONNECTICUT ENERGY ENVIRONMENT

Integration of Flood Modeling into Planning

- Vulnerability Assessment
- Zones of Shared Risk
- Resilience Corridor



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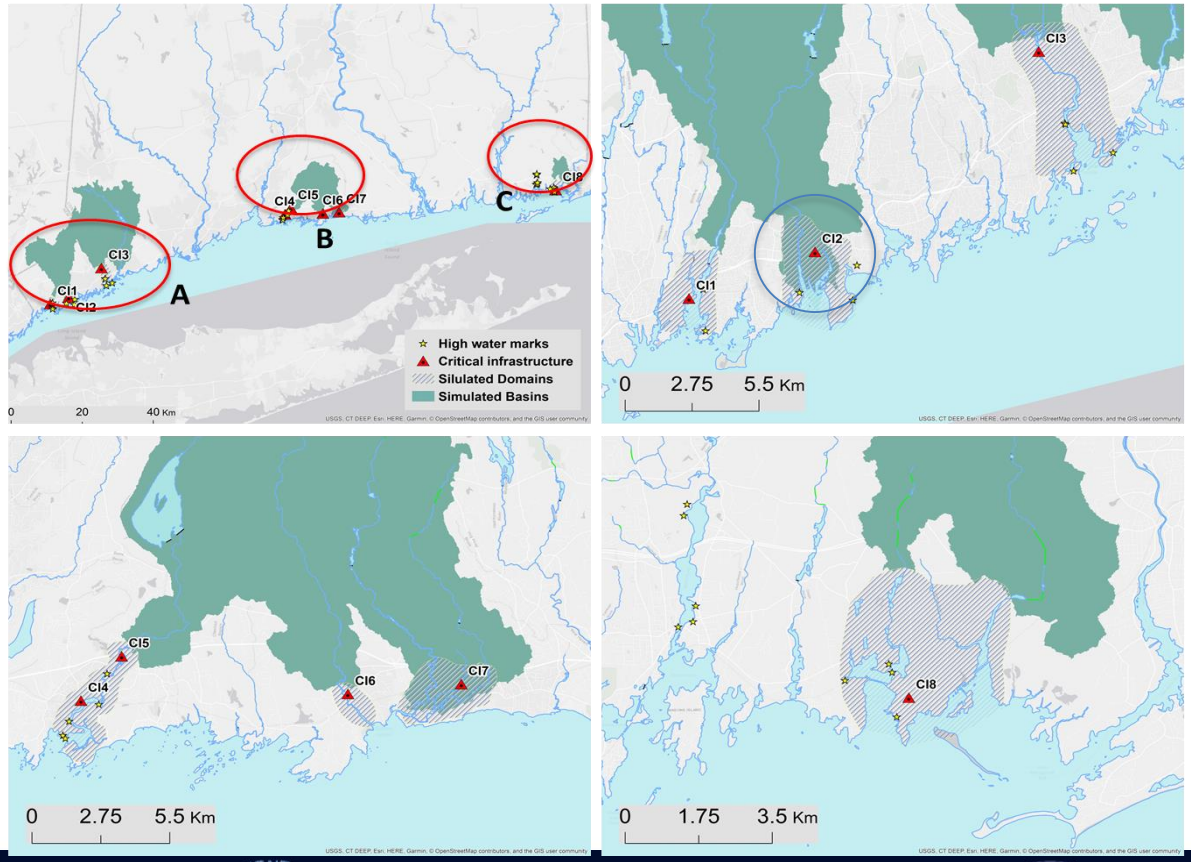
Substations Vulnerability to Compound Flood Events

Derive inundation maps for potential hurricane landfalls in New England: compound hazards from riverine flooding, coastal surge and tide, and SLR (sea level rise) due to climate change effects.



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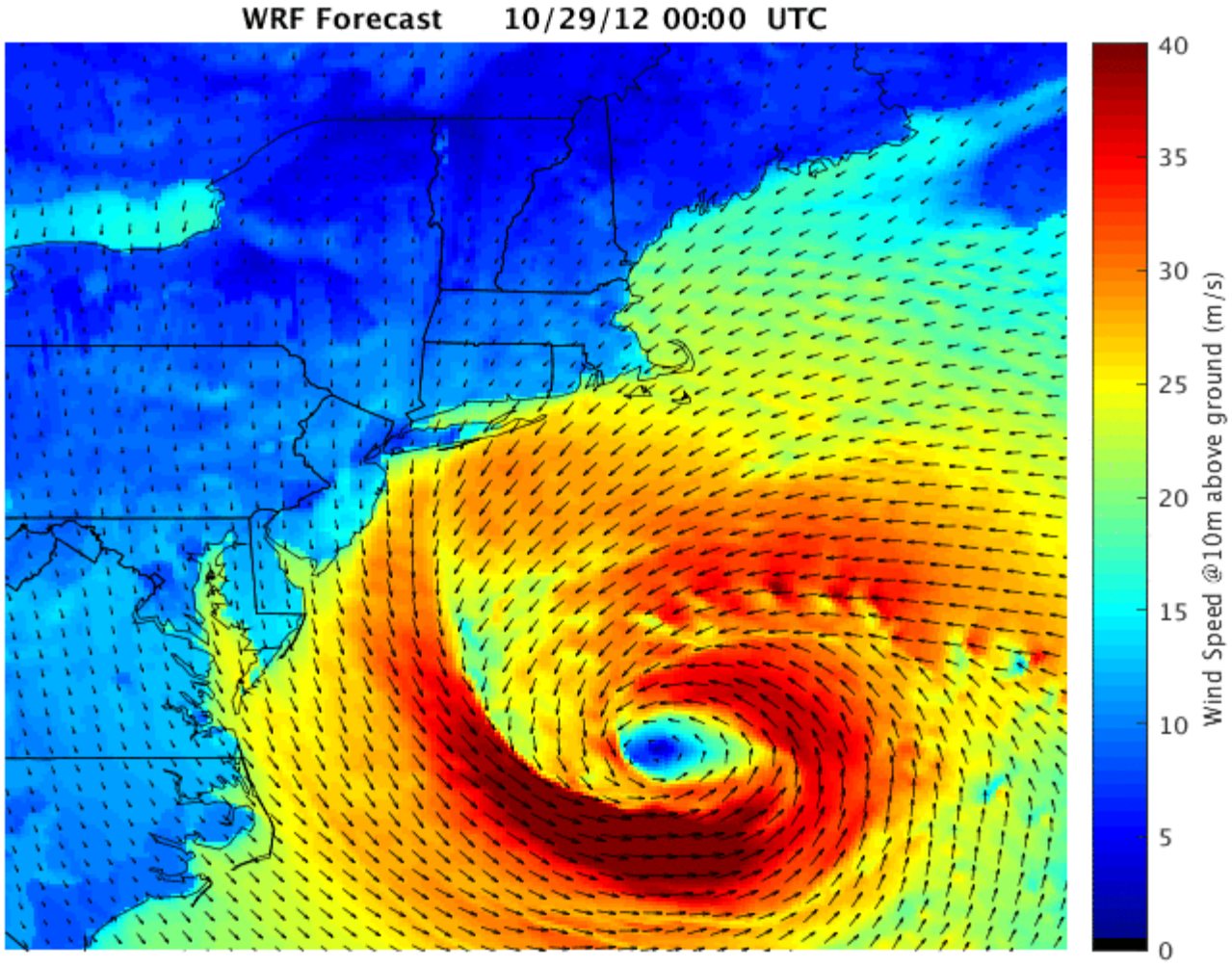
Future Sandy scenario



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Future Sandy scenario – South end substation