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Eversource Energy Center Annual Workshop
Innovation Partnership Building
University of Connecticut

Assessing compound risk for existing electrical substations over the State of Connecticut

Enhancing grid resilience in a changing climate

by

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Introduction

Industry Relevance and Need

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Flood risk and early warnings

1. *Intensification of hydrometeorological extremes, poses an immediate threat to numerous substations lying close or within coastal and inland floodplains across Connecticut.*

2. *The vulnerability of critical infrastructure, and the associated flood risk, should be estimated as meticulously and accurately as possible, to determine how planning and operations may be affected.*

Address the technical, financial, and societal issues that may arise from the potential susceptibility of Eversource Energy substations to compound flood events across the State of Connecticut, under the influence of climate change.

2024 California floods (Source: CNN)

Project Goals & Objectives

Compound flood risk and climate change over CT

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September 2023 – August 2026
(Initiated in Jan. 2024)

Assessing compound risk for existing electrical substations over the State of Connecticut, toward enhanced grid resilience in a changing climate

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Across various temporal scales and return period levels!

Goals

1. Robustly assess the susceptibility of existing substations against compound flood events.
2. Highlight the potential vulnerability of these critical facilities and reveal trends in the underlying flood risk induced by climate change.
3. Provide valuable information that supports decision making for future hazard mitigation projects and enhanced grid resilience.
4. Evaluate the future exposure of the system to hydrological hazards.

Research Approach

Study Domain

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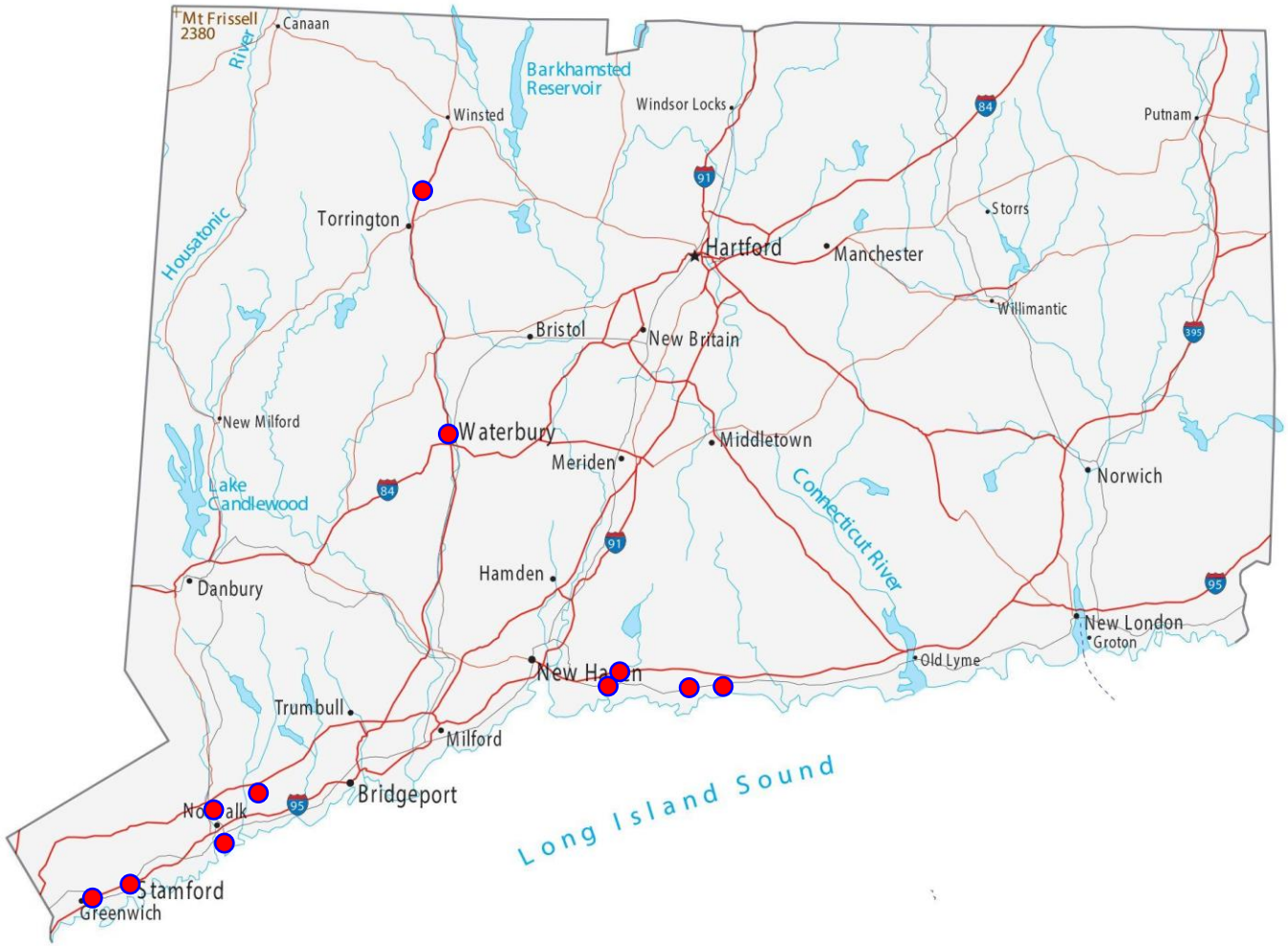
11 *locations in coastal and inland areas*



Research Approach

Real-time early warning system

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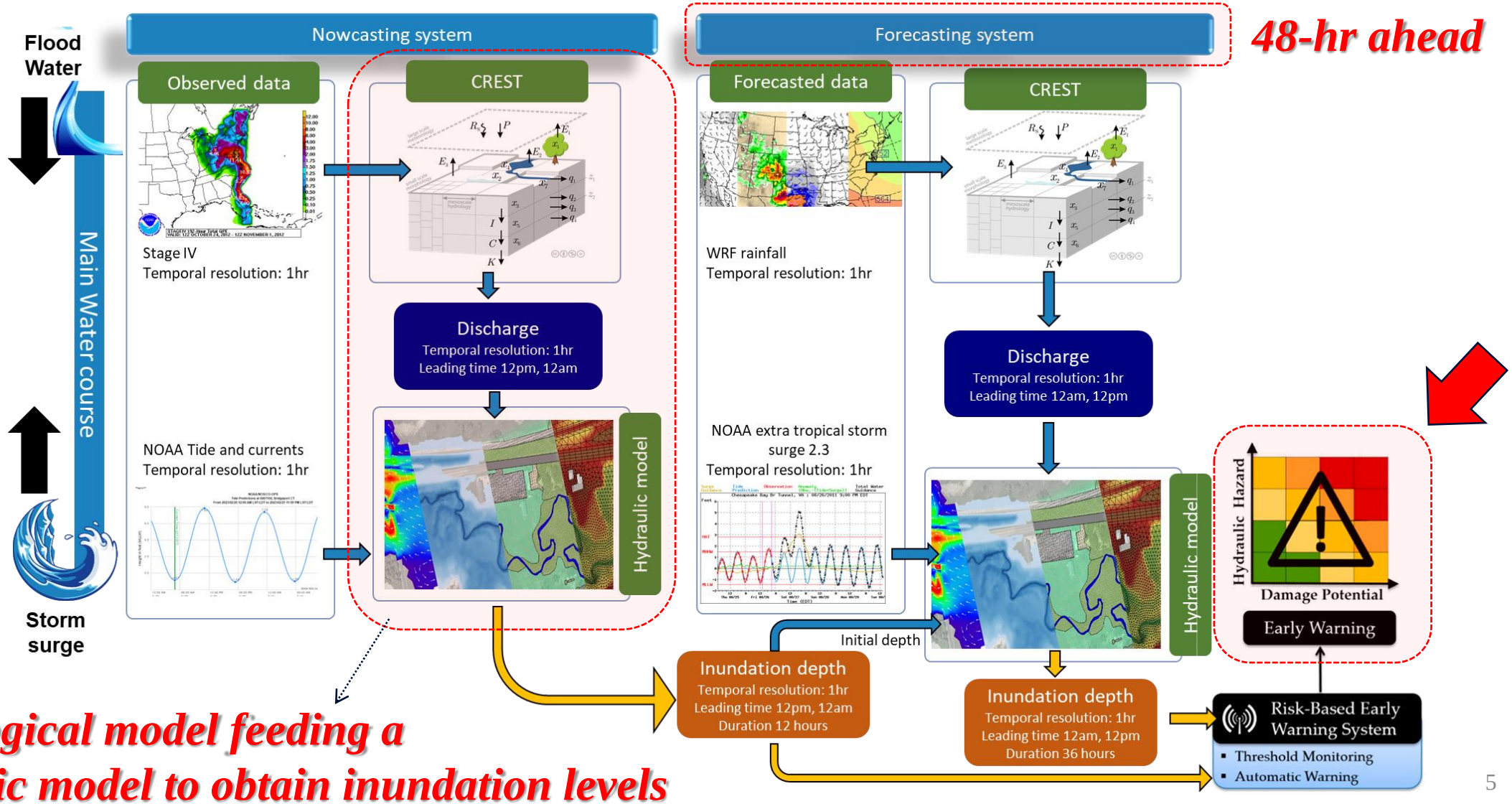

Hydrological model feeding a hydraulic model to obtain inundation levels

Research Approach

Compound flood risk estimation

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Parametric statistical models that account for nonstationarity

1. Return periods of hydrometeorological variables

Hydrodynamic model simulations

2. Acquired inundation levels

3. Climate simulations for various RCPs

Parametric linkage

Future flood risk and exposure

Compound flood risk estimation for existing substations

Project outcomes

Milestones and deliverables

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- *Integrated and innovative tools for the statistical analysis of flood events and their driving mechanisms that account for climate change effects.*
- *A parametric linkage between the return periods of observed hydrometeorological extremes and the inundation levels.*
- *Estimates of exposure and flood risk for the remainder of the 21st century, based on future climate scenarios.*
- *Real-time early warnings for potentially hazardous conditions over existing Eversource Energy substations.*

Research Impact

Links to EEC research pillars

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1. *Advances leading-edge research and technology to assure reliable power during extreme weather events and limit outages for substantial portions of the grid.*

2. *Identifies potential vulnerabilities of the system and highlights areas for design improvements toward enhanced resiliency.*

3. *Addresses existing needs, and provides useful and interpretable tools, while encompassing the effects of climate change on flood risk.*

4. *Supplies valuable information on potential future exposure of Eversource Energy critical infrastructure across the State of Connecticut.*