Consortium for Climate Risk in the Urban Northeast (CCRUN)

A NOAA Regional Integrated Sciences and Assessments (RISA) Project

Co-generated Climate Science Information for Urban Decision Makers

Boston

New York

Philadelphia

CCRUN

Mr. Daniel Bader

RISA Regional Integrated Sciences and Assessments

CCRUN Team

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CCRUN

RISA Regional Integrated Sciences and Assessments

CCRUN Problem Statement

Urban populations and infrastructure have unique vulnerabilities to extreme climate events, and these vulnerabilities are projected to increase in the future. The metropolitan areas of the Northeast U.S. are at the vanguard of resilience efforts, in part due to the involvement of CCRUN scientists in each city's efforts. ***However, preparation for the full range of climate risks facing the region requires much more work.*** *The primary challenge is* ***to make these resilience efforts – both underway and planned – as successful as possible, and to scale them up to meet the scope of the need****.*

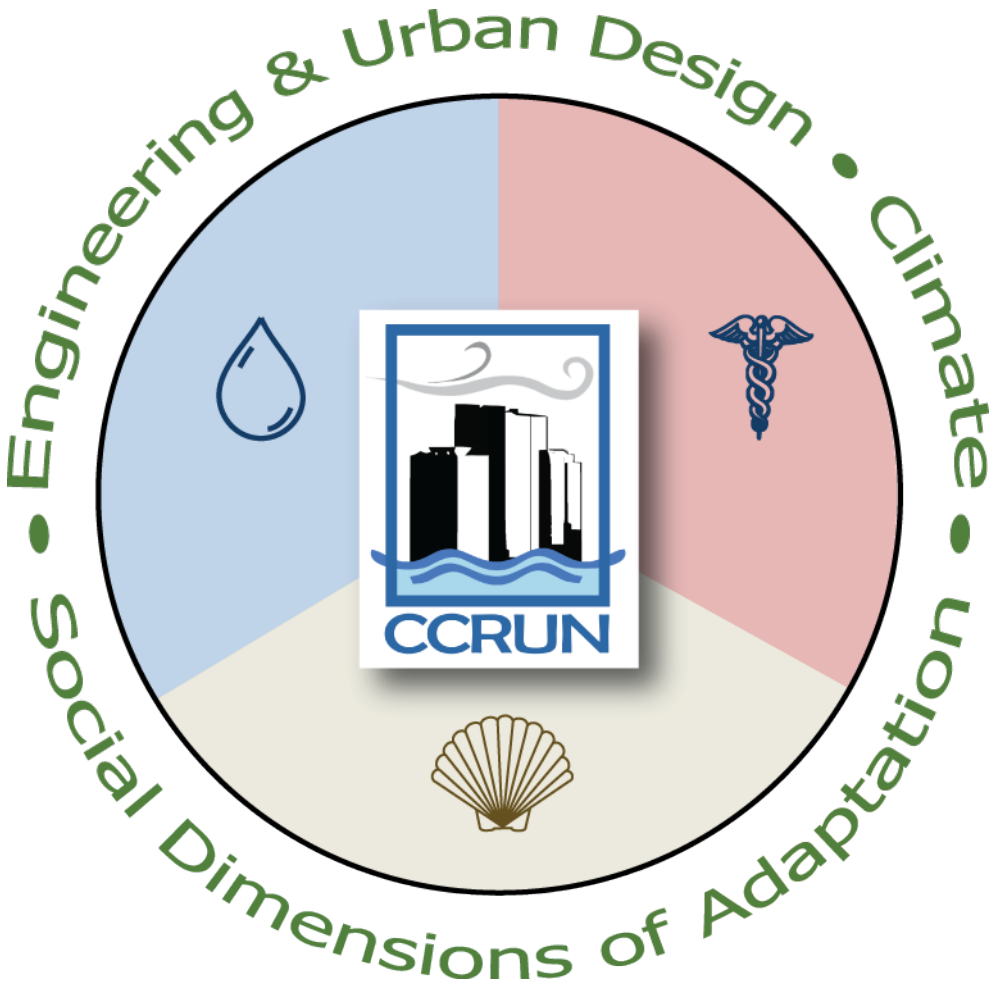
Cross-cutting Research Questions

- ***Research Question 1: Climate and Climate Impact Information.*** *Which climate and climate impact information products, including CCRUN Phase I products, are influencing decision- making and adaptation action? How and why are these products being used? What modifications would be needed to address different types of stakeholders? What types of communities of practice based on co-generation of knowledge have been most successful?*

- ***Research Question 2: Adaptation.*** *Which adaptation strategies are most effective for different urban populations and in different urban contexts? How can these strategies be improved? Would alternate strategies have yielded better outcomes?*

- ***Research Question 3: Transformation/Opportunities for Large-Scale Action.*** *What are the region's key conditions (e.g., institutional, regulatory, infrastructural, and/or socioeconomic) that serve as opportunities for, or barriers to, 'ramping up' meaningful climate resilience practice?*

Research Sectors and Themes



CCRUN

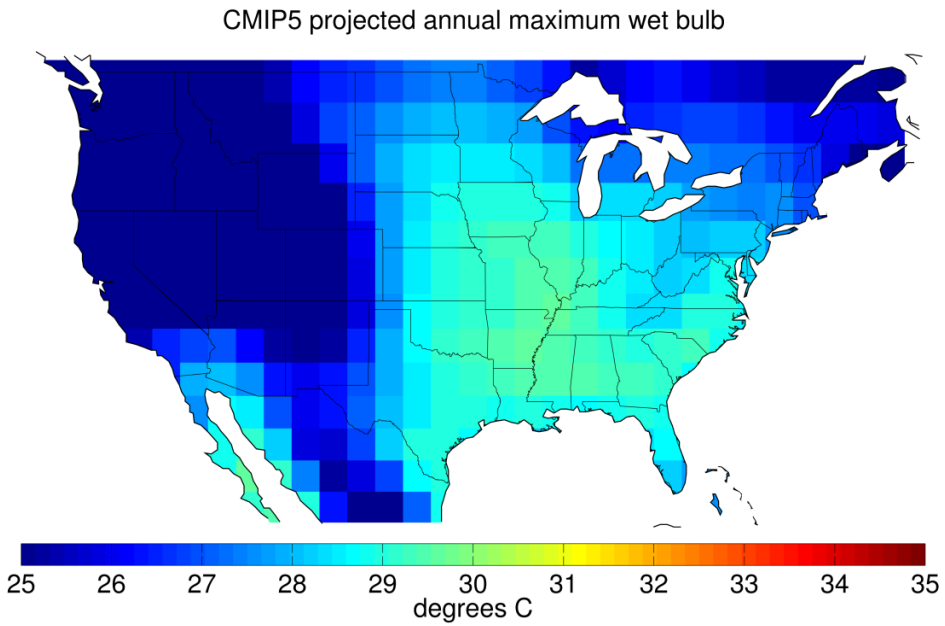
RISA
Regional Integrated Sciences and Assessments

Sample CCRUN Activities

Primary Sector	Select Phase I Activities & Products	Sample Outcomes	Select Phase II Proposed Activity/Products
Climate	Downscaled climate projections for Philadelphia, NYC, and Boston; city-wide climate risk assessments, including NPCC Report; climate science contributions to Sea Level Tool for Sandy Recovery	Provided climate science foundation for $20 billion SIRR; contributed to the formation of a community of practice around coastal mapping and planning	Focused analysis on potential changes in extreme events, including heat stress (heat and humidity), intense precipitation, and coastal storms
Coasts	Hydrodynamic modeling and mapping of coastal flood risk in the NYC region	Identified and communicated urban locations with greatest flood risk vulnerability	Hydrodynamic modeling and mapping of 1) coastal flood risk in Philadelphia and Boston and 2) adaptation strategy impacts on the amount of coastal flooding
Health	Risk assessment of projected heat impacts on mortality and morbidity in Philadelphia, NYC, and Boston	Formation of climate & public health communities of practice	Extend work to consider health impacts of 1) combined heat and humidity, and 2) coastal storms
Water	Decision support tools for managers of water supply in NYC, Boston, and Providence based on projected changes in average temperature and precipitation	Built capacity and informed water sector decision-making around drinking water supply issues	Assess and map flood risk for water infrastructure by integrating updated extreme rainfall projections (IDF curves), sea level rise & coastal flooding, and elevation of system nodes

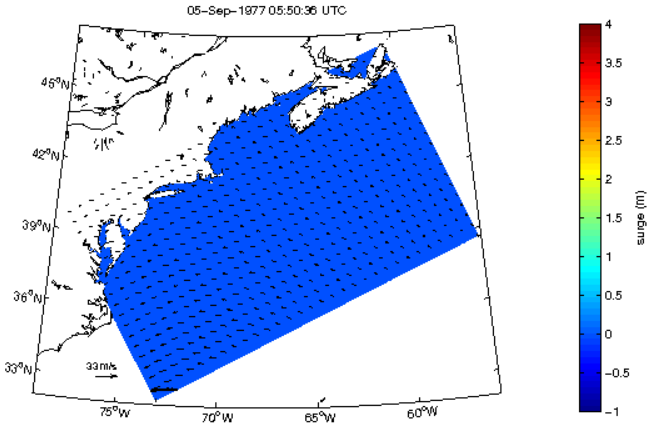
Climate Science

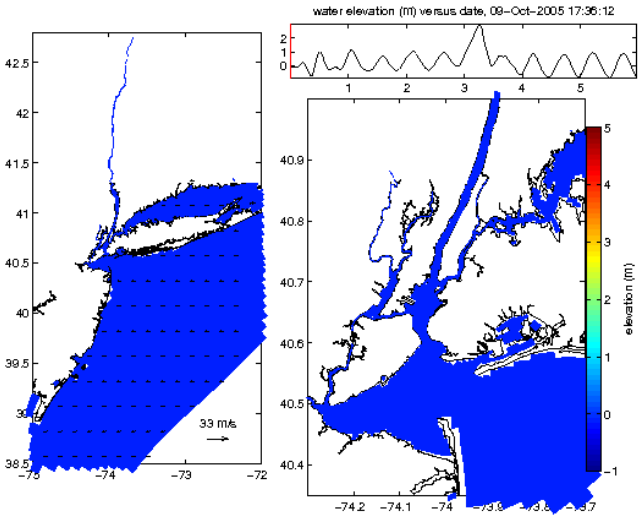
- Advance understanding of the extreme events that most impact our urban stakeholders:
  - High heat and humidity
  - Heavy rain events
  - Coastal storms
- Projections will be co-generated with decision-makers
- A new focus will be providing climate information to support the evaluation of engineering and adaptation actions
- Key Points
  - Small changes in average conditions can be associated with large changes in the frequency, intensity, and duration of climate extremes
  - Climate change can impacts urban systems in nonlinear ways, with potential for cascading effects



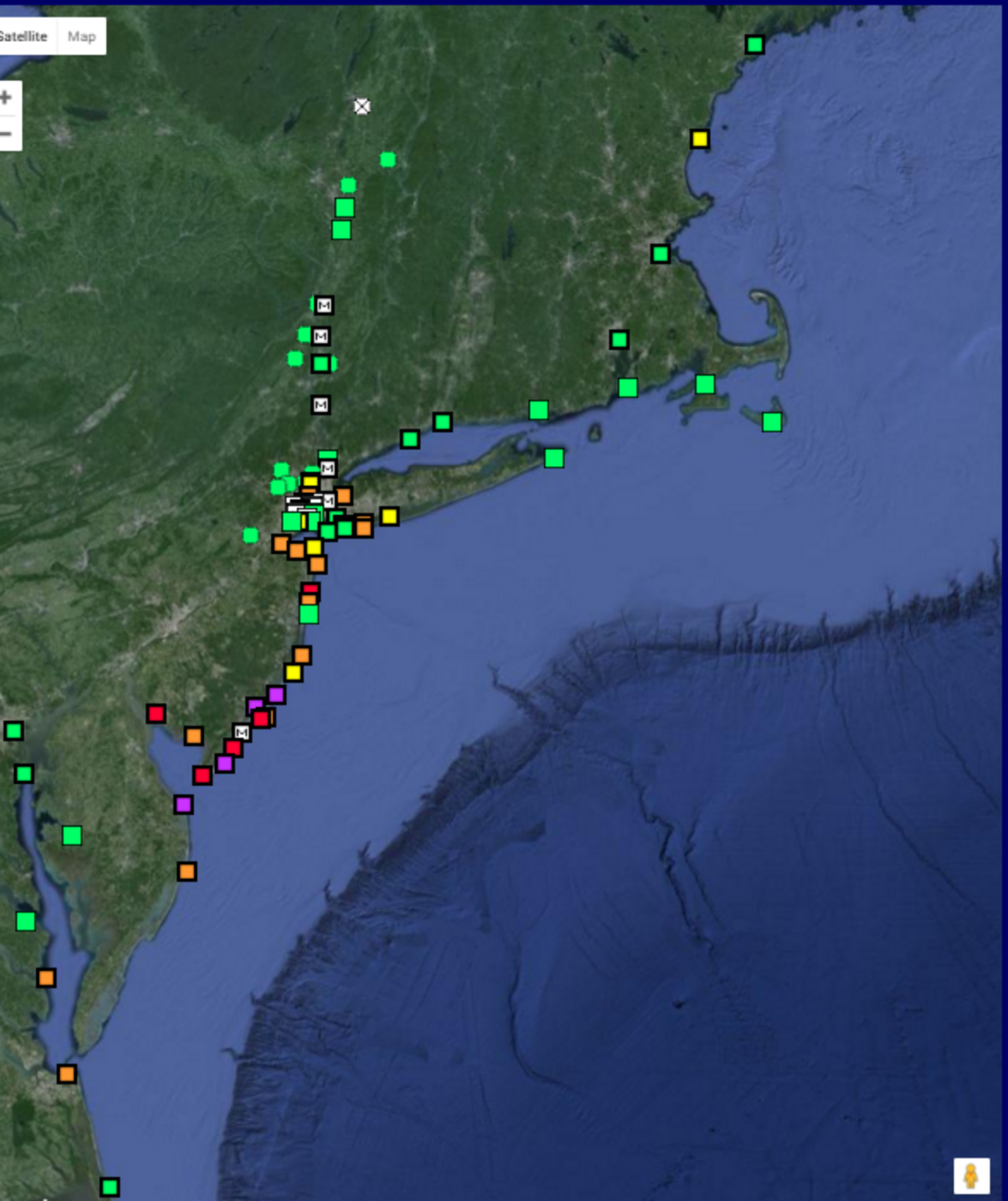
Coastal Core Capabilities and Interests

- Ocean modeling, including:
  - Flooding, waves, erosion storm surges, waves, erosion, water quality
- Coupled atmosphere-ocean urban modeling
- Probabilistic forecasting
  - This week (weather), this year, or future decades
- Quantification of flood adaptation measures





Forecast Period: 2016-01-23 10:00 AM through 2016-01-26 10:00 AM ET



SFAS Stations

Station: Select a Station to Display Time Series Plot

- Major Flood
- Moderate Flood
- Minor Flood
- Near Flood
- Normal Levels
- Blowout
- Model Predictions Only, Currently

Marker color indicates current water level.
Blinking markers indicate predicted flooding.

Page auto-refresh in: 4:27

To **register for email flooding notifications**, or to update registration information, enter your primary email and click the Manage... button:

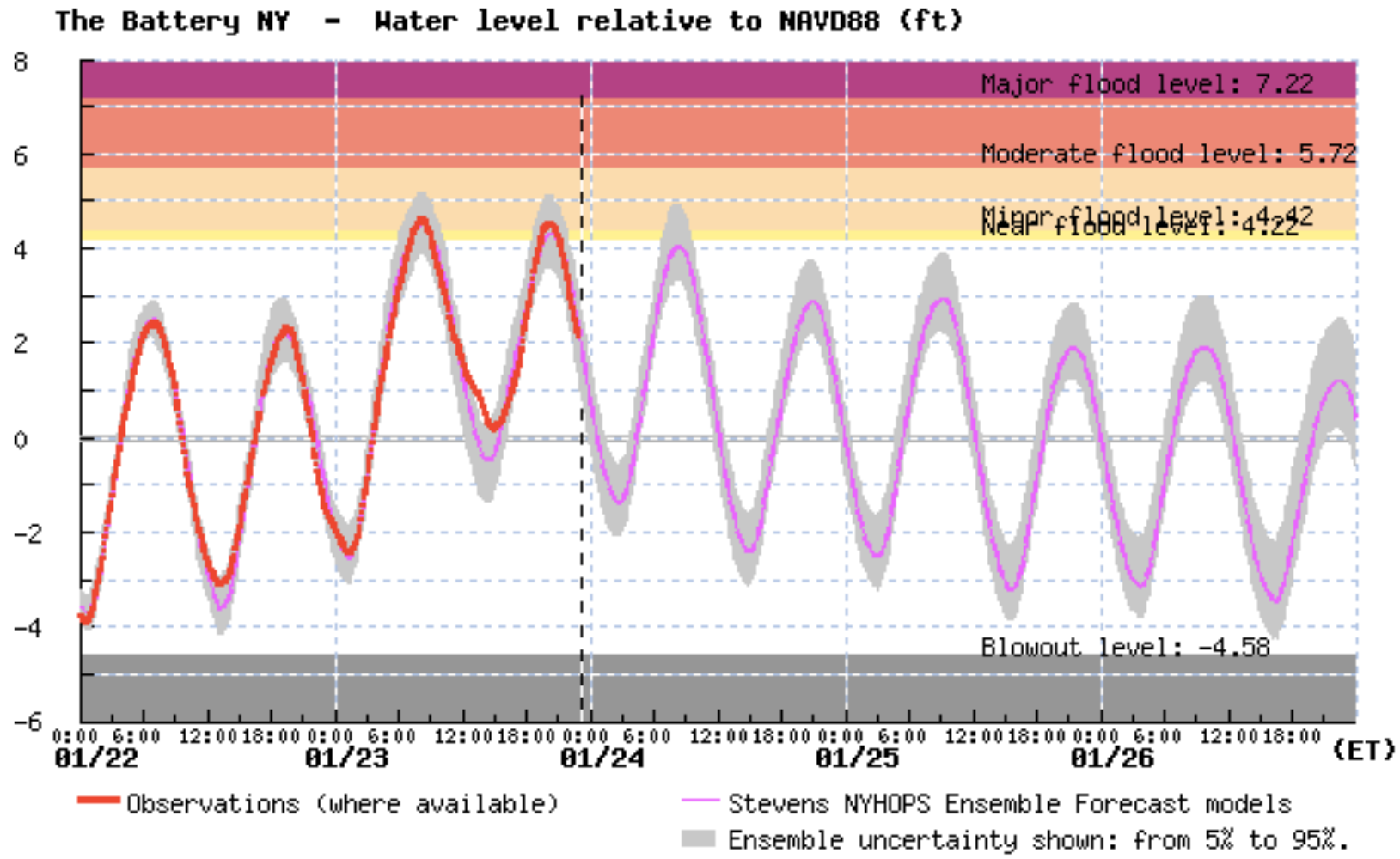
Manage Email Notifications

If you have questions or comments, please contact:
Dr. Nickitas Georgas

Latest News about SFAS as of: December 08, 2015

The Stevens FAS is a collaboration among
Stevens Institute of Technology
Stony Brook University
NOAA Meteorological Development Lab
NJ Meadowlands Environmental Research Institute

Funding has been provided by
The Port Authority of New York and New Jersey,
New York Sea Grant, and other sponsors.


The Battery NY - Water level relative to NAVD88 (ft)
Major flood level: 7.22
Moderate flood level: 5.72
Minor flood level: 4.42
Near flood level: 4.22
Blowout level: -4.58
8
6
4
2
0
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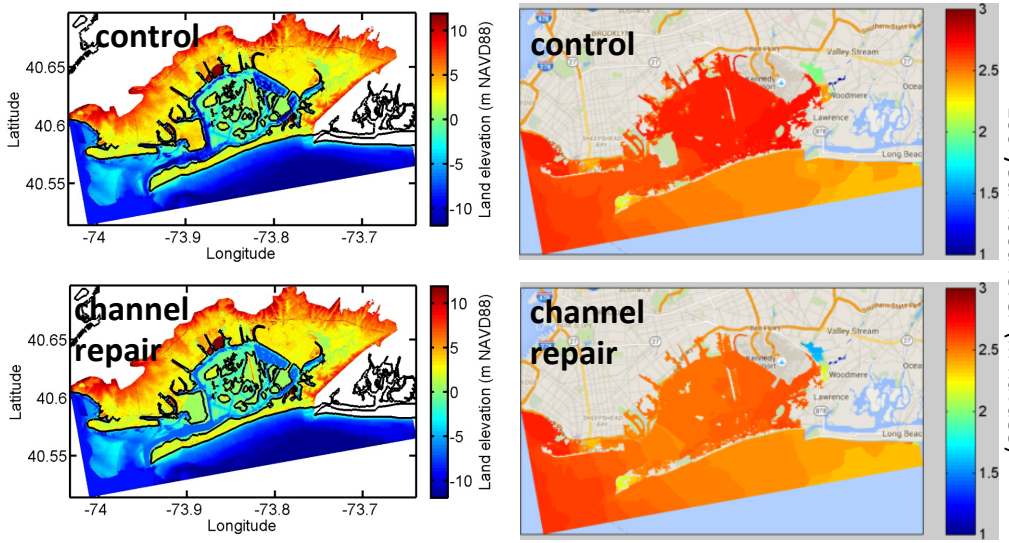
01/22
01/23
01/24
01/25
01/26
(ET)
Observations (where available)
Stevens NYHOPS Ensemble Forecast models
Ensemble uncertainty shown: from 5% to 95%.

Proposed Coastal Products

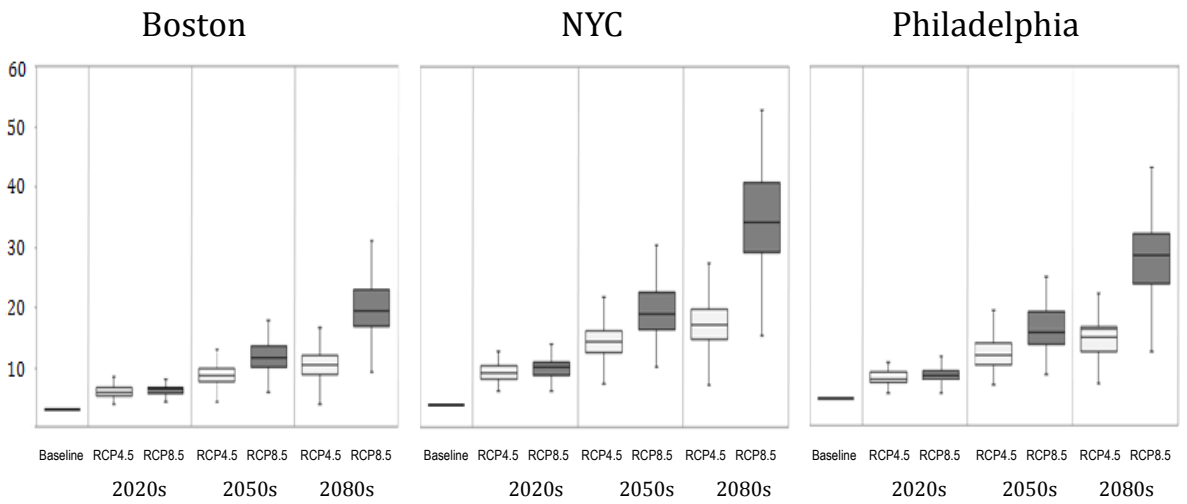
- NYC, Boston, Philadelphia flood hazard assessments, mapping
- Innovative flood forecasting products
- Flood adaptation quantification
- Broader, more tangible flood metrics and resilience metrics
- Dynamic flood mappers

Innovating, Quantifying Flood Adaptation



Philip Orton

Health Mission and Goals



Baseline and projected annual heat-related mortality rates for 2020s, 2050s and 2080s according to the 33 GCMs and RCP4.5 and RCP8.5.

- Catalyze cross-disciplinary, cutting edge science to address how climate change affects health
- Train a new generation of professionals in the public health dimensions of climate change vulnerabilities, impacts, and adaptation strategies
- Partner with governments, NGOs, and clinicians to ensure that the knowledge we generate informs strategies for reducing harm to vulnerable populations

Climate and Health Program Interests and Capabilities

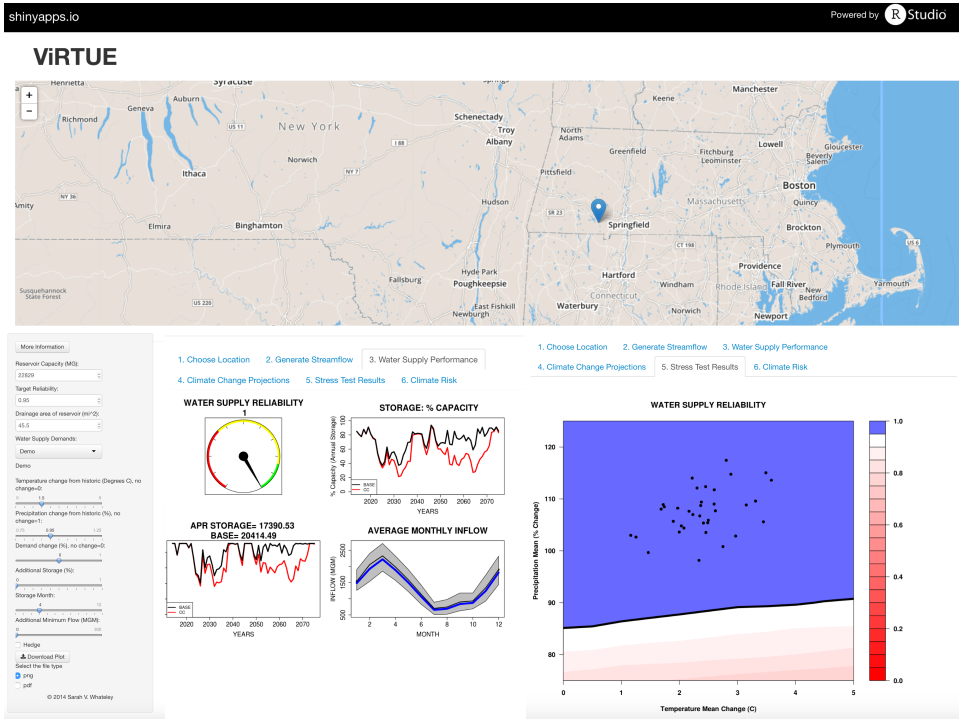
- Exposure Measurement
- Cold-Related & Heat-Related Health Effects
- Infectious and Non-Infectious Diseases
  - Influenza, west Nile virus, chikungunya
  - Blood pressure, asthma, sleep disturbance, heat illness, mortality
  - Mental Health: PTSD, depression
- Linking Climate Projections to Health Outcomes
- Disaster Preparedness & Health Disparities

Columbia Bike Study

Water Resources

- Evaluation of the potential impacts of climate change on the millions of individuals in the Boston-NYC-Philadelphia urban corridor served by some of the major water supply utilities in the region.

- Tools and models were care available for the three cities to calculate climate-induced impacts on water availability.
  - Web-based tool, known as ViRTUE, was developed that affords smaller municipalities the ability to estimate the reliability of their systems and water availability under climate change



- New research areas
  - Risks of Urban Flooding Utilizing Updated IDF Curves
  - Sediment and Nutrient Export in Urban Watersheds

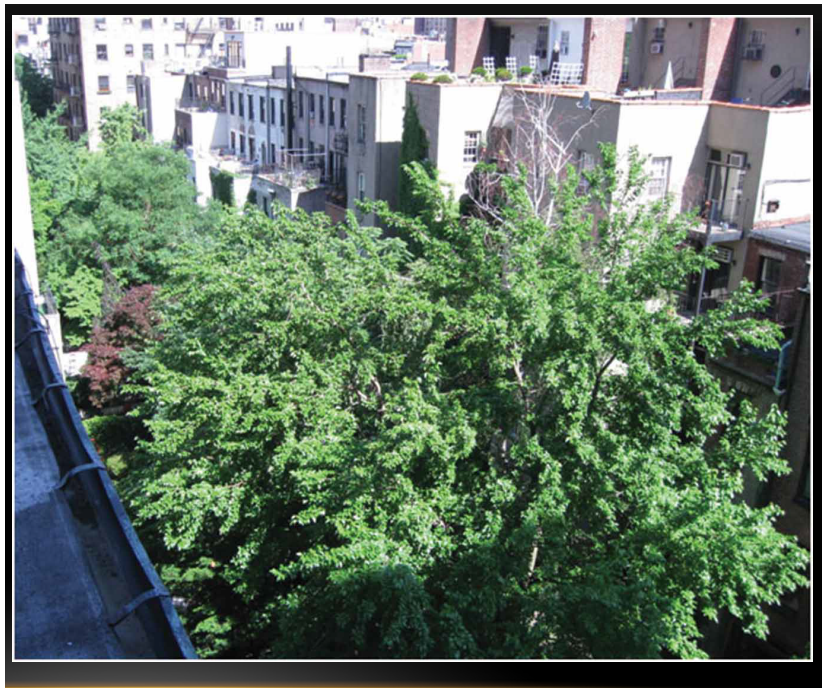
Engineering and Design

- Climate can alter the ability of all ecosystems to provide regulating, supporting, cultural, and provisioning services.

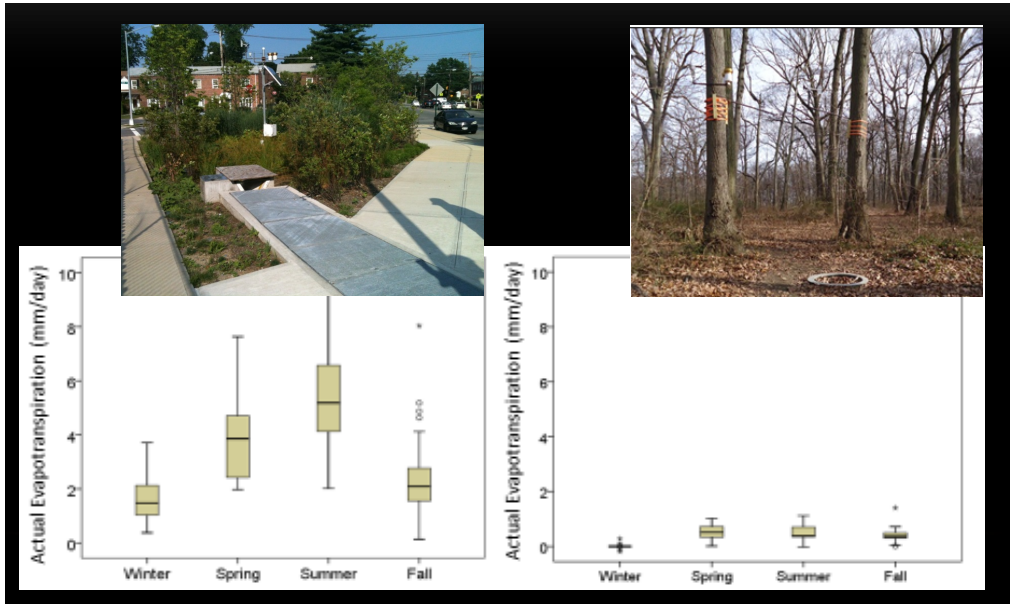
- Resilient cities support urban populations through a range of ecosystem services

- Though climate risks are widely acknowledged, rarely do government agencies have dedicated budgetary line items either for implementation of resilience plans, or to acto broadly on urban ecosystem service enhancement.

- By contrast, formidable investments are routinely made to upgrade infrastructure (e.g. to meet regulatory requirements, address gaps in service, replace aging assets) and to modify urban land use (due to cultural shifts associated with “resurging cities).



Engineering and Design Research Questions



- With sufficient climate data, can innovative new approaches to urban design, infrastructure planning and operation, and land use planning restore, enhance, or create ecosystem serve levels so as to engender resilience, despite regional climate change?

- Can resilience be fostered through gradual patterns of urban regeneration, guided by appropriate climate sensitive policies, or does it need specially funded infrastructure initiatives?

Social Science Research

- Focus on contexts and opportunities to accelerate meaningful adaptation

- Social science team will lead participatory processes (e.g., the Vulnerability, Consequences and Adaptation Planning Scenario (VCAPS) Process) in conjunction with the sector teams
  - Research Question 1; - evaluating the impact of existing climate products
  - Research Question 2 and 3; help assess the effectiveness of adaptation strategies in different contexts, using evidence-based measures of resilience
  - Research Question 3; identify and understand the levers that support, or hinder, adaptation

Next Steps

- More social science and more engineering/urban design, to support documentation and evaluation of adaptations that are underway and planned
- Emphasis on extreme events
- Broader partnerships with other regional thought-leaders and actors
  - Outreach to NOAA partners within the Northeast, including National Weather Service ,integration of CCRUN activities into pre-established stakeholder-NOAA relationships (formal partnership with the Northeast Regional Climate Science Center (NRCC) and the Eastern RCSD)
  - Northeast Climate Science Center
  - Urban Climate Change Research Network
- Novel approaches to interacting with these groups and other groups
  - Becoming a network hub
  - 'Working visits' with leaders from outside the region?
  - Advisory Council

For more information, please contact: Daniel Bader dab2145@columbia.edu