

# Updated Climate Projections for New York State

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# Climate Change and New York State

## *A Long History of Action*

- New York State and New York City both have long history of action responding to climate change
  - Responding to Climate Change in New York State (ClimAID)
  - New York City Panel on Climate Change
- Recent extreme weather events (including Hurricane Irene and Hurricane Sandy) illustrate climate vulnerabilities across the state and the need for adaptation planning



# Updating Climate Projections for New York State

- Develop new historical climate analysis and quantitative projections for mean annual changes and extreme events across the state for the 2020s, 2050s, and 2080s
- Projections will include
  - Mean annual and seasonal temperature and precipitation, as well as extreme events, including heat waves and intense precipitation;
  - Sea level rise, based on components from the latest climate models and emerging understanding of components not simulated by climate models;
  - Qualitative projections for some extreme events, including coastal storms and extreme winds
- Use ClimAID Report (2011) to guide regions and stations used for observed climate analysis and future climate projections

# New York State Climate Regions



# Observed Climate Trends (1900 -2012)

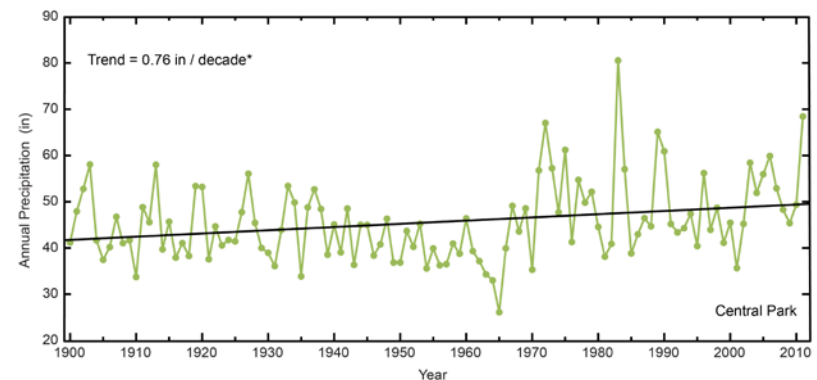
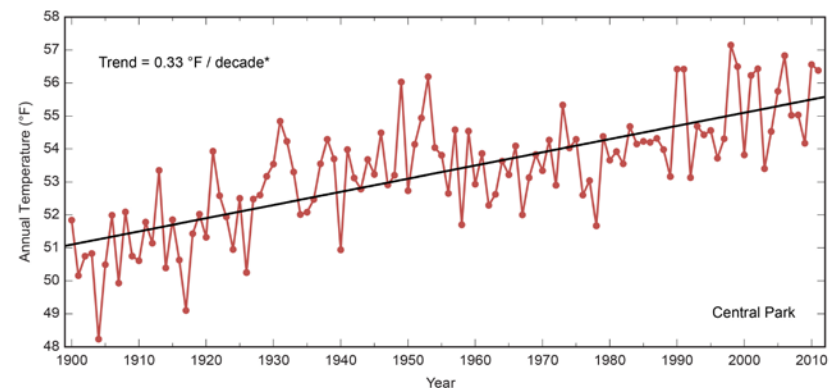
## *Temperature and Precipitation*

Observed Weather Station	Temperature Trend (° F/decade)	Precipitation Trend (in/decade)
Region 1 – Rochester	0.32**	0.34**
Region 2 – Port Jervis	0.35**	0.35
Region 3 – Elmira	0.09*	0.58**
Region 4 – New York City	0.33**	0.76**
Region 5 – Albany	0.22**	0.90**
Region 6 – Watertown	0.22**	0.54**
Region 7 – Indian Lake	0.21**	0.19

\* Trend is significant at the 95% significance level

\*\* Trend is significant at the 99% significance level

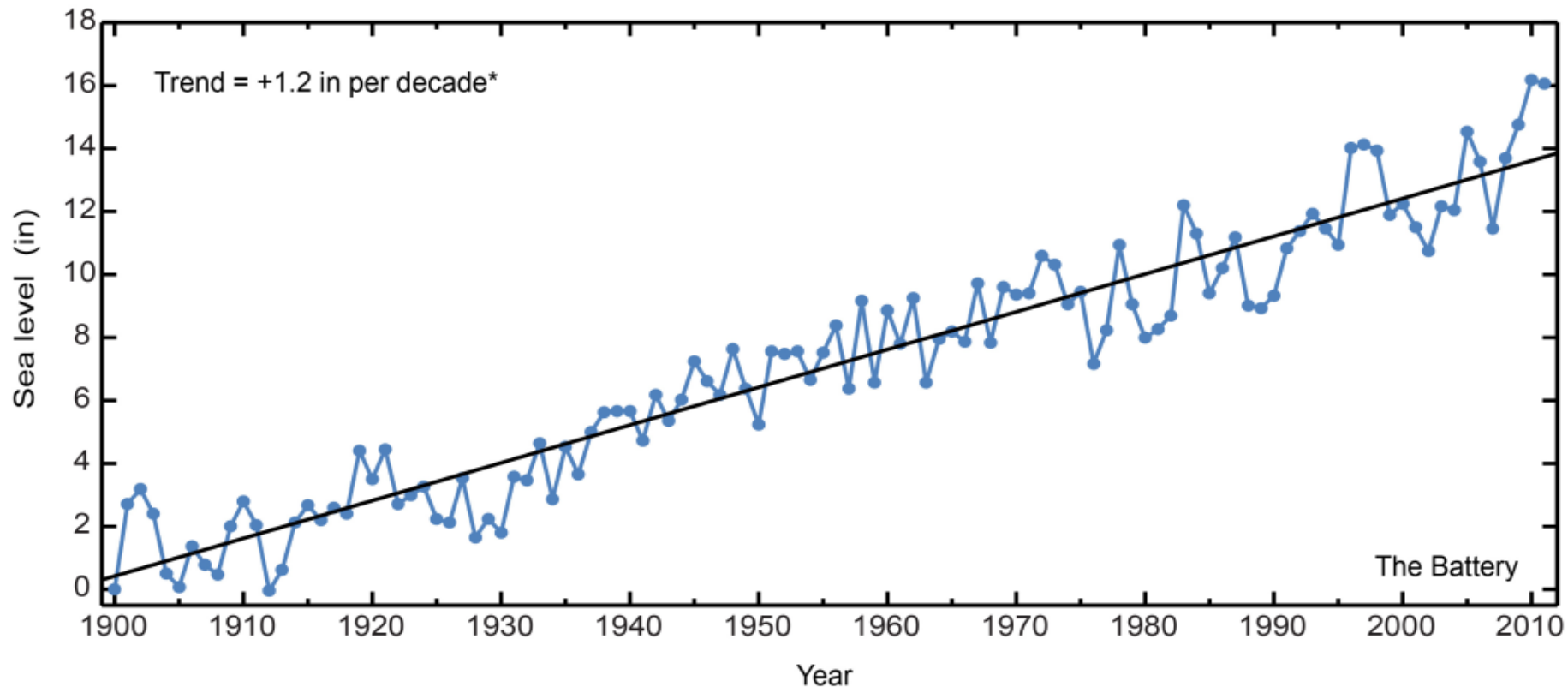
All data are from NOAA NCDC USHCN v2 dataset.





# Observed Climate Trends (1900 – 2012)

## *Sea Level Rise*

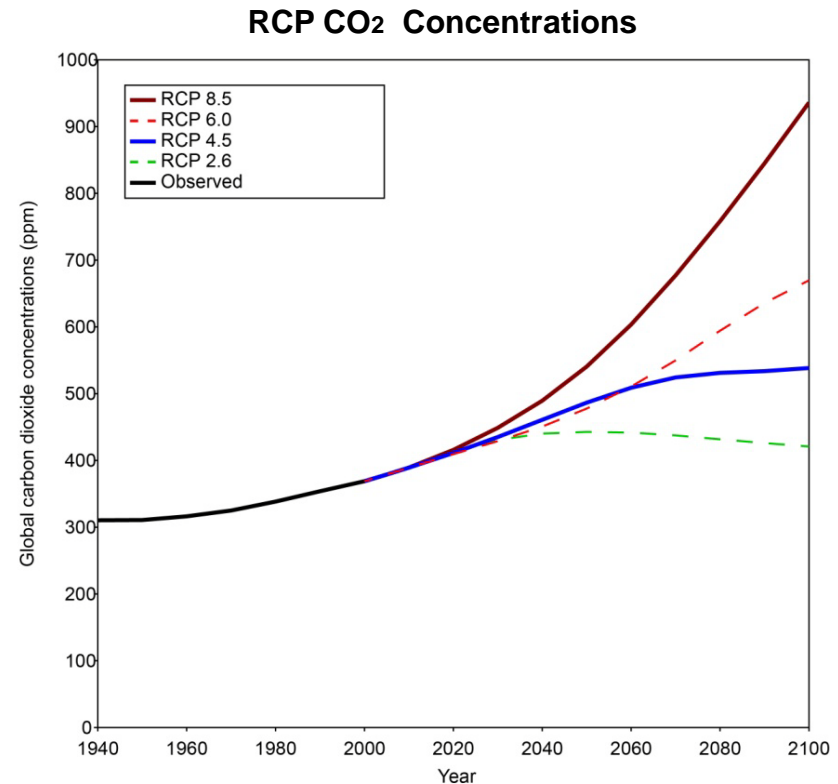


***Sea level in New York City (at the Battery) has risen 1.1 feet since 1900.***

# Climate Projection Methods

## *Temperature and Precipitation*

- **Variables**
  - Mean annual changes
  - Changes in extreme events
- **Quantitative projections based on global climate model simulations**
- **Coupled Model Intercomparison Project Phase 5 (CMIP5)**
  - 35 global climate models (GCMs)
  - 2 representative concentration pathways (RCP4.5, RCP8.5)
  - Timeslices: 2020s, 2050s, 2080s
  - 1 ensemble member per GCM
  - Single gridbox downscaling (Horton et al., 2011)



# Mean Annual Changes

## *Temperature and Precipitation*

Region 2 - Catskill Mountains and West Hudson River Valley

2013 Update

Air temperature Baseline (1971-2000) 48 °F	Low-estimate (10 <sup>th</sup> percentile)	Middle range (25 <sup>th</sup> to 75 <sup>th</sup> percentile)	High-estimate (90 <sup>th</sup> percentile)
2020s	+ 1.6°F	+ 2.2 to 3.1°F	+ 3.5°F
2050s	+ 3.1°F	+ 4.2 to 6.1°F	+ 6.9°F
2080s	+ 4.0°F	+ 5.4°F to 9.6°F	+ 10.7°F

Precipitation Baseline (1971-2000) 48 inches	Low-estimate (10 <sup>th</sup> percentile)	Middle range (25 <sup>th</sup> to 75 <sup>th</sup> percentile)	High-estimate (90 <sup>th</sup> percentile)
2020s	- 1 percent	+ 1 to + 8 percent	+ 10 percent
2050s	+ 1 percent	+ 3 to + 11 percent	+ 14 percent
2080s	+ 2 percent	+ 6 to + 14 percent	+ 18 percent

Based on 35 GCMs and two Representative Concentration Pathways. Baseline data are from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC) and are for Mohonk Lake, Port Jervis, and Walton, New York. Shown are the low-estimate (10th percentile), middle range (25th percentile to 75th percentile), and high-estimate (90th percentile) 30-year mean values from model-based outcomes.



# Sea Level Rise Methods

- **Developed single range**
  - Included future changes in polar ice sheets
- **Updated model-based components with CMIP5**
  - 24 Global Climate Models
  - 2 Representative Concentration Pathways (RCP 4.5 and RCP 8.5)
- **Revised meltwater and land-subsidence terms**
- **Added additional components**
  - Land water storage
  - Gravitational, isostatic, rotational ('fingerprint') term

# Sea Level Rise Projections

## New York City (Region 4)

Sea level rise <sup>1</sup> Baseline (2000-2004)	Low-estimate (10 <sup>th</sup> percentile)	Middle range (25 <sup>th</sup> to 75 <sup>th</sup> percentile)	High-estimate (90 <sup>th</sup> percentile)
2020s	2 inches	4 to 8 inches	11 inches
2050s	7 inches	11 to 24 inches	31 inches

<sup>1</sup> Based on 24 GCMs and 2 Representative Concentration Pathways.

# Next Steps and Future Work

- Complete quantitative and qualitative projections for all New York State climate regions
- Prepare short written report summarizing updated historical climate analysis and future climate projections
- Engage with stakeholders across the state to incorporate feedback into ongoing work