Projected Extreme Rainfall Intensity Duration Frequency (IDF) Curves for NY

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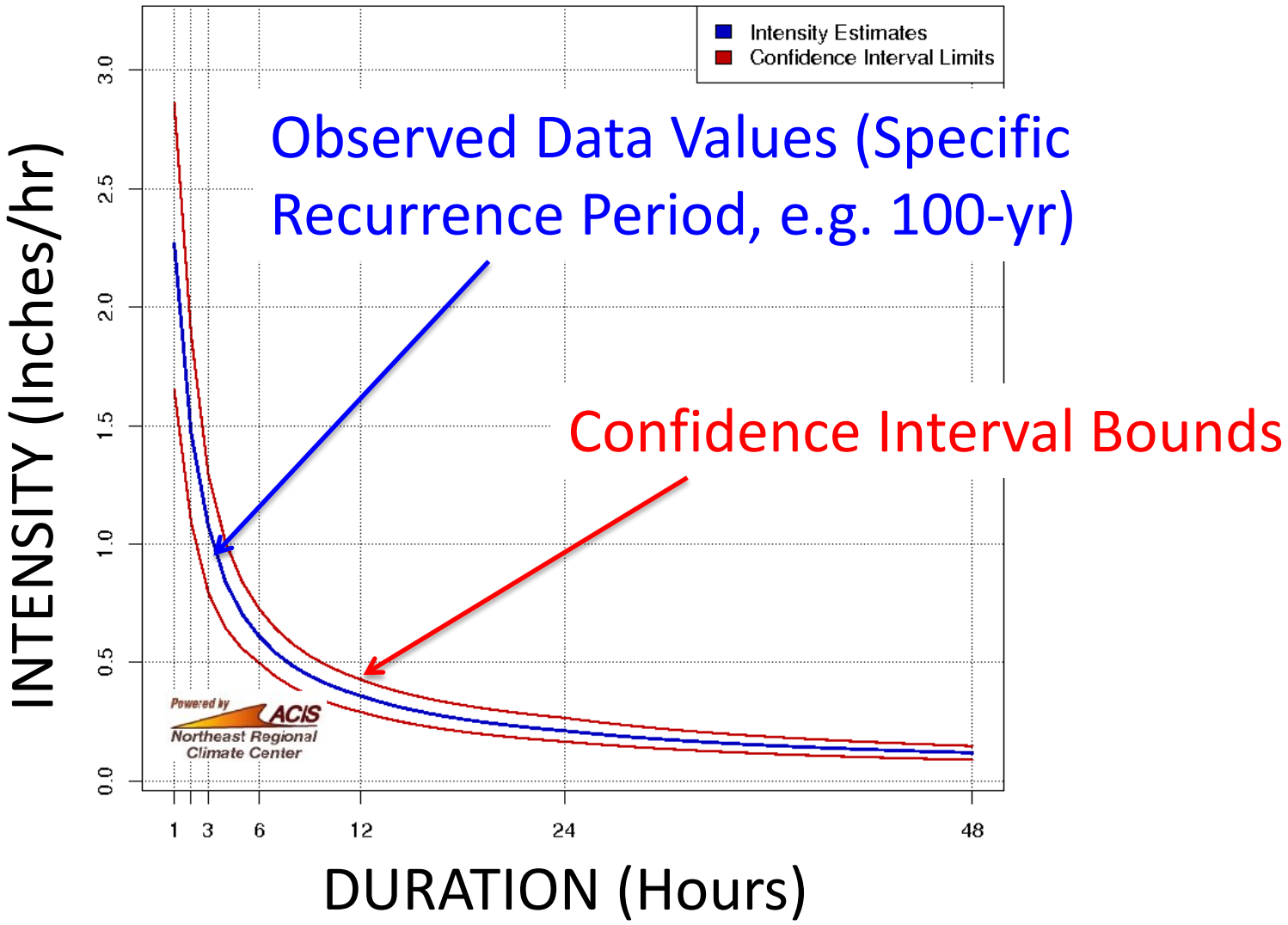
Anatomy of an IDF Curve



IDF Curves 101

- Partial Duration Series (PDS)

  ***n* highest** independent daily rainfalls **in *n* year** period

- Fit Statistical Distribution to Data

  Smooth sampling variations in observed period

  Extrapolate beyond period of record… 100-yr storm from 50-yr record

  Tested Beta-P (Wilks approach) and **L-moments GEV** (NOAA Atlas 14)

  Adopted L-moments GEV fits

- Monte Carlo Resampling Provides Confidence Intervals

  Randomly Draw 1,000 *n*-year samples from PDS.

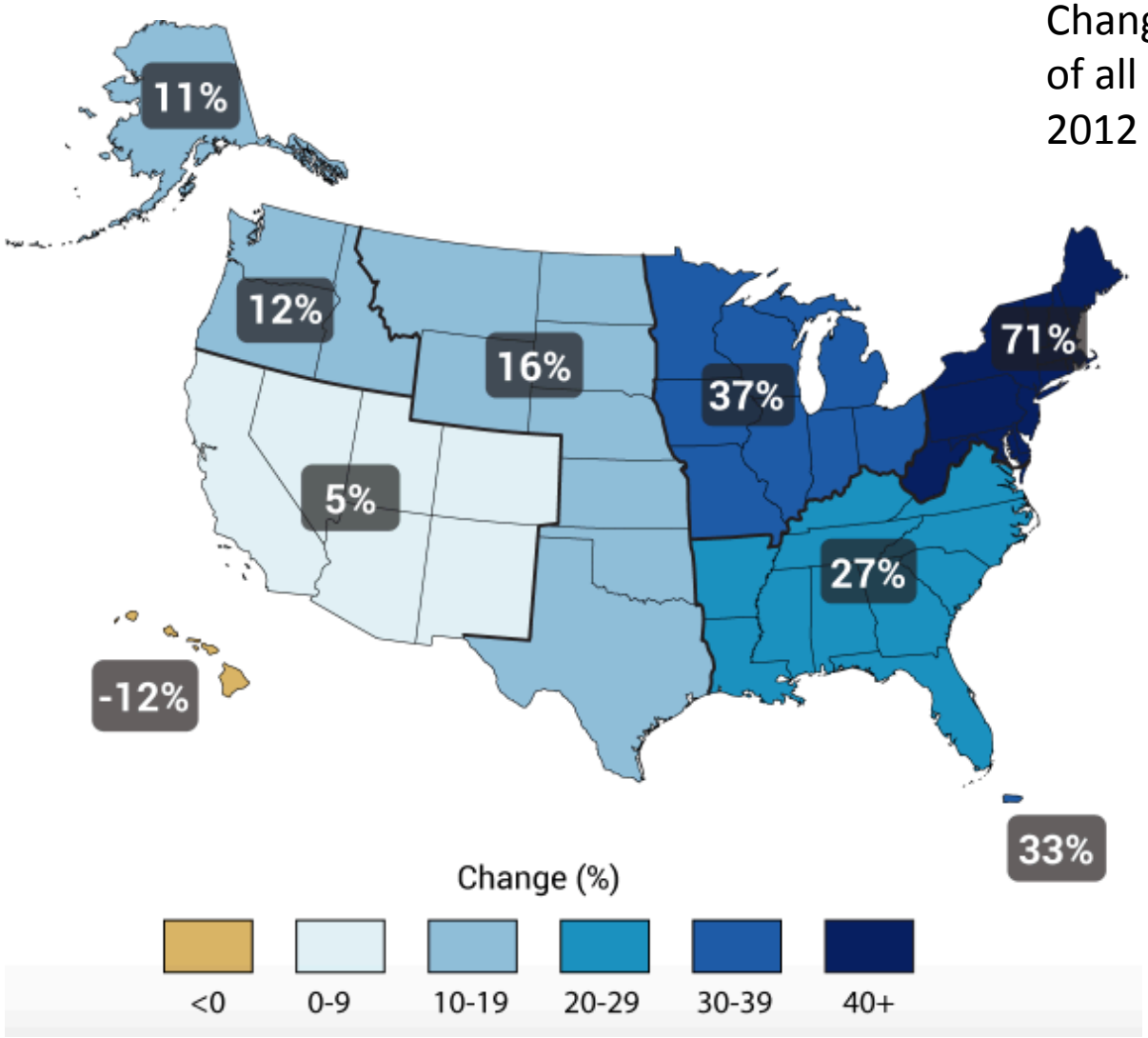
  Refit distribution to random samples.

  Retain 5th and 95th percentiles confidence interval (90%).

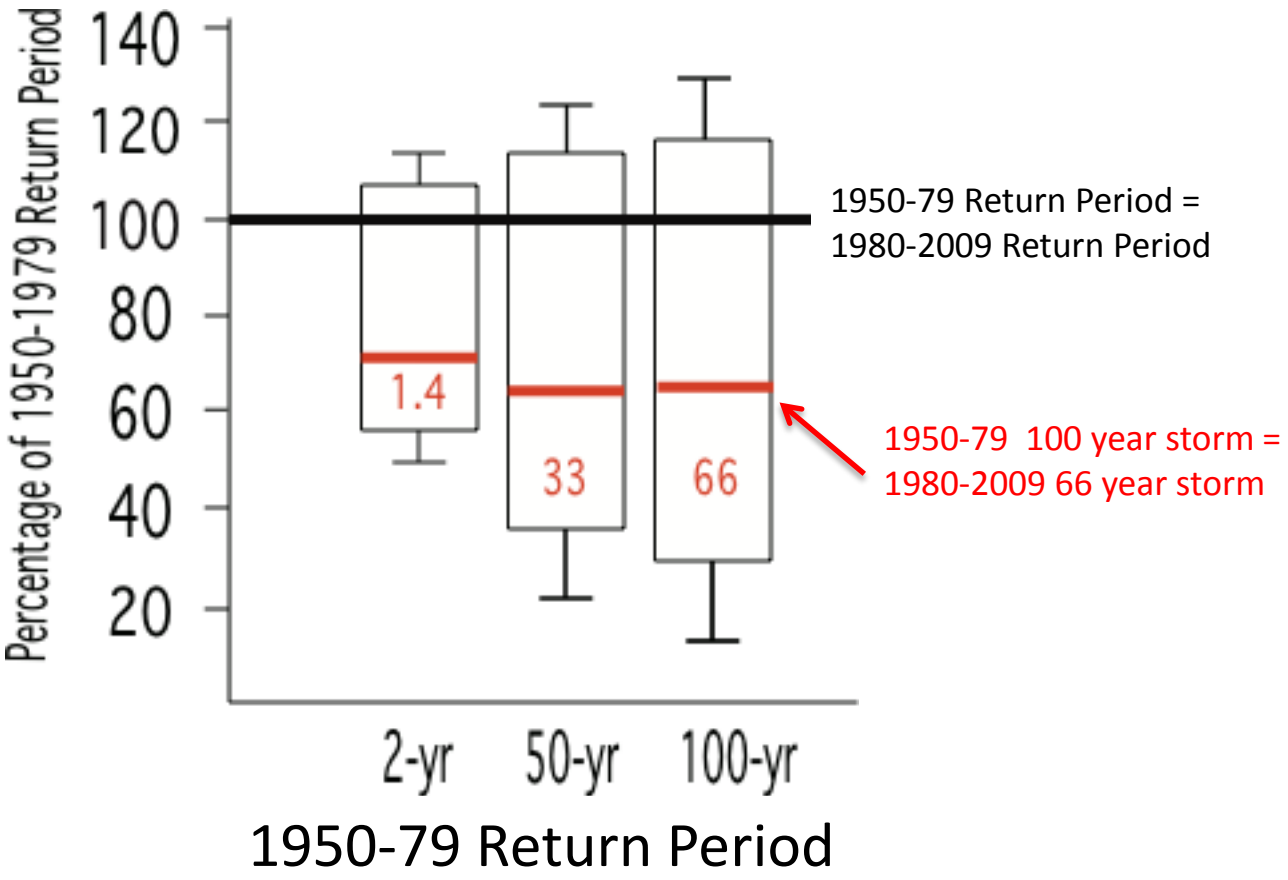
Extreme Precip in a Changing Climate

Change in heaviest 1% of all daily events 1958-2012

from Karl et al. 2009



Extreme Rainfall 1950-79 vs 1980-2009



The 100-year storm has become the 66 year storm!

DeGaetano, Arthur T., 2009: Time-Dependent Changes in Extreme-Precipitation Return-Period Amounts in the Continental United States. *J. Appl. Meteor. Climatol.*, **48**, 2086–2099.

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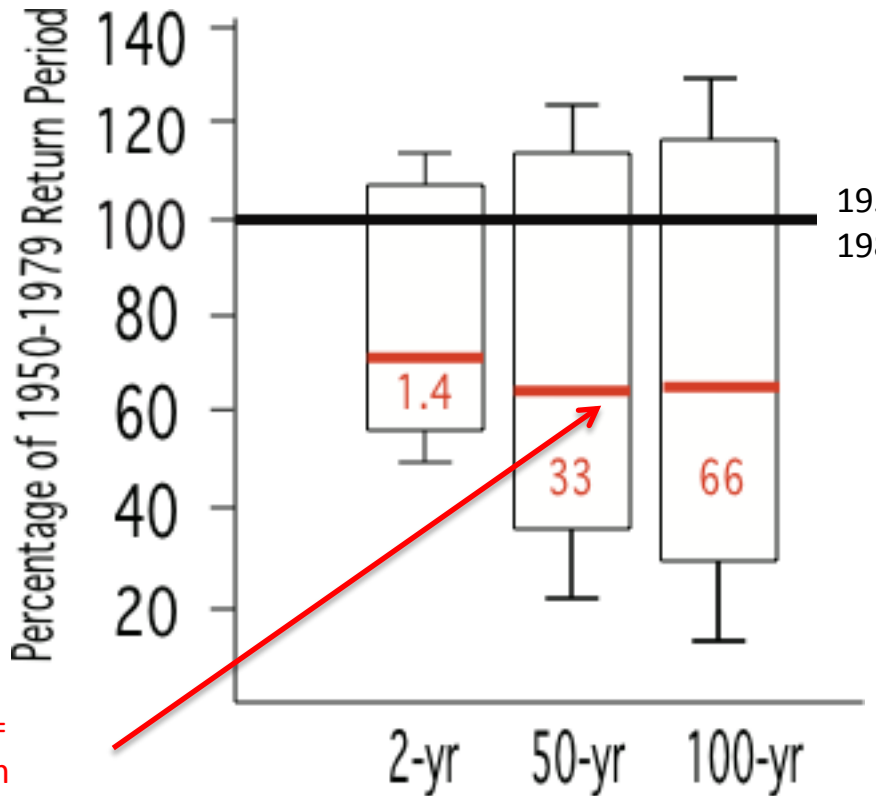


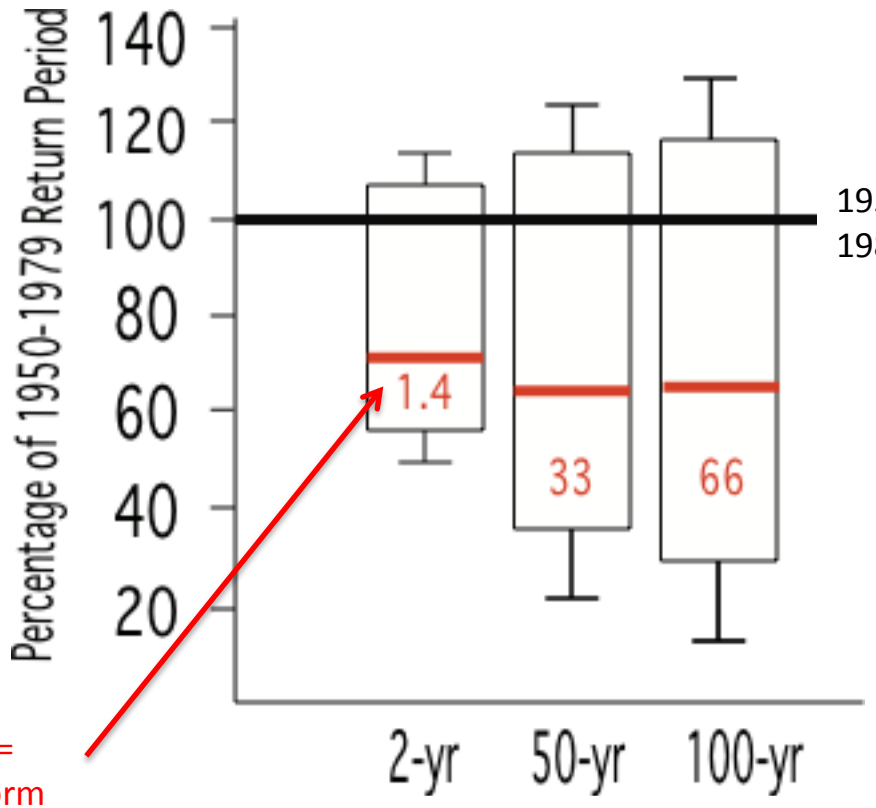
1950-79 Return Period =
1980-2009 Return Period

1950-79 50 year storm =
1980-2009 33 year storm

The 50-year storm has become the 33 year storm!

DeGaetano, Arthur T., 2009: Time-Dependent Changes in Extreme-Precipitation Return-Period Amounts in the Continental United States. *J. Appl. Meteor. Climatol.*, **48**, 2086–2099.

Extreme Rainfall 1950-79 vs 1980-2009



The 2-year storm has become the 1.4 year storm!

DeGaetano, Arthur T., 2009: Time-Dependent Changes in Extreme-Precipitation Return-Period Amounts in the Continental United States. *J. Appl. Meteor. Climatol.*, **48**, 2086–2099.

New York Climate Risk and Resiliency Act CCRA

- Advances NY's policies toward **climate change adaptation**
- Applies to **permitting, funding and regulatory decisions**

  For example

  Smart growth assessments
  Wastewater treatment plant funding
  Hazardous waste facilities siting
  Design and construction of petroleum and chemical storage facilities
  Oil and gas drilling
  State acquisition of open space

- Applicants must **demonstrate** that they have taken into account future physical climate risks caused by storm surges, sea-level rise or **flooding**.

Downscaling Approaches

1) Dynamical Downscaling (CORDEX) (also NARCCAP)

→ Regional climate models (RCMs) run at 50-km resolution and driven by atmosphere–ocean general circulation (AOGCM) models

2) Statistical Downscaling – Delta Method (CMIP5)

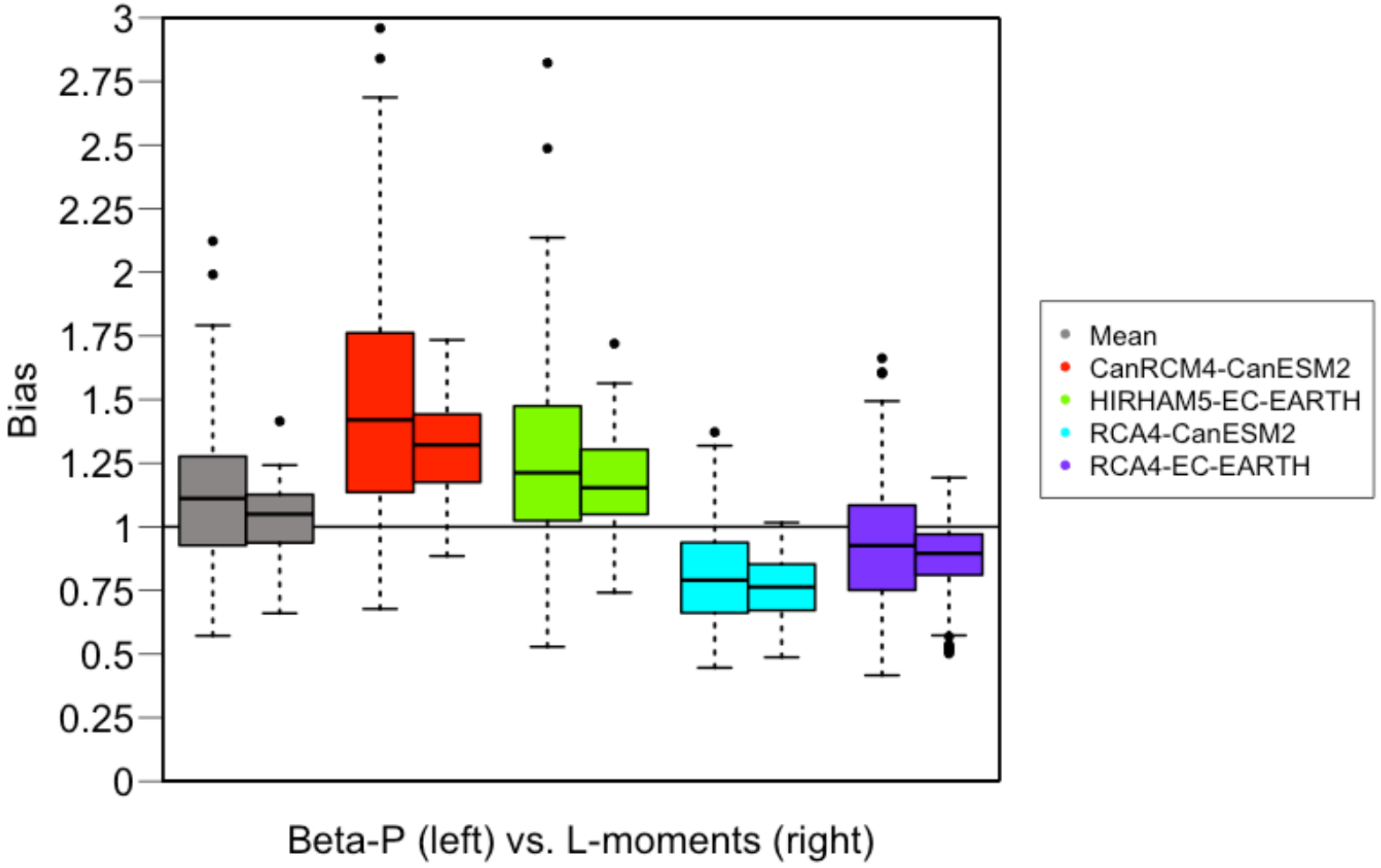
→ Compares model-simulated precipitation extremes between historical and future periods (at GCM resolution)

3) Statistical Downscaling – Analog Method (CMIP5)

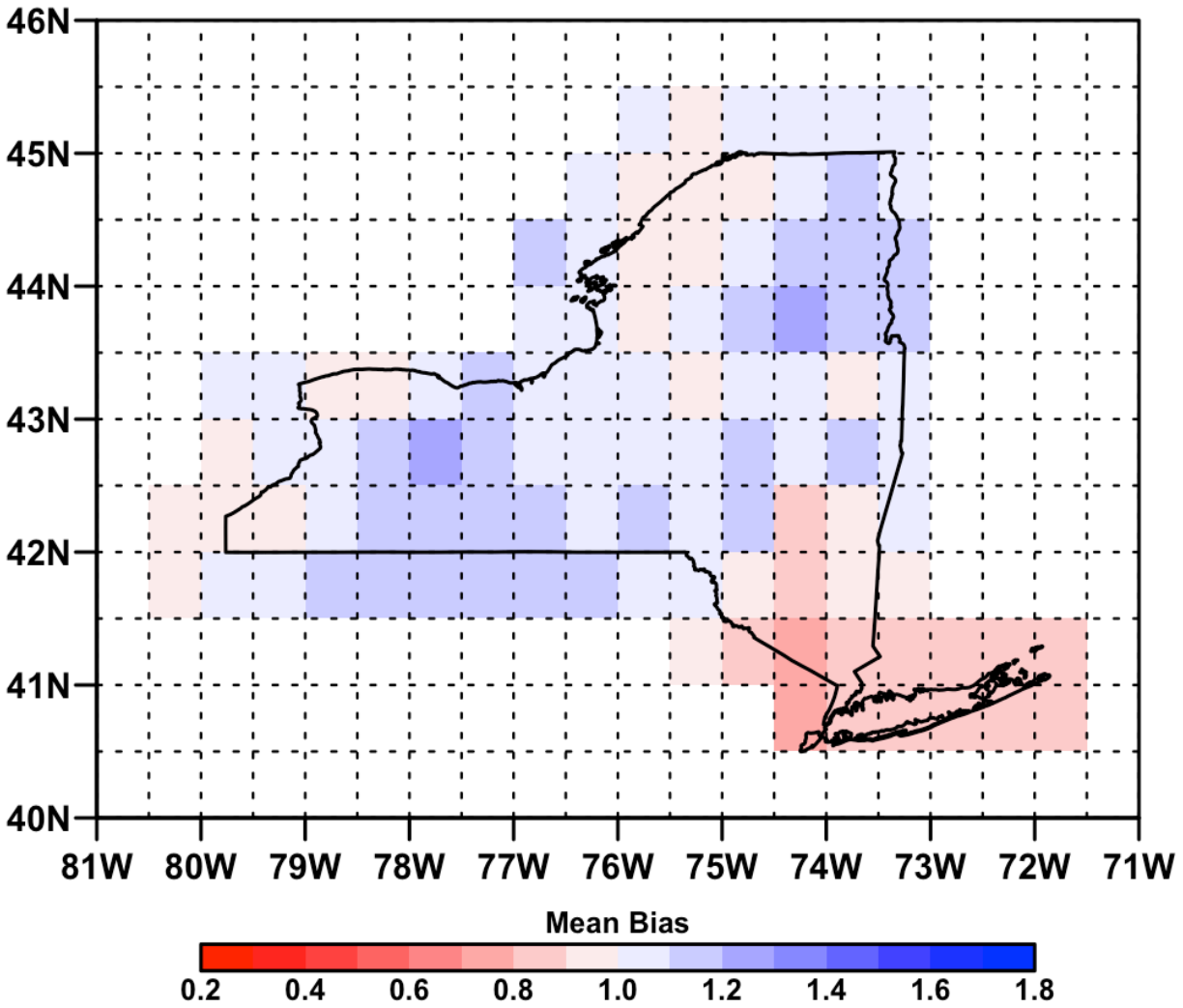
→ Uses historical weather map analogues to predict the occurrence of extreme precipitation on a given day


REALITY
CHECK
AHEAD

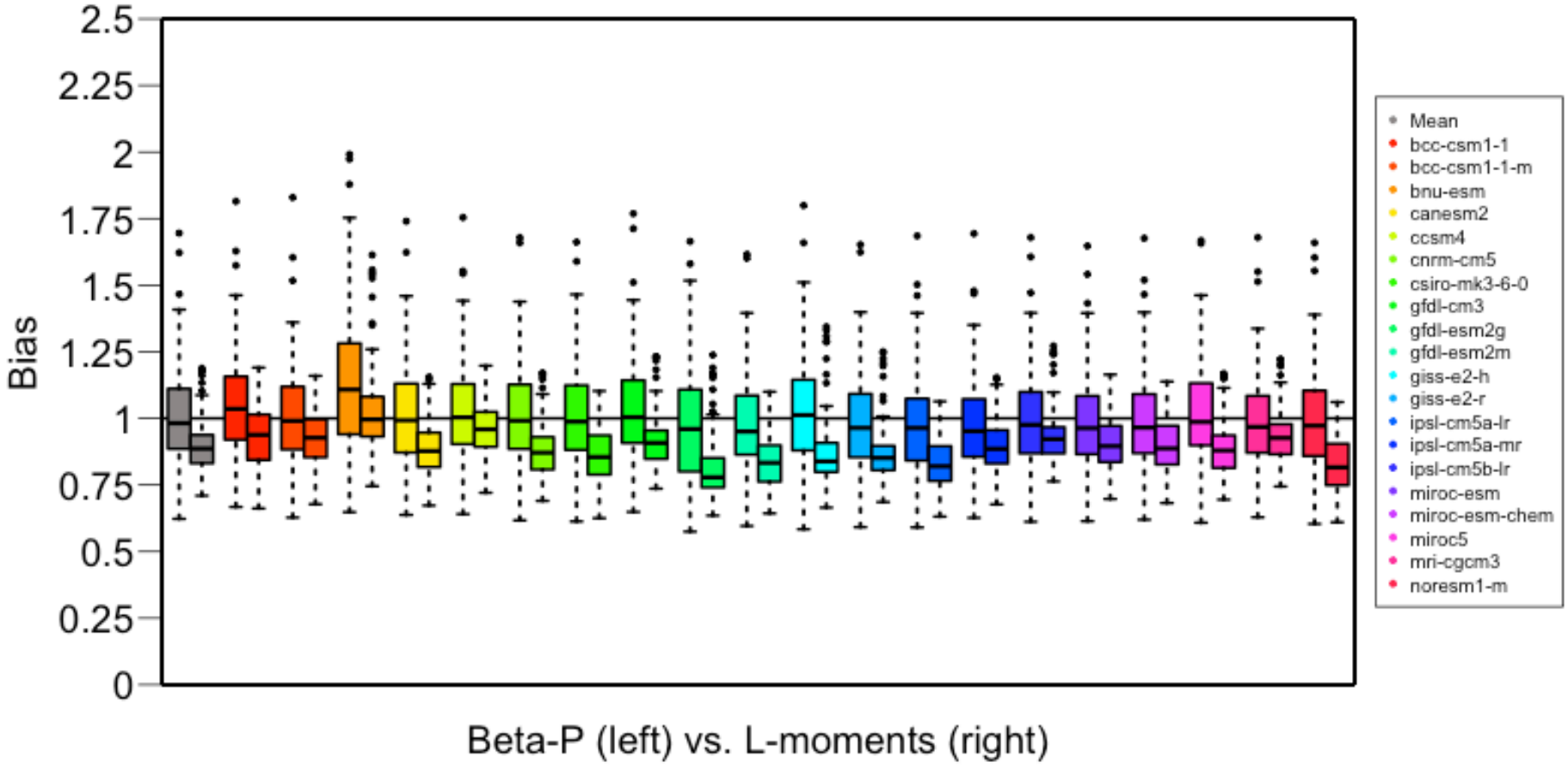
Bias: 1-day 100-year Rainfall Amounts
CORDEX vs. Observed



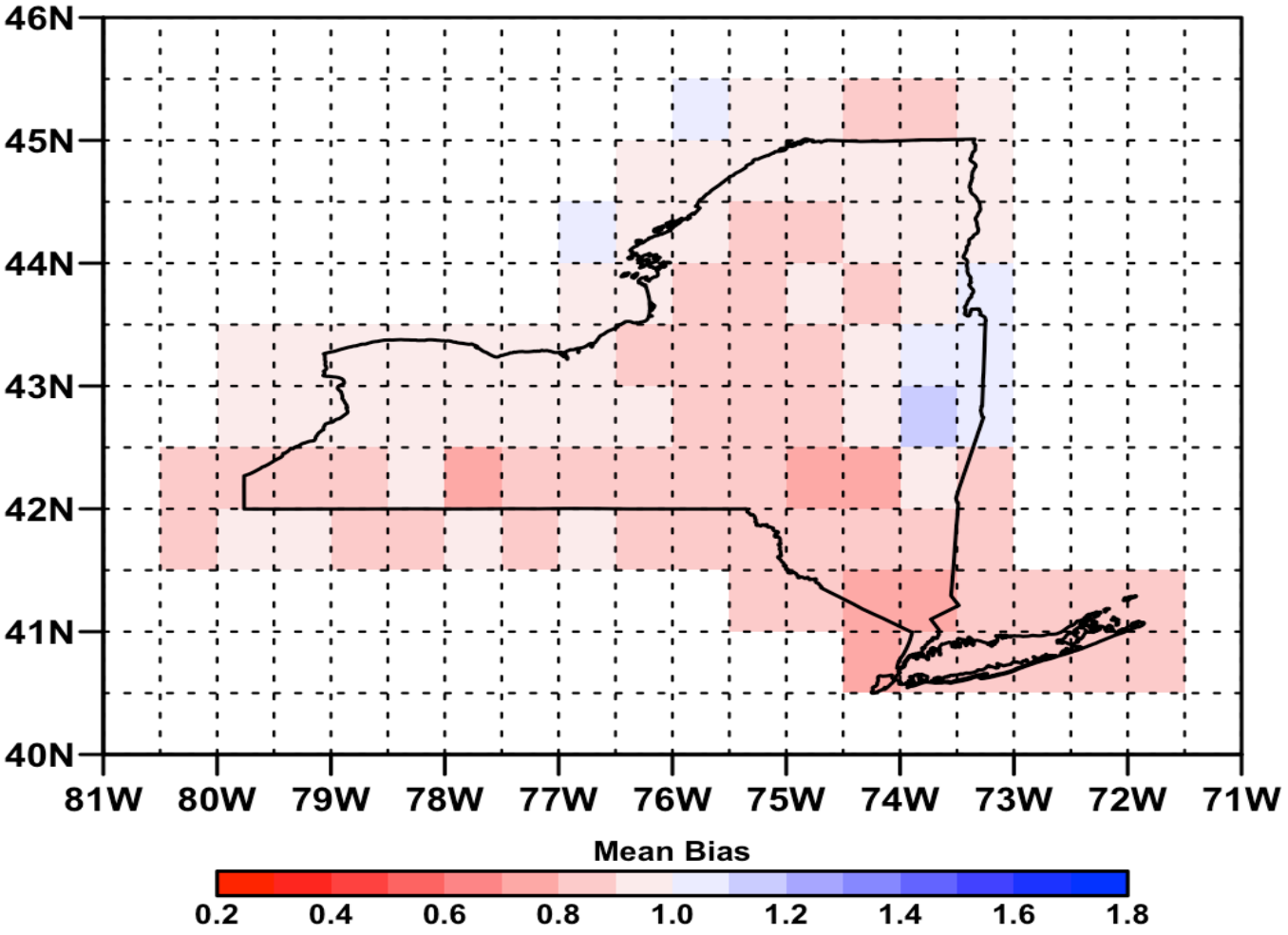
CORDEX vs Observed Ensemble Mean Bias: 1-day 100-year Rainfall



Bias for 1-day Extreme Rainfall Amounts
Analog Method (Reanalysis) vs. Observed



Analog vs Observed Ensemble Mean Bias: 1-day 100-year Rainfall

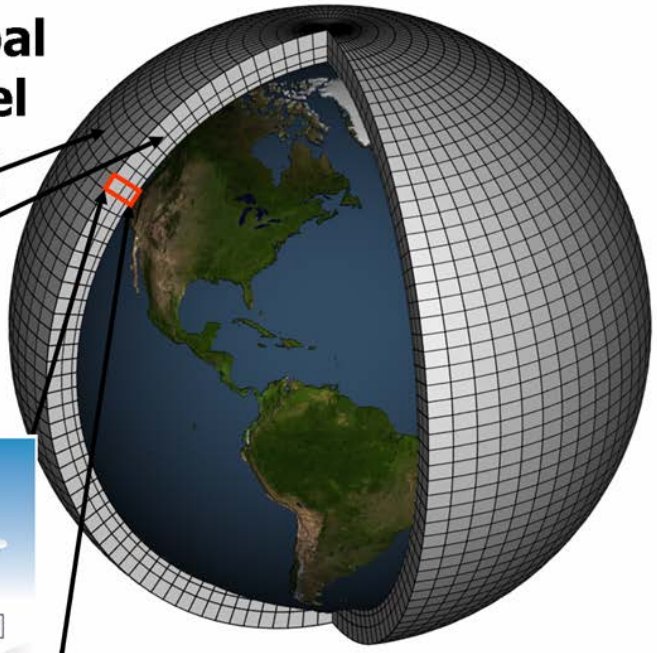


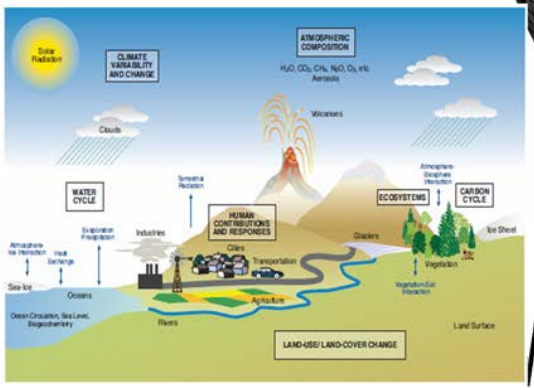
What Does the Future Hold?

Schematic for Global Atmospheric Model

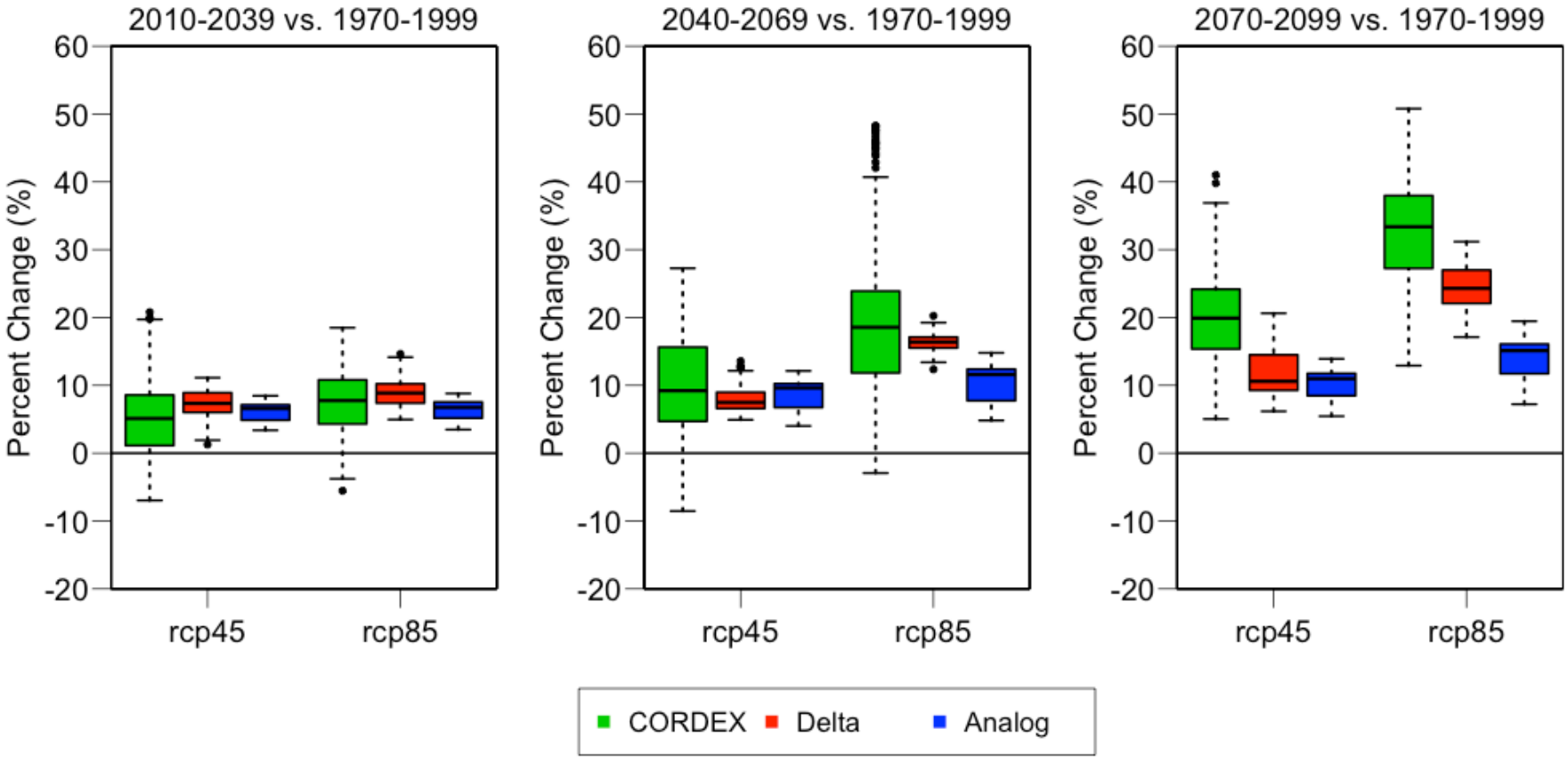
Horizontal Grid (Latitude-Longitude)

Vertical Grid (Height or Pressure)

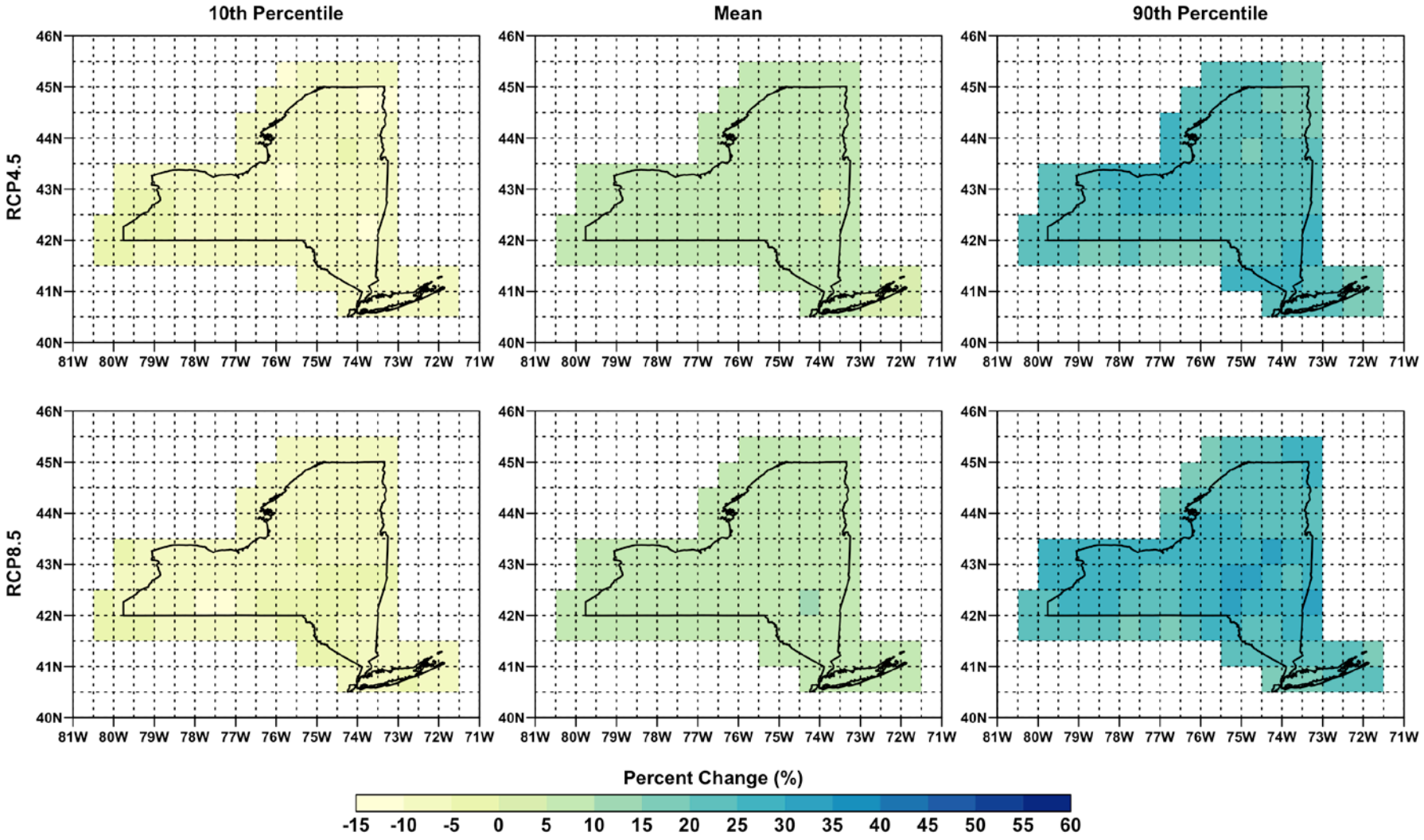




Projected Changes in 1-day Extreme Rainfall Amounts Relative to 1970–1999



Projected Changes in 1-day 100-year Rainfall Amounts 2010–2039 vs. 1970–1999



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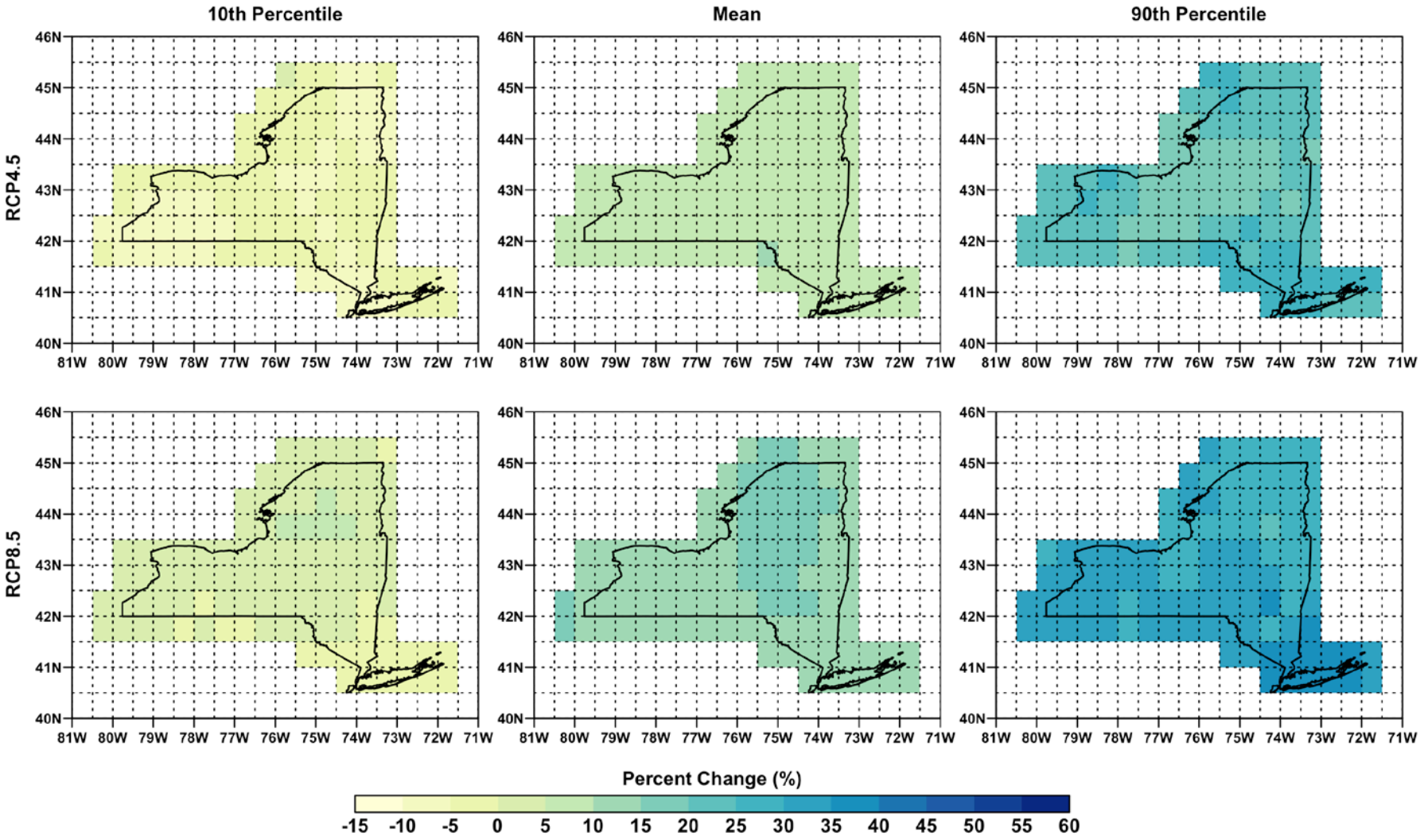
Projected Changes in 1-day 100-year Rainfall Amounts 2040–2069 vs. 1970–1999



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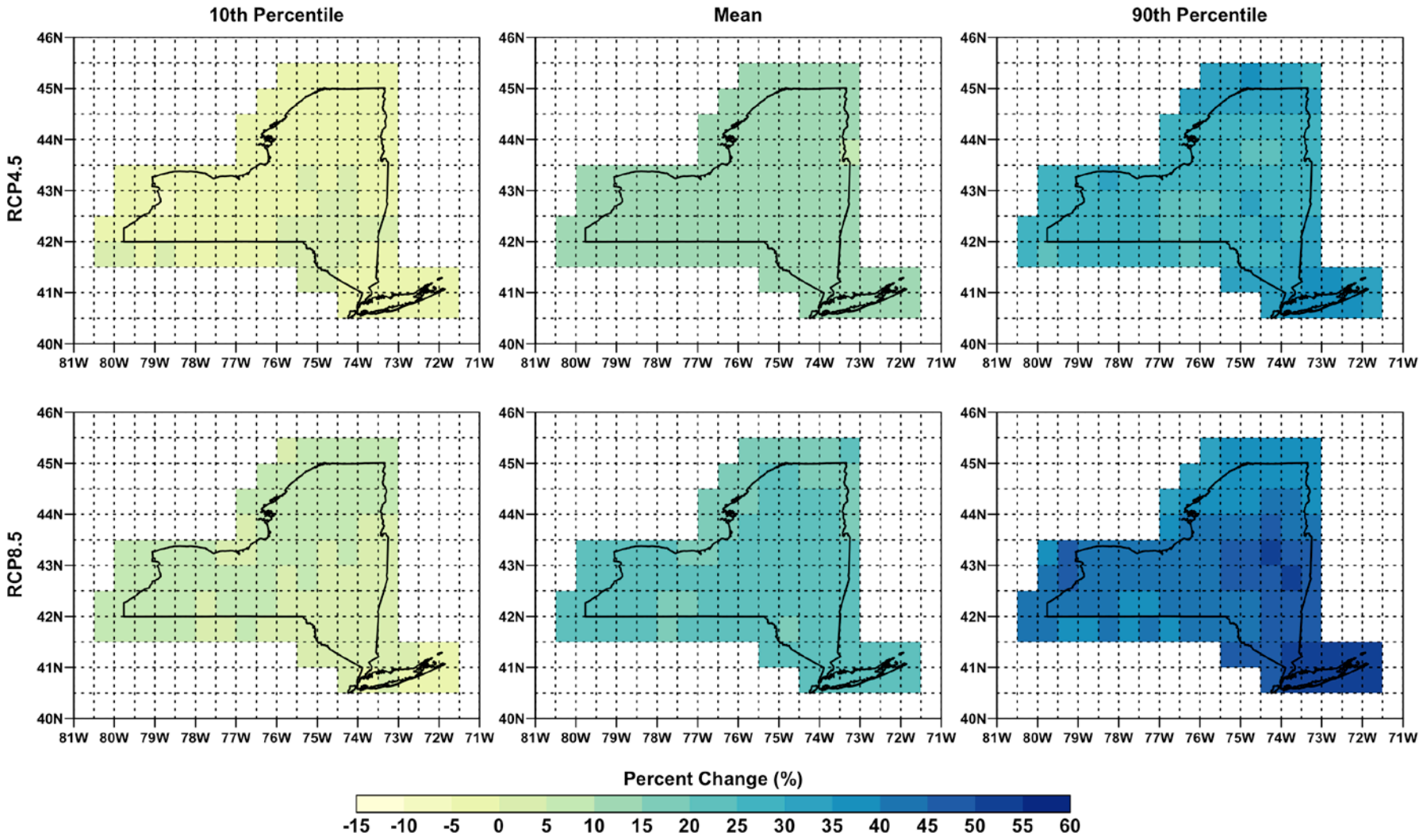
Projected Changes in 1-day 100-year Rainfall Amounts 2070–2099 vs. 1970–1999



Station-specific IDF Graphs | Statewide Maps of Projected Changes

Select a Station Location by Clicking Map

Select a RETURN PERIOD

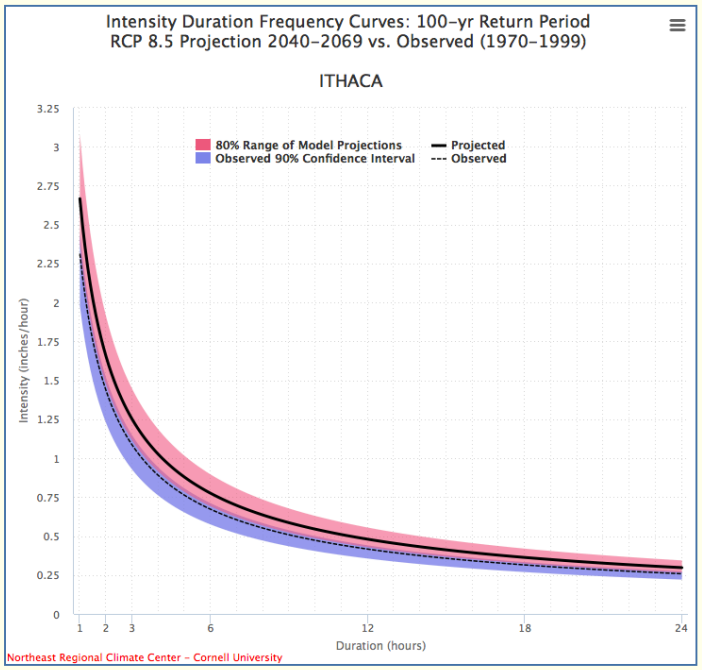
2-yr | 5-yr | 10-yr | 25-yr | 50-yr | 100-yr

Select an EMISSION SCENARIO

- High RCP 8.5
- Low RCP 4.5

Select a TIME PERIOD

- 2010-2039
- 2040-2069
- 2070-2099



About this Project Numerous studies have documented significant increases in both the frequency and magnitude of extreme precipitation in the northeastern U.S. since the mid-to-late 20th century. The most recent assessment from the Intergovernmental Panel on Climate Change (IPCC) suggests that the frequency and magnitude of extreme precipitation in this region will likely continue to increase throughout the 21st century. Such changes could greatly exacerbate the societal impacts of extreme precipitation in the future. In consideration of these impacts, the Northeast Regional Climate Center (NRCC) has partnered with the New York State Energy Research and Development Authority (NYSERDA) to downscale global climate model output and create extreme precipitation projections that will ultimately be incorporated into climate change adaptation planning for New York State. Read more...

	Projected 2040-2069 Intensity Ensemble Member			Observed 1970-1999 Intensity with Confidence Interval (CI) Bounds		
Duration (hrs)	10th	Mean	90th	Low CI	Mean	High CI
1	2.38	2.67	3.08	1.98	2.31	2.45
2	1.47	1.65	1.91	1.23	1.43	1.52
3	1.11	1.25	1.44	0.93	1.08	1.15
6	0.69	0.77	0.89	0.57	0.67	0.71
12	0.43	0.48	0.55	0.36	0.42	0.44
18	0.32	0.36	0.42	0.27	0.31	0.33
24	0.27	0.30	0.34	0.22	0.26	0.27

http://ny-idf-projections.nrcc.cornell.edu

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THANK YOU!