Predicting & Managing Extreme Weather & Climate Events

AGU 2011

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Twelve U.S. Weather & Climate Disasters JAN–NOV 2011

IPCC Special Report

WORKING GROUPS I+II

Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX)

ipcc INTERGOVERNMENTAL PANEL ON climate change WMO UNEP

Get Fact Sheet | Overview | Report | Contributors | Press & Events | IPCC Process | Background

Special Report

Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX)

SUMMARY FOR POLICYMAKERS

PDF - 29 pages - 5.6MB

FULL SREX REPORT

Available February 2012

Read the Press Release and see Generic Presentation

- Worldwide Scientific Collaboration -

220	62	18784
AUTHORS	COUNTRIES	REVIEW COMMENTS

http://ipcc-wg2.gov/SREX/

Twelve U.S. Weather & Climate Disasters JAN–NOV 2011

Environmental Intelligence Across the Weather-Climate Continuum

	Weekly	Monthly	Seasonal – Annual	Decadal
National & Global	Drought Monitor – Agriculture	Monthly State of the Climate Reports – Decision Makers	Annual State of the Climate Reports – Decision Makers	National Climate Assessment – Decision Makers
Regional	Hurricane Tracks – Emergency Planners	Heat Wave Prediction – Public Health Officials	Drought Outlook – Agriculture	Climate Normals – Construction, Infrastructure, Agriculture
Local	Tornado Warnings – General Public, Most sectors	Heating & Cooling Degree Days – Energy Sector	Temperature & Precipitation Outlooks – Agriculture	Extreme Detection & Attribution – Insurance

Integrated Observations

CHALLENGES

Reference-quality *in-situ* observation networks that are robust to extreme events

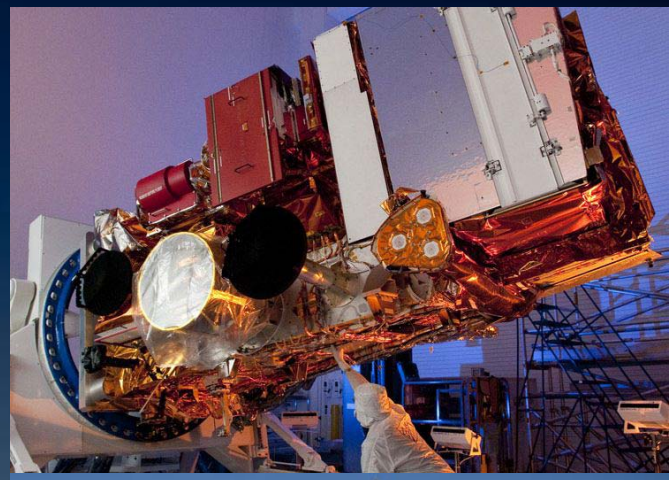
Maintain continuity of climate record

- Risk of gaps in the satellite records
- Need coordinated approach - planned redundancy

Design and operate an interdependent observing system

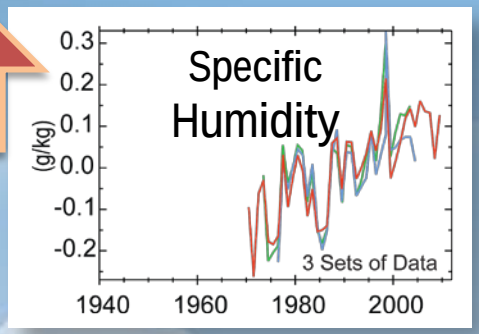
- Understand the predictive value of each system
- Observing Systems Simulation Experiments for climate
- Linking observing systems and modeling requirements
- Purposeful reduction of structural and statistical monitoring errors (Example follows)

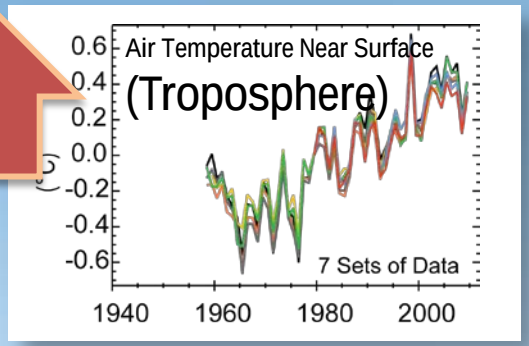
NPP

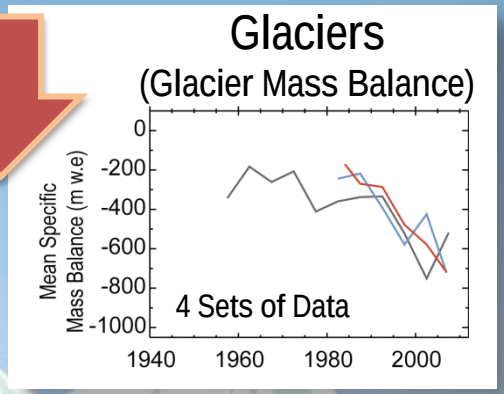


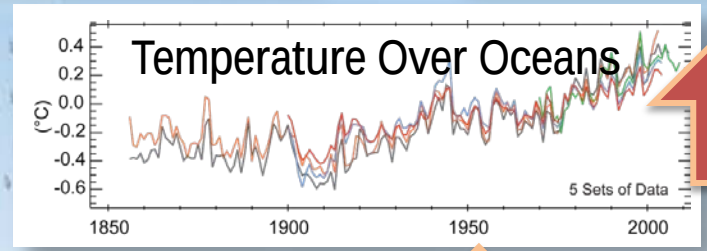
USCRN Station

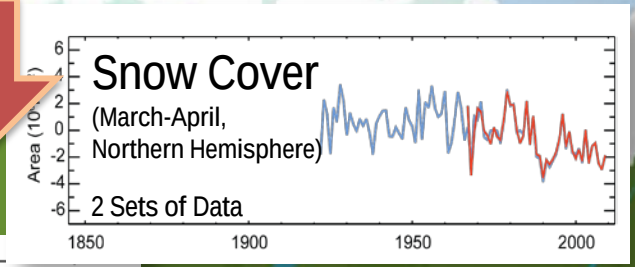
Analysis: Purposeful reduction of structural and statistical monitoring errors

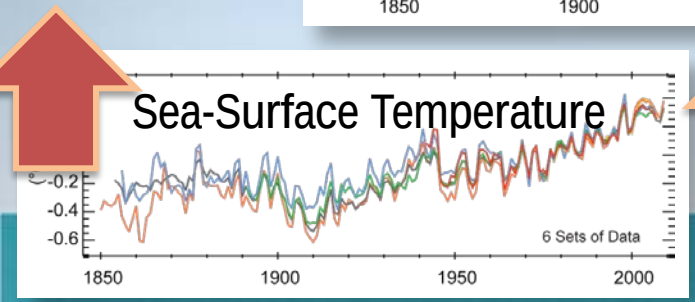


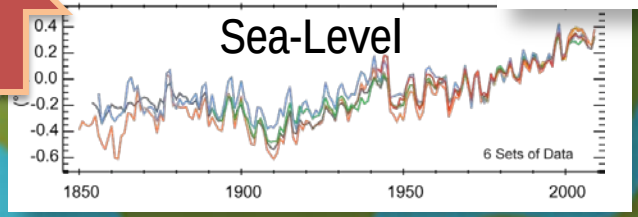


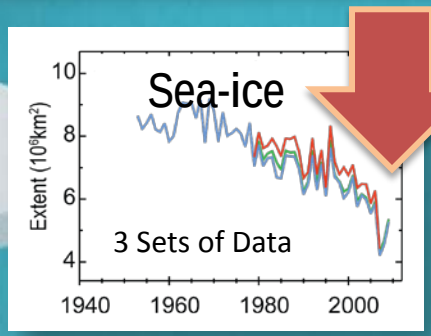


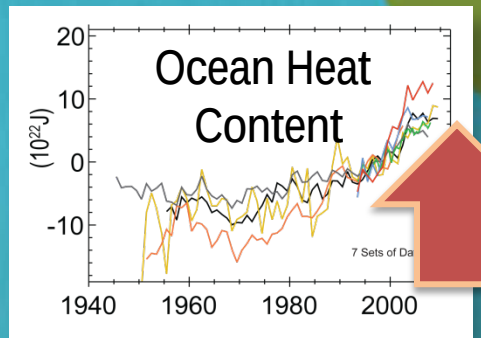


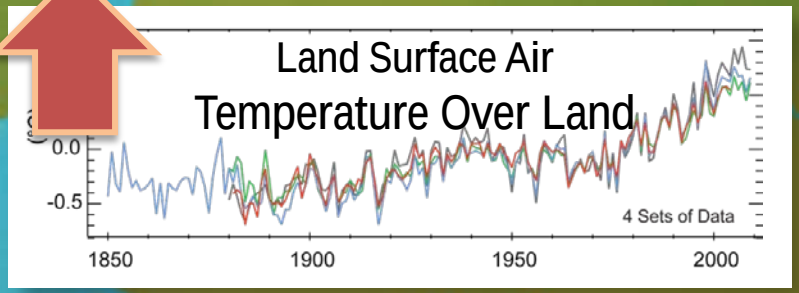










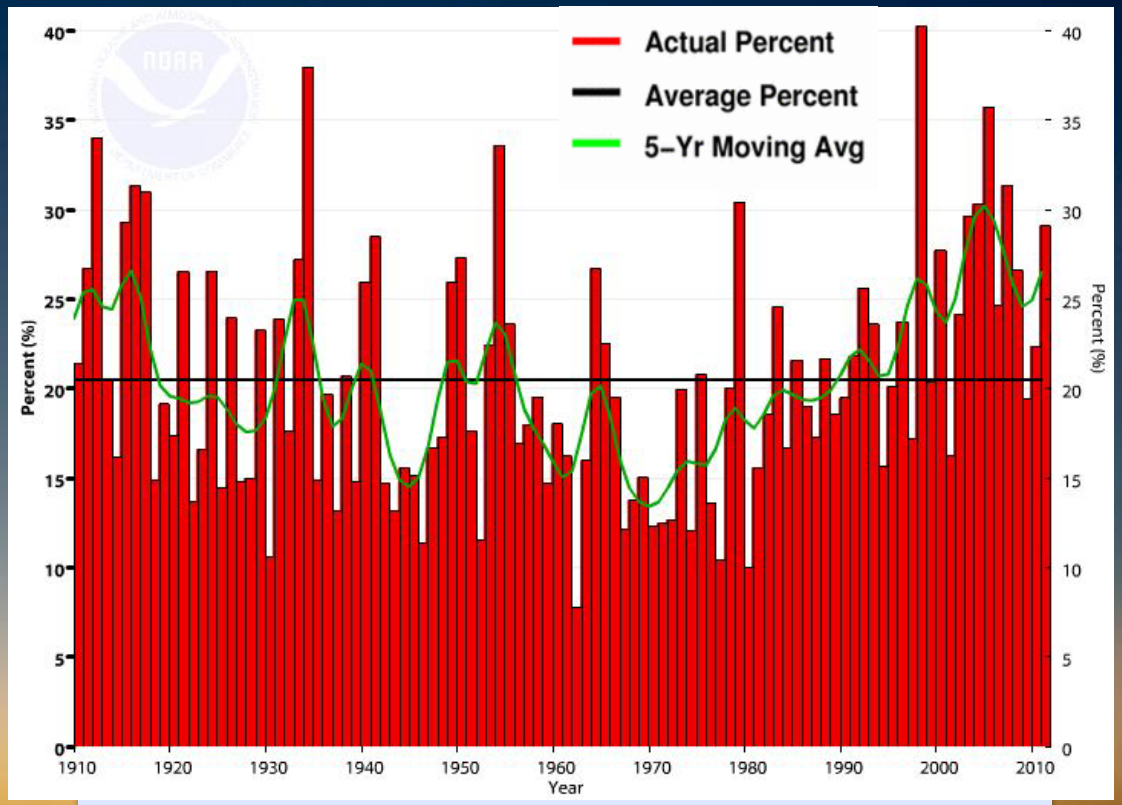


Monitoring/Communication Tools

NOAA U.S. CLIMATE EXTREMES INDEX

The index is sensitive to climate extremes in

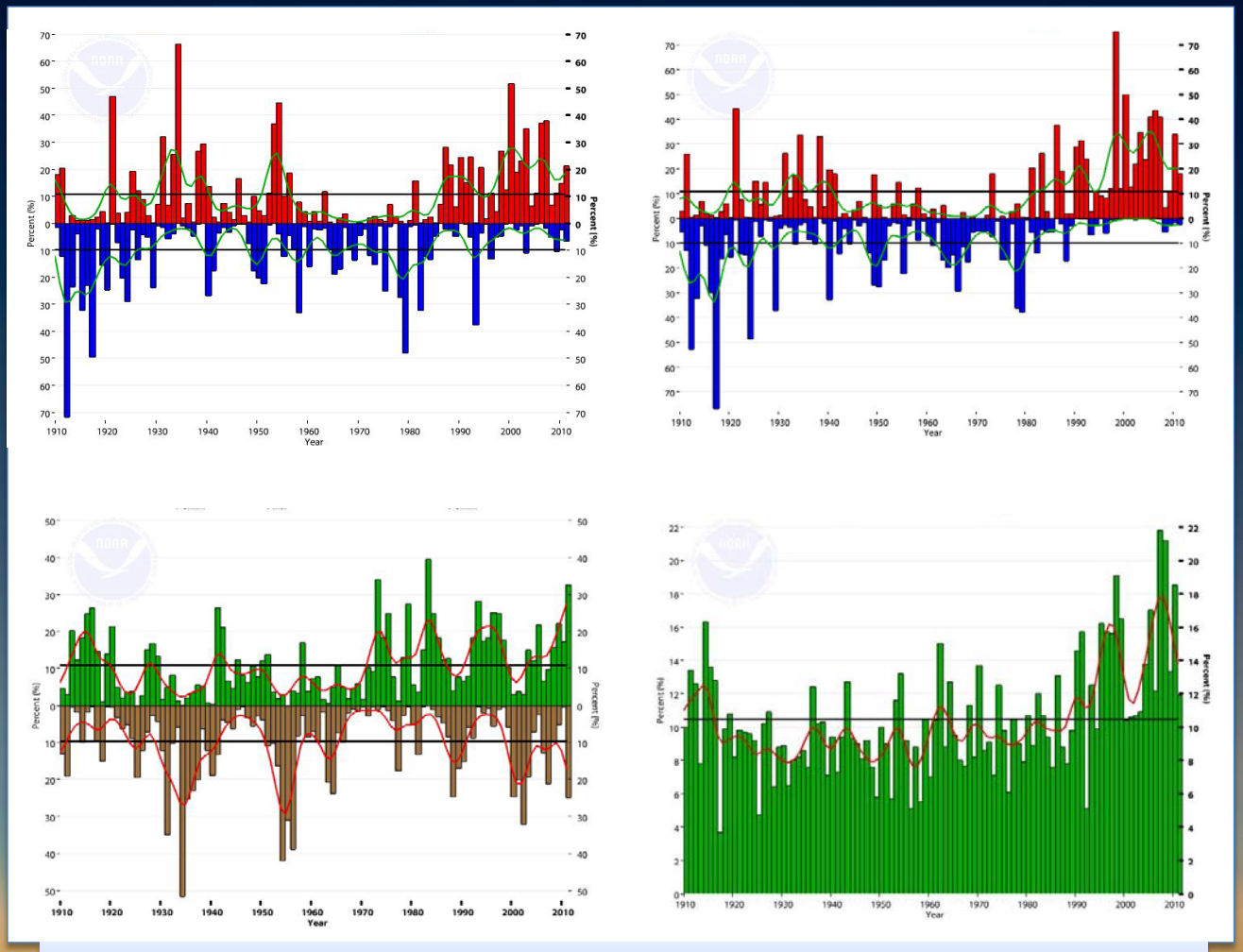
- Monthly maximum and minimum temperature
- Daily precipitation and runs of dry days
- Monthly Palmer Drought Severity Index: indicates too little or too much soil water
- Landfalling tropical storm and hurricane wind velocity



Year-to-date (Jan – Oct) 1910 to 2011

What's Driving the Increase Since the 1970s?

Extremes in Maximum Temperature



Extremes in Minimum Temperature

Drought Severity and Water Surplus

Extremes in 1-Day Heavy Precipitation

All graphs are year-to-date (Jan – Oct) 1910 to 2011

Integrated Modeling

CHALLENGES

Right scaling

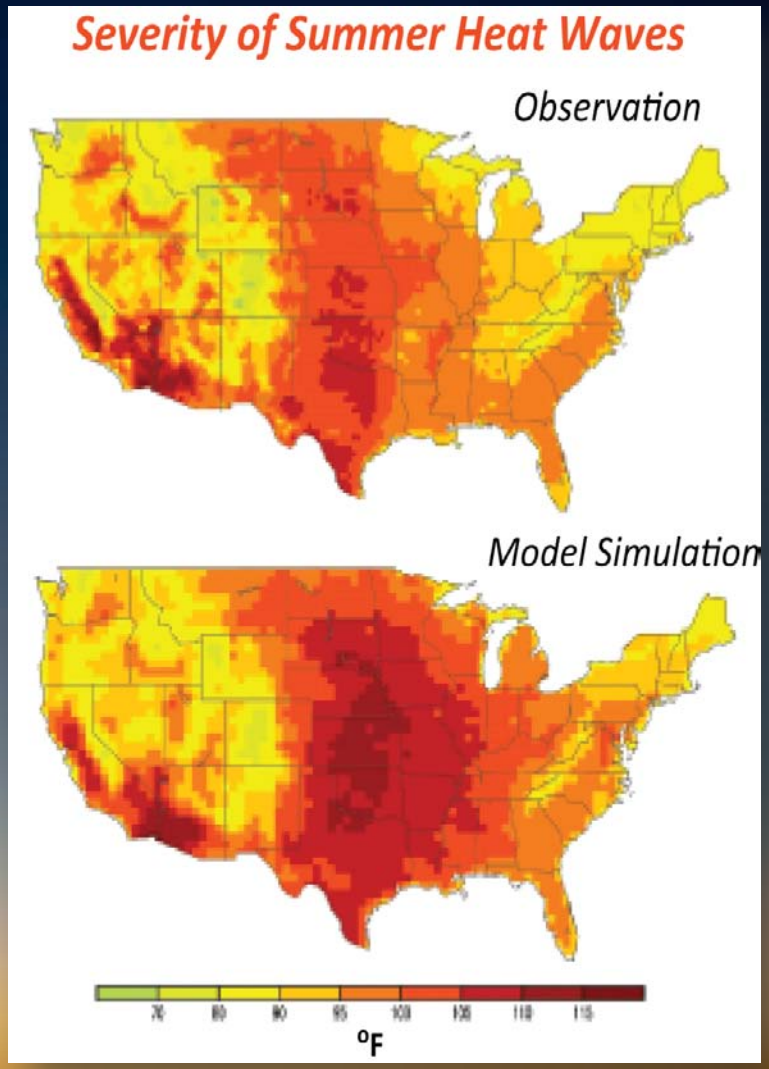
- Includes downscaling
- Societal interest in weather-scale events, e.g. fog, ice storms, blizzards, thunderstorms, etc.
- Physical and statistical approaches necessary
- Model complexity linked to time and space scales

Multi-model ensembles

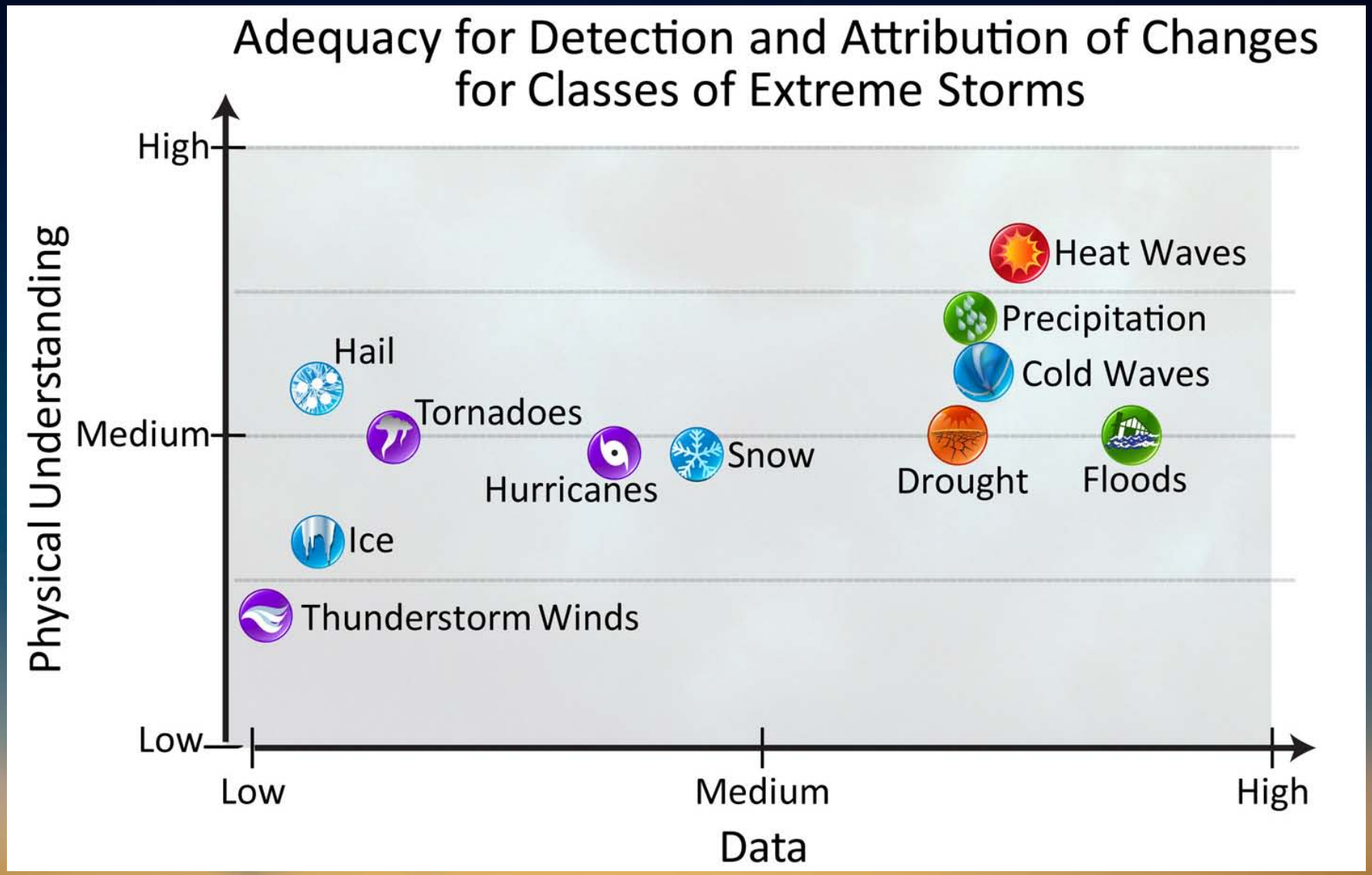
- Improve intraseasonal-to-interannual prediction skill

Seasonal and Decadal Prediction

- Explore and identify Sources of Predictability
  - Stratosphere – Troposphere Interactions
  - Ocean-Atmosphere Interactions
  - Land -Atmosphere Interactions
- Anthropogenic
  - Atmosphere/ocean interactions



Detection & Attribution of Changes

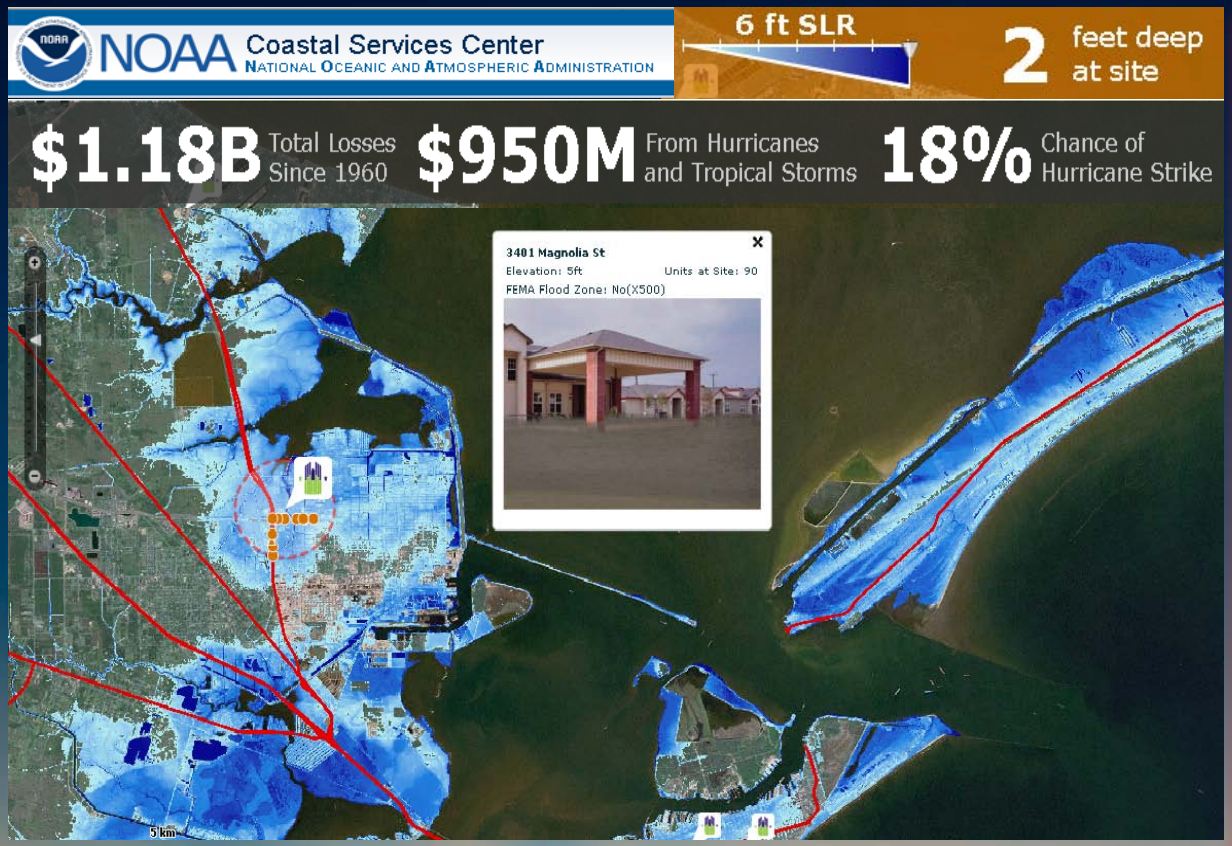


Decision Support Tools

CLIMATE FORECASTS & SERVICES

Decision Support Tool

NOAA's DIGITAL COAST



Features

- **Displays** potential future sea levels
- **Provides** simulations of sea level rise at local landmarks
- **Communicates** the spatial uncertainty of mapped sea levels
- **Models** potential marsh migration due to sea level rise
- **Overlays** social and economic data onto potential sea level rise
- **Examines** how tidal flooding will become more frequent with sea level rise

http://www.csc.noaa.gov/digitalcoast/tools/slrviewer

Sea Level Rise Impacts Viewer

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