Three Imperatives for Climate and Sustainability

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Imperative 1: Making the Most of Earth System Models

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Earth System Models are Incredibly Sophisticated

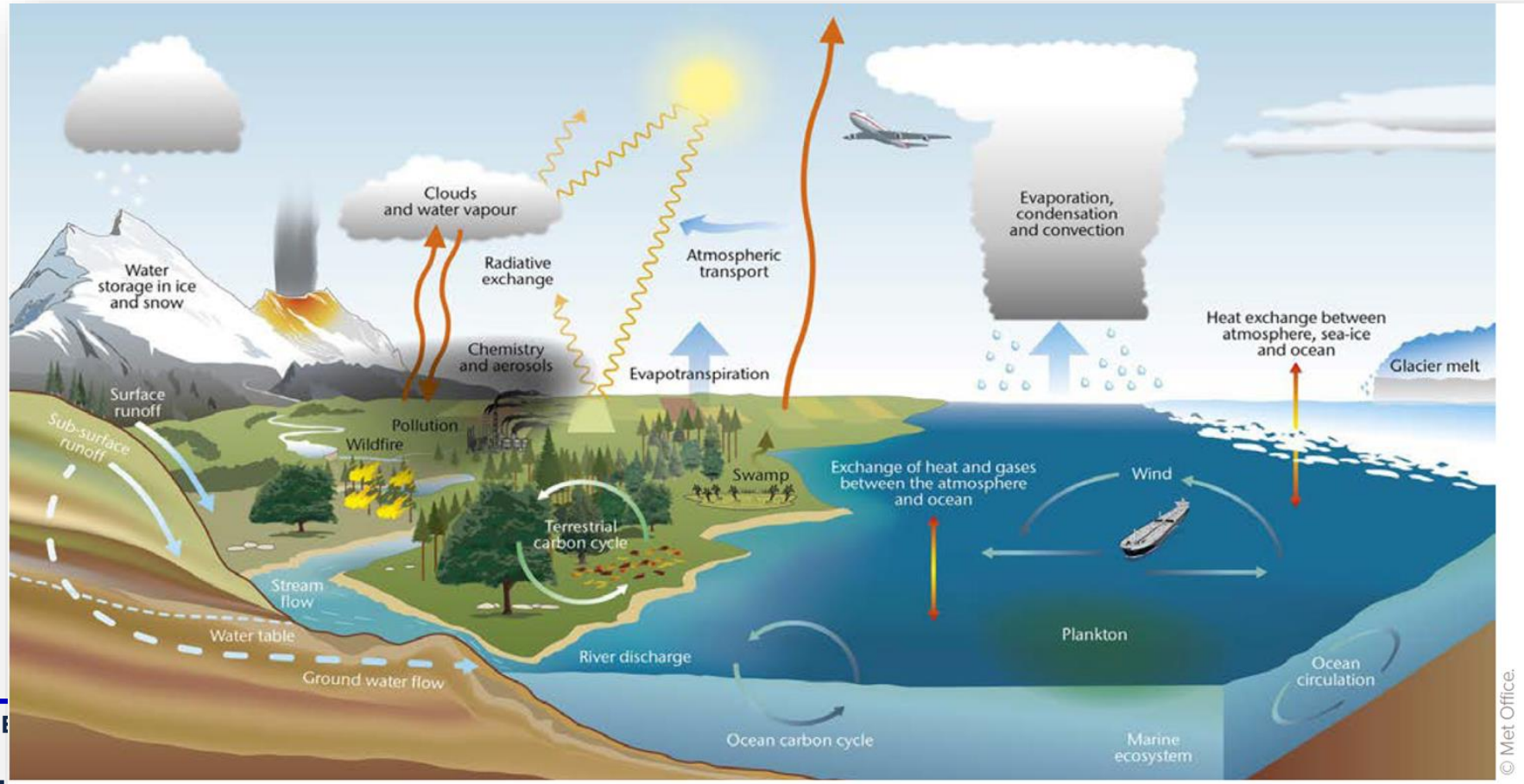
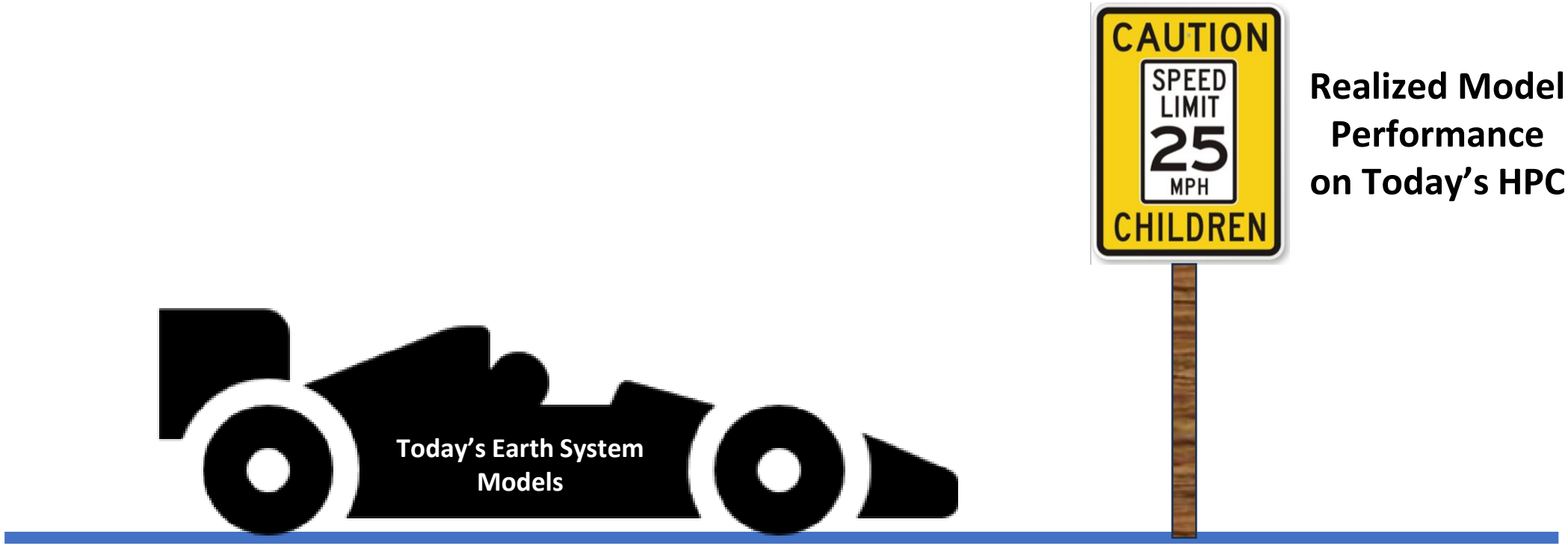


Image Credit: UK Met Office

Requiring the Most Powerful Computers on the Planet

Image Credit: Oak Ridge National Laboratory

Problem: Models Can Only Attain a Fraction of the Ultimate Capability of Today's Machines



Why is this Important?

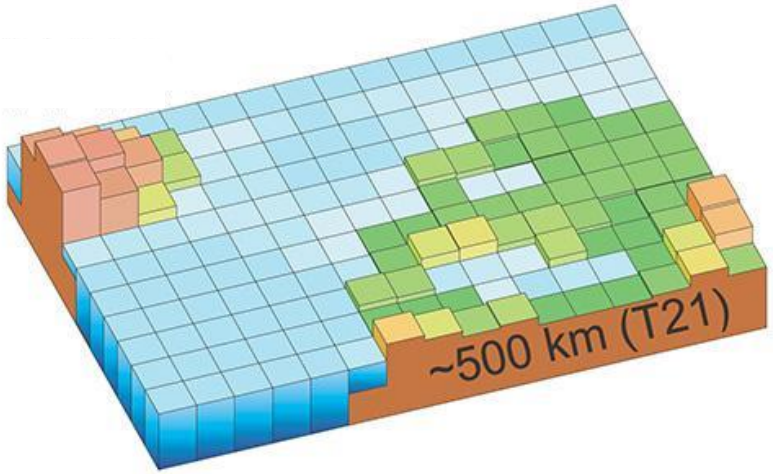
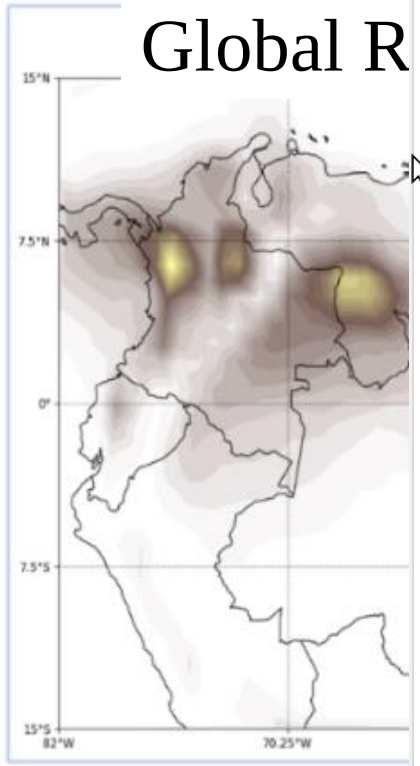
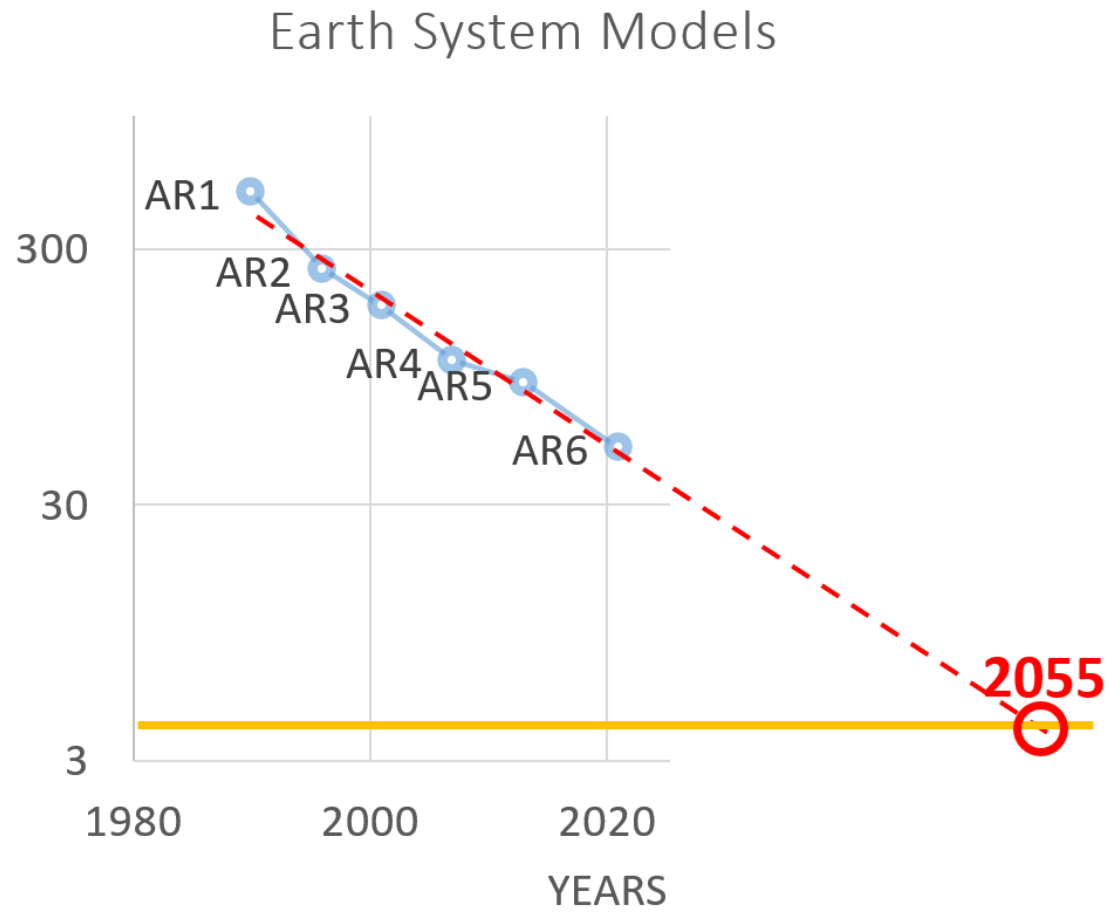


Image Credit: IPCC Fourth Assessment

Current Computer Power Limits Model Resolution & Physics
? Biases, Uncertainties, Inability to Capture Details





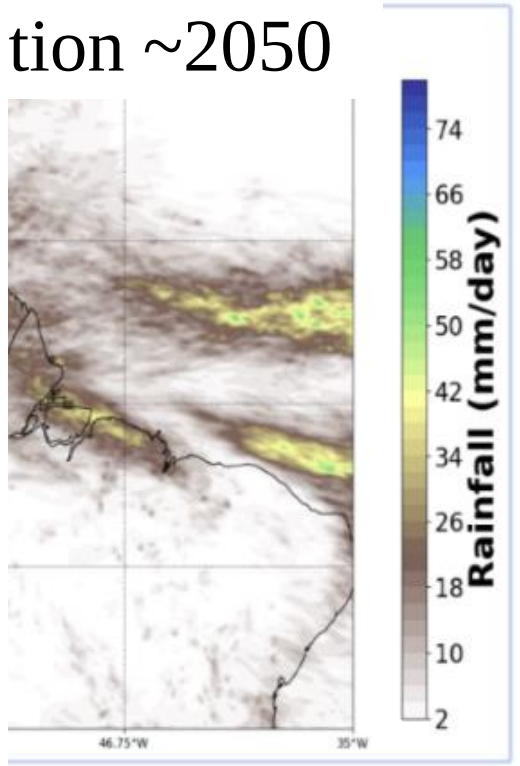


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Image Credits: Andy Prein and Richard Neale, NSF UCAR/NCAR

Details Matter: Extreme Weather Events Attributed to Climate Change

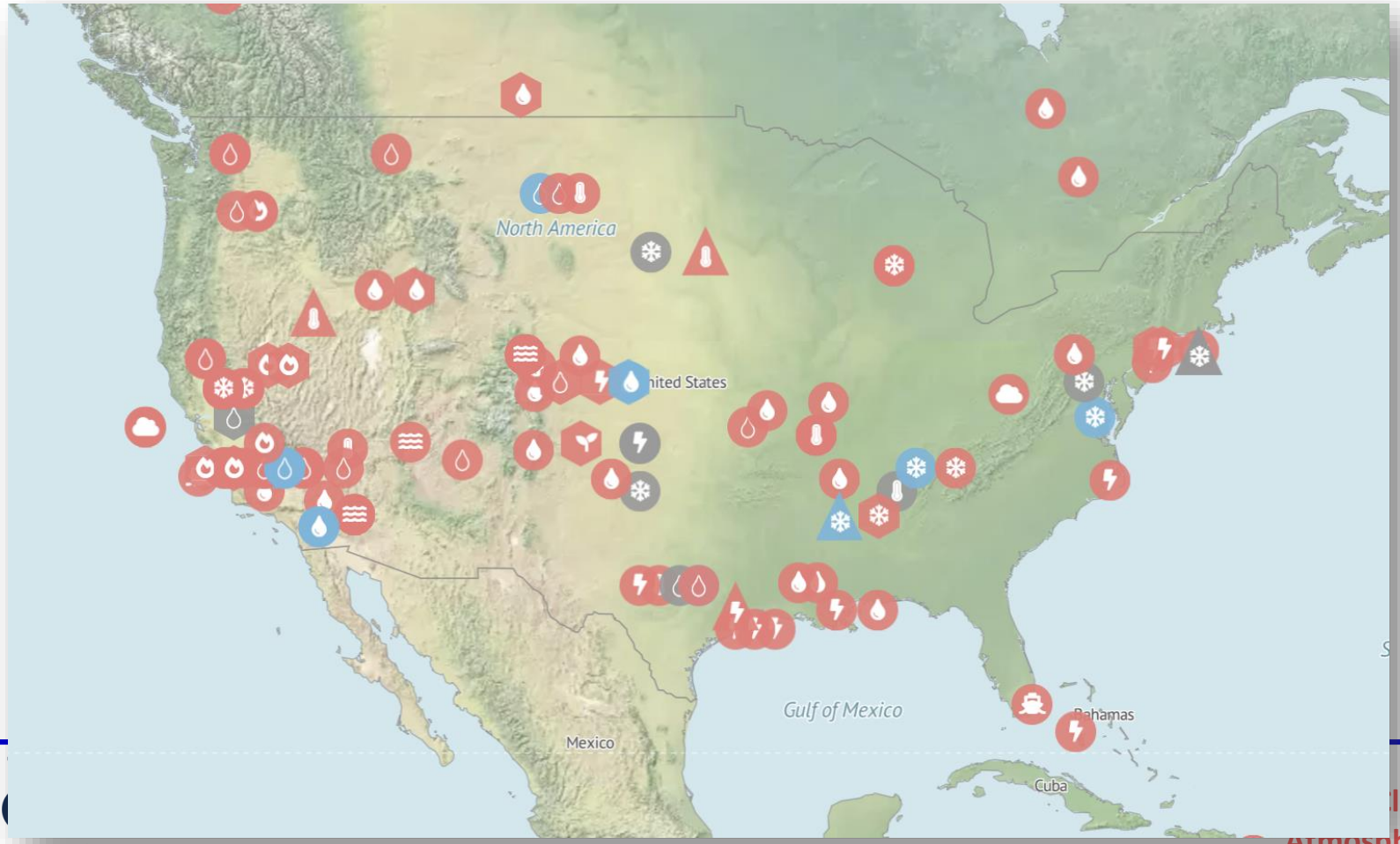

Image Credit: Carbon Brief

INTERNATIONAL SUMMIT ON A SPECIAL PURPOSE COMPUTATIONAL SYSTEM FOR FRONTIER EARTH SYSTEM SCIENCE AND CLIMATE SIMULATION & PROJECTION

When: September 29 – October 2, 2024

Where: University of Illinois Urbana-Champaign USA

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Imperative 2: Speaking of Extreme Events! How Do they Change in a Changing Climate?

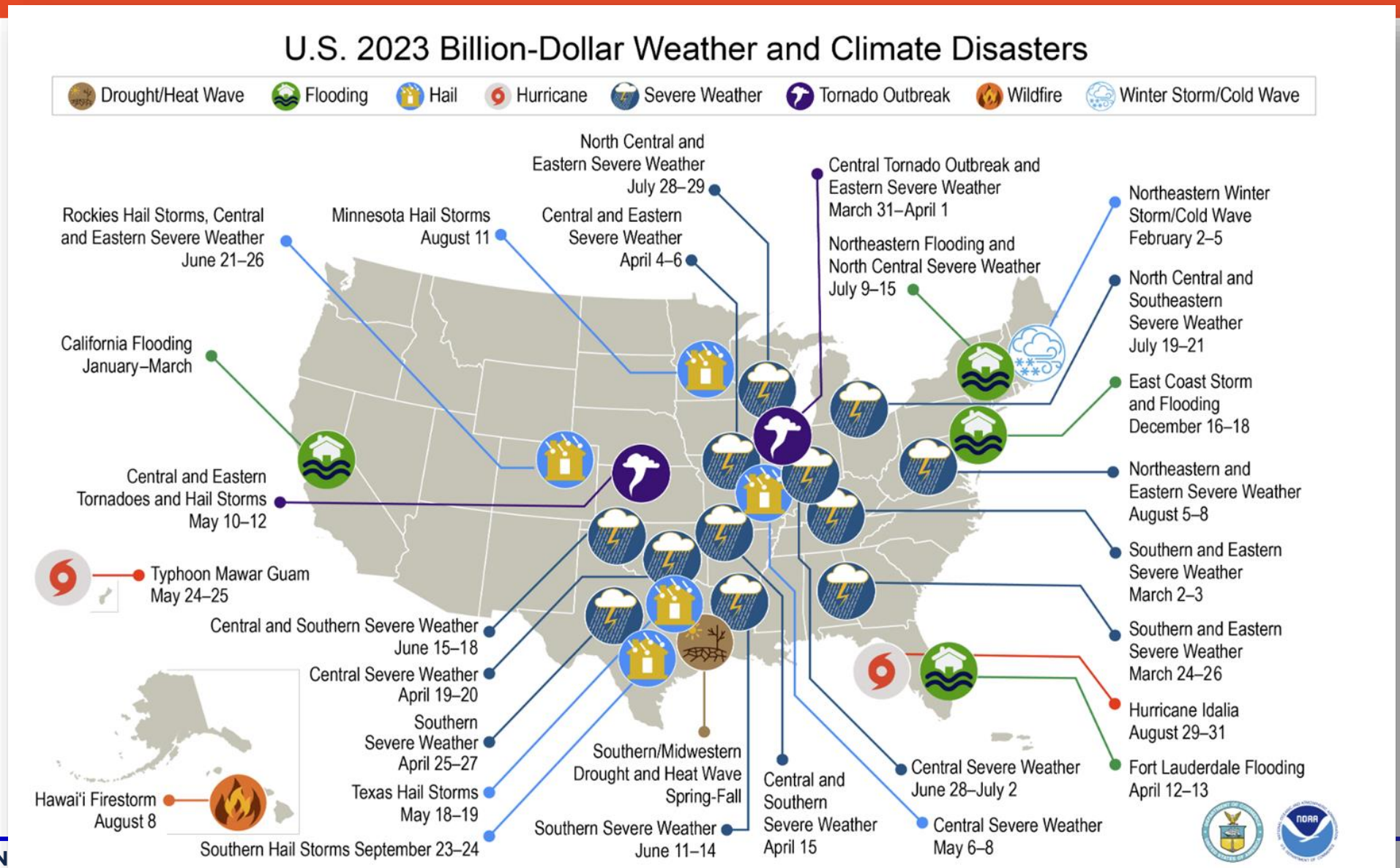
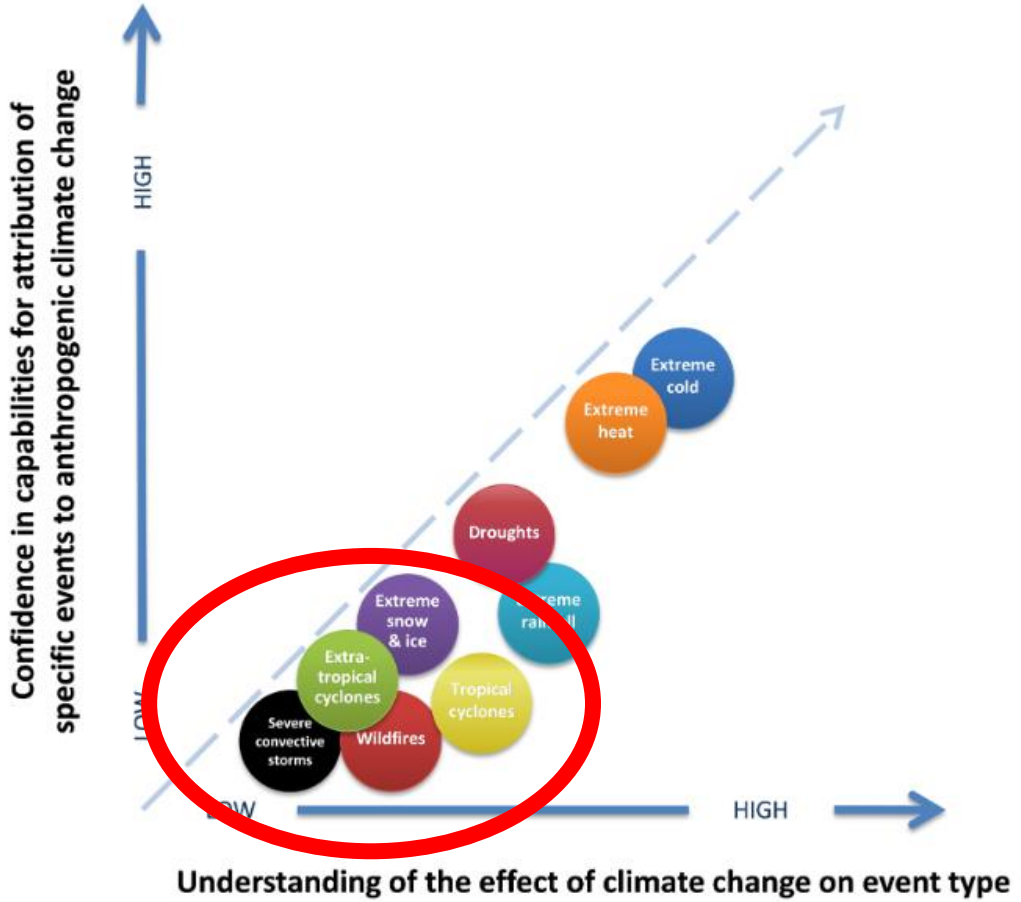


Image Credit: NOAA

Attributing Extreme Weather Events to a Changing Climate is Key Going Forward



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National Academies of Sciences, Engineering, and Medicine 2016. Attribution of Extreme Weather Events in the Context of Climate Change. Washington, DC: The National Academies Press. https://doi.org/10.17226/21852.

The Impacts are Far Reaching and $$$

Health

Transportation

Energy/Utilities

Construction

Recreation

National Security

Agriculture

Risk/Reinsurance

Comms

Manufacturing

Mining

Supply Chain

Wildfires

Water Availability

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The University of Illinois Urbana-Champaign is Developing a Concept for a National Center for Extreme Events in a Changing Climate (E2C2)

- Driven by stakeholder needs, fundamental research questions, emerging technologies
- Highly interdisciplinary, convergent research approach
- Cornerstone is global fine-scale simulations capable of capturing high-impact weather over long periods of time

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Imperative 3: Understanding the Predictability of the Earth System

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What is the ONE Thing We All Want to Know?

- **THE FUTURE!!**
- Numerous **examples**
  - Spread of infectious disease
  - Degree of personal educational attainment
  - State of Earth's climate & associated impacts
  - Individual susceptibility to disease
  - The economy
  - Arcs of technological evolution
  - Political and military plans of adversaries
  - Drug discovery
  - Molecular fabrication
  - Genomic evolution
  - Human behavior under stress
  - Reliability of infrastructure
  - Stock market
  - Invasive species
  - Likelihood of mass shootings
  - Election outcomes
  - Many others…

We Predict the Fuure in Many Ways, From Weather to Elections to the Stock Market to Sports

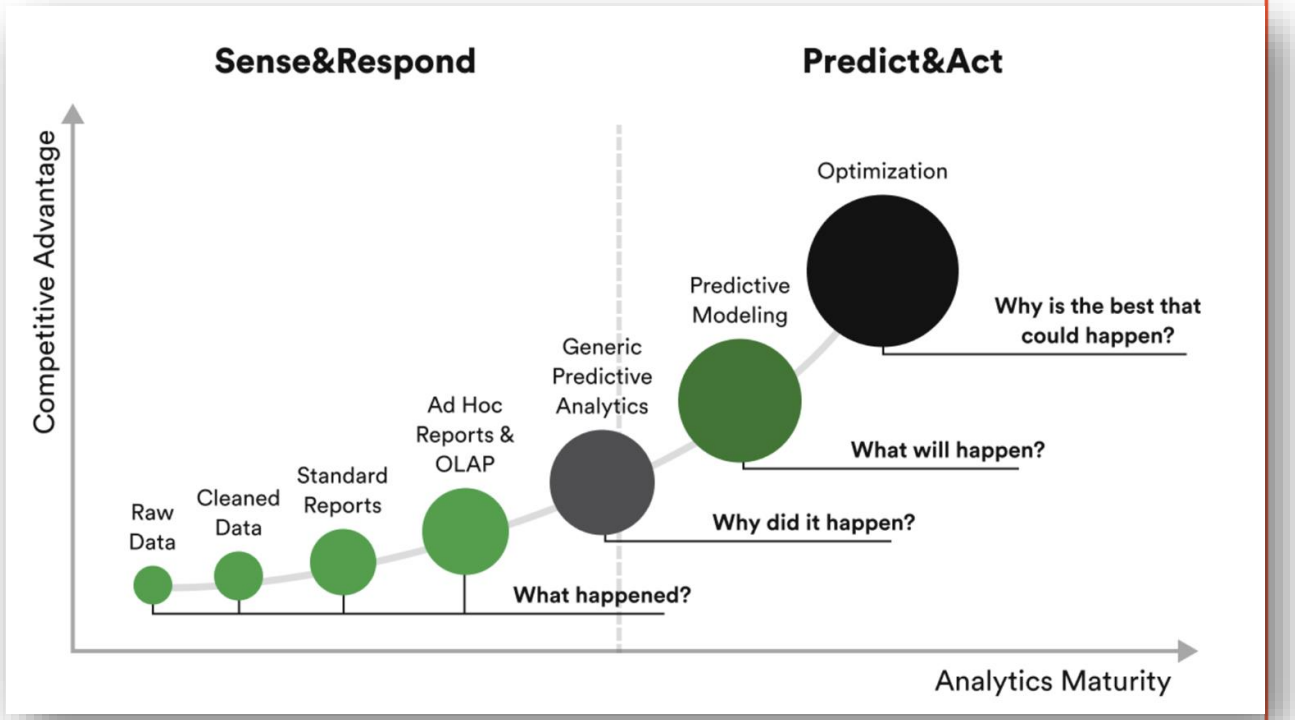

Image Credit:

We All Want to Know the Future!

But HOW KNOWABLE is it??

The First Step

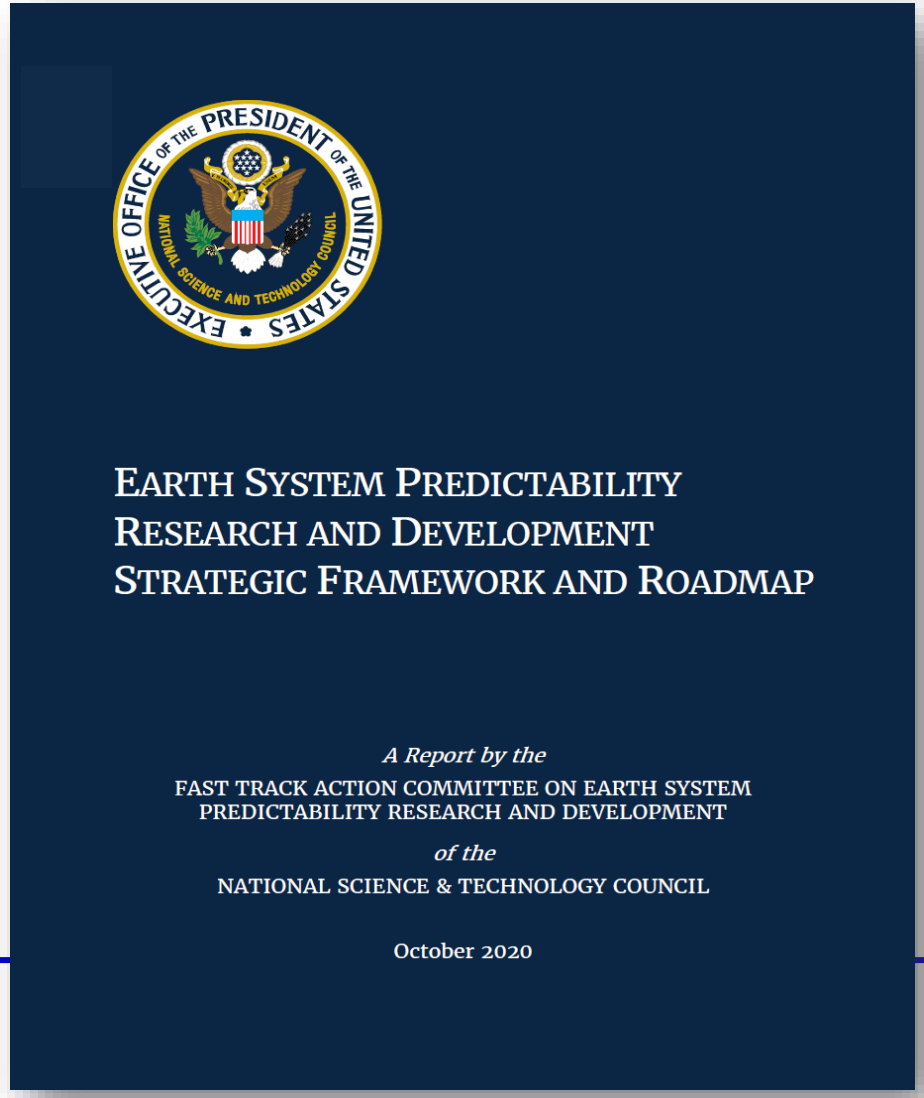

Image Credit: OSTP

The Second Step

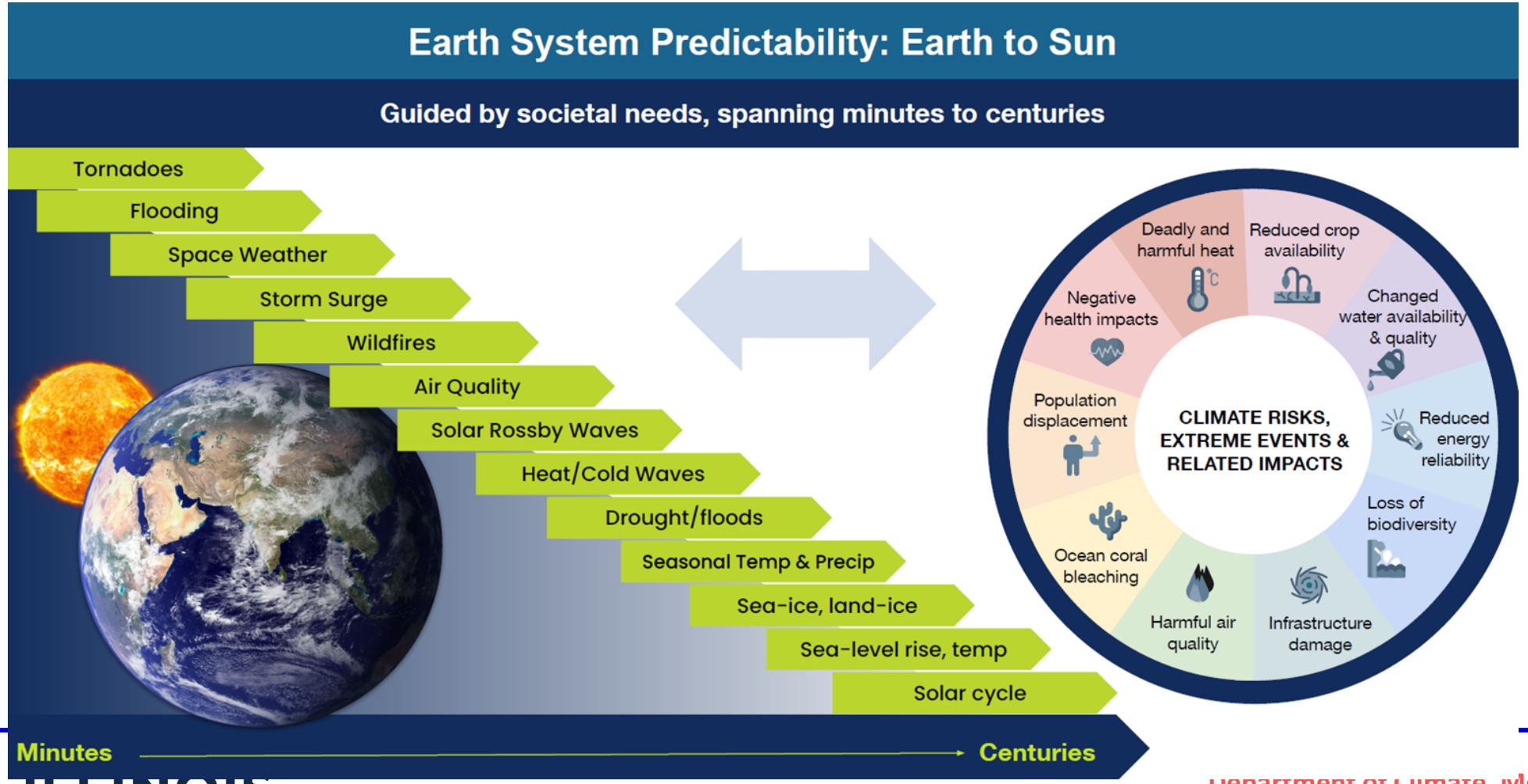

Image Credit: NSF UCAR/NCAR

The Third Step

The University of Illinois Urbana-Champaign is Developing a Concept for a National Center for Predictability Science and its Applications (NCPSA)

- Across all disciplines
- Theory to application

Image Credit: NSF UCAR/NCAR

What Does this Mean for Brazillinois?

- These 3 imperatives link to 2 of the Brazillinois themes:
  - Climate and Sustainability
  - Public Health and Medicine
- Brazil has a variety of extreme weather events
- How they change in a changing climate will be critical to Brazil's future
- Numerous opportunities for collaboration in the public and private sectors!

Image Credit: NSF UCAR/NCAR