



25

Northern Illinois
University



WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON



CIRCS

Center for Interdisciplinary Research on Convective Storms



NSF Award #2413246

Who's here?



A Salas O'Brien Company

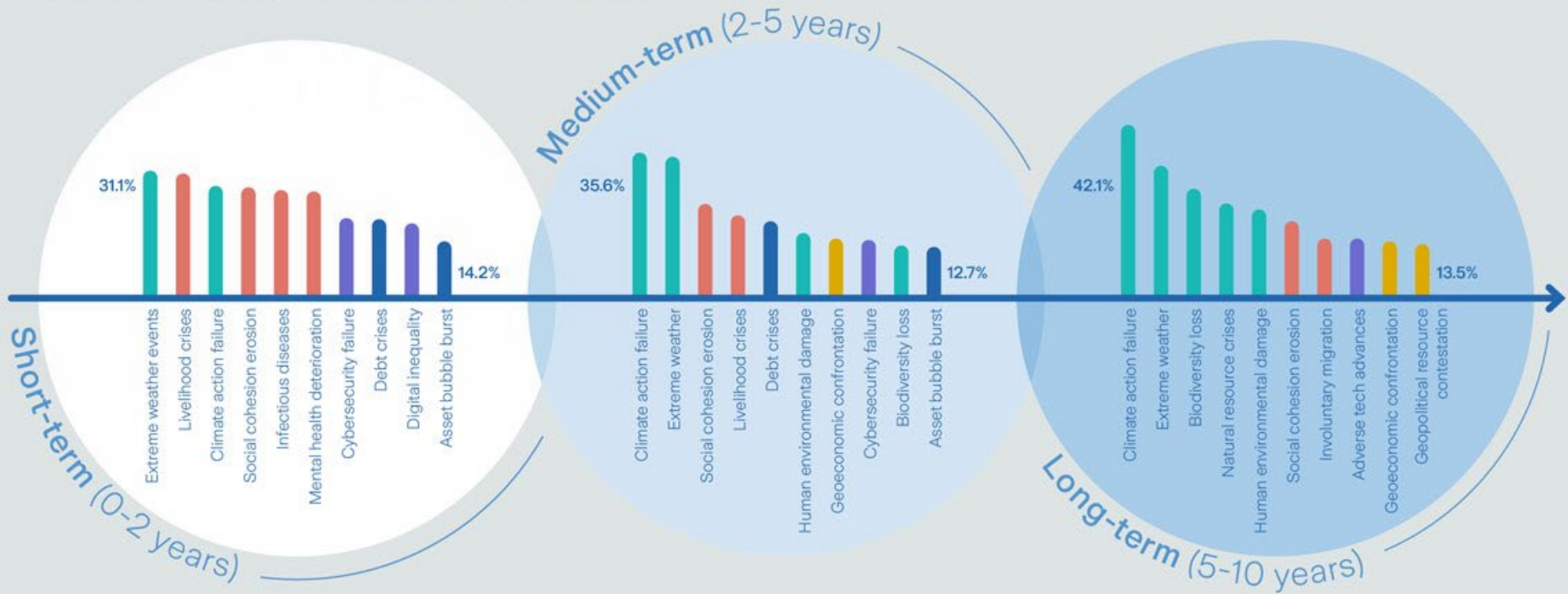


Affiliated with The Institutes



Why are we here?

Risks critical threat timeline

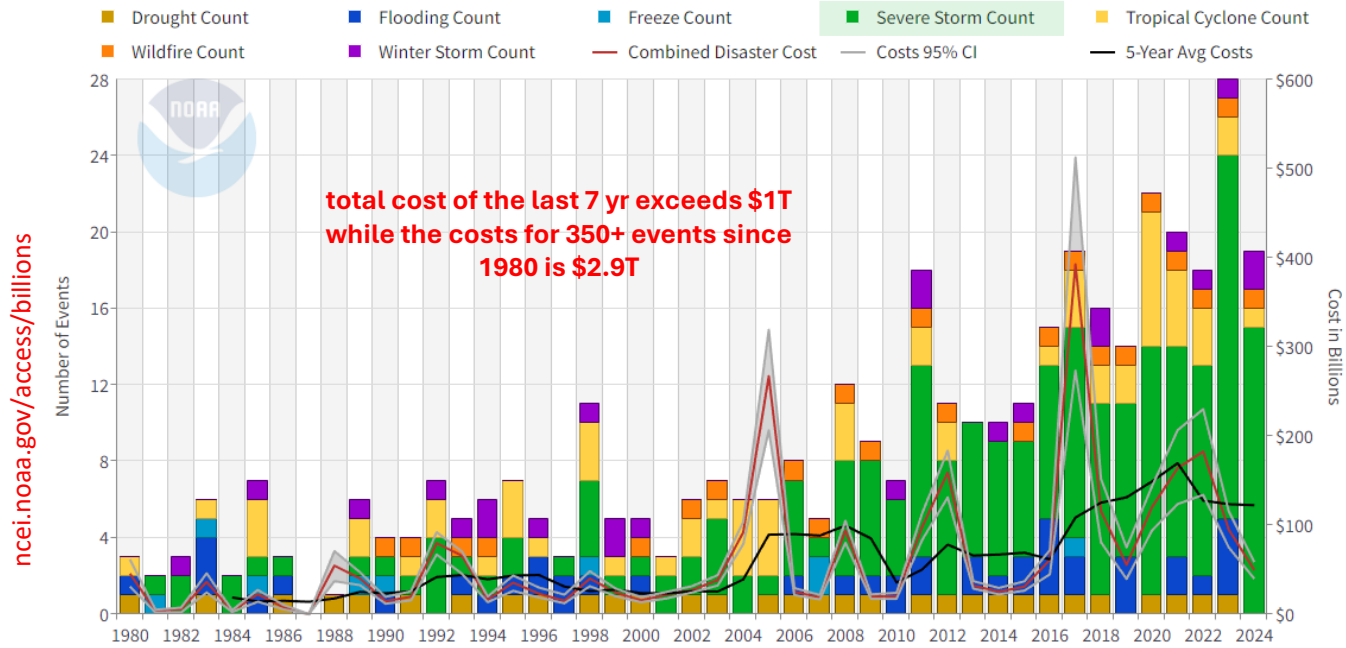


Source: Global Risks Perception Survey 2021, World Economic Forum



Why are we here?

United States Billion-Dollar Disaster Events 1980-2024 (CPI-Adjusted)



ncei.noaa.gov/access/billions

3 of top 10 costliest tornadoes have occurred since 2011

(2011 Joplin, 2011 Tuscaloosa, and 2013 Moore)

\$2-3B each – Is a \$10B tornado possible? Yes!

Derechos aren't cheap either: Aug 2020 (\$12.7B); Dec 2021 (\$1.9B); Jun 2022 (\$3.2B)

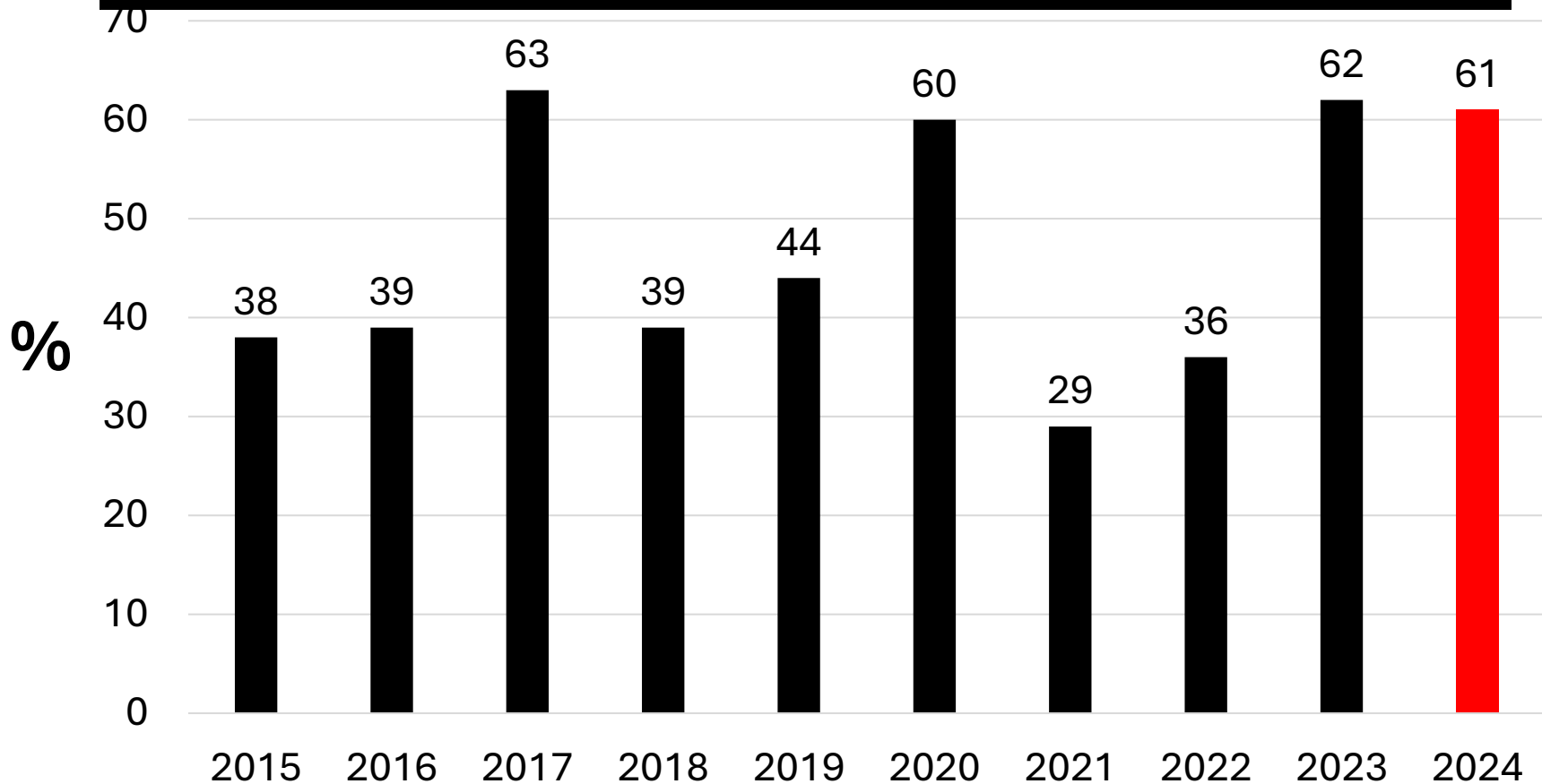
Calgary, AB had a \$2.3B hailstorm on 5 August 2024

- Near exponential growth in losses from severe convective storms (SCSs), w/ changes in weather, exposure, and inflation → predicting losses difficult
 - 30-yr mean: \$11B
 - 5-yr mean: \$29B
 - '23-24: \$100B+?
- Regional climate trends leading to greater exposure.
- **Cat model infancy.** Often do not adequately address convective storm frequency, variability, exposure, etc.



“It’s pretty difficult to look away and not recognize that this is certainly not a secondary peril”

- Steve Bowen, Gallagher Re to *Insurance Insider*



Source: Gallagher Re

The *opportunity*...




Search NSF 

[Find Funding & Apply](#) ▾ [Manage Your Award](#) ▾ [Focus Areas](#) ▾ [News & Events](#) ▾ [About](#) ▾

[Home](#) / [News](#) / NSF-NOAA partner to promote the creation of centers for modeling catastrophic impacts and risk assessment of climate change



 [View image credit & caption](#)

NSF News

NSF-NOAA partner to promote the creation of centers for modeling catastrophic impacts and risk assessment of climate change

Industry-University Cooperative Research Centers Program (IUCRC)

PROGRAM SOLICITATION

NSF 20-570

REPLACES DOCUMENT(S):

NSF 17-516



National Science Foundation

Directorate for Engineering

Engineering Education and Centers

Directorate for Computer and Information Science and Engineering

Directorate for Geosciences

Directorate for Social, Behavioral and Economic Sciences

© 2020 Victor Gensini



**Northern Illinois
University**



CIRCS

Center for Interdisciplinary Research on Convective Storms



WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON



Advancing our understanding of the multifaceted impacts that convective storms impose on society and the economy.



Research Thrusts



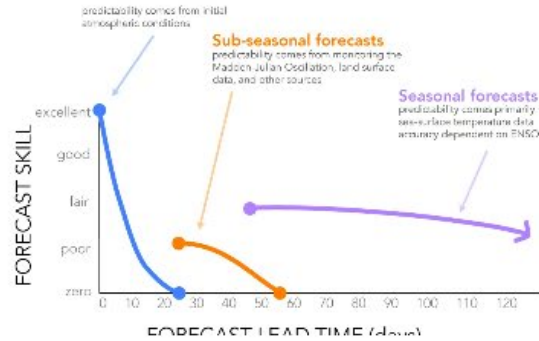
Societal Impacts

Link our understanding of convective storms to the significant impact they pose on society and the economy.



Data Science

Explore emerging techniques in artificial intelligence and machine learning to improve methods and workflows.



Prediction

Improve prediction of convective storms across a variety of time and space scales.



Modeling

Leverage explicit and implicit modeling approaches across a range of weather and climate scales.



Climate Change

Unraveling the multifaceted impact of climate change on convective storm perils.

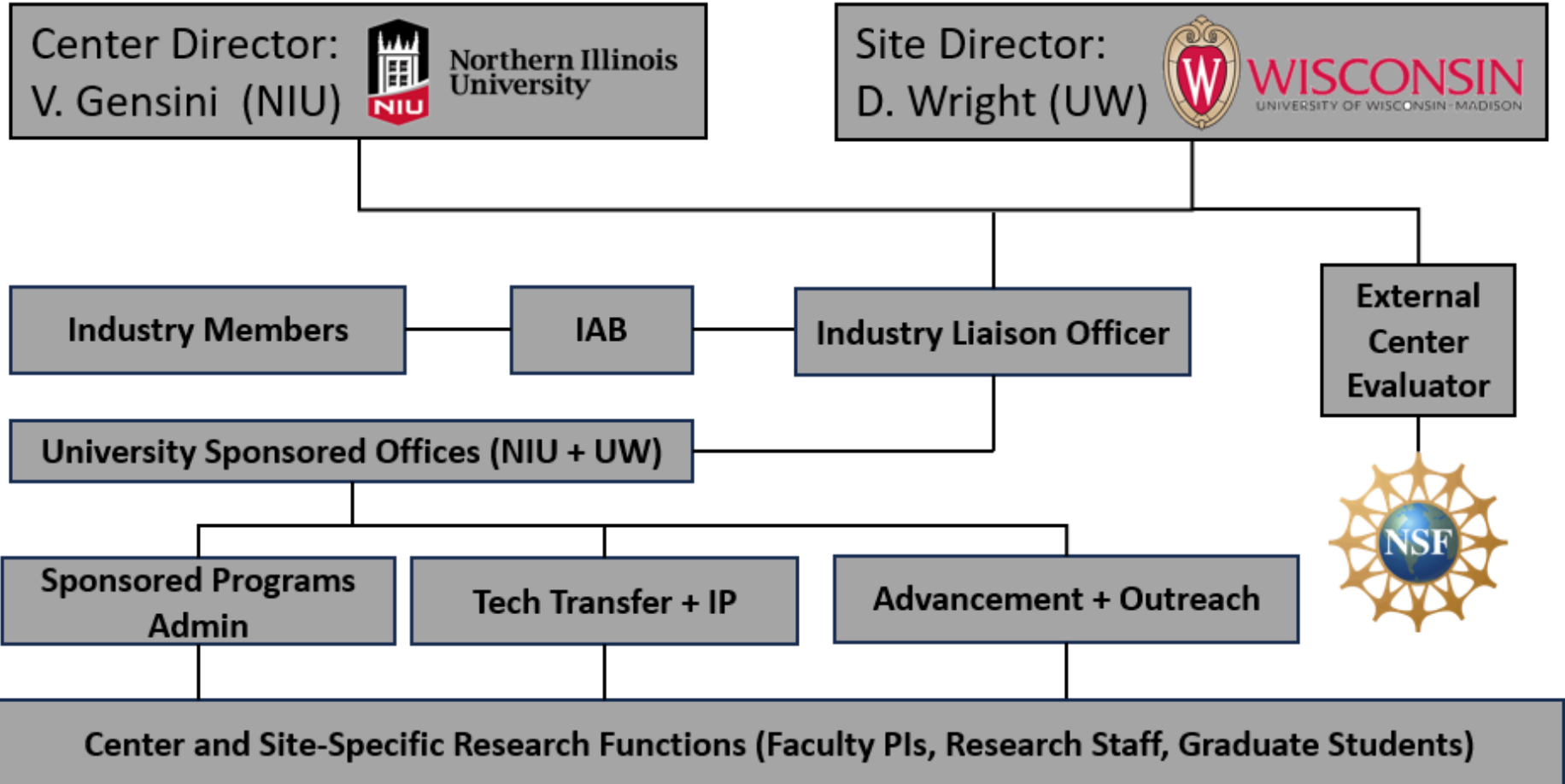


Risk

Assess past, present, and future aspects of convective storms to better inform risk, variability, and vulnerability assessments.

Proposed Org Chart

Center for Interdisciplinary Research on Convective Storms (CIRCS)



Leadership Team



Victor Gensini

Center Director

Associate Professor, Northern Illinois University



Daniel Wright

Site Director

Arno Lenz Memorial Associate Professor of
Water Resources Engineering, University of
Wisconsin-Madison



Stephen Bennett

Interim IAB Chair

Chief Scientist, The Demex Group



Principal Investigators



Hamed Alhoori

Computer Science (NIU)



Walker Ashley

Earth, Atmosphere, & Environment (NIU)



Daniel Bauer

Actuarial Science (UW)



David Koop

Computer Science (NIU)



Paul Block

Civil and Environmental
Engineering (UW)



Kyle Cranmer

Physics; Data Science Institute (UW)



Reva Freedman

Computer Science (NIU)



Andrea Lopez Lang

Atmospheric and Oceanic Sciences (UW)



Alex Haberlie

Earth, Atmosphere, & Environment (NIU)



Lei (Larry) Hua

Statistics and Actuarial Science (NIU)



Nicholas Karonis

Computer Science (NIU)



Philip Mulder

Risk and Insurance (UW)



Principal Investigators



Yisub Kye

Statistics and Actuarial Science (NIU)



Tristan L'Ecuyer

Atmospheric and Oceanic Sciences (UW)



Peng Shi

Risk and Insurance (UW)



Maoyuan Sun

Computer Science (NIU)



Jonathan Martin

Atmospheric and Oceanic Sciences (UW)



Allison Michaelis

Earth, Atmosphere, & Environment (NIU)



Stephen Strader

Geography (Villanova)



Justin Sydnor

Risk and Insurance (UW)



Christine Nguyen

Industrial and Systems Engineering (NIU)



Angela Rowe

Atmospheric and Oceanic Sciences (UW)



Sahar Vahabzadeh

Mechanical Engineering (NIU)





UW-Madison's Unique Resources

2,500+ faculty and 10,000+ graduate students across world-class academic departments

- Department of Risk and Insurance
- Department of Atmospheric and Oceanic Sciences
- Department of Civil and Environmental Engineering
- Many more (Statistics, Computer Science, Math, etc.)





Data Science Institute

Powered by American Family Insurance



- Strong focus on insurance applications via AmFam partnership
- Network of data science-focused faculty and staff, connections to Computer Science Department and elsewhere
- In-house data science and software experts



Dr. Kyle Cranmer
Director





Center for Climatic Research

Nelson Institute for Environmental Studies



Cooperative Institute for Meteorological Satellite Studies
University of Wisconsin-Madison



Space Science and Engineering Center

University of Wisconsin-Madison

- Faculty & permanent research staff with diverse weather and climate expertise
- Modeling and forecasting, especially for extreme weather
- Satellite remote sensing and development of value-added products



Tristan L'Ecuyer
CIMSS Director





Behavioral Research Insights Through Experiments Lab

Wisconsin School of Business

BRITE Lab

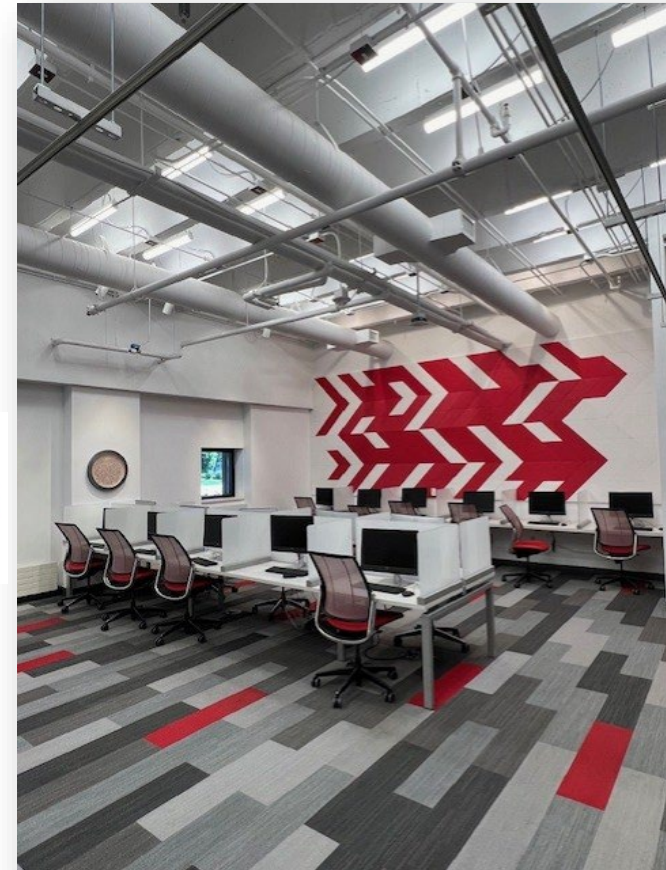
- hub for behavioral and experimental social-science research and a physical computer lab for conducting experimental studies
- Permanent support staff and pool of subjects
- Provides support for survey best practices, on campus and beyond



University of Wisconsin Survey Center

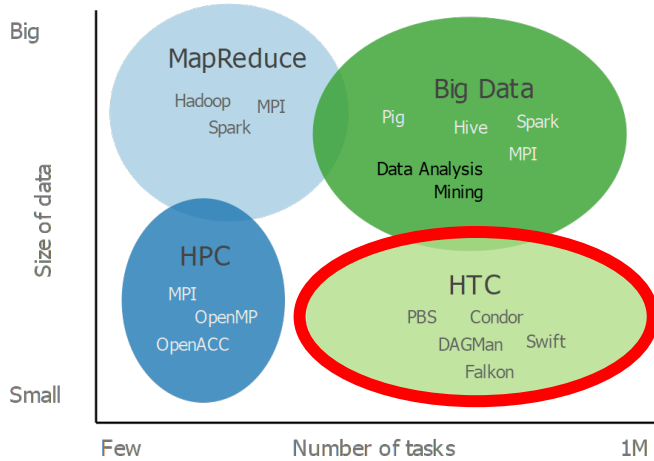
UWSC

- Data collection and research technical solutions services
- Expert study design consultation and implementation for surveys combining any mode: mail, web, telephone, and face-to-face and mixed modes
- Qualitative methods (focus groups, cognitive interviews, and structured observations)





CENTER FOR HIGH THROUGHPUT COMPUTING



Unique, highly-scalable computational solutions

- Comparable total core hours to the nation’s largest supercomputers
- Faster, easier, cheaper (usually free!) solution for most types of workflows
- Excellent support for individual researchers and larger initiatives
- Track record of supporting private enterprises/partnerships





NIU's Unique Resources

1,100+ faculty and ~4,000 graduate students

- Department of Earth, Atmosphere, and Environment
- Department of Computer Science
- College of Engineering and Engineering Technology
- Department of Statistics and Actuarial Science



Why



Northern Illinois University



“International leaders in cutting-edge climate analytics applied to extreme weather perils”

100s of professional media hits on research; 15,000+ name mentions;
a potential reach of over 11 billion readers/viewers; publicity value equivalency of >\$125 million



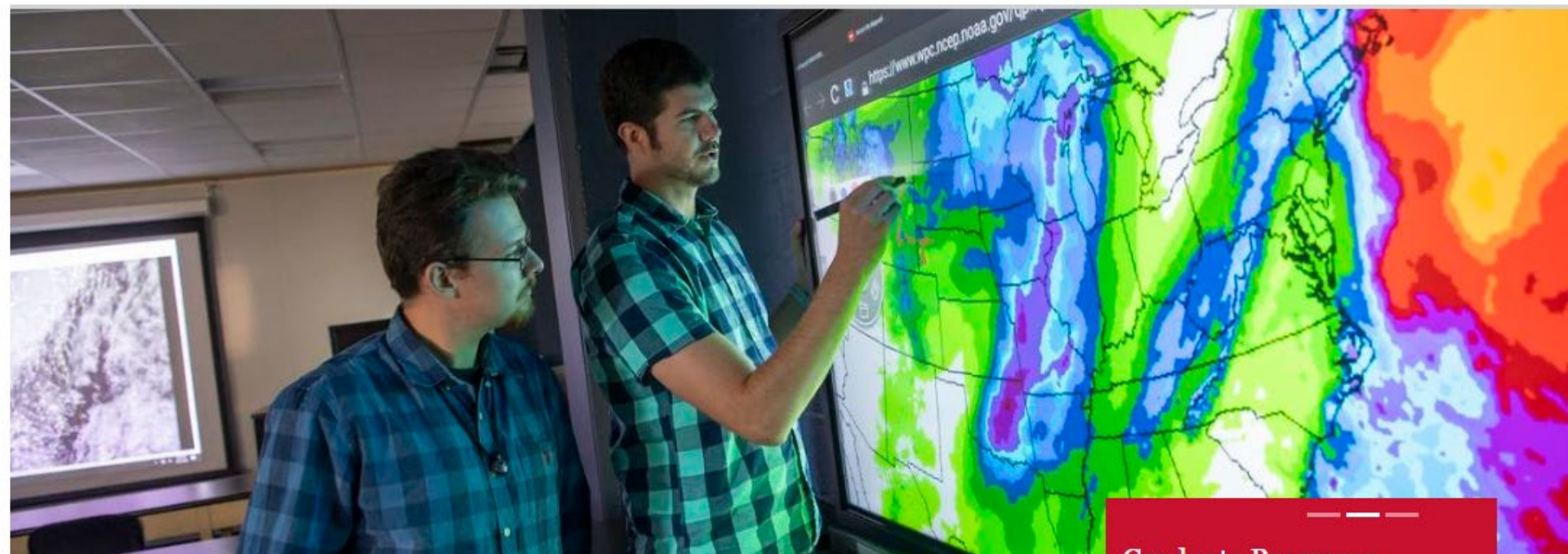


NORTHERN ILLINOIS UNIVERSITY

Department of Earth, Atmosphere and Environment

College of Liberal Arts and Sciences

- [Home](#)
- [About](#)
- [Undergraduate Programs](#)
- [Graduate Programs](#)
- [Research](#)
- [Join Us](#)



Earth, Atmosphere and Environment

Welcome to the Department of the Earth, Atmosphere and Environment (EAE) at Northern Illinois University! Our unit utilizes the natural links between geology, geography and atmospheric sciences to strengthen connections among faculty to grow interdisciplinary research and build new student programs.

Our undergraduate and graduate programs will build upon our strengths in traditional areas, while expanding into new and emerging interdisciplinary domains. In addition to classroom instruction, we offer educator licensure and a wide array of research opportunities for undergraduate and graduate students.

Graduate Programs

[READ MORE](#)



Weather, Climate, Society

Research Group at Northern Illinois University



Dr. Walker Ashley, CCM
PROFESSOR
Ph.D. University of Georgia
Meteorology, Climatology, Hazards



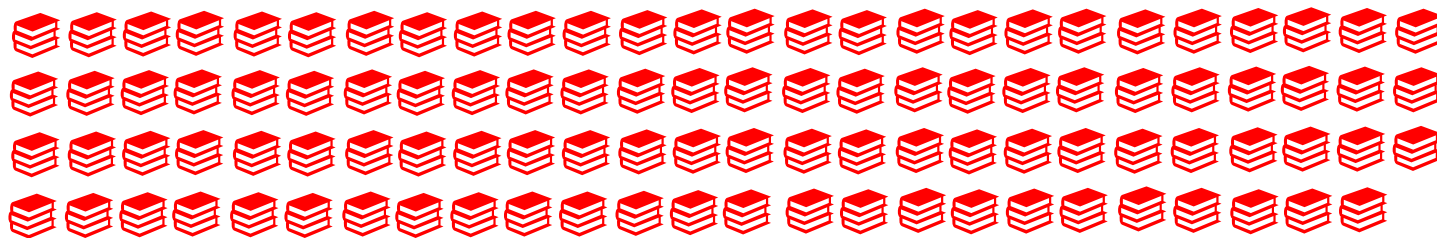
Dr. Victor Genaini, CCM
ASSOCIATE PROFESSOR
Ph.D. University of Georgia
Extreme Weather, Climate Variability, Change



Dr. Allison Michalewicz
ASSISTANT PROFESSOR
Ph.D. North Carolina State University
Synoptic Meteorology, High-Impact Weather,
Climate Change



Dr. Alex Habedien
ASSISTANT PROFESSOR
Ph.D. Northern Illinois University
Regional Climatology, Machine Learning,
Hazards



> 100
Journal
Publications

9 Federal Research Grants



1 National Laboratory
Partnership



1 Presidential Research
Professor



3 Editorships



2 Certified Consulting
Meteorologists



1 Distinguished Teaching
Professor



- High-resolution Climate Modeling
- Climate Change
- Short- and long-range Forecasting
- Vulnerability Assessment
- Extreme Weather
- Machine Learning and AI

WCS Graduate Students



Robert Fritzen

PH.D. CANDIDATE

Numerical Weather Prediction



Caitlin Roufa

PH.D. STUDENT

Climate Dynamics, Severe Storms



Logan Bundy

PH.D. STUDENT

Applied Climatology, Agriculture



Hunter Martinez-Buehrer

M.S. STUDENT

Atmospheric Rivers, Climate Change



Anya Aponte

M.S. STUDENT

Mesoscale Meteorology, Climate

James DiGilio

M.S. STUDENT

Meteorology, Climatology



Kyle Pittman

PH.D. STUDENT

Severe Convective Storms



Skye Leake

PH.D. STUDENT

Climate Change, Agriculture, Sci. Comm.



Margo Andrews

PH.D. STUDENT

Remote Sensing, Severe Storms



Nathan Sonntag

M.S. STUDENT

Mesoscale Meteorology, Machine Learning



Tony Illenden

M.S. STUDENT

Extreme Weather, Predictability



Tyson Stewart

M.S. STUDENT

Applied Climatology, GIS



Dominic Cosentino

M.S. STUDENT

Severe storms, Applied Meteorology



Dominique Watson

M.S. STUDENT

GIS, Forensic Meteorology



Sean Whelan

M.S. STUDENT

Severe Storms, Machine Learning



Anna Olsen

M.S. STUDENT

Applied Climatology, Energy Forecasting



Brandon Weart

B.S. STUDENT

Numerical Weather Prediction, Severe Storms



Sean Phipps

B.S. STUDENT

Mesoscale Meteorology

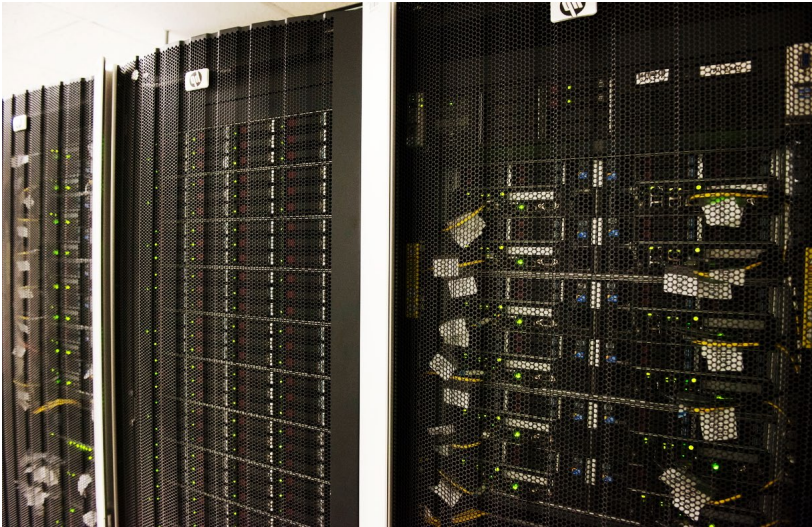


Dynamical Downscaling

computationally intensive technique that uses relatively coarse climate model output to inform high-resolution weather models that provide long-range (weeks to decades) insight into future weather hazards at regional or local scales



SDSC
SAN DIEGO
SUPERCOMPUTER CENTER



NORTHERN ILLINOIS UNIVERSITY

Center for Research Computing and Data

Division of Research and Innovative Partnerships

Argonne NATIONAL LABORATORY





Contact Us

Richard Mocarski, Ph.D.

Vice President for Research and Innovation Partnerships

Email: rmocarski@niu.edu

Phone: [815-753-1768](tel:815-753-1768)



Northern Illinois Center for Community Sustainability

We know that sustainability and innovation go hand in hand.

By enabling connections and shared projects across disciplines, we commit to create new knowledge, inform policy-making and inspire action related to food systems innovation, water resources and environmental change. By building bridges between researchers, local governments and the private sector, we aim to enable innovation and put the latest research into practice to make a positive difference.

We're ready to harness the untapped potential of our peri-urban location to develop cutting-edge research, build stronger local economies and become a world leader on advancing peri-urban sustainability.



Science

IN DEPTH

METEOROLOGY

Hail chasers plan largest ever field campaign

ICECHIP project aims to improve predictions of economically costly hailstorms



CIRCS Workforce Development Plan

- Cohort of NIU and UW-Madison graduate students, postdocs, and faculty
- Graduate-level interdisciplinary course(s) and intercampus exchanges: weather/climate risks and career paths
- CIRCS coffee hours
- Career Fairs/Career Days
- Workshops on Data Science, Project Management, Individual Development Plans, etc.
- Undergraduate student engagement: NIU's "Research Rookies", UW-NSF REUs, etc.
- How can industry be involved?



We are ...

- **trailblazers** at generating datasets, methods, and new knowledge on how climate change *contributes* to changes in peril frequency, magnitudes, and spatiotemporal shifts
- **novel** at generating methods and understanding of how *changing* risk *commingles* with *changes* in vulnerability to result in a *changing* disaster landscape
- **skillful** at filling the gap left by cat modeling by providing a deeper and more focused understanding of SCS perils
- **leaders** at generating forecast skill at daily to subseasonal timescales
- at the **forefront** of AI and ML applications in atmospheric and disaster science

We have ...

- **access** to unique resources (e.g., supercomputing, storage, MC simulation tools) that are not *freely* available to industry
- the **requisite skills** to understand scales and their interactions, and can speak languages spanning multiple disciplines
- an **understanding** of the industry's knowledge barriers
- the **essential skills** to push bounds without hyperbole or meritless promises

Goals over the next 36 hours...

- Showcase initial projects
- Gather Airtable and oral feedback
- Listen to ***you!***
 - Pain points
 - Relevancy
 - Project Tweaks
- Better understand level of member support heading into December full phase I NSF proposal. \$

Thank you for joining the conversation!



CIRCS

Please be an active participant!