Setting a standard for climate risk science: a use case for EVE

Adam Sobel, Columbia University

Berlin Summit for EVE

July 4, 2023

Summary up front

- We need global, public tools, data & understanding to assess climate risks.
- Climate adaptation finance is thus far inhibited by the absence of such.
- EVE has the potential to change this, by setting a new standard.

The insurance industry is beginning to reckon with climate change

Why Ian May Push Florida Real Estate Out of Reach for All but the Super Rich

The hurricane's record-breaking cost will make it even harder for many to get insurance, experts say — threatening home sales, mortgages and construction.

Cleanup in the aftermath of Hurricane Ian in Fort Myers Beach, Fla., on Oct. 5. Callaghan O'Hare for The New York Times

By Christopher Flavelle

Flavelle, a climate adaptation reporter for The Times, has long covered the effect of climate change on insurance markets.

Oct. 13, 2022

Then there is a brand new, rapidly growing industry around climate risk for other purposes than insurance

Aladdin® by BlackRock

TCS now a part of S&P Global

Gro Intelligence

McKinsey & Company

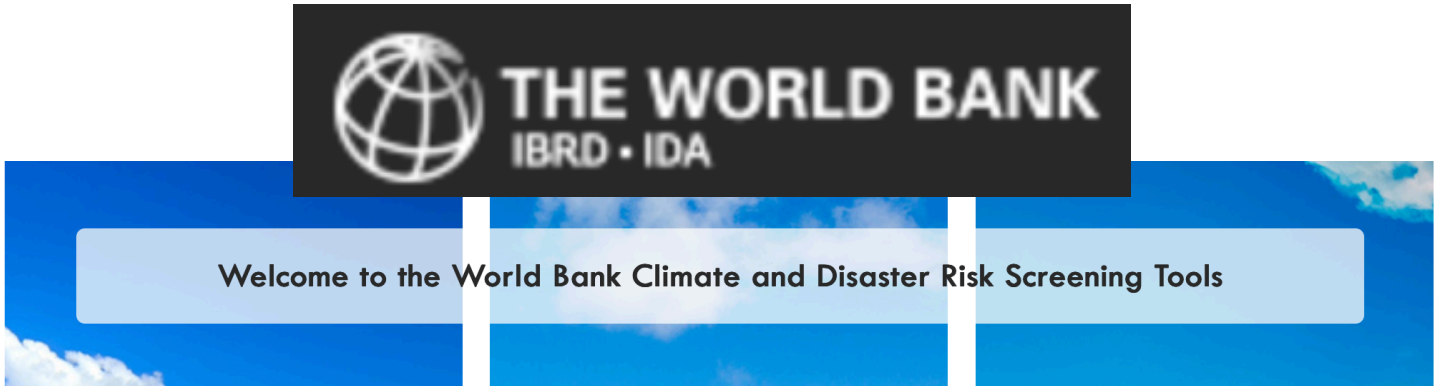
Climate Change

pwc

Climate risk modeling services

A window into the future of environmental impacts to your business.

And growing demand in the public sector: science for climate adaptation, disaster risk reduction, & humanitarian assistance.



START NETWORK

Climate Centre

Governments need it too!

ECONOMIC REPORT OF THE PRESIDENT

Opportunities for Better Managing Weather Risk in the Changing Climate

By Frances Moore, UC Davis

Information on climate risks that is of high quality and is trusted, decision-relevant, and widely disseminated is foundational for adaptation planning and is urgently needed. Yet it is now largely missing.

REPORT TO THE PRESIDENT

Extreme Weather Risk in a Changing Climate: Enhancing prediction and protecting communities

Executive Office of the President

President's Council of Advisors on Science and Technology

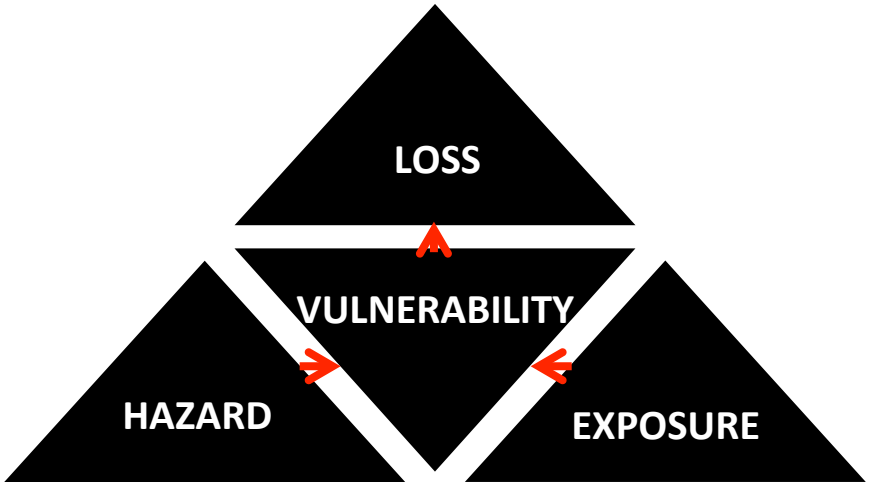
...households, communities, companies, and government agencies do not have sufficiently reliable and geographically specific information about how they may be affected by extreme weather. While a burgeoning industry is beginning to provide climate risk information, much of this is of questionable quality... Also, much of this information is too costly for most individuals or small municipalities to afford...

Physical risk (loss, damage, etc.) can be represented via statistics of individual event losses:

loss = exposure * vulnerability[1](hazard)

Hazard = (event max value of) a geophysical variable
Exposure = stuff that is there
Vulnerability = how much of the stuff will be lost for a given level of hazard

The scales at which these things are represented, and the kinds of data used, vary enormously from one application to another, and the consequences are not systematically understood.



Credit: Radovan Drinka,
Aon/Impact Forecasting

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- Is responsive to these pragmatic needs
- Provides transparent and publicly available tools
- Undergirds those tools with solid scientific understanding
- Treats uncertainty responsibly
- Is ethical

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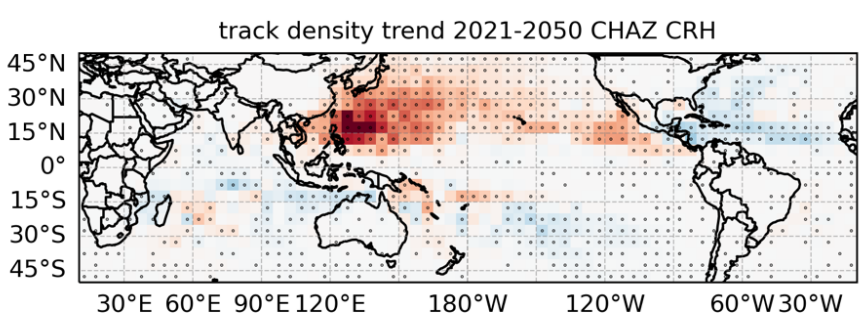
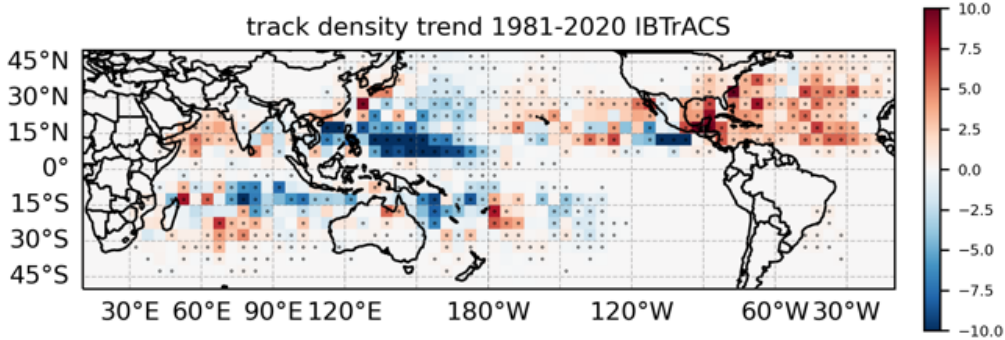
*Projected GHG-forced hurricane activity trends (left) don't look like recent observed trends (bottom) due to disagreement in Pacific SST trend pattern; see T. Palmer's talk yesterday, and our paper in press, *PNAS*





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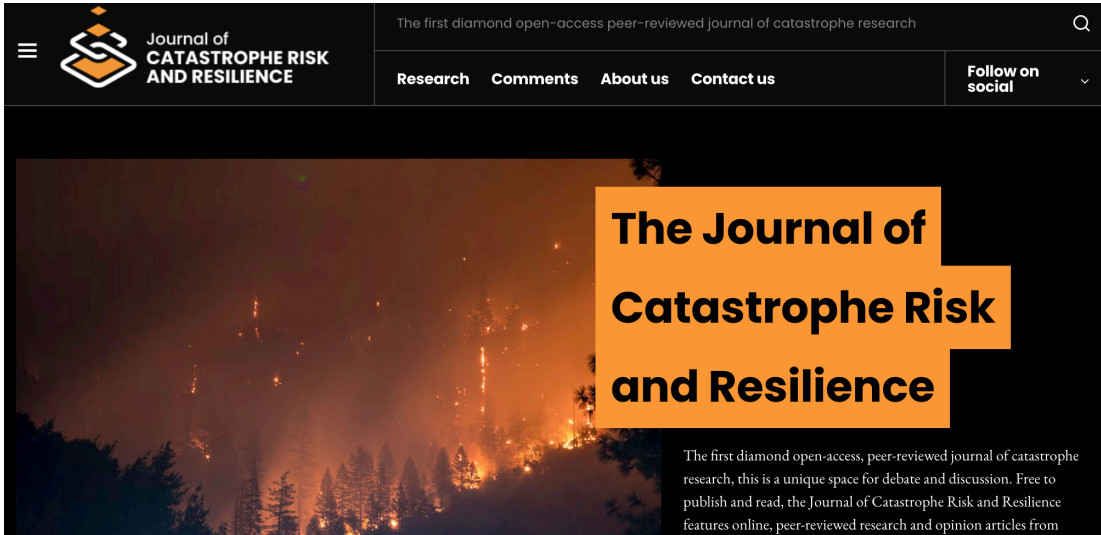
Fields need journals!
journalofcrr.org
New, diamond open access



Methodologies for characterizing extreme event hazard

- Historical record
  - Pros: it's real!
  - Cons: record is too short, and becoming unrepresentative.
- Climate models
  - Pros: physics-based, climate change is organic, mostly open source, well documented.
  - Cons: not necessarily good at extremes. Expensive & complicated to use. Biases. Don't represent impacts.
- Insurance industry catastrophe models
  - Pros: close to the data (small biases), fit for purpose.
  - Cons: Proprietary, "black box". Mostly empirical, climate change is hard to include. Country/region specific, focused on the biggest markets
- Downscaling CMIP
  - Pros: can be custom-designed for purpose
  - Cons: inherit the issues of the parent models, and introduce new ones

EVE 4 Climate Adaptation: some assertions

- The strongest use case for EVE is climate adaptation.
- No matter how good EVE's models are, we won't be able to prove their longer-term projections or predictions "right".
- But EVE could be transformative by *setting a global standard,* and unlocking adaptation finance.

AI-generated image by freepik.com
prompt: "climate adaptation finance global south"

Green Climate Fund Decision B.33/13: Guidance on the approach and scope for providing support to adaptation activities (August 2022)

(bold mine)

- The GCF Board "requests the Secretariat... to advance...

  -Preparation of ...funding proposals, which are based on **best available information about climate risk**,vulnerability and adaptation solutions...
- Reaffirms .. adaptation proposals will include an **evidence-based analysis** to show that the proposed activity is likely to be an effective adaptive response to the risk or impact **of a specific climate change hazard, based on best available information and data"**

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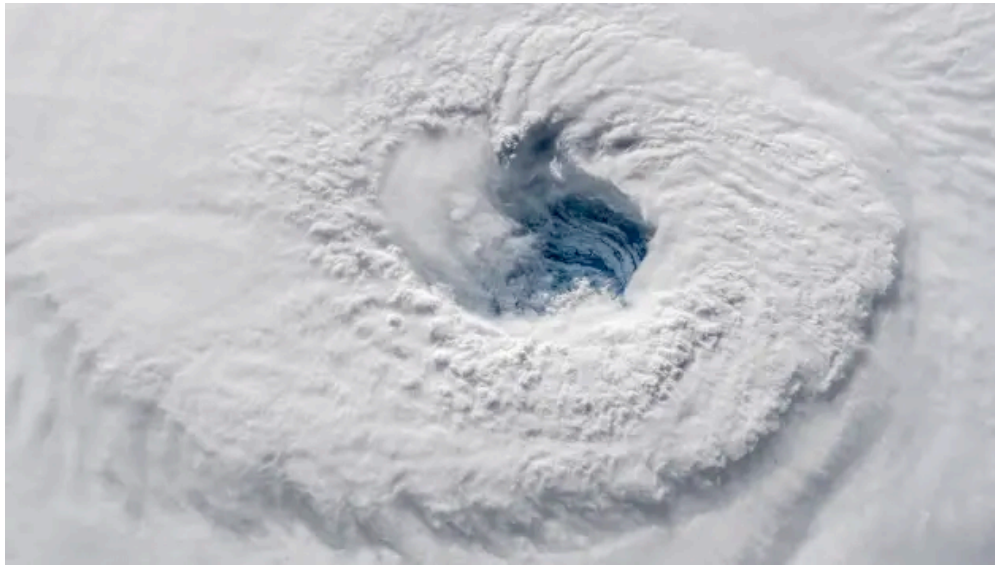
Any other funder will want the same! But the places most deserving are often the most data-poor; private sector data are generally expensive; quality of all data is inconsistent and hard to assess

EVE could set a new standard

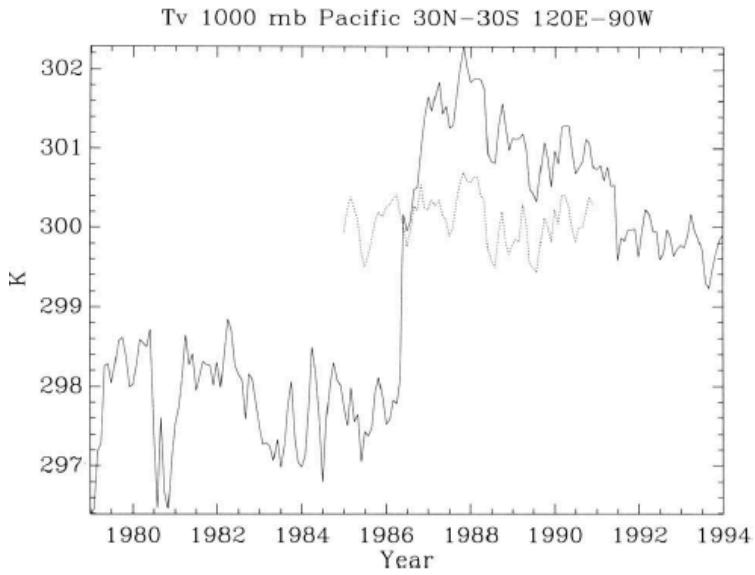
- High resolution will improve extremes, while keeping them internally consistent with the large-scale climate
- Good chance large-scale biases will improve
- Data will be global and of ~uniform quality



Hurricane Florence seen from space. Credit: NASA

Standards can be transformative

- NCEP/NCAR Reanalysis 1: maximized temporal consistency
- CMIP3: made multi-model ensembles widely available
- Open, available, and scientifically state-of-the-art
- *Wide use -> scrutiny -> trust*



Spurious jump due to analysis system changes (solid) eliminated by reanalysis (dotted)
Kalnay et al. (1996, BAMS)

EVE Challenges

- Small ensemble size; ML (or lower-resolution) “inflation” will be important
- Will resolution fix biases?
- Serving data at scale by “ML on top’ ...
- *Being sufficiently responsive to real user needs; inclusive, equitable, pluralistic, trusted...*

EVE should treat *how to make climate information best serve society* as seriously as *how to produce the best climate information*.

EVE shouldn't be overly prescriptive up front about how to do this. Focus first on structure, process, and governance.

Hire good people to figure it out, and give them real resources and power --- including influence over the science and technology.

ML/AI may allow the service provision to scale, but broad, deep, ethical human engagement with users will be essential to success.