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C3WE

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Tools in support of reducing the impacts of weather and climate extremes

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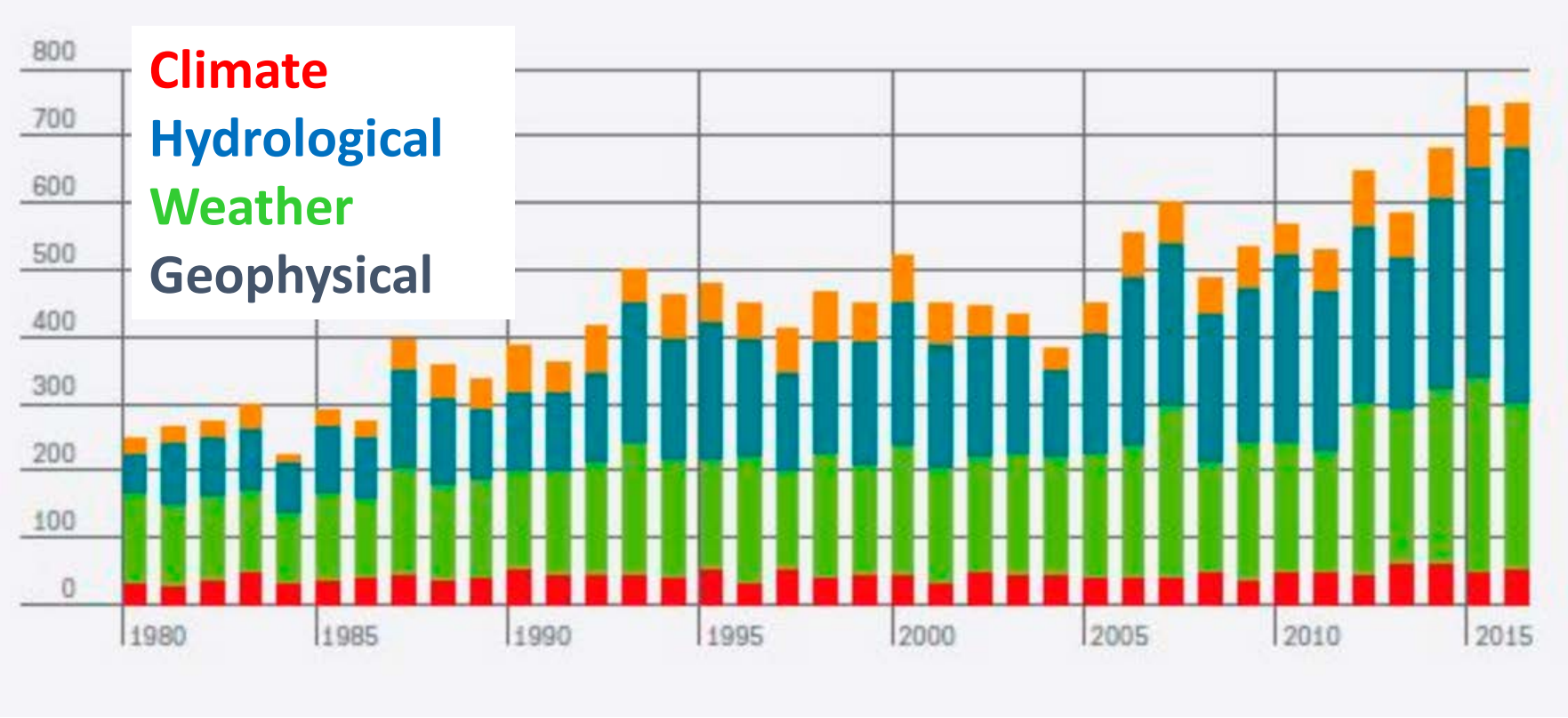
Global ‘Natural’ Disasters



(Munich Re)

Capacity Center for Climate and Weather Extremes

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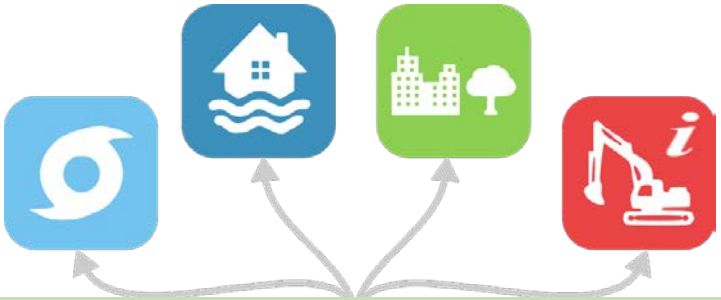
Operating Principles

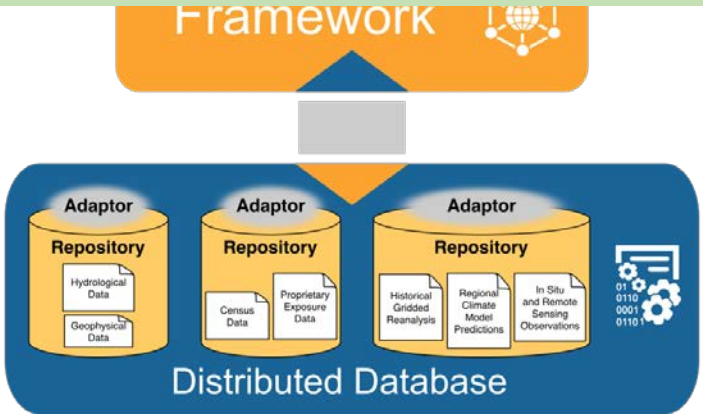
- **Provide what is needed, not what we think is useful**
- **Nation-State-City Scales**
- **Uncertainty/Confidence**
- **Graceful Failure: Including the consequences of failure at the planning stage.**

The Global Risk, Resilience and Impacts Toolbox



Community Tools

Supports both Societal and Research Activities



Engine and Visualization

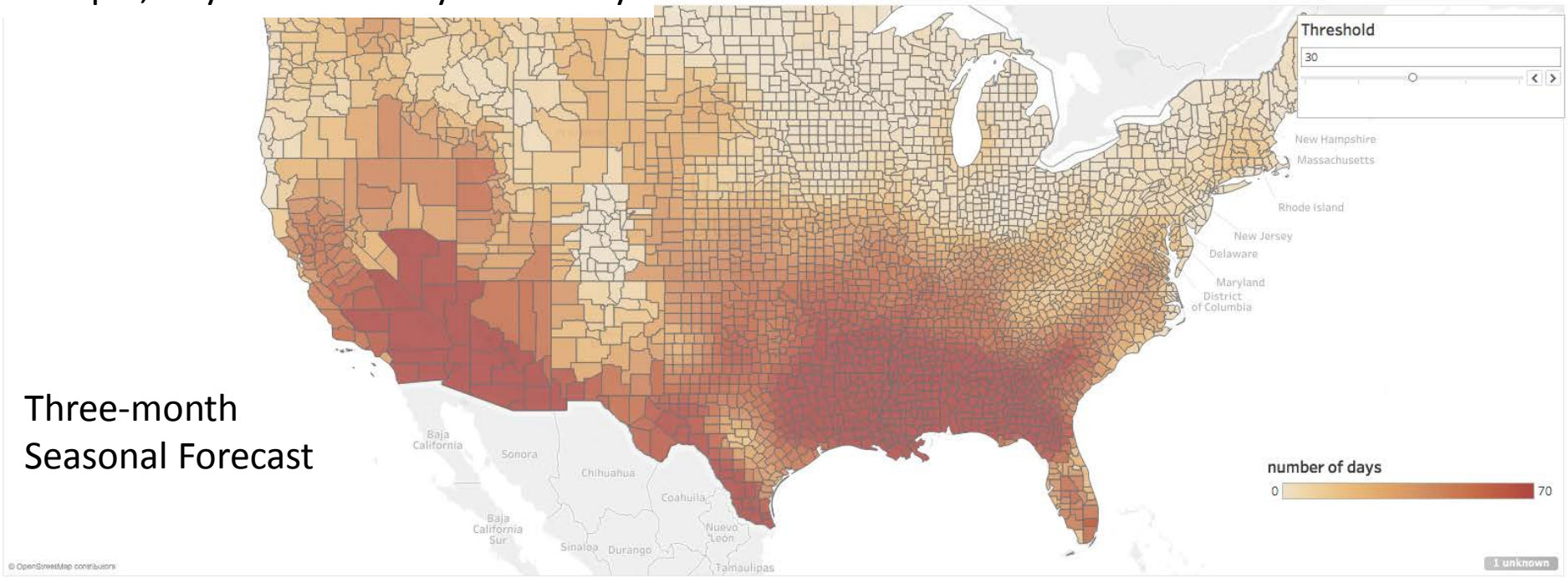
Operates in Cloud

Data

Collaboration with Tableau, Willis TW, IAG, Zurich Insurance, NSF, Geoscience Australia, Academia and others.

Climate-I Construction

Example, Days over 30°C by US County



Three-month
Seasonal Forecast

Applicable anywhere on earth
Currently Temperature, Rain, Wind

(Visualization: Tableau)

Choose a State

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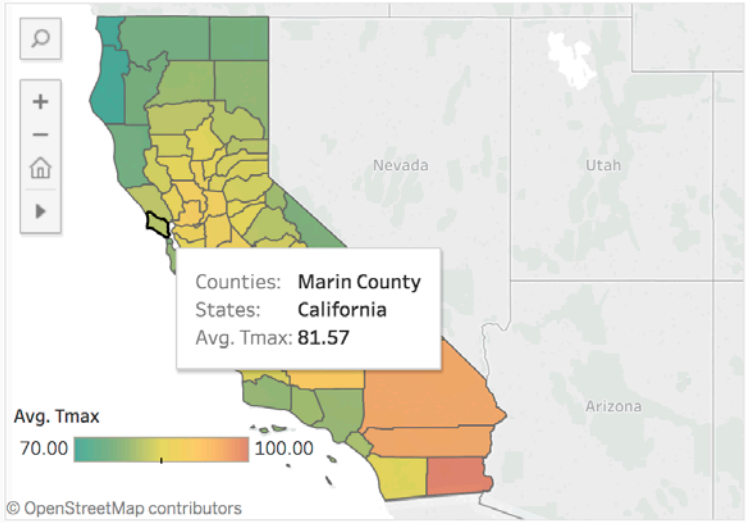
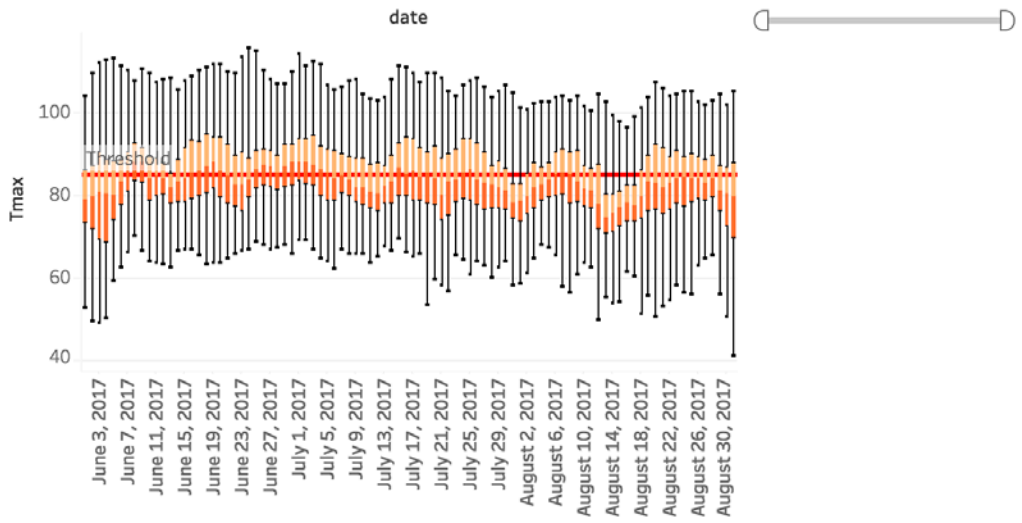
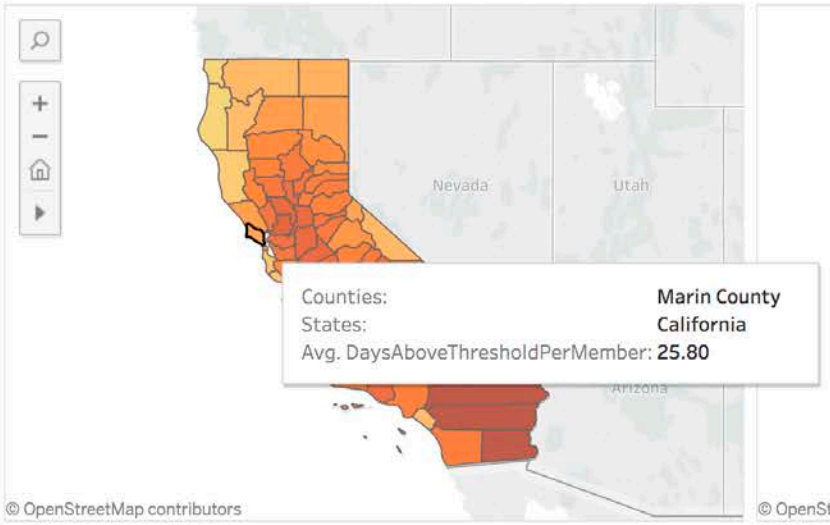
Average(Tmax)



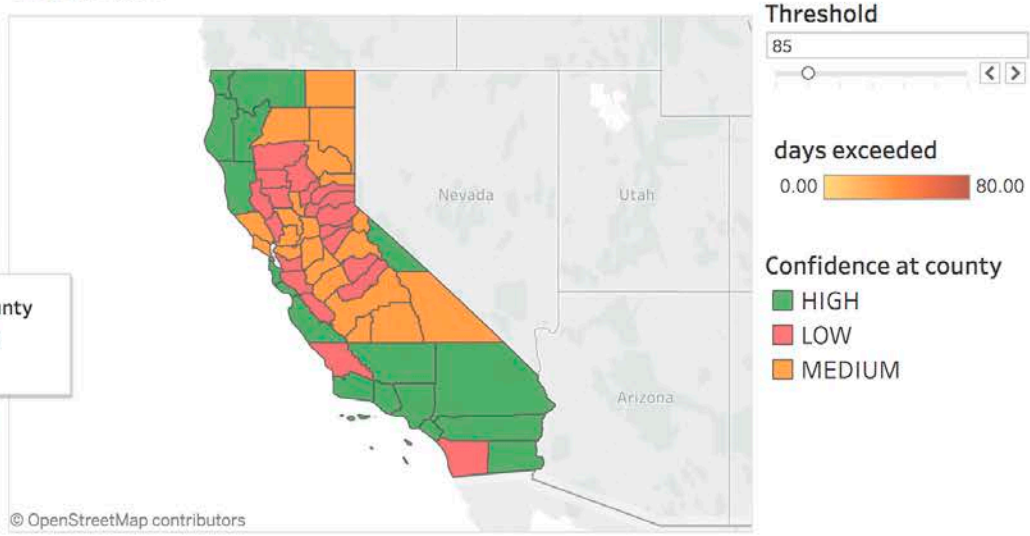
Time series



days exceeded

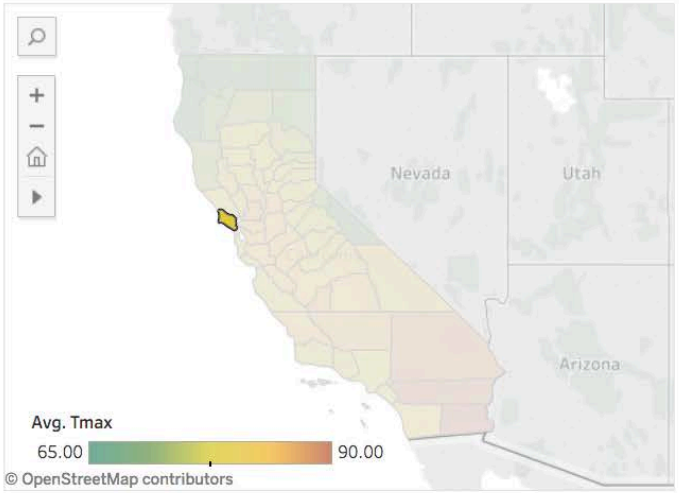


confidence

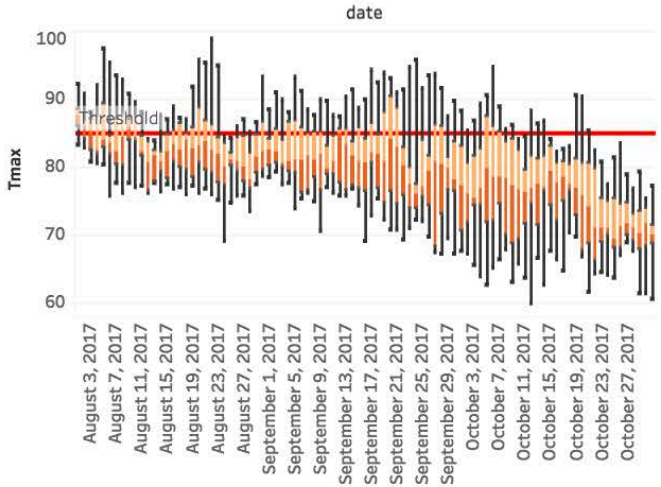


Marin County

Average(Tmax)



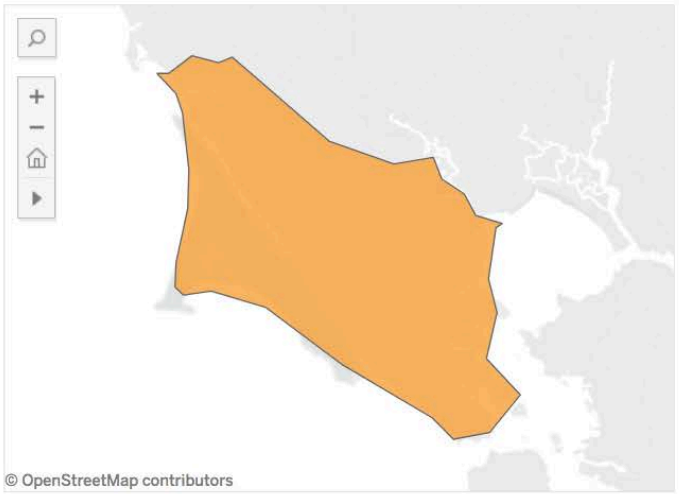
Time series



date

8/1/2017 — 10/31/2017

days exceeded



Confidence

Threshold

85

days exceeded

0.00 — 80.00

Confidence

MEDIUM

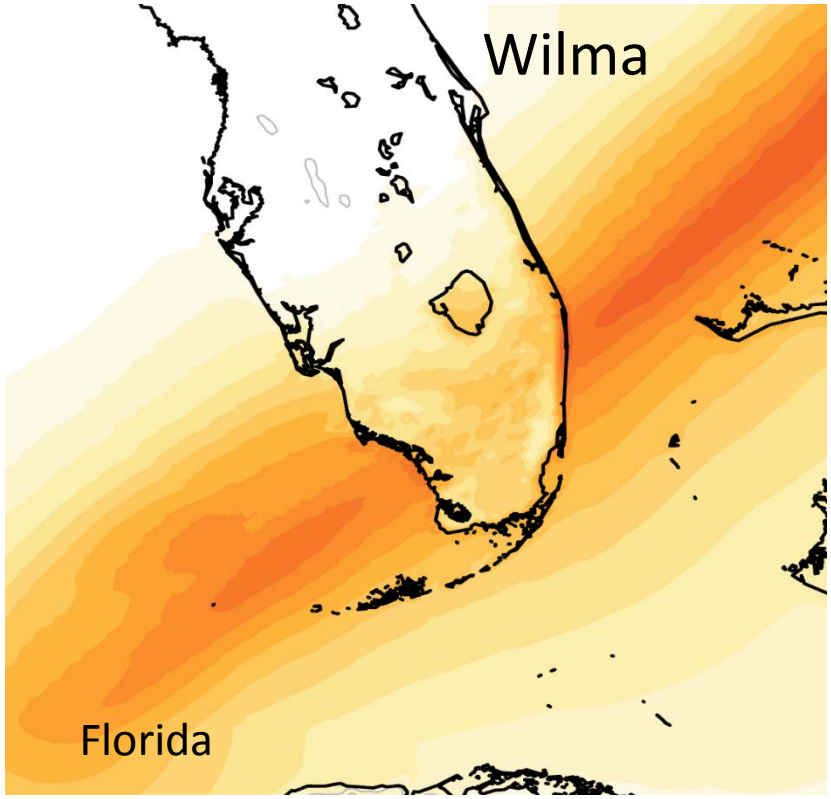
Tropical Cyclone Risk Assessment System

- **Global Tropical Cyclone Cat and Wind Footprint Model:**
  - *Development of the TCRM from Geoscience Australia (www.geoscienceaustralia.github.io/tcrm)*
  - *Improved Winds using modified Holland Profile, and simplified Wang and Kepert Boundary Layer Model*
- **Cyclone Damage Potential**
  - *(Intensity, Size, translation)*
- **Hybrid Numerical Tropical Cyclone Model:**
  - *Based on WRF*
  - *Capacity to reproduce desired tropical cyclone characteristics and track*
  - *Provides detailed rain and wind at levels for damage assessment, e.g. standard 10 m, or 100m and other levels for high-rise buildings.*

Global Wind Footprint Re-analysis

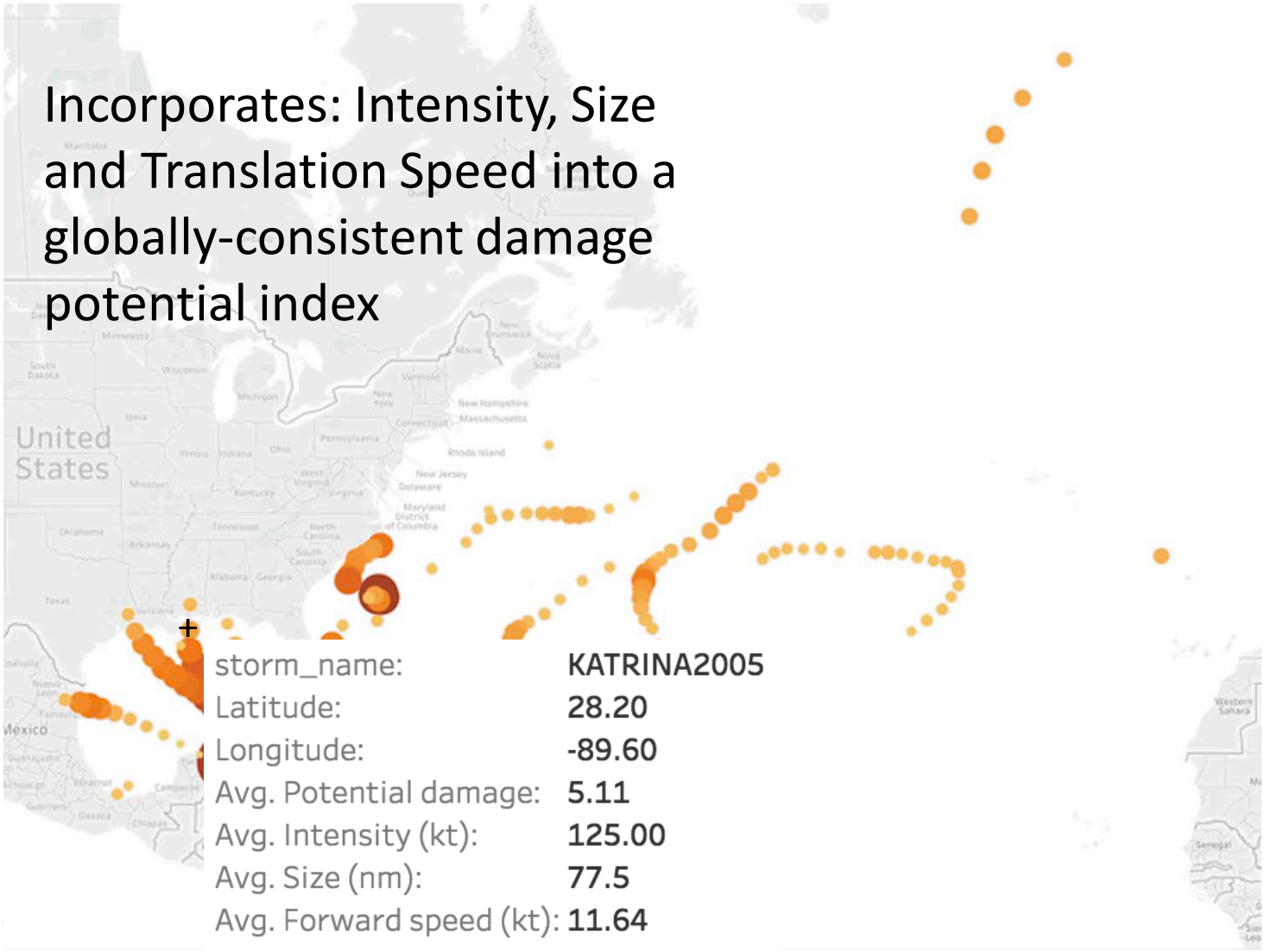
(Supported by Willis Towers Watson)

Example Footprints



Cyclone Damage Potential

Incorporates: Intensity, Size and Translation Speed into a globally-consistent damage potential index



Accumulated Rainfall

Control

SST +2

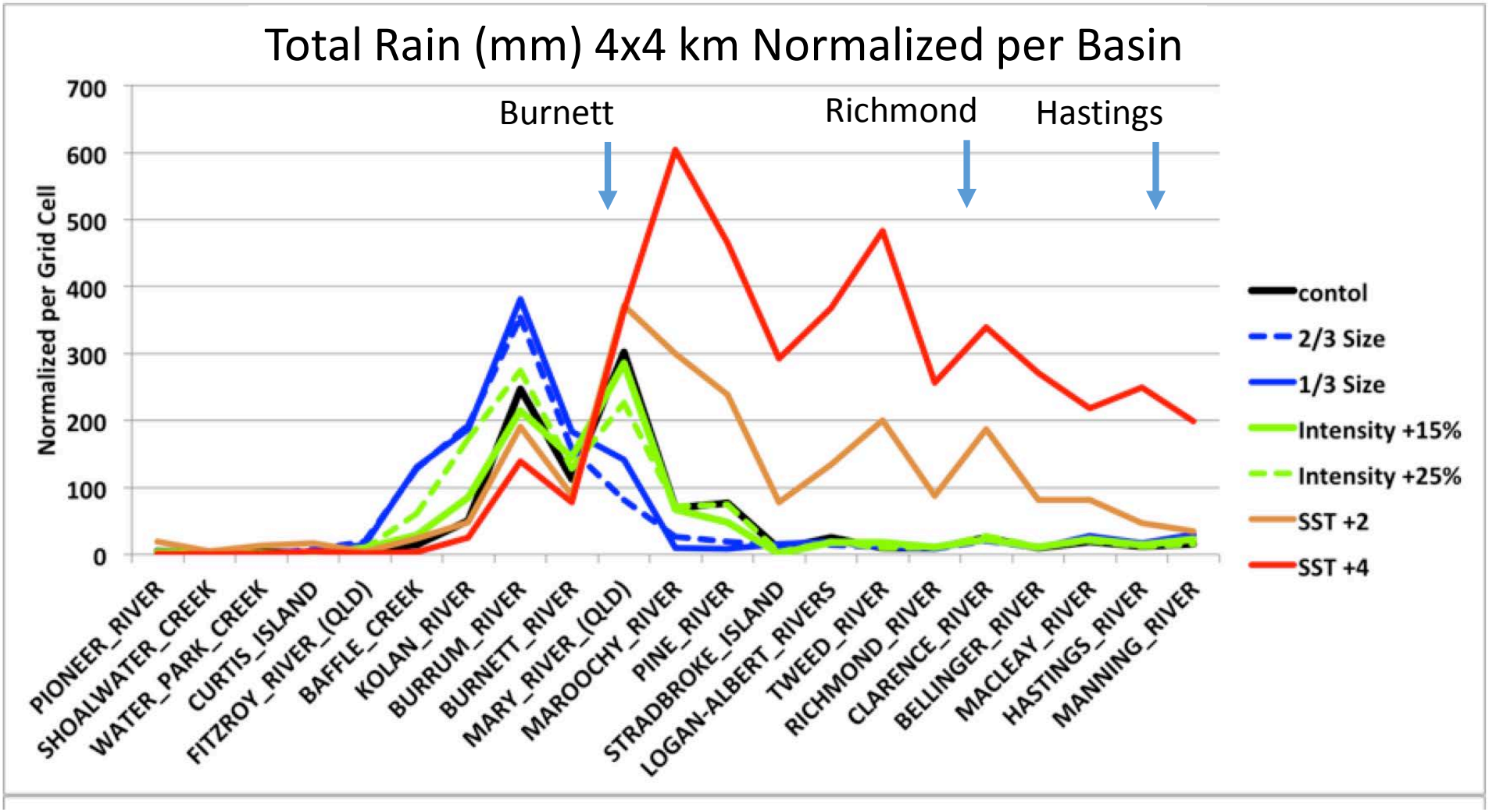
Burnett River

Richmond River

Hastings River

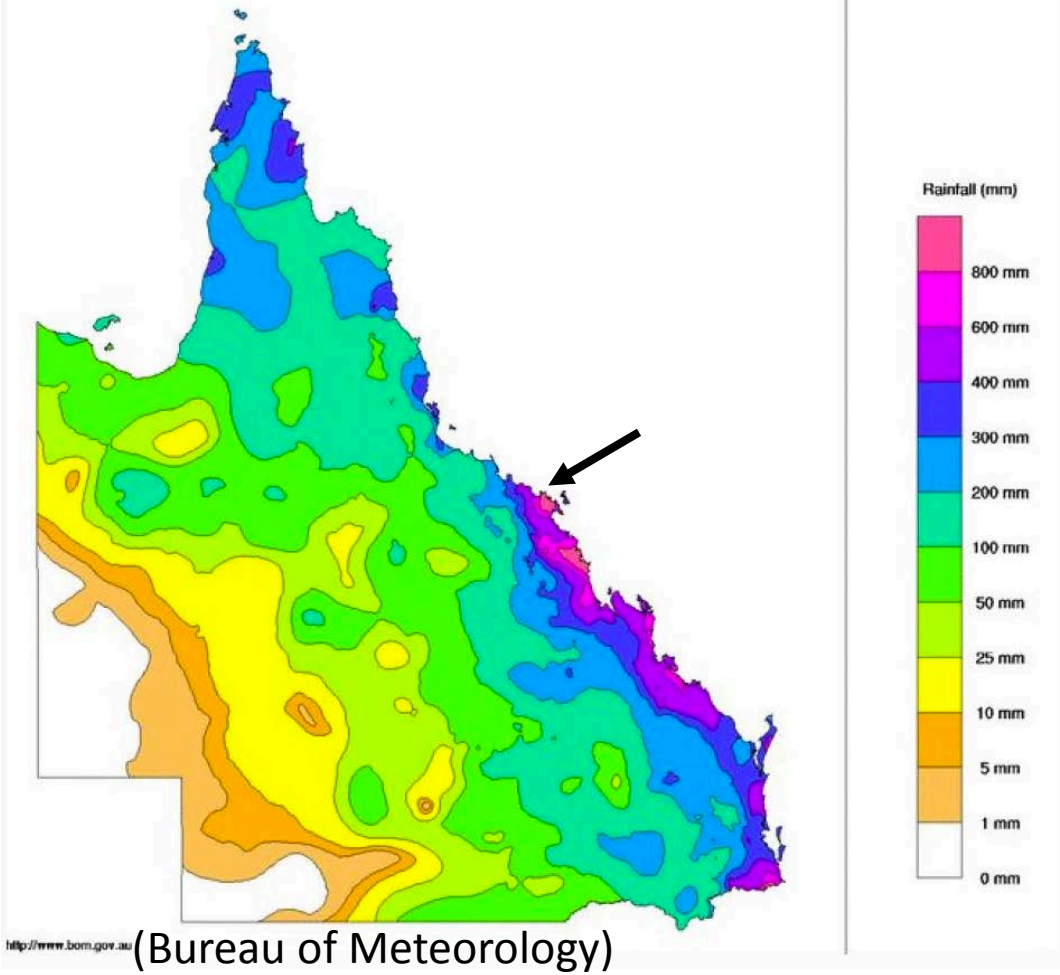
(*Original Design for IAG Australia*)

Rainfall Changes by River Basin



Severe Tropical Cyclone Debbie

March Rainfall Queensland



(Bureau of Meteorology)

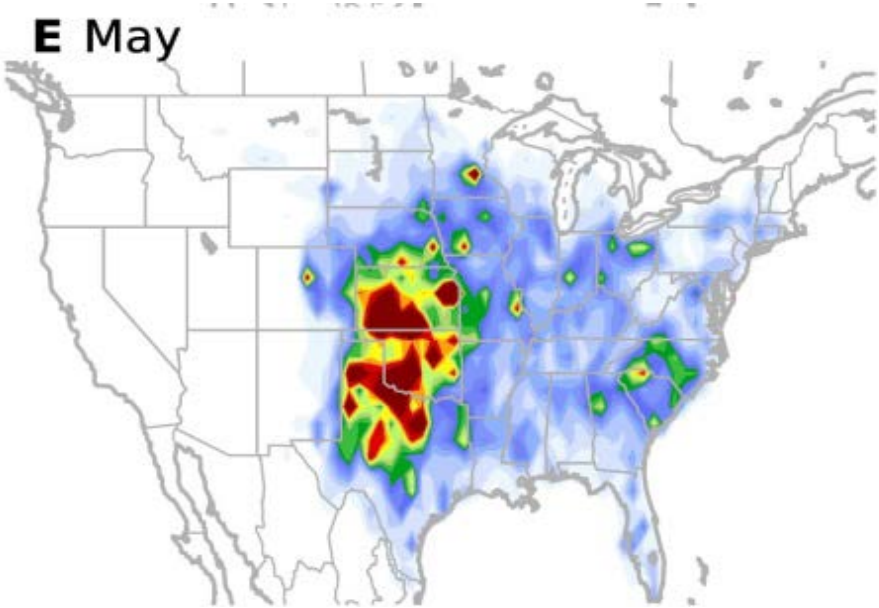
Record March Rainfalls at 62 locations

Massive damage, disruption, and insurance losses.

Assessing Hail Impacts

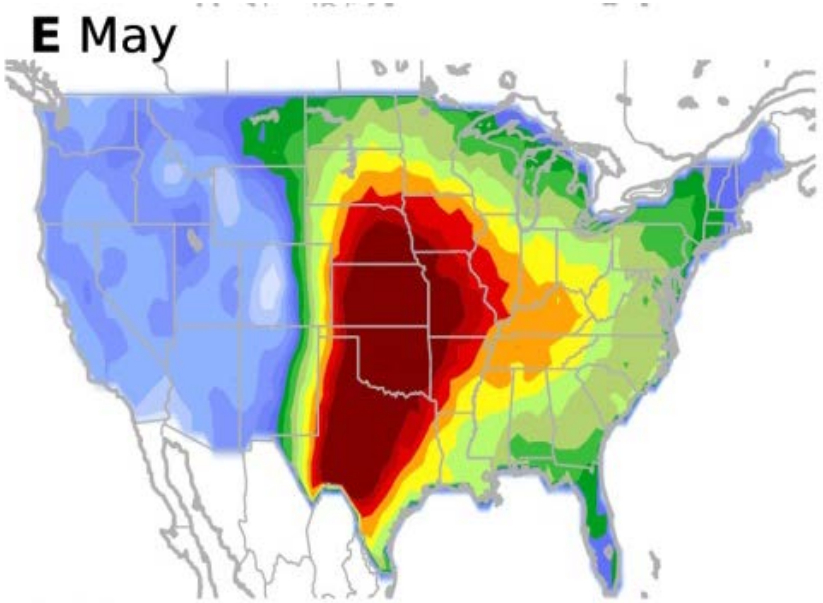
Convert observed days of >2.5cm hail to days where the environment can support hail (LHED = Large Hail Environment Days)

Observed



Average for Period 1979-2015

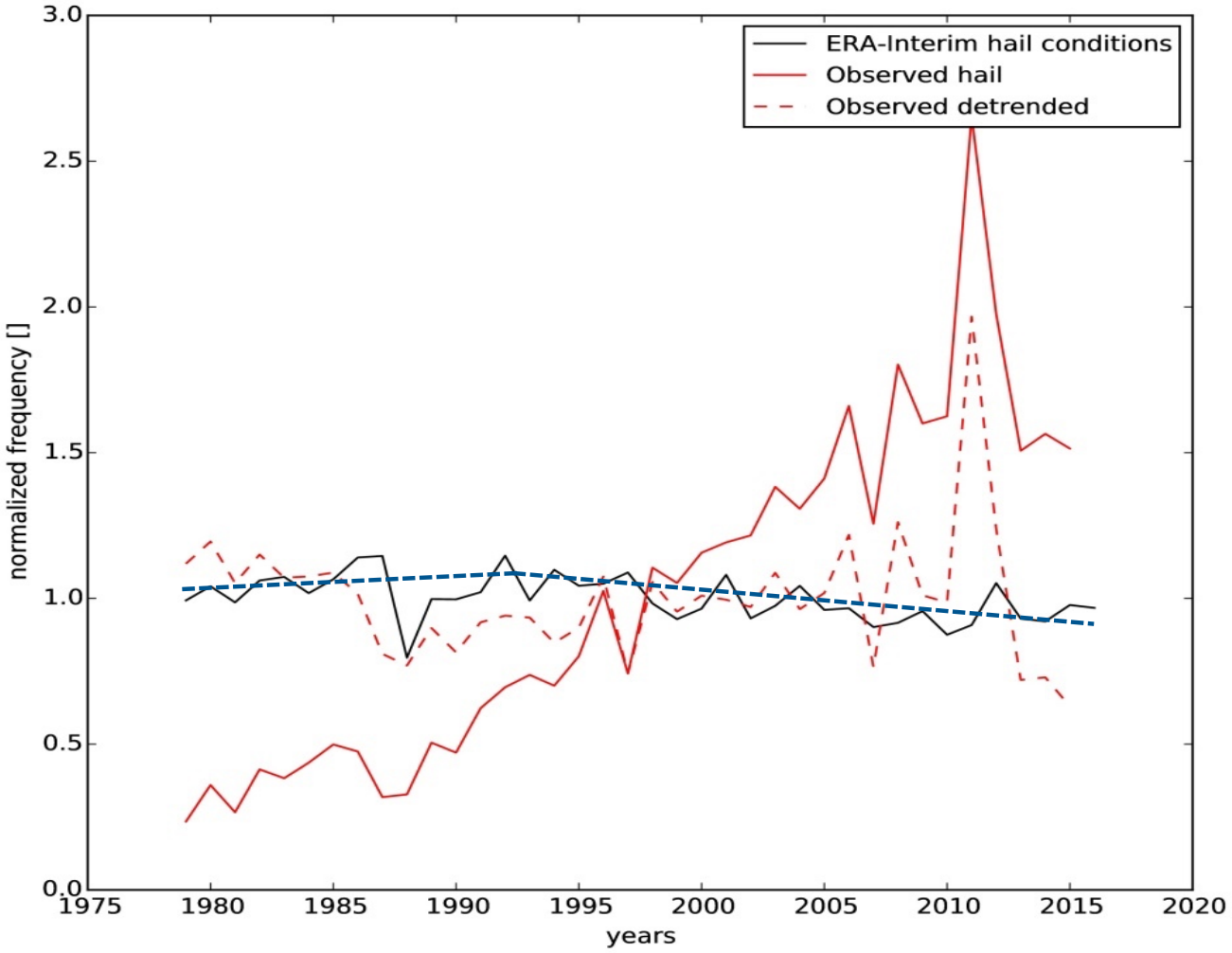
LHED from ERA



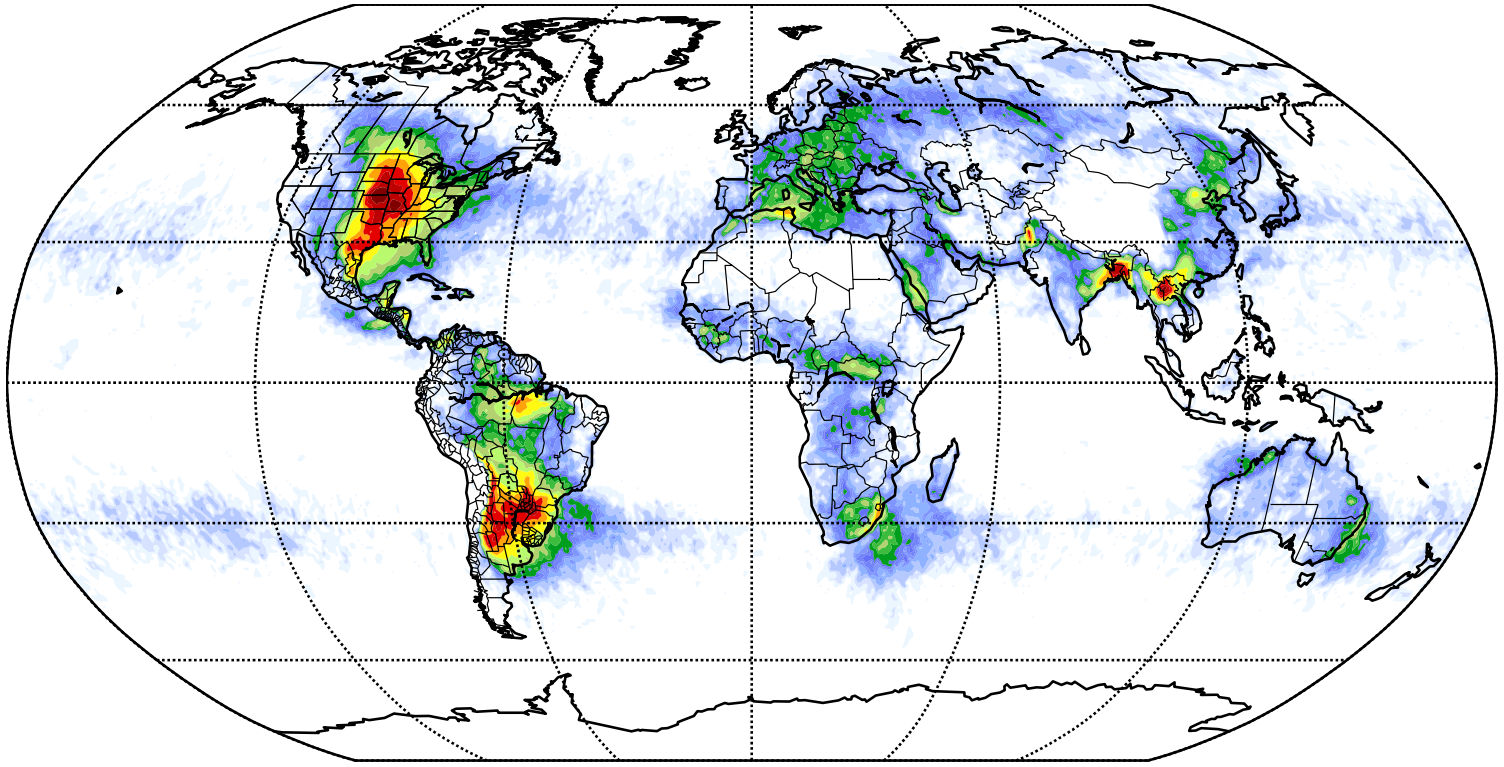
(Prein 2017)

(*Responding to numerous requests*)

Trends in Hail Frequency



Global LHED



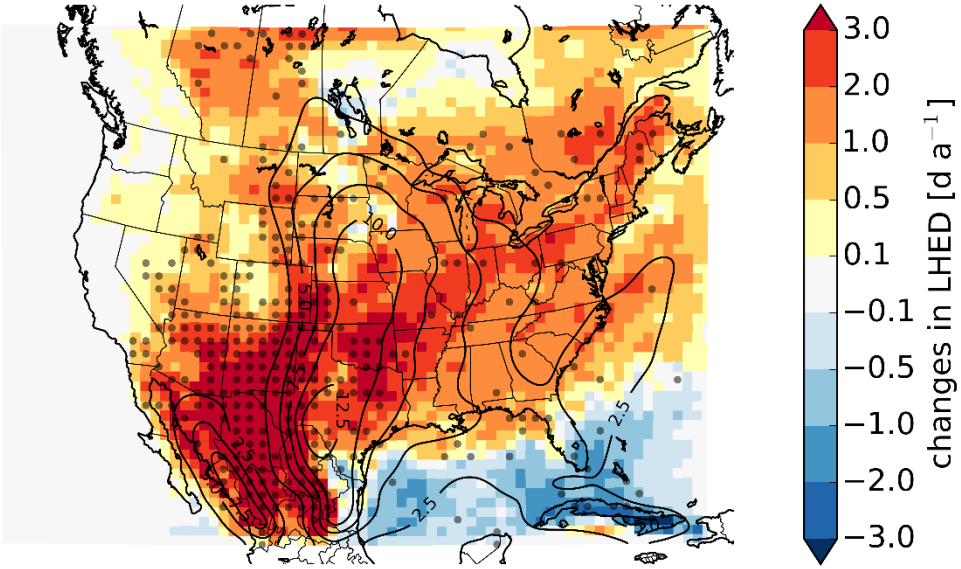
environment days per year in 0.75°x0.75° area

LHED = Large Hail Environment Days from ERA Interim

Climate Change Impact USA

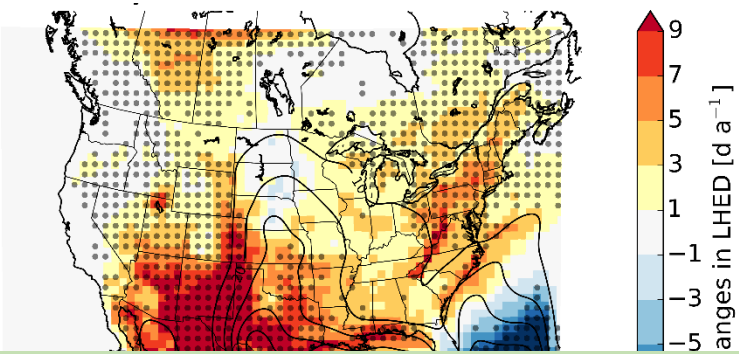
Climate change in LHED

Contours: Current Climate
Dots: Significant at .05

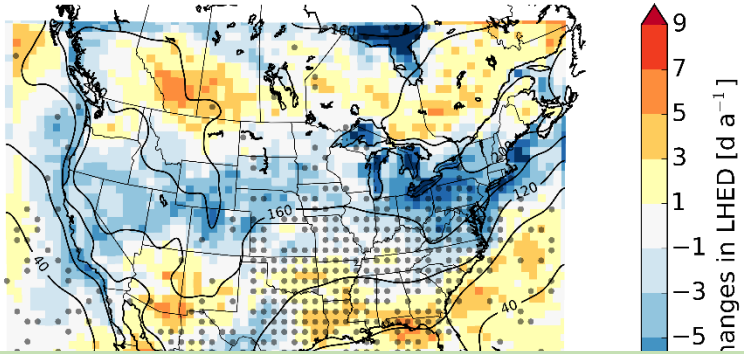


- North American wide increase in large hail risk
- **LHED** = Days where the environment could support hail>2.5 cm.

Climate change due to thermodynamics



Climate change due to dynamics



Next tool Development: Assessing Extreme Rain

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GRRIT:

Community Collaboration to:

- **Increase Resilience**
- **Improve Planning**
- **Reduce Vulnerability, and**
- **Support Adaptation**

Through a peer-reviewed set of appropriate tools