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Climate Change and Catastrophe Modelling: The Problem With Historical Data

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Agenda

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- Spotting trends (e.g. the impact of climate change) in historical data
- What might we do if we can't spot trends in historical data?
- Why is this important for catastrophe modelling?

Quick Quiz: 4 Historical Datasets

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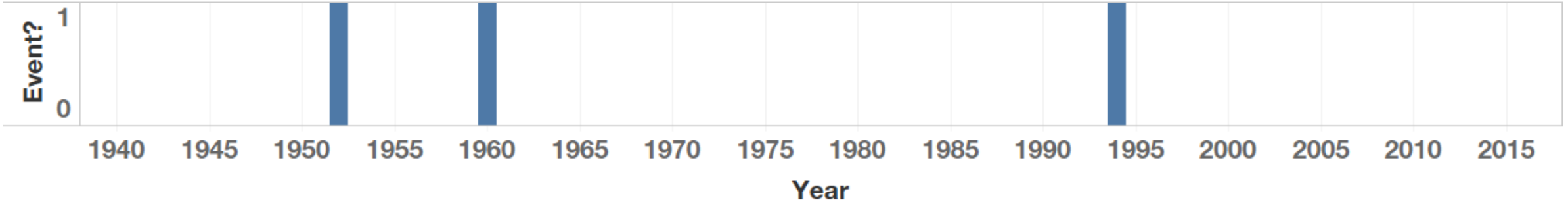
- **Take a look at the following dataset – can you spot a trend?**



Quick Quiz: 4 Historical Datasets

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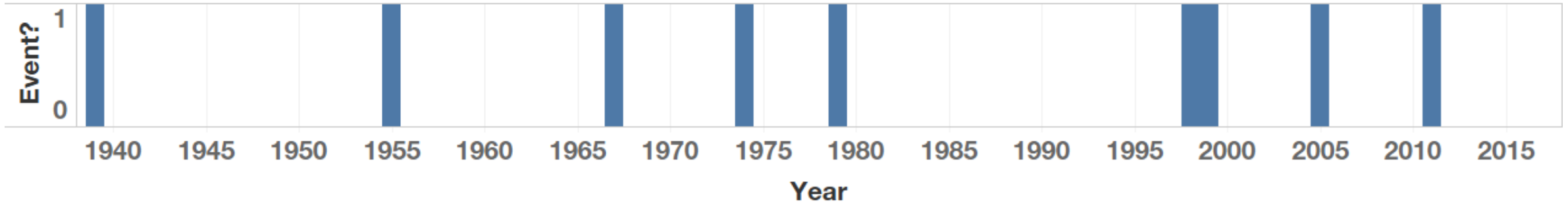
- **What about this one?**



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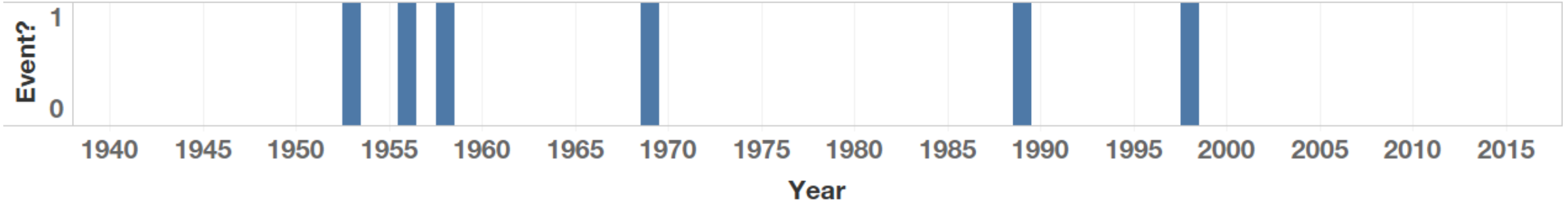

Quick Quiz: 4 Historical Datasets

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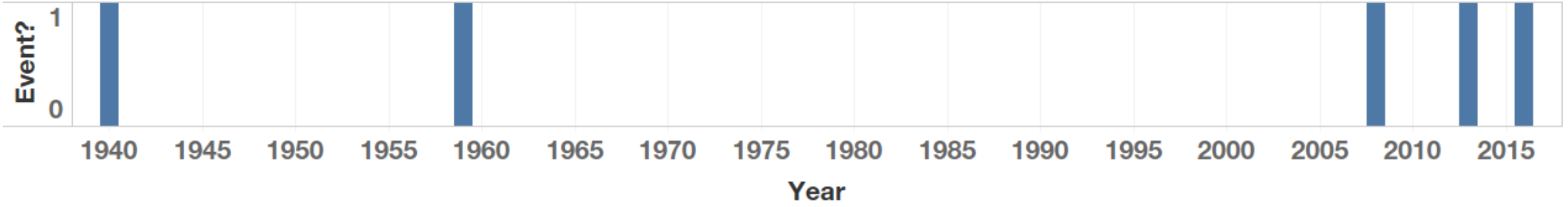
- **And this one?**



Answer

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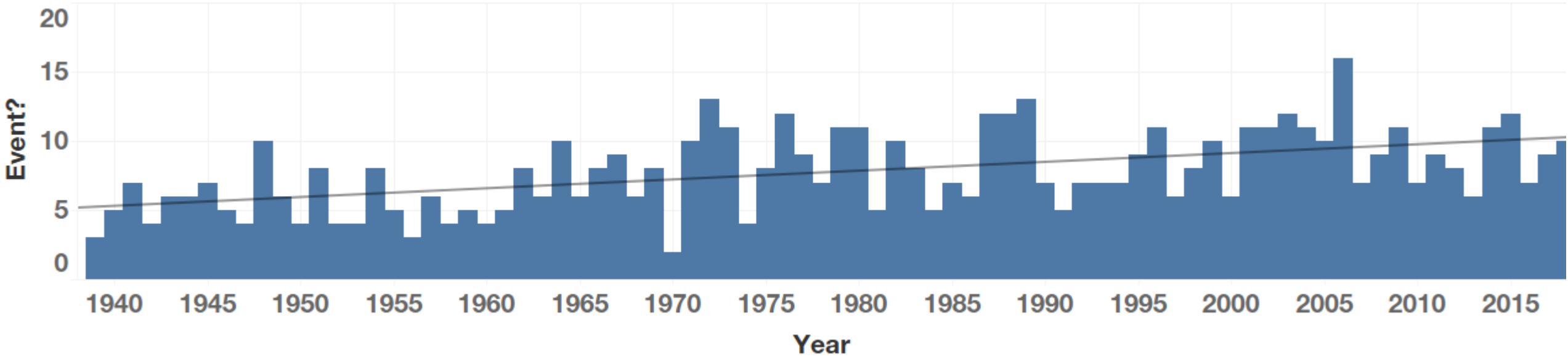
- Yes there is a trend in the data
- Confession time: I made the data up!
- Chance of an event increases from 5% to 10% across the data
- If we add up 100 of these “simulations” we get this:



Here's The Problem

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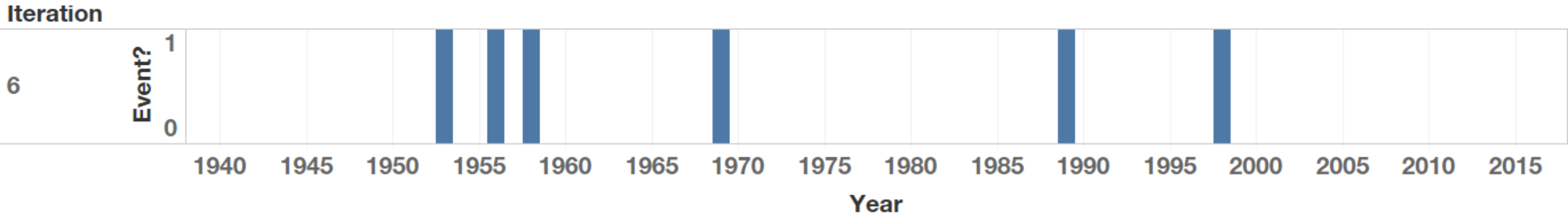

- **Our historical data will only ever be one series !**

Why is this important for Catastrophe Modelling?

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- We often use historical data as inputs for our catastrophe models to set hazard rates
- Trends may not be evident from simple historical datasets that are too short to pick up any trend
    - …including climate change trends

Trends in Losses

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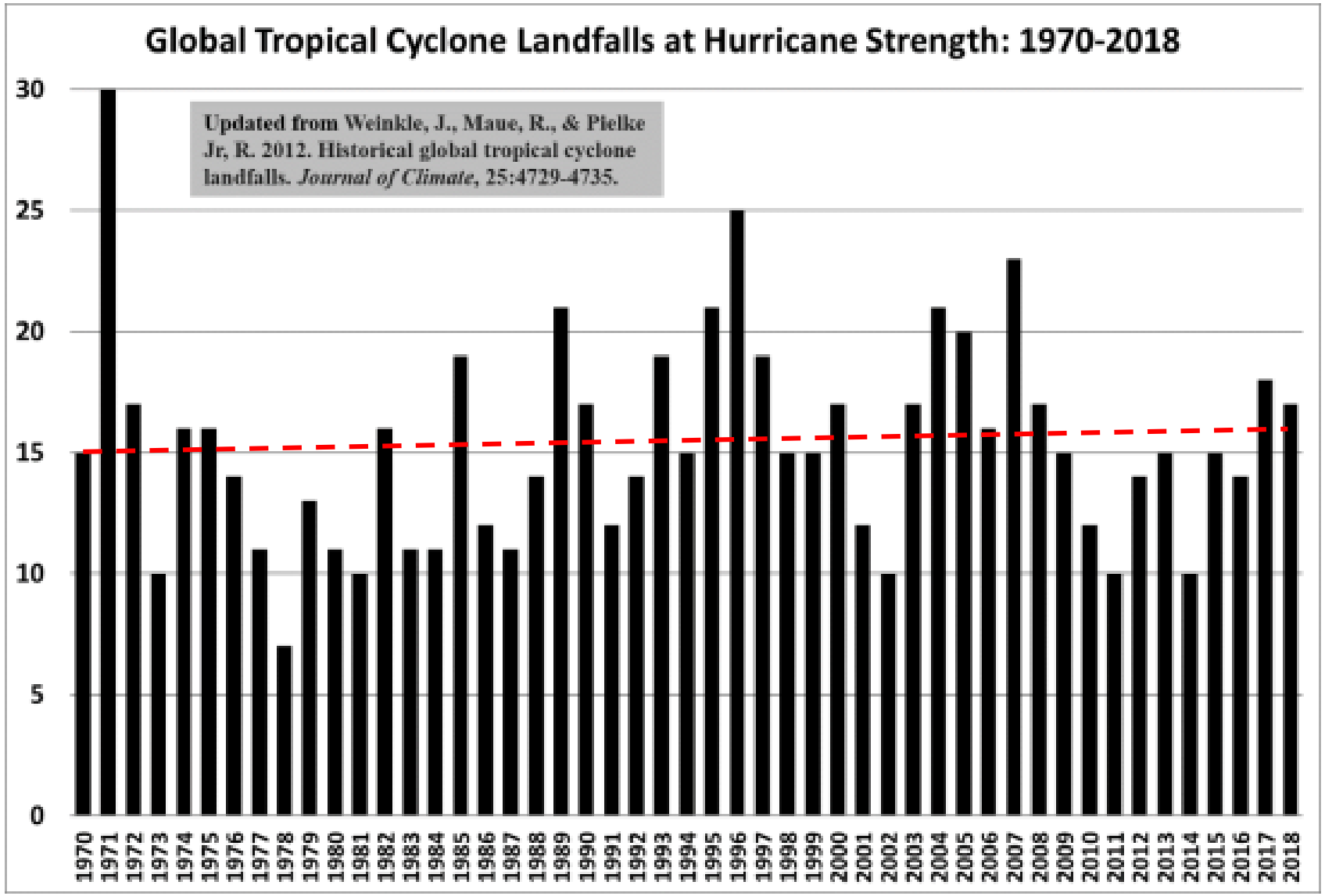
- No suggestion of a trend in global cyclone landfalls
- But what if we'd had the last 48 years all over again?



What can we do?

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- Re-simulate our atmosphere's "history" multiple times in climate models
- Often requires enormous computing power
- Multiple "re-runs" of history to
  - understand if trends in "our history" make sense
  - highlight trends in extreme events that might not appear in "our history"
- Huge caveat to this: most climate models have biases

Project Team

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- **Sam Franklin (Institute of Environmental Analytics)**
  - **Responsible for most of the data production behind the graphs you'll see**
- **Dr Debbie Clifford (Institute of Environmental Analytics)**
- **Prof Len Shaffrey (Dept. of Meteorology)**

Institute for Environmental Analytics

University of Reading

Project Sponsors and Thanks

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Climate-KIC

PERILS

Technical University of Denmark

Project Setup

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- Climate model simulating the world 100 times over from 1951-2011
  - 100 different takes on history – “ensembles”
- We looked at how European Windstorm risk *might* be changing
- Japanese dataset: 2.2 PB of data available for non-commercial use
- Dataset simulates impact of climate change

One Ensemble Run: EU Windstorm Losses

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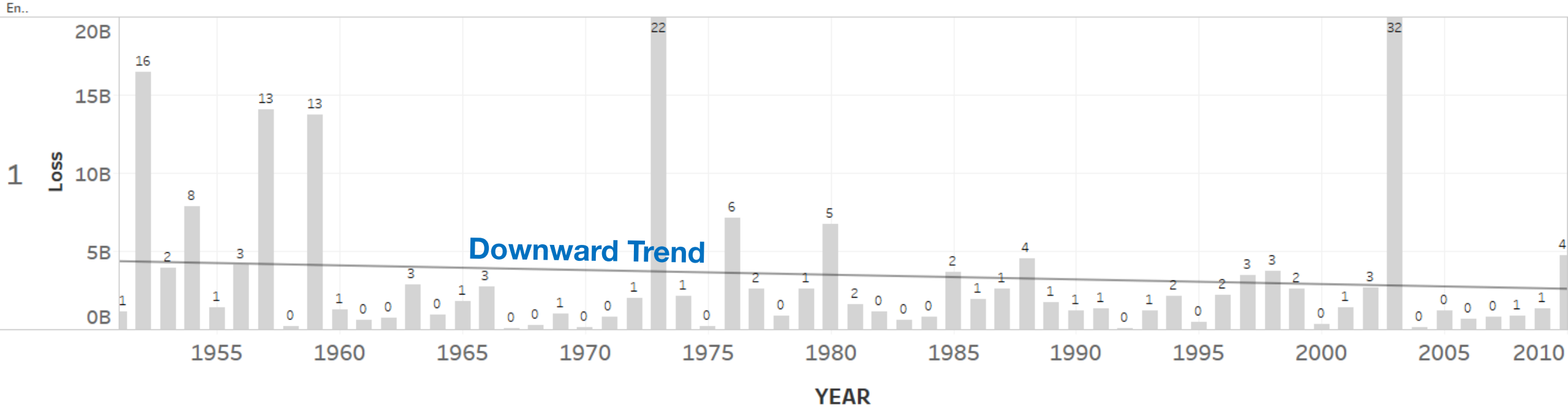
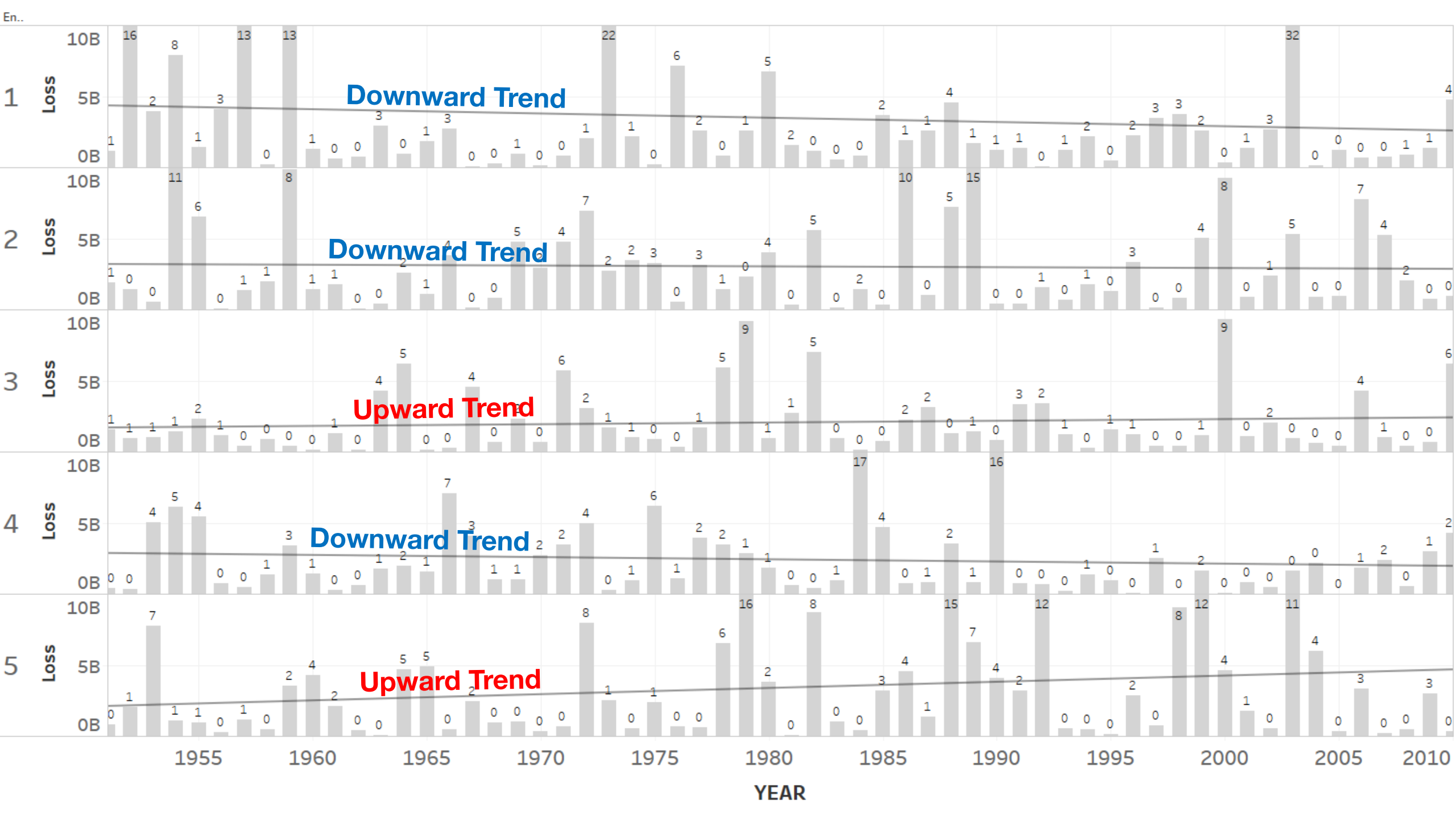
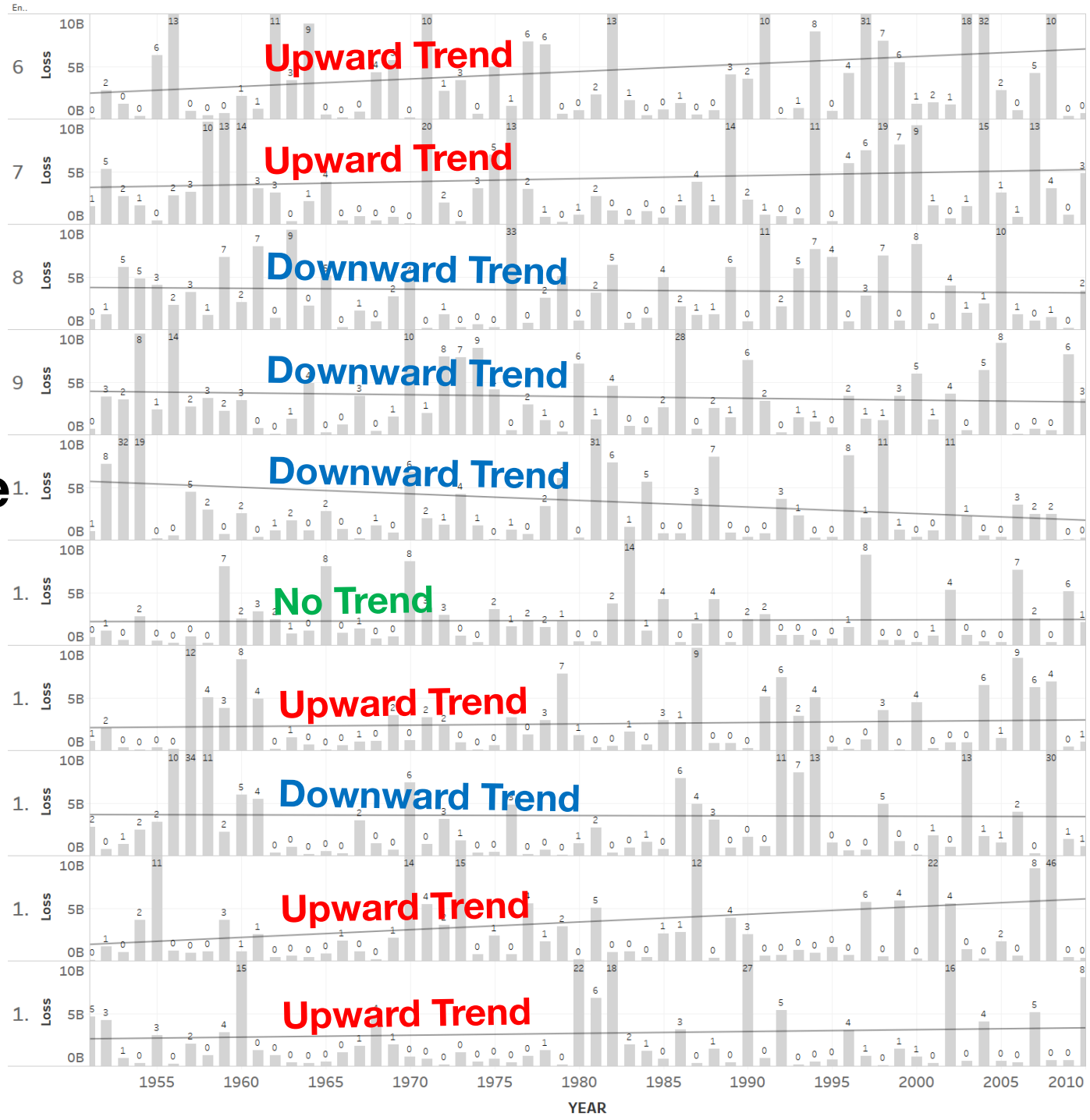
- Bars show total EU windstorm loss in that simulated year
- Downward trend in the data:
  - Similar to what has been noted in historical data



- What about another view of “history”…or five?


En..
1
2
3
4
5
Loss
10B
5B
0B
Downward Trend
Downward Trend
Upward Trend
Downward Trend
Upward Trend
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
YEAR

- **Re-runs of history have variations of trends**
- **Suggests atmosphere is quite “variable”**
- **Highlights concern in following trends in historical data slavishly**



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What about the full 100 runs?

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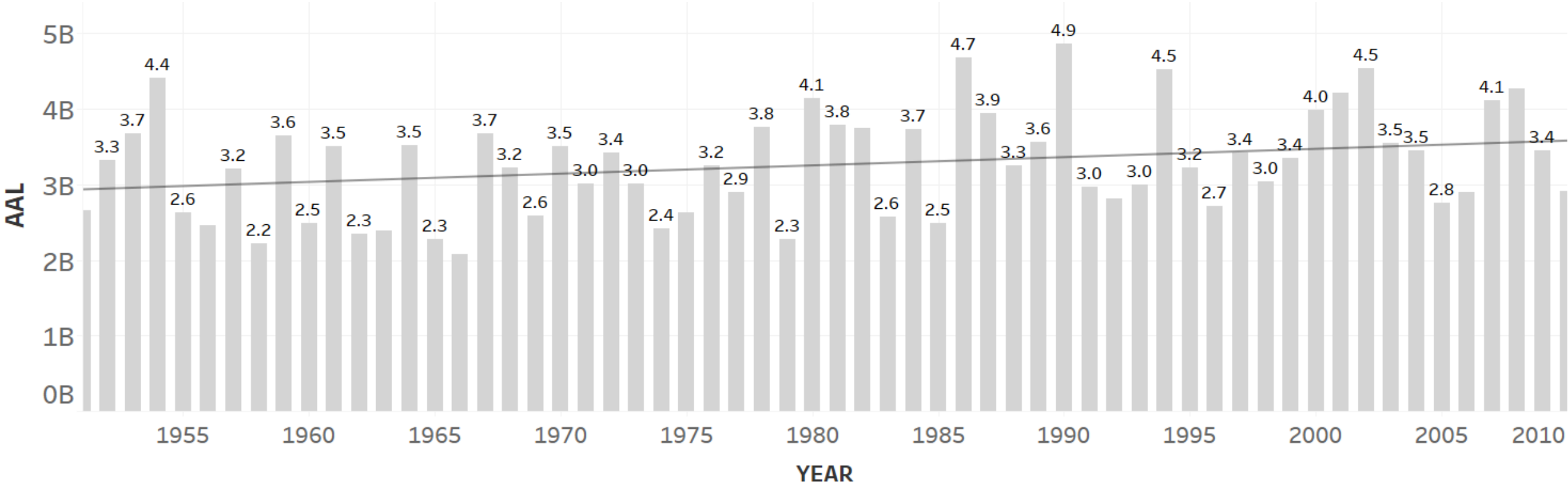
- **Average annual loss for each year across the 100 simulations**



- **Trend line shows a gradual 20-25% increase in risk over 1951-2011**

Impact of Historical Baseline on EP Curves

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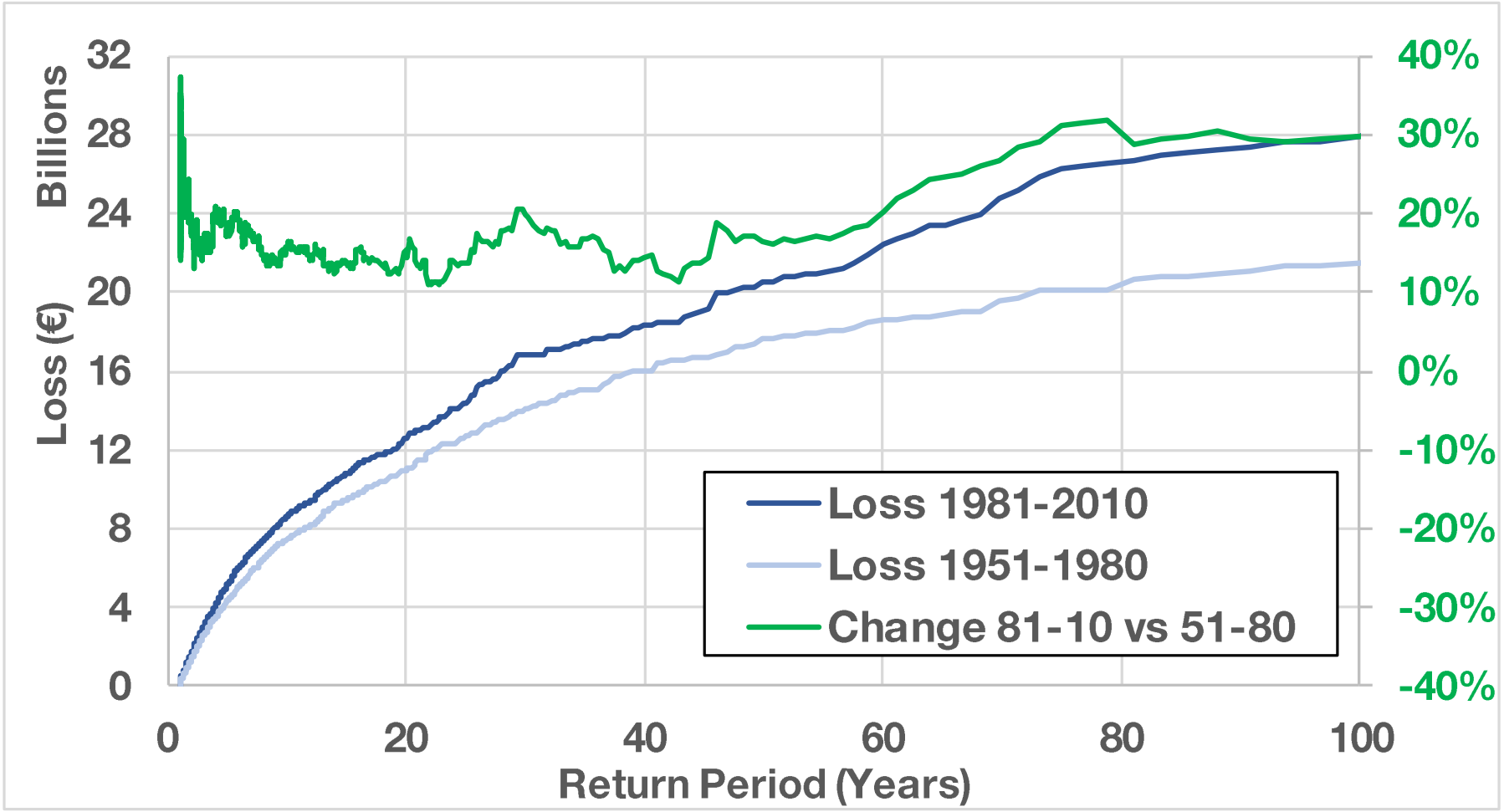
- **Shift to higher losses over time**
- **1981-2010 risk around 15-30% higher than 1951-1980**



The Downward Trend in EUWS Activity

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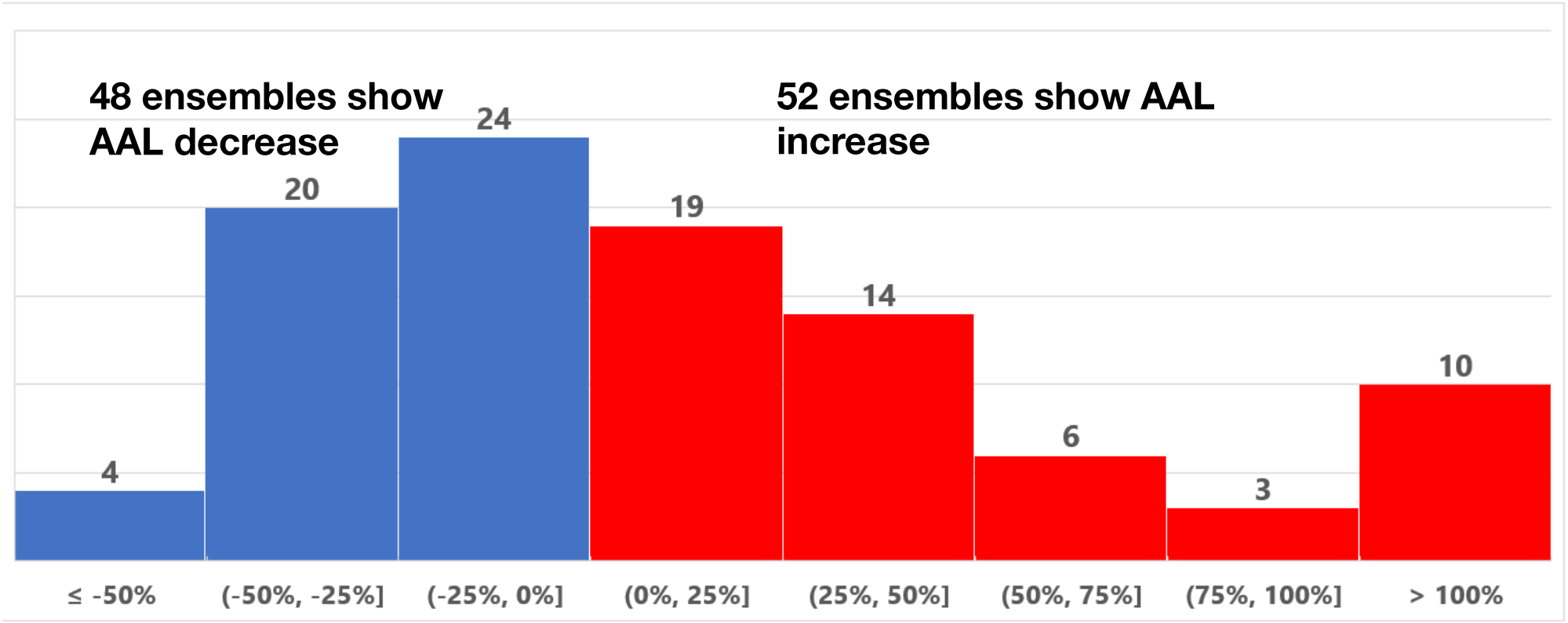
- We've seen a downward trend in activity since 1990 that is offered as a View of Risk by brokers and some model vendors
- Compare AAL from 1951-1990 vs. 1991-2010 from the 100 ensembles



Thoughts

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- Historical data may not provide us with enough information to understand trends in data
- Re-simulating “history” multiple times using climate models *may* better help us understand how risk is changing over time
- I would like to make this type of data increasingly available through OASIS / Simplitium
- Datasets like this potentially a good complement to cat model output

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Thank You

Want to find out more?

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www.catinsight.co.uk