Creating Value Through Increased Transparency

Challenges in Catastrophe Modeling

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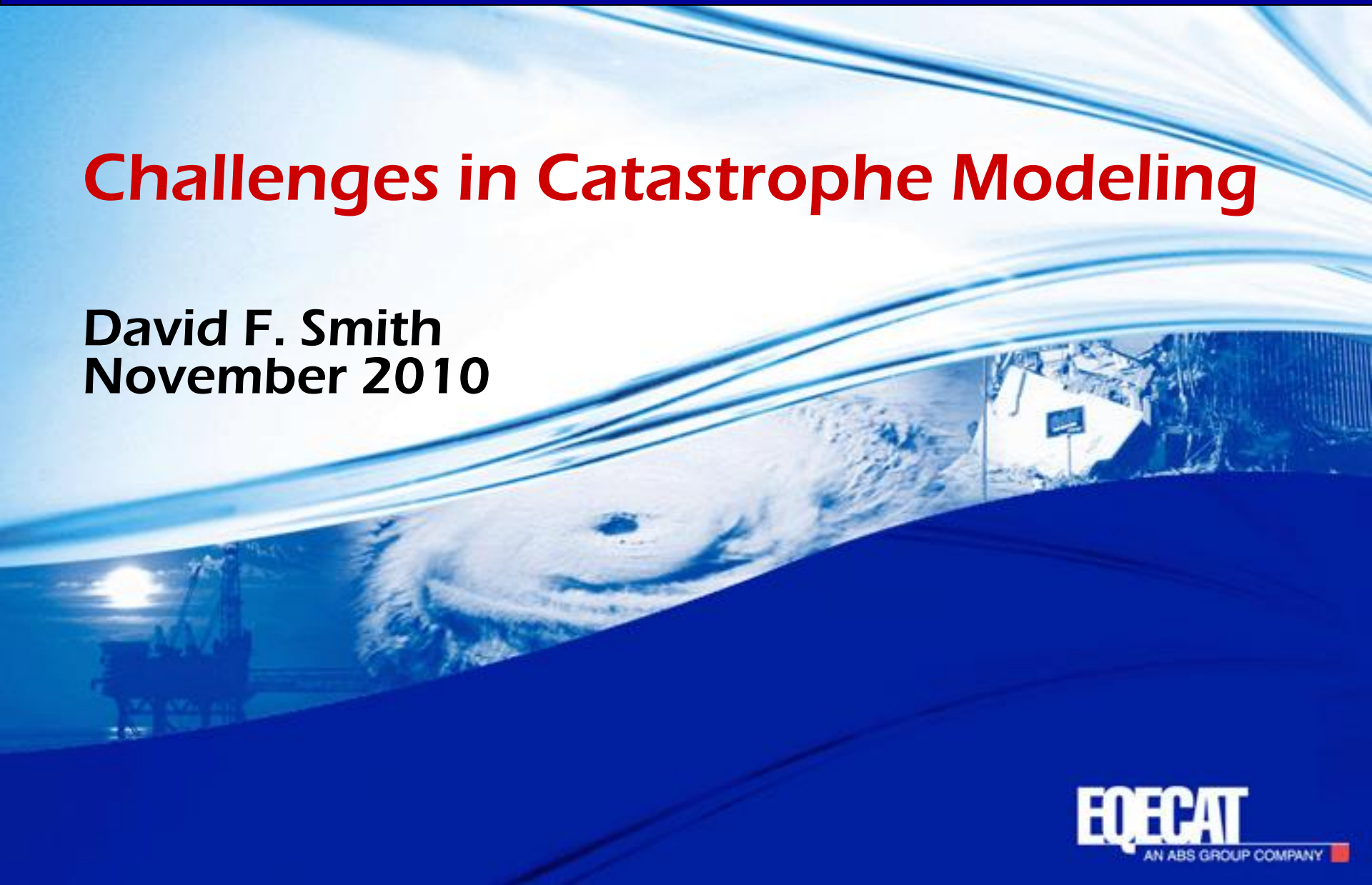

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Agenda – 4 Challenges

- Scarcity of data
- Near term hurricane frequency quantification
- Quantification of uncertainty
- Resource intensiveness

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Scarcity of Data (hurricane)

- Uncertainties in best track data are significant, especially (but not only) prior to the satellite era (~pre 1970)
  - Single 'definitive' data set (HURDAT) gives false sense of certainty
  - Multiple agencies maintain similar data in the Western North Pacific, providing a glimpse into the uncertainties
- Even ~110 years of US hurricane landfall data is limited, e.g. with respect to major hurricanes in the Northeast
  - E.g. is the 1938 storm a 1-in-110 event? 1-in-75? 1-in-150?
- The limited and uncertain historical record can be supplemented with numerical modeling (e.g. derive event frequencies from AOGCM modeling)

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Scarcity of Data (windspeed)

- Surface windspeed observations in hurricanes are often few and far between, and often the instruments fail and/or record questionable measurements
- Nevertheless the windfield models are:
  - Based on sound science
  - Calibrated using the observations that do exist
- If any significant bias exists, it is likely compensated by the vulnerability functions to some extent

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Scarcity of Data (exposure / claims)

- Exposure (and claims) data capture in the U.S. is among the best in the world and continues to improve
  - Location (street address, lat/lon)
  - Construction classes appropriate for cat modeling
  - Height, age
  - Mitigation measures
- But where no significant events have occurred recently, the claims data is limited or non-existent (e.g. Northeast hurricane, New Madrid EQ)
- Models are continually improved as more data becomes available

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Criticisms of Near-term Hurricane Frequency Models

Assertions:

- The utility of near-term models (and long-term) can be confidently evaluated using 3 years of historic data
- Near-term models are not appropriate for hurricane risk modeling

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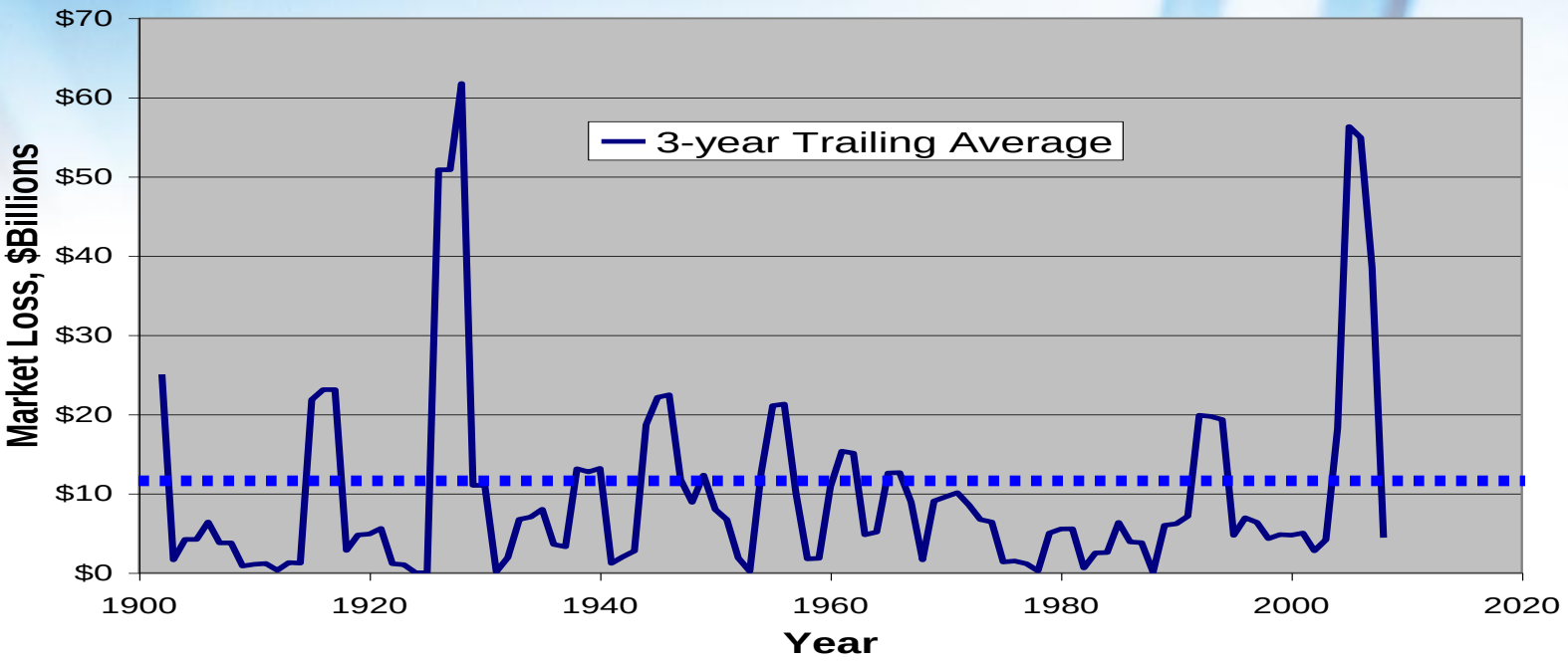
Annual hurricane losses are volatile



The trailing 3 year average is highly variable

Average annual loss ~ $11 billion
Standard deviation ~ $22 billion

- More Than 2/3 of the Normalized Losses Have Come From a Dozen Seasons
- Individual Seasons Have Contributed > 10% of the Normalized Losses Since 1900

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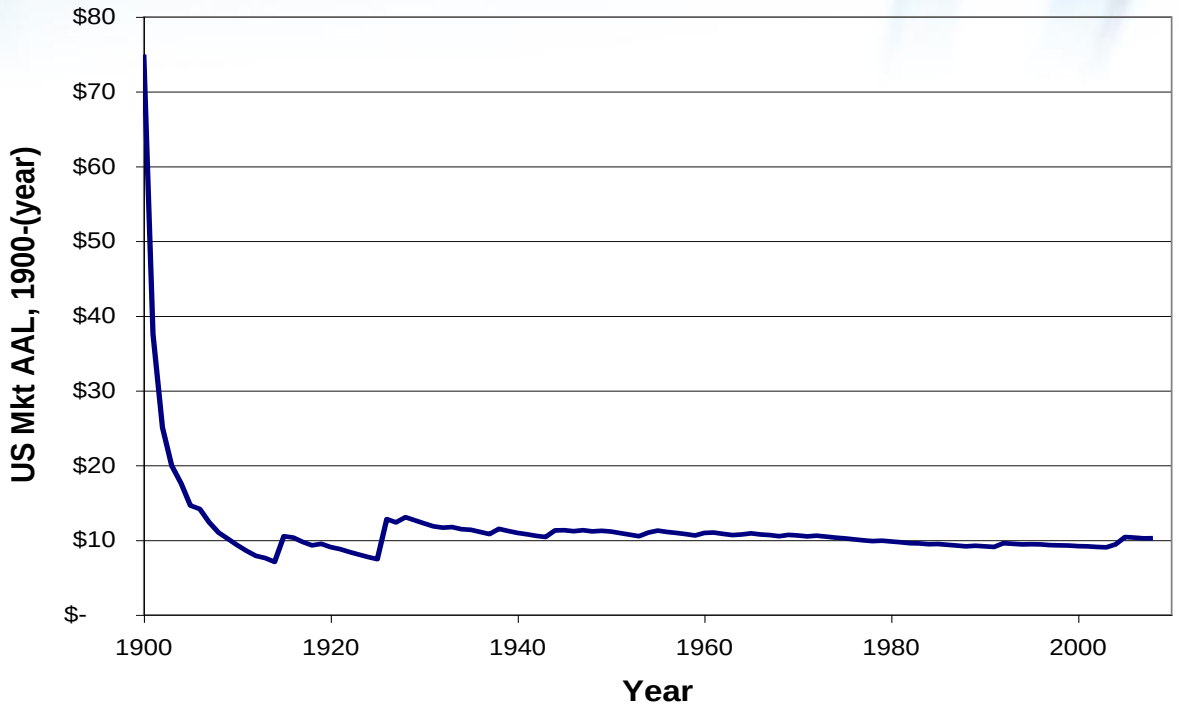
What Can We Do with Historic Data?



Historical AAL stabilizes at about 40 years

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Near-term Frequency Models vs. Predictions/Forecasts

- The EQECAT near-term model is essentially the same as the long-term model – except that it employs only the most relevant ~half of the historical record
- It is a representation of the risk, conditional on the presence of a set of aspects of the climate system that are significant for tropical cyclone development and intensification (warm AMO)
- It is NOT a prediction of what will happen over the next 5 years, let alone the next season

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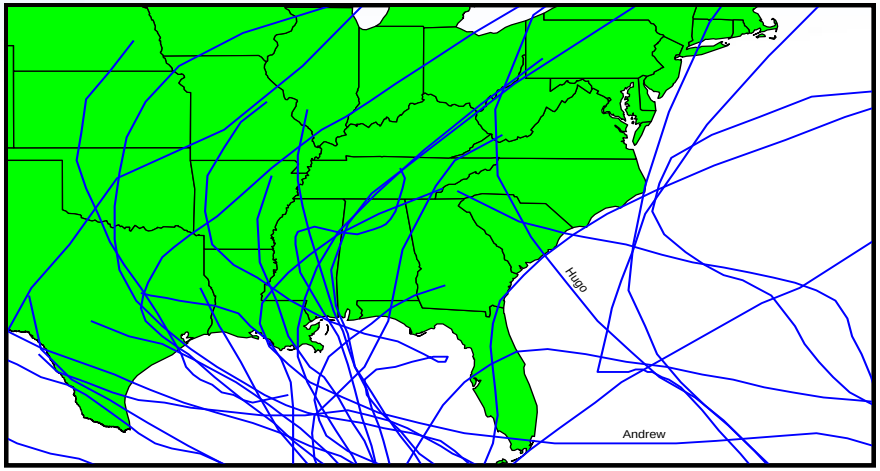
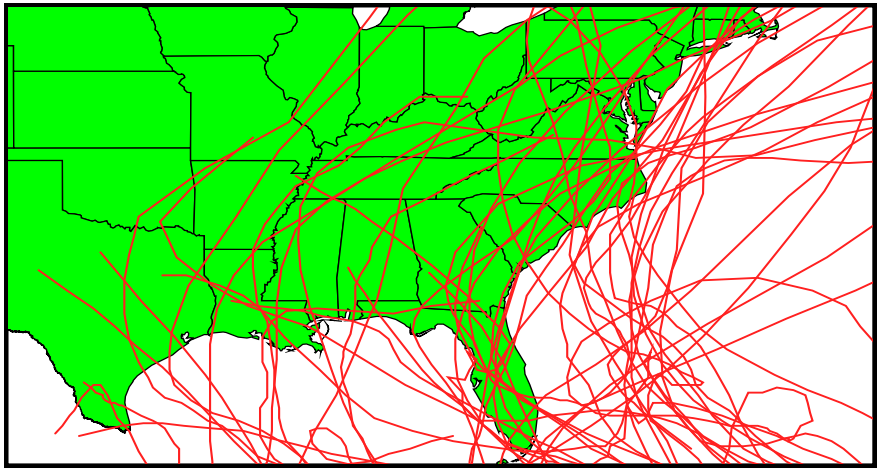
Cat 3+ Hurricane Activity During AMO Cycles



Cool AMO
28 CAT 3+ events in 51 years
Frequency of 0.55 per year



Warm AMO
49 CAT 3+ events in 58 years
Frequency of 0.84 per year

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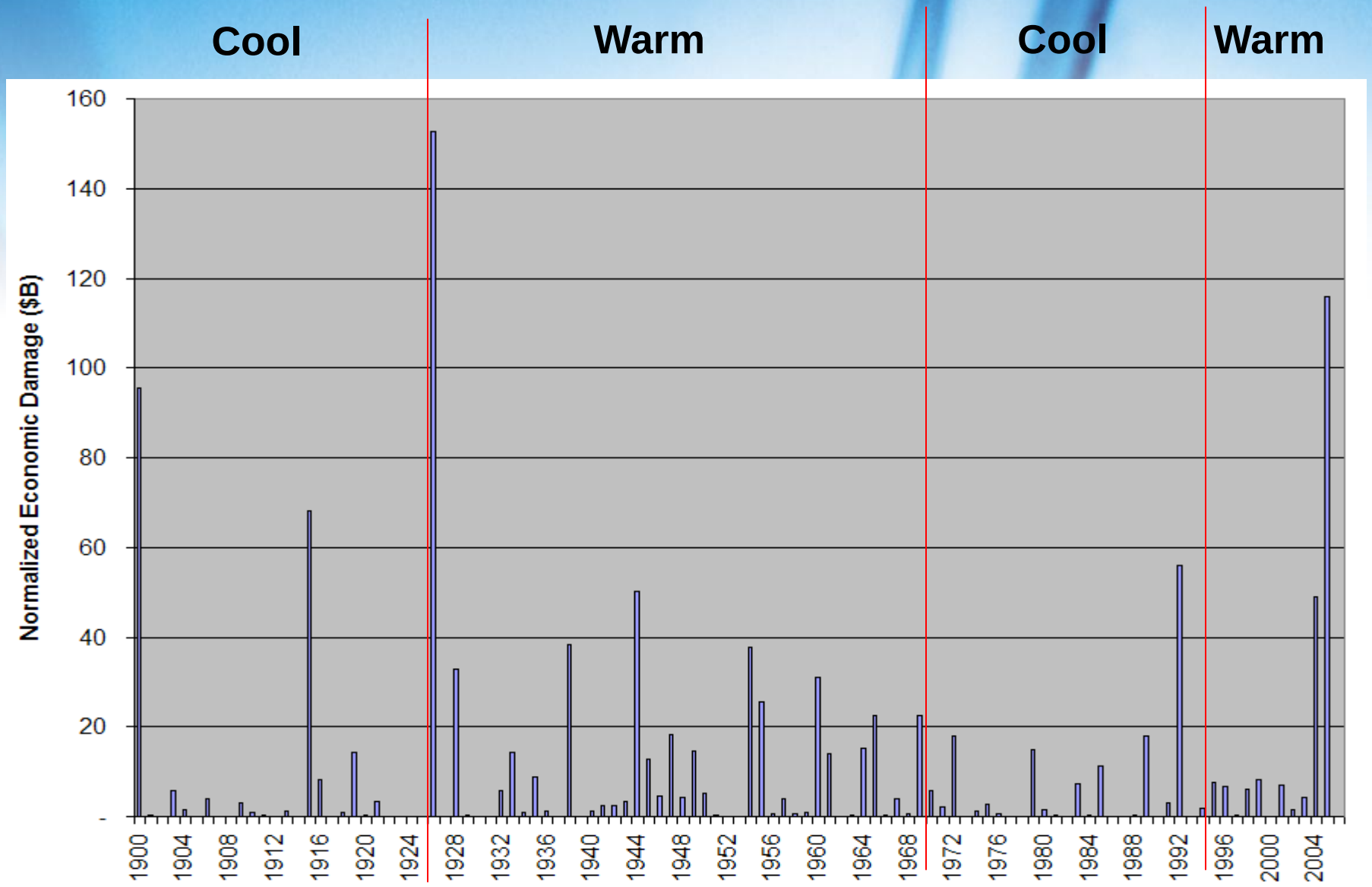

From Pielke et al, Normalized Hurricane Damages in the United States: 1900-2005

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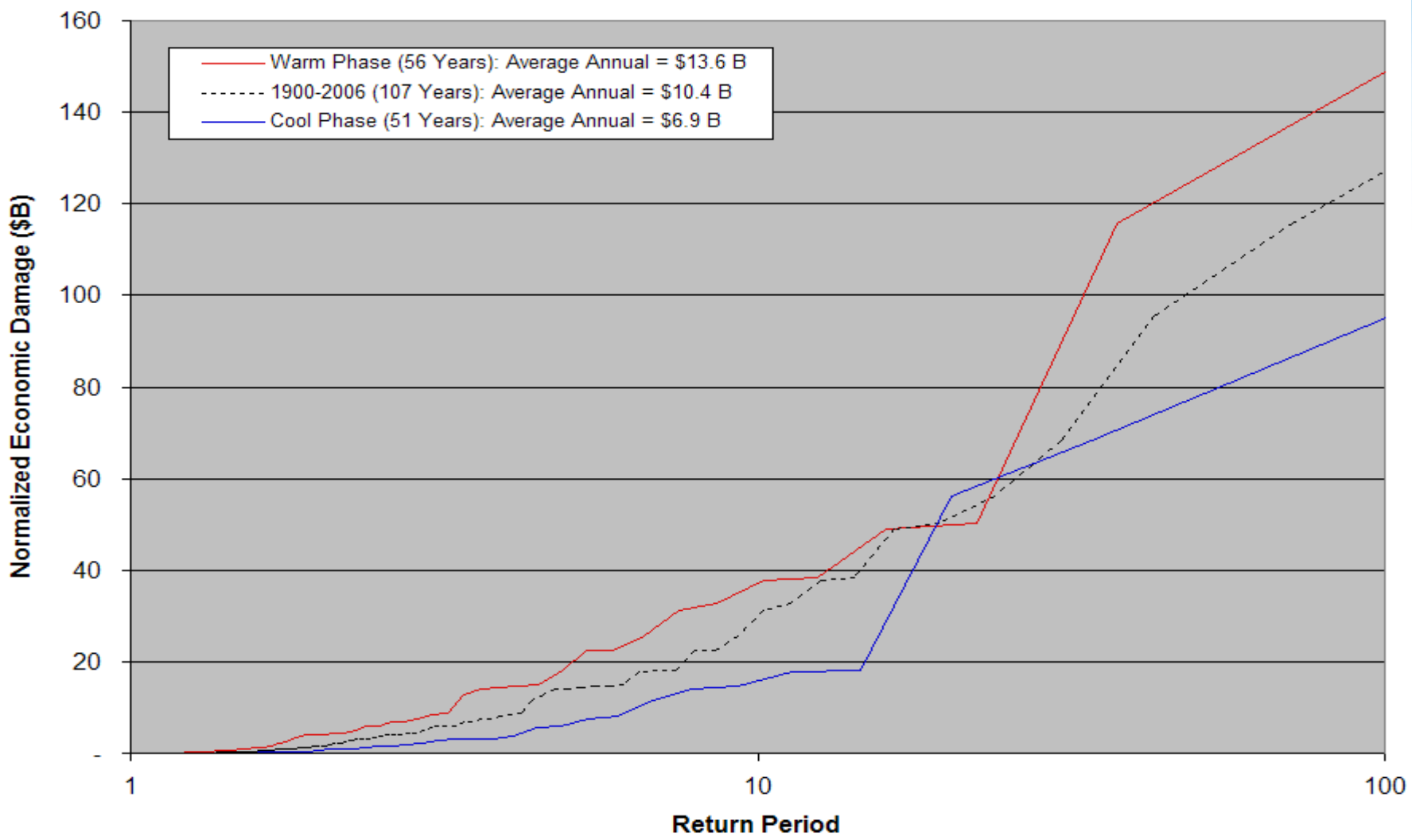

From data in Pielke et al, Normalized Hurricane Damages in the United States: 1900-2005

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Quantification of Uncertainty (1)

- Appropriate treatment of uncertainty has been a focus of EQECAT since its foundation. This is expressed as a core value:
  - Modeling is but a representation of risk and entails a significant degree of uncertainty … We will acknowledge and expose uncertainty, not promote delusional exactitude.
- This includes quantifying the uncertainty at every step of the cat modeling process, and propagating this throughout the chain of results (including correlation aspects)

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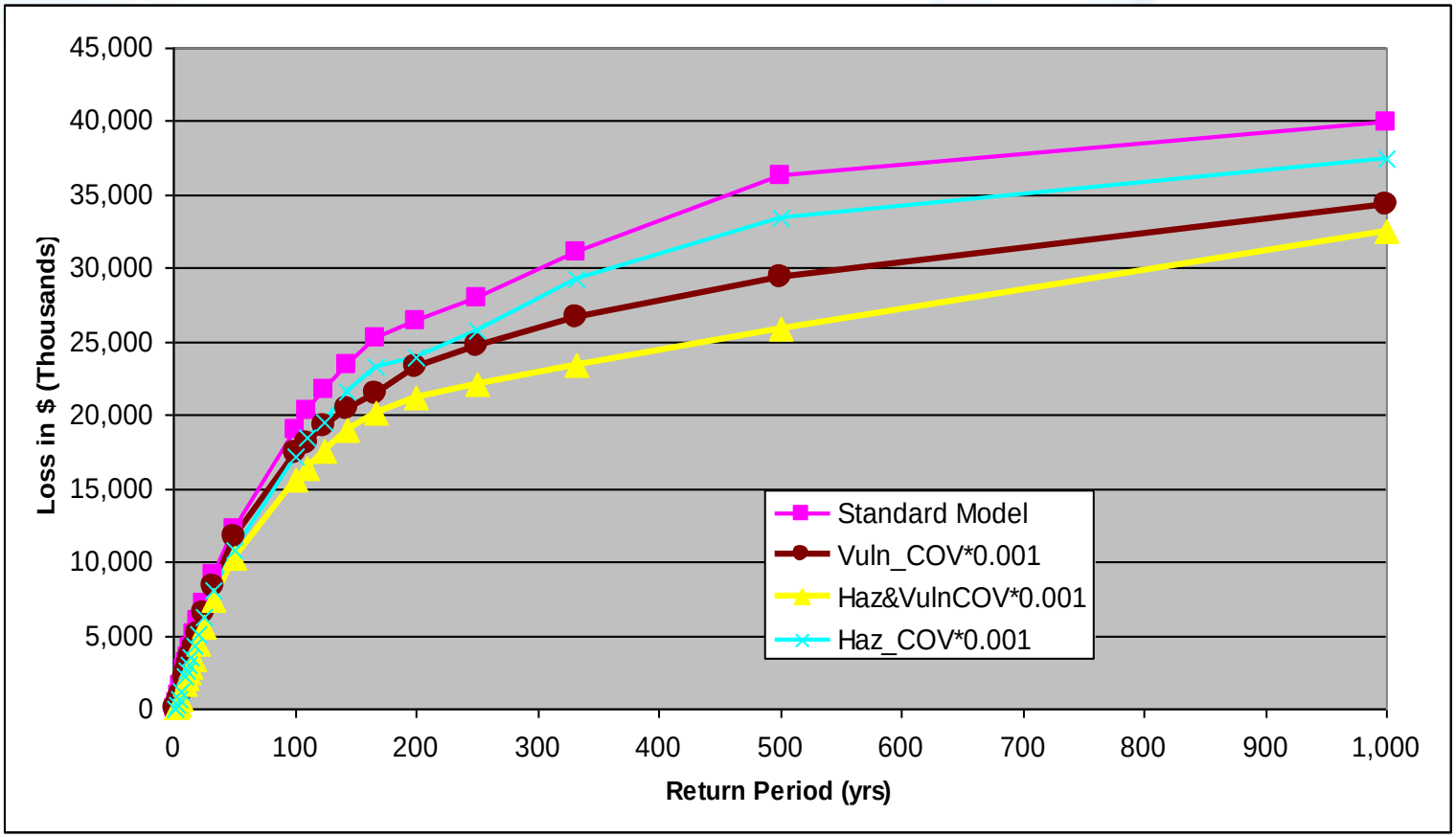
Quantification of Uncertainty (2)

- Improvements in understanding:
  - More detailed and comprehensive documentation
  - Improved dialog between model builders and model appliers
  - Multiple model solutions
  - TVAR vs. VAR (e.g. average of all losses above the 1-in-100 level, vs. the threshold loss at the 1-in-100 level)
  - Inclusion, and more refined inclusion, of auxiliary loss components such as storm surge, rainfall-induced flooding, tree damage, etc.

Importance of Uncertainty in a Loss Analysis

Sensitivity due to both hazard & vulnerability uncertainty



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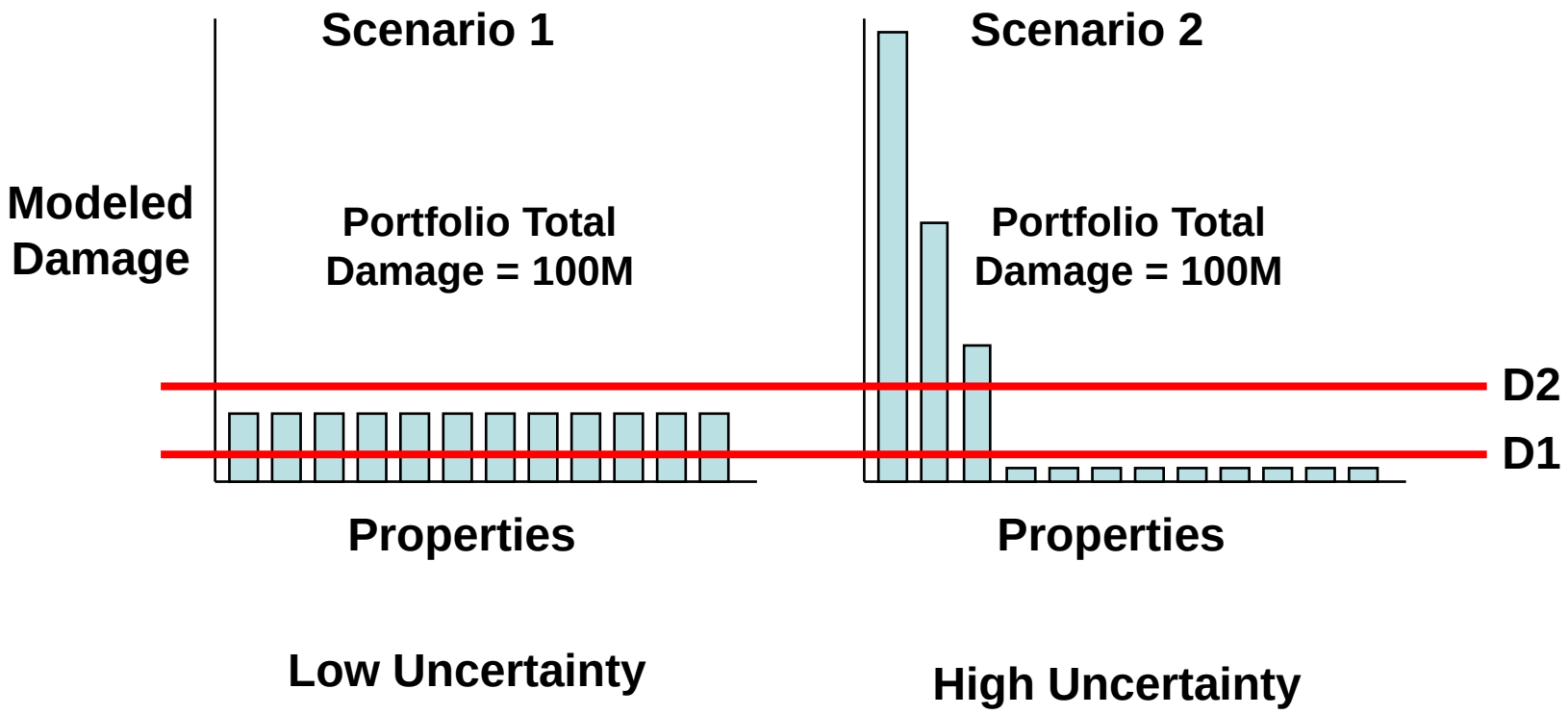
Understanding and Modeling of Uncertainty

Loss Variability Due To Deductibles / Policy structures



Mitigating Resource Intensiveness

- Automation
  - E.g. XML interface through which to import exposure data, launch analyses, extract results, etc.
  - Allows for integration into company's data/workflow, multi-model analysis, etc.
- Data standards / common formats
  - E.g. ACORD
  - EQECAT supports the industry, hence supports these efforts / standards
- Improved dialog between model builders and model appliers

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Thank You!

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