The impact of present and future climate changes on the international insurance & reinsurance industry

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Overview

Likely impact of climate change on international insurance industry

Climate change as a source of uncertainty

Climate change in perspective

Key topics

- How will climate change influence risk?
- What is expected from us as an industry?
- How will we respond?

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How will climate change influence risk?

- climate change will influence magnitude, frequency and geographic location of extreme events
- the detailed impact at national level remains uncertain
- climate change is just one of many sources of uncertainty

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How will climate change influence risk?

From IPCC 4 – February 2007

Observations:

- 11 out of the last 12 years rank amongst the warmest years ever recorded
- 80% of the heat added to the earth's system is being absorbed by the oceans
  - causing volume expansion, hence sea level rise
  - 1961-2003 average sea level rise 1.8 mm/year
  - 1993-2003 accelerated rise 3.1 mm/year
- increased precipitation trends since 1900:
  - North and South America, northern Europe and northern Asia
- drying trends since 1900:
  - Sahel, Mediterranean, southern Africa and south-eastern Asia.

Projections:

- more frequent heat waves and heavy precipitations very likely
- typhoons and hurricanes may become more intense
- Increases in the amount of precipitation at high latitudes very likely
- decreases in the amount of precipitation likely in subtropical areas

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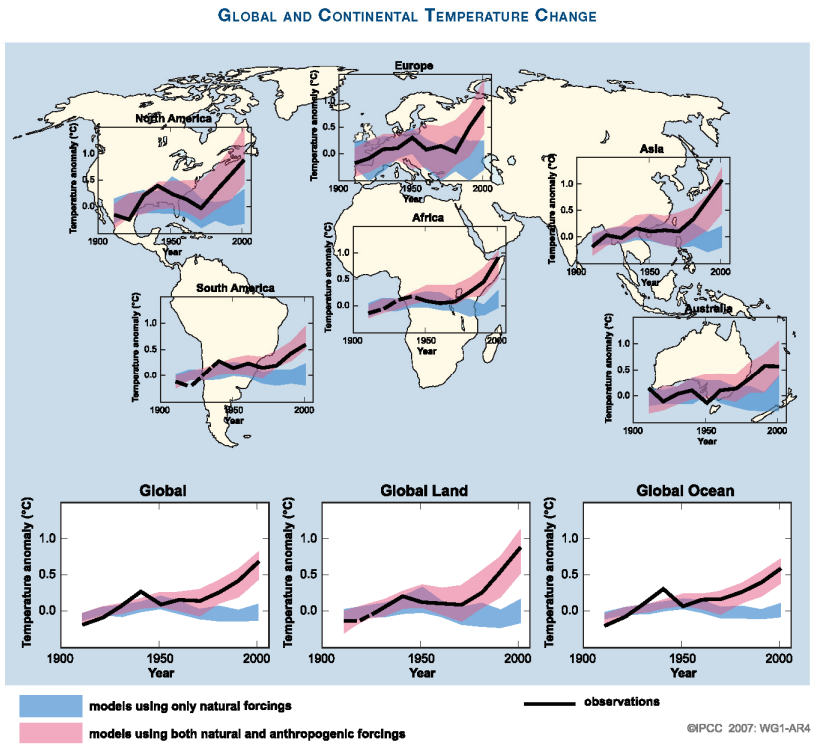
Climate change will influence the key risk factors

- Climate change and extreme events – scientific consensus is that climate change is likely to impact on **frequency, severity** and **location** of **extreme events**
- Insurers are concerned with the **impact** of extreme events
  - potential for catastrophic loss
  - threaten the stability and solvency of insurers
- Climate change can influence:
  - Magnitude
  - Frequency
  - Geographic location

  of extreme events

But – uncertainty in how **local impacts** will develop under climate change



IPCC AR4 2007

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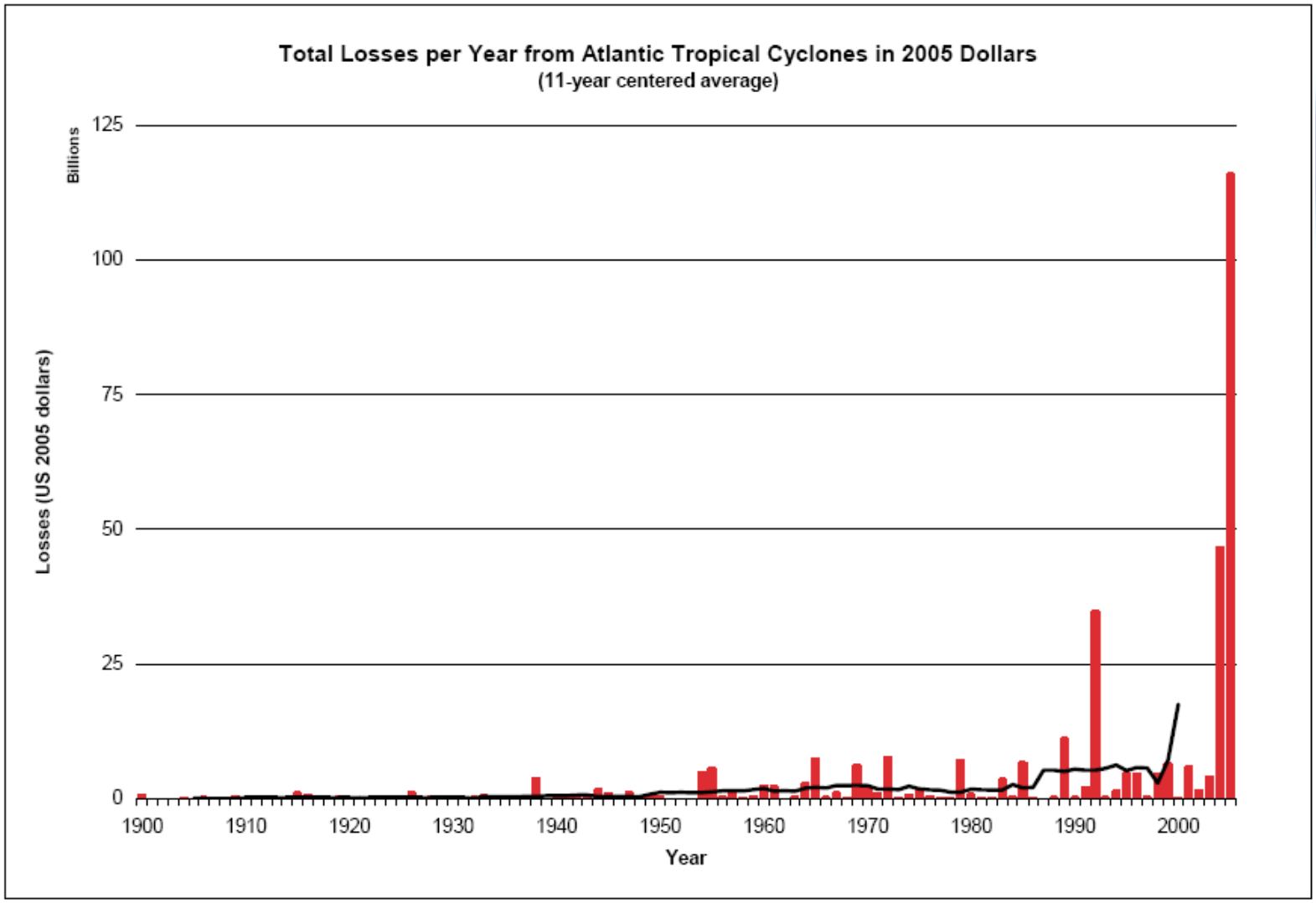
Exposure: US land-falling hurricane losses – actual



source: Normalized Hurricane Damages in the United States: 1900-2005
Pielke et al Natural Hazards Review (submitted)

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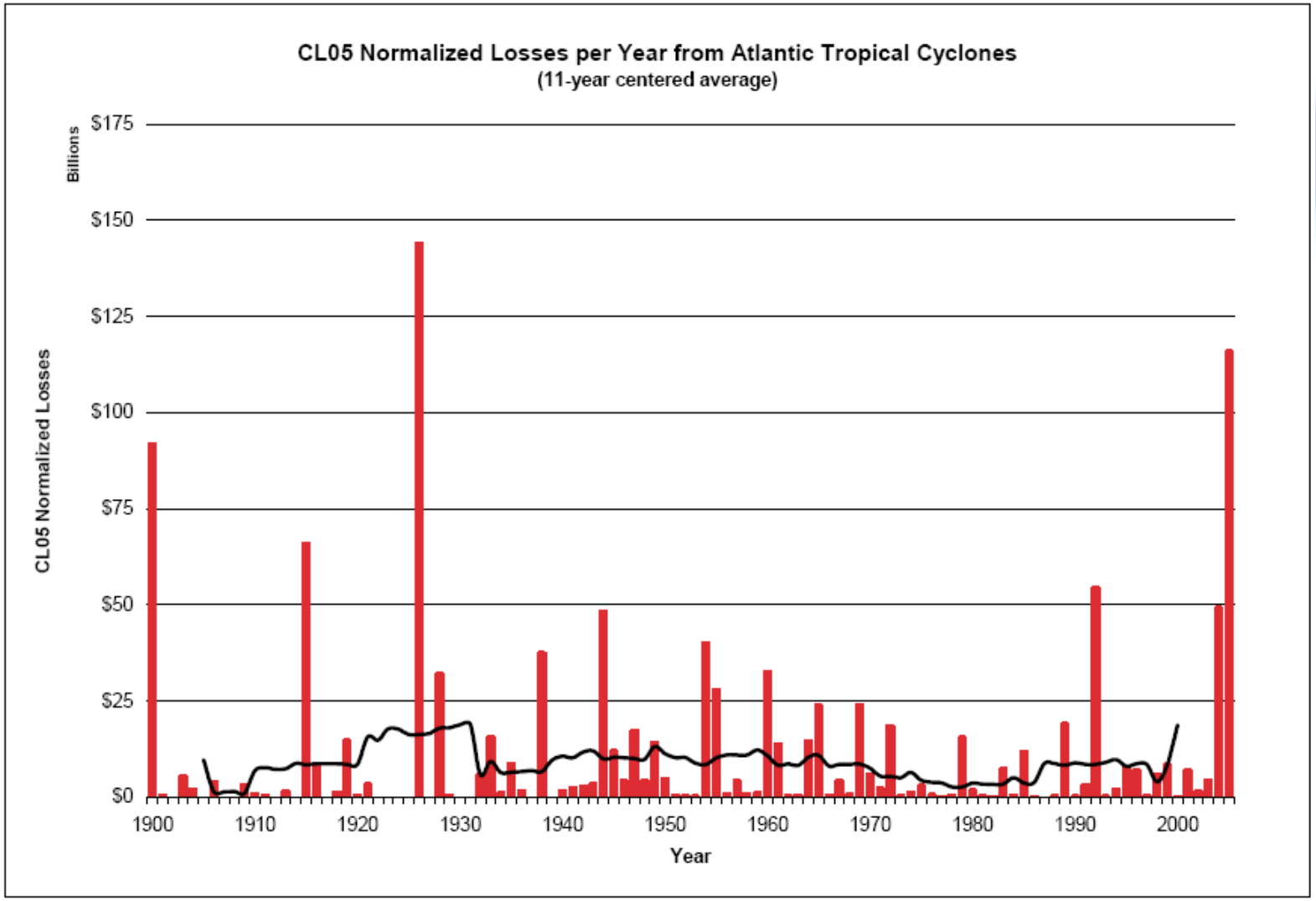
Exposure: US land-falling hurricane losses – revalued



source: Normalized Hurricane Damages in the United States: 1900-2005
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Exposure: growth factors

- population growth
- growth in property values
- growth of urban concentrations
- settlement and development in exposed regions
- rise in standard of living
- increased international trade - marine cargo exposure
- increased insurance penetration
- increased correlation means exposure to cat events rises faster than income base

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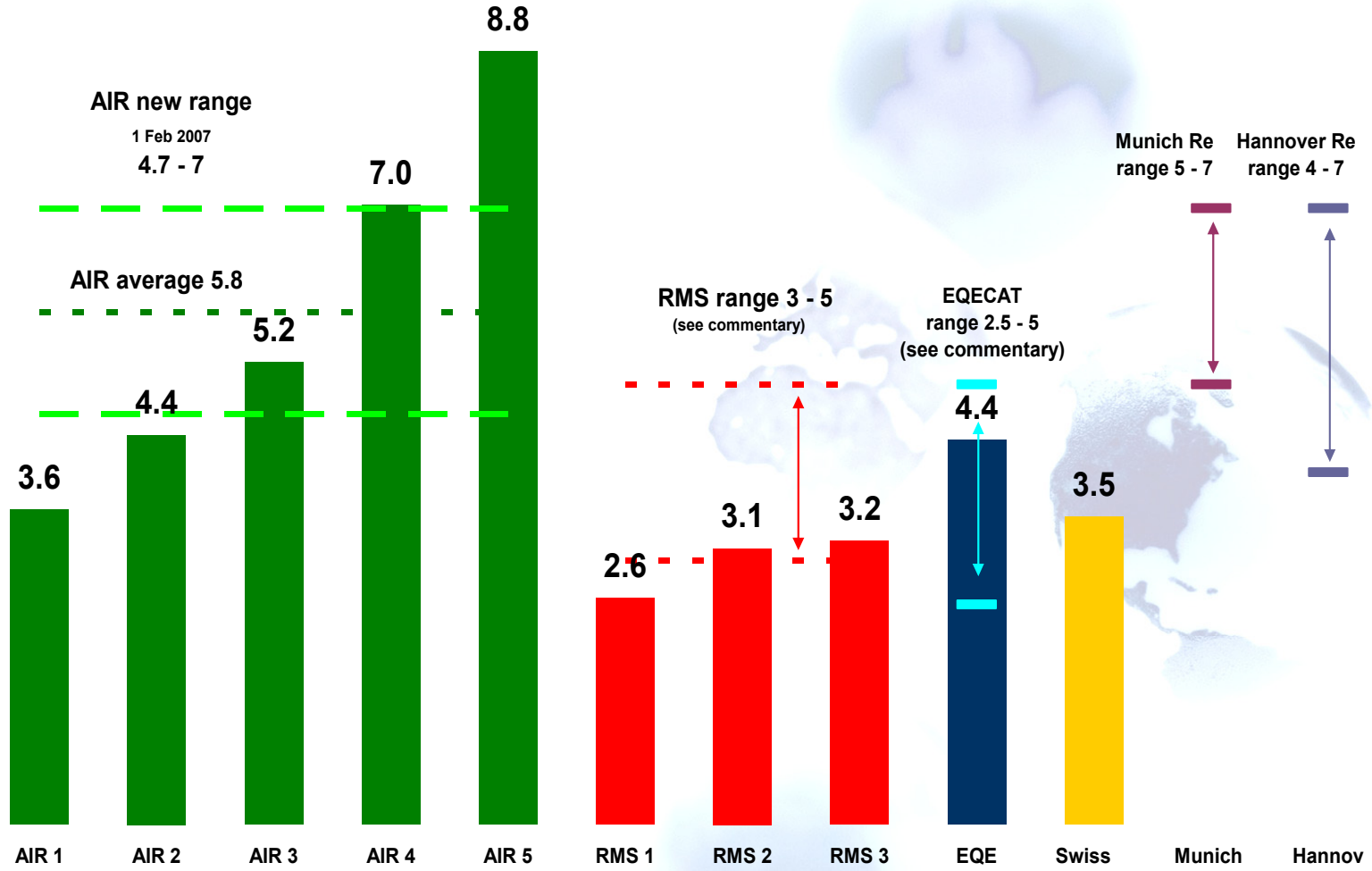
Initial loss estimate variability



Source: Willis event report – Windstorm Kyrill (01/02/07)

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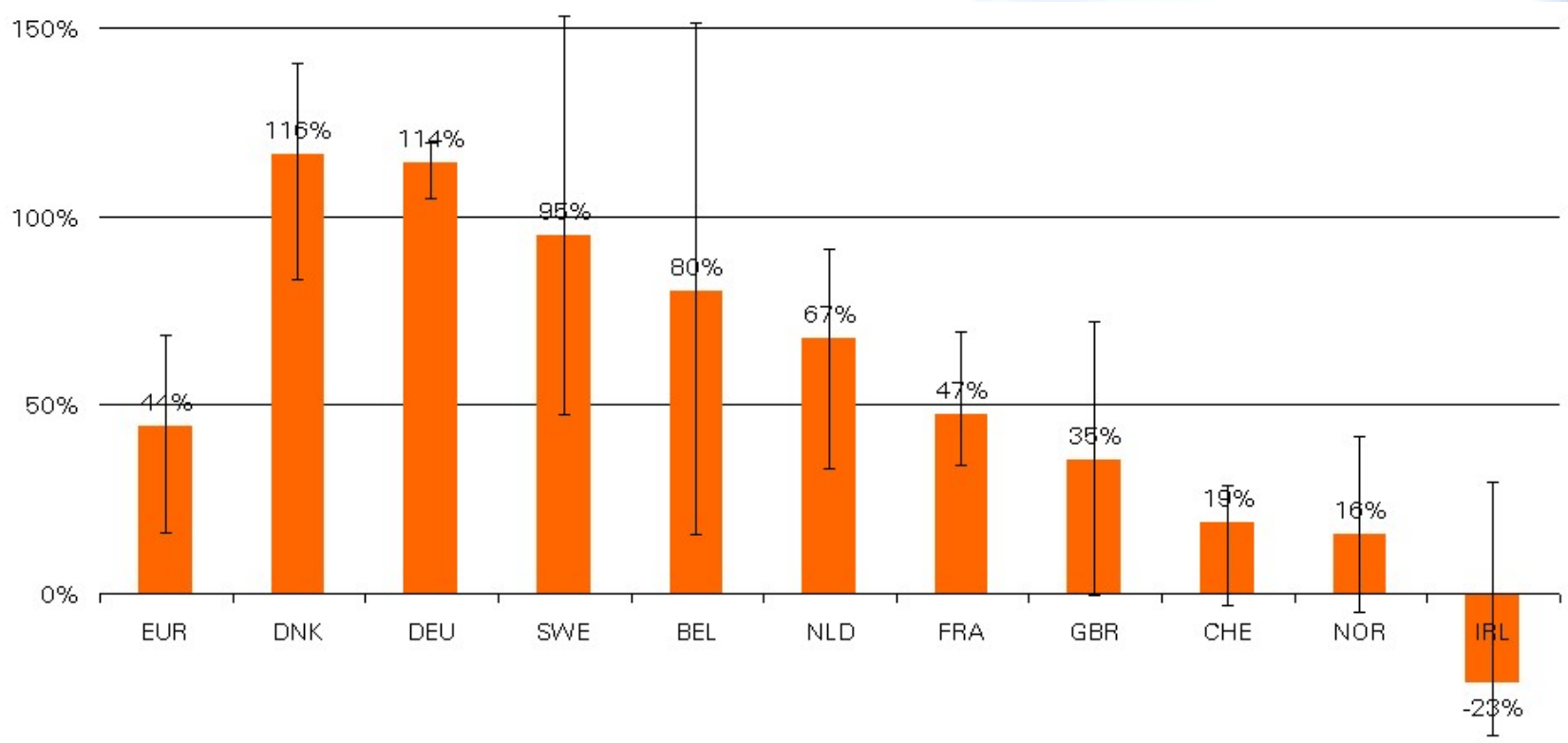
View of reinsurers ?

Swiss Re expects insured storm losses in Scandinavia to double by the end of the century



Source: Swiss Re, NORIS, Stockholm , 29 August 2007

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What the scientists still do not know….

A conversation with Professor Julia Slingo, Director of Climate Research, National Centre for Atmospheric Science reveals remaining areas of scientific uncertainty, including:

- Interaction between global warming and natural decadal changes in the North Atlantic (e.g Thermohaline Circulation)
- Effects of global warming on El Nino and Monsoons
- Abrupt changes of equilibrium and threshold – climate surprises (e.g. catastrophic ice sheet collapse)!
- Regional and local rainfall changes
- Changes in frequency and intensity of extreme weather events

"Limitations of our climate models, especially resolution, are major factors"

… sadly many of the key things insurers need to understand !

Walker INSTITUTE

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So how will climate change influence risk?

- impact of change will vary geographically and over time
- existing hazards change, new hazards emerge
- impact on frequency and severity unclear
- data too limited
  - current trends vs natural variability
- change happens over….
  - decades and centuries
  - large geographic areas
- local uncertainty in what the impacts will be
  - confused by feedback systems

- climate change is actually just another source of uncertainty

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What is expected from us as an industry ?

- The insurance & reinsurance industry will be expected to provide protection from risks arising from climate change
- Our understanding of and use of the scientific facts will be crucial in shaping the industries response
- This influence of our response to climate change is likely to grow beyond the confines of reinsurance to shape the wider economic questions and choices of climate change in society.

… great expectations !

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Role and response of insurance markets

- Regional and international society will be required to adapt and share the costs of climate change

- Financial sharing undertaken by two mechanisms
  - Taxation (Public)
  - Insurance (Private)

    or via hybrids of both mechanisms

- Insurance & Reinsurance is the ultimate “Community Product”
  - Allow communities to share risk at region and national levels
  - Allows risk to be shared across continents and markets
  - Increasing wealth and increasing risk will increase this role
  - Growing importance of this role under climate change will awaken stakeholders from beyond the industry

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Risk management and climate change

- growing connection between insurance and academia
- contextual information vs “plug-in” data
- data and modelling required for everywhere
- reduction in insurance relief relative to economic losses
- interface between insurance and public policy
- insurance cannot provide cover for the predictable
- portfolio risk management to combine scientific knowledge with underwriting

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Growing status of catastrophe modelling

- the models mediate the science, provide the parameters of the debate and guide decision making beyond insurance players
- modelling expertise will move from sidelines to centre stage of business, economics and public policy
- provide the calculations that will underpin the choices of governments and society as well as underwriters …

  e.g.

  - The licensing of catastrophe models by US state regulators such as Florida.
  - The central role of catastrophe modelling in the creation of national catastrophe insurance schemes and post disaster management.

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Communicating climate change & uncertainty

- The re/insurance industry will communicate its view on the science and impact of climate change via the price mechanism.
- The public ‘receives’ this communication by the insurance cost of their own property and through it their contribution to catastrophe reinsurance premiums allows international society to spread and share the costs of events.
- Ultimately reinsurance premiums are set by the markets view of catastrophe risk and climate driven events form the largest single portion of this.
- Risk carriers seek to balance competitiveness with prudent underwriting.
- There is not “one” industry view. Differing market views reflect the inherent uncertainties in climate change opinion.
- Nevertheless, catastrophe modelling is providing the technical reference point for the ‘value of risk’.

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Mediators of catastrophe risk, capital, security & society

- Generation of risk capital demand:
  - Media and political/economic opinion leaders
  - Consumers and customers

- Generation of risk capital supply
  - Underwriters & other “riskmongers”
  - Investors (aka consumers and customers)

- Moderators and mediators of catastrophe & capital
  - Regulators (consumer protection)
  - Rating agencies (investor protection)
  - The civil justice system (societies’ protection)
  - The political systems (national and supranational Interests)

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How will we respond?

- Since the early 1990s the international insurance industry has adopted an increasingly analytical approach to the assessment and evaluation of risk. This will continue.

- Catastrophe loss models will play an increasingly important role

- Closer integration between climate models & catastrophe loss models

… we will analyse!

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Catastrophe risk identification and quantification

- before cat models
  - experience-based pricing – statistical extrapolation
  - poor identification of extremes - no geography, no science, no engineering
- cat modelling introduced to reinsurance sector in early 1990s
  - exposure-based modelling
  - thousands of synthetic events to capture potential frequency and severity
  - loss probability distinct from event probability
- discipline this created is as important as the numbers in output
- cat modelling has become a pre-requisite for new capital, esp Bermuda
- provided demonstrable stability - far fewer failures in 2000-2005 vs 1990-1995

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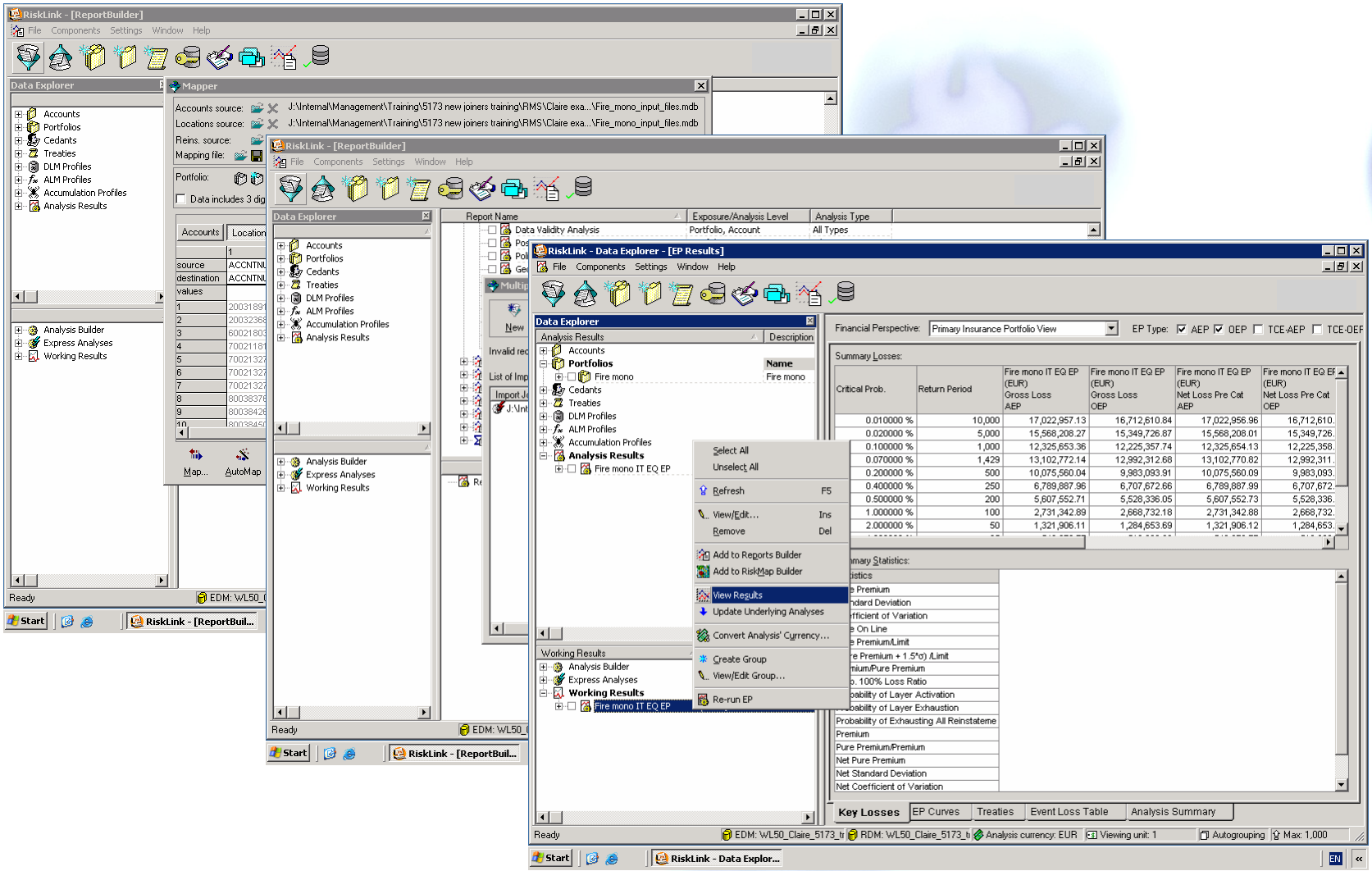
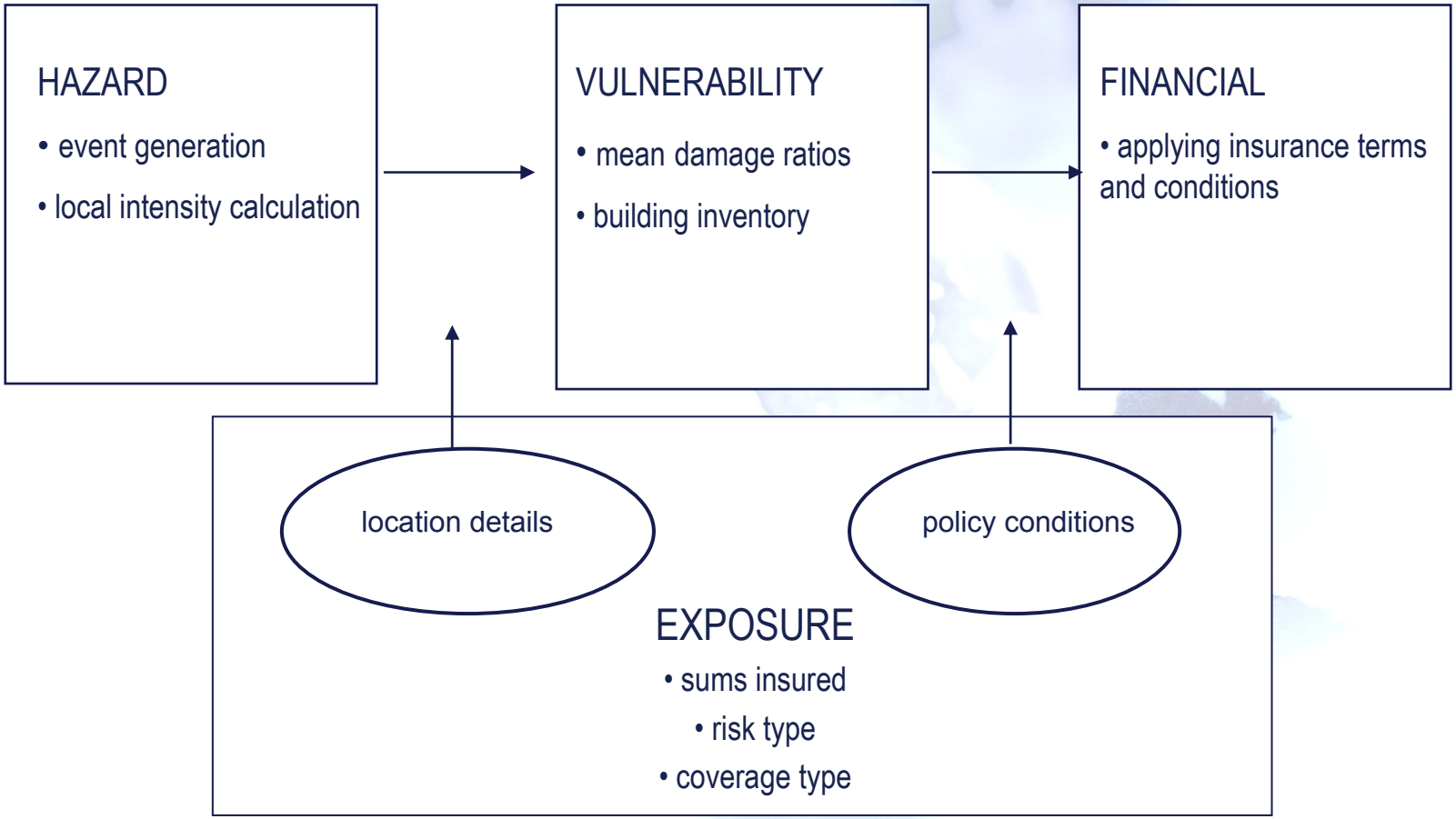
Catastrophe loss models: software example



Catastrophe loss models: structure



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Detailed data capture required

- insurance exposure data:
  - capture and reporting limited by legacy systems
  - quality and type has not been standardised
  - trans- and multi-national policies mean location identification is confused
  - potentially largest source of error in modelling
- extensive data auditing essential to reduce systemic error
- “aggregated” data should be confined to history
- full capture of in-force exposures with all attributes is most sound basis for modelling

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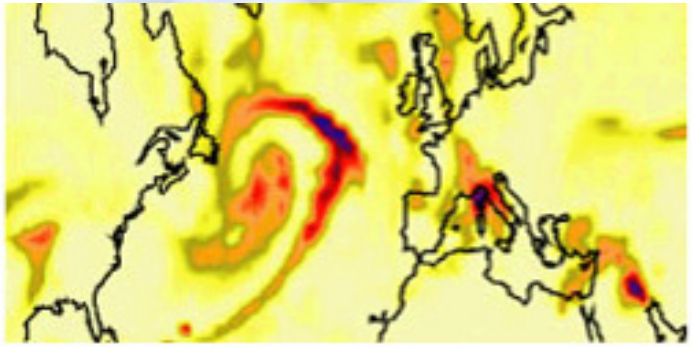
Climate models vs catastrophe models

- Catastrophe models:
  - Attempt to model weather events and associated losses
  - Do **not** model ‘climate’
  - But – provide the means of quantifying loss potential from extreme events
- Climate models (GCMs):
  - Attempt to model the long term global climate and key parameters (e.g. temperature, precipitation, wind, oceanic currents) through simulation of physical earth system processes (e.g. atmosphere, ocean, earth)
- We need to combine the two



HiGEM – High Resolution Global Environmental Modelling

UK-Japan Climate Collaboration >>

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To summarise

- Climate change will influence risk but it is one of many sources of uncertainty
- The insurance and reinsurance industry will be called upon to offer protection from the impacts of climate change (which are uncertain)
- Insurers will need to adopt an increasingly analytical approach to the assessment and evaluation of risk – uncertainty in many forms will need to be accommodated in this analysis

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So what can we conclude about the impact of climate change on our industry?

… the future is uncertain !

- Uncertainty and it's quantification will be a key issue for the future
- The entire international insurance industry was founded upon a willingness to take on the issue of uncertainty
- We are well equipped to face the future influence of climate change

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