Scientific and Economic Rational for Climate Insurance

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Insurance Industry an Early Alerter to Global Warming

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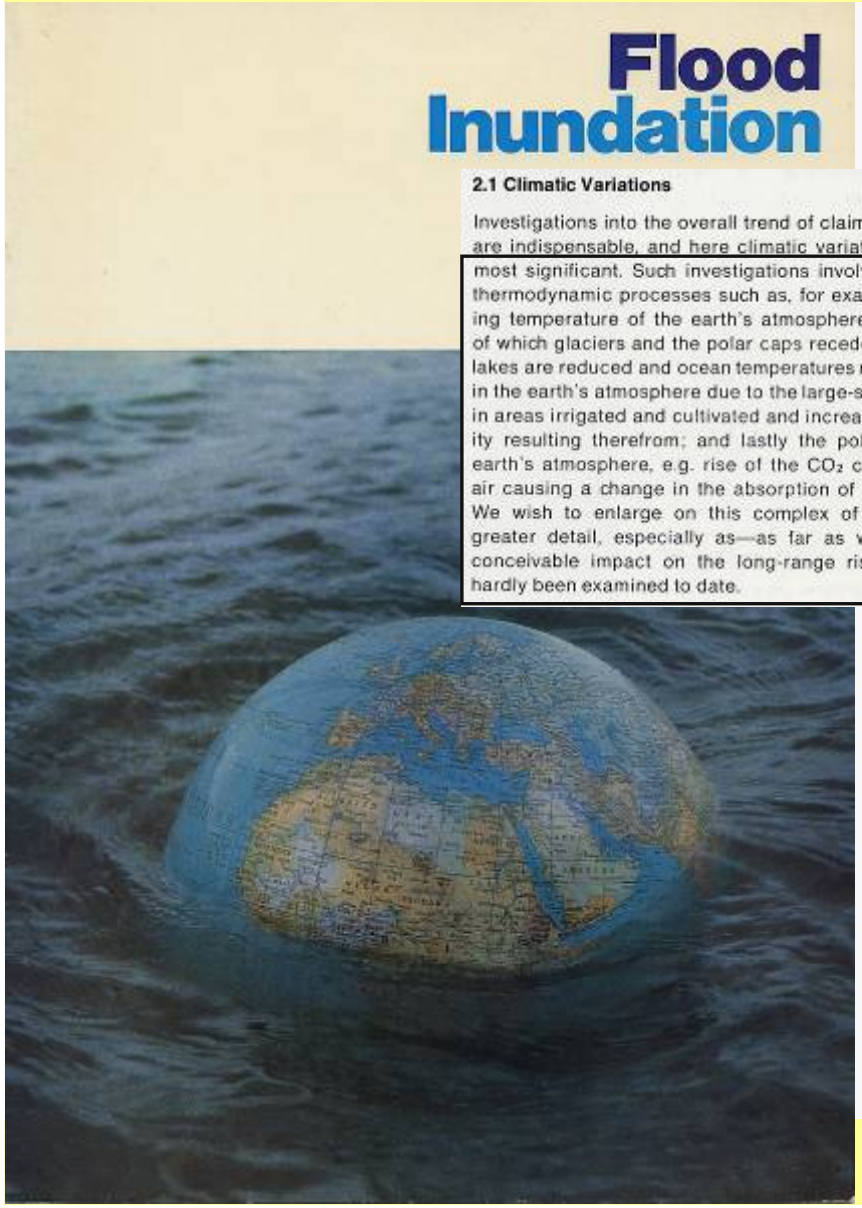

most significant. Such investigations involve a study of thermodynamic processes such as, for example, the rising temperature of the earth's atmosphere (as a result of which glaciers and the polar caps recede, surfaces of lakes are reduced and ocean temperatures rise); changes

earth's atmosphere, e.g. rise of the CO_2 content of the air causing a change in the absorption of solar energy.

greater detail, especially as—as far as we know—its conceivable impact on the long-range risk trend has hardly been examined to date.

Munich Re Publication
Flood / Inundation (August 1973)

Munich Re NatCatSERVICE

One of the world's largest databases on natural catastrophes

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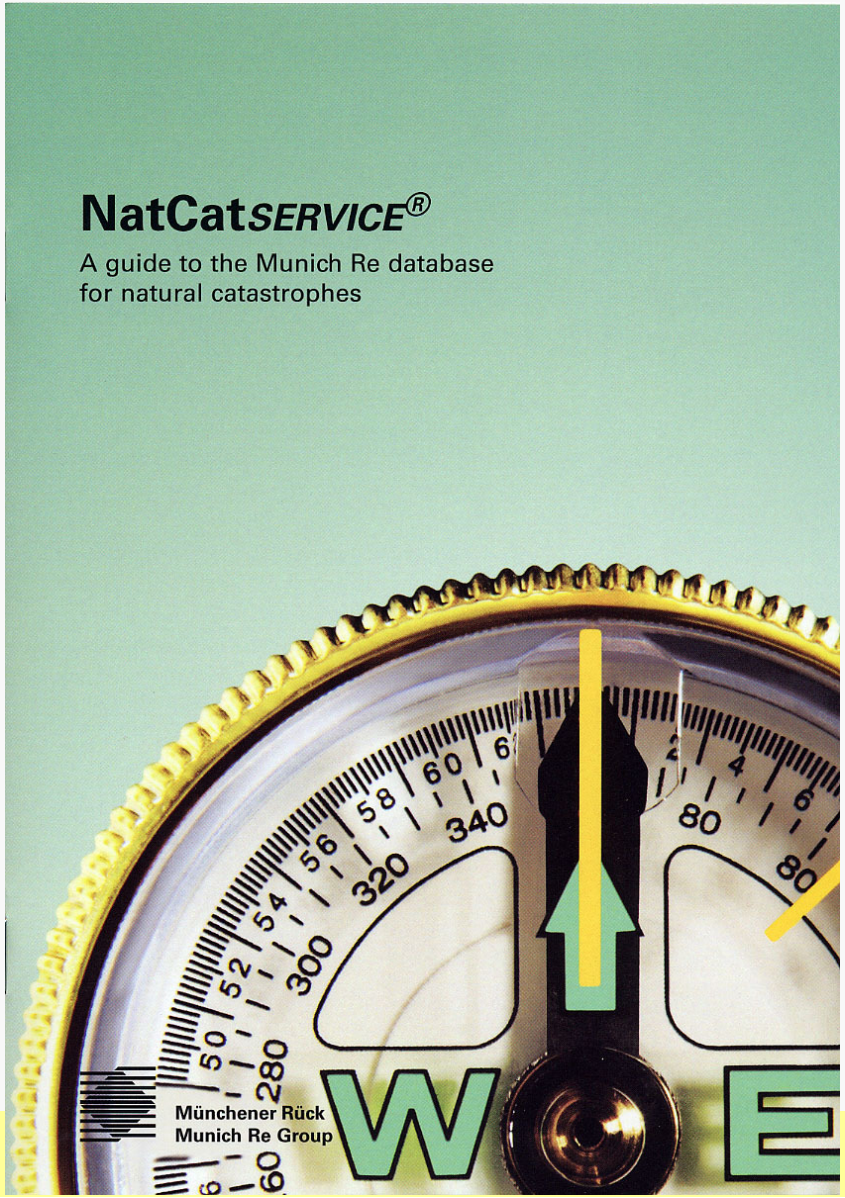

The database today:

- From 1980 until today all loss events, for USA and selected countries in Europe all loss events since 1970
- Retrospectively all Great Disasters since 1950
- In addition all major historical events starting from 79 AD – eruption of Mt. Vesuvio (3,000 historical data sets)

Currently more than 25,000 events

Flood catastrophes globally 1980 – 2006

Number of events – trend line

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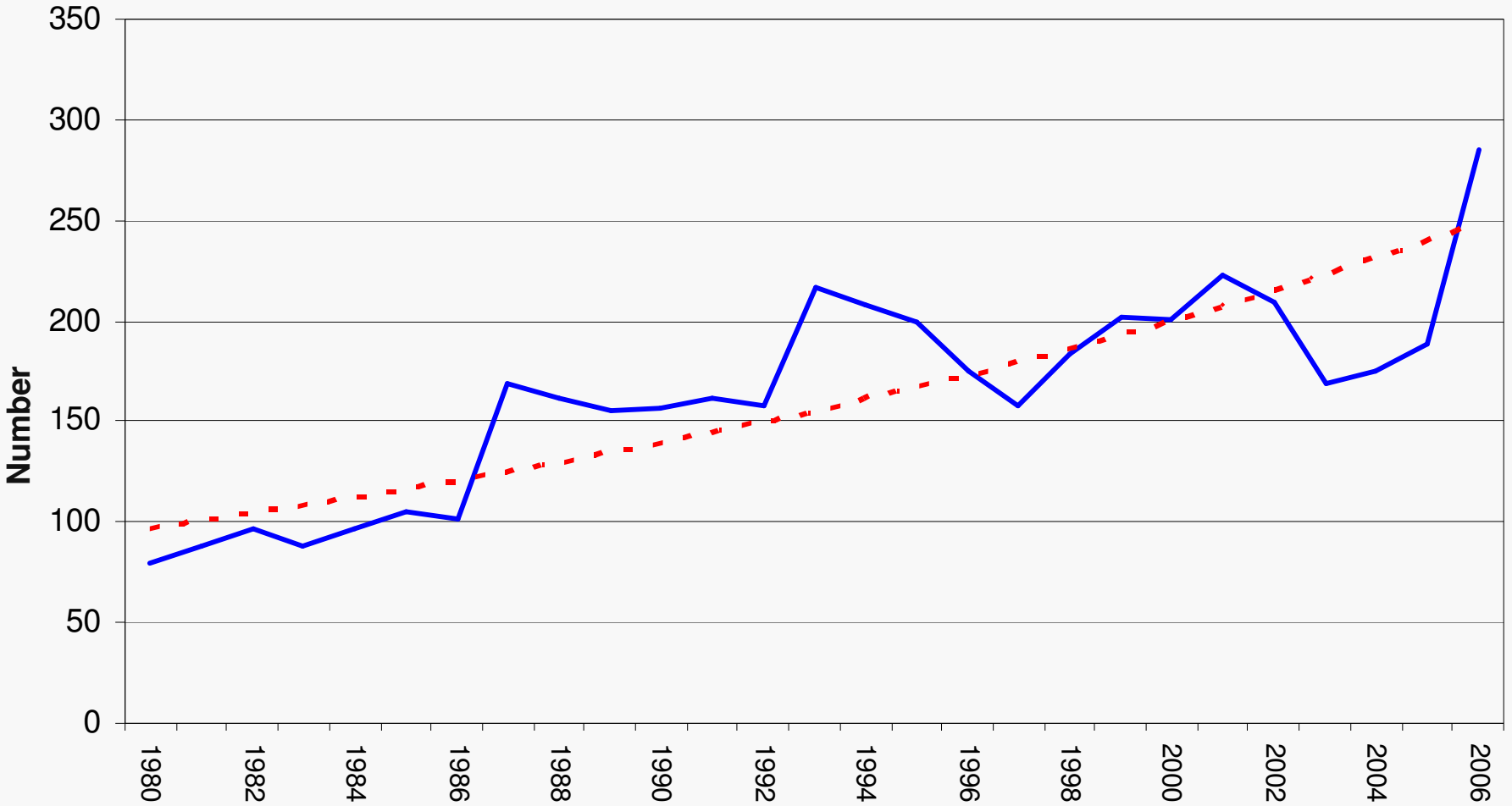

Windstorm catastrophes globally 1980 – 2006

Number of events – trend line

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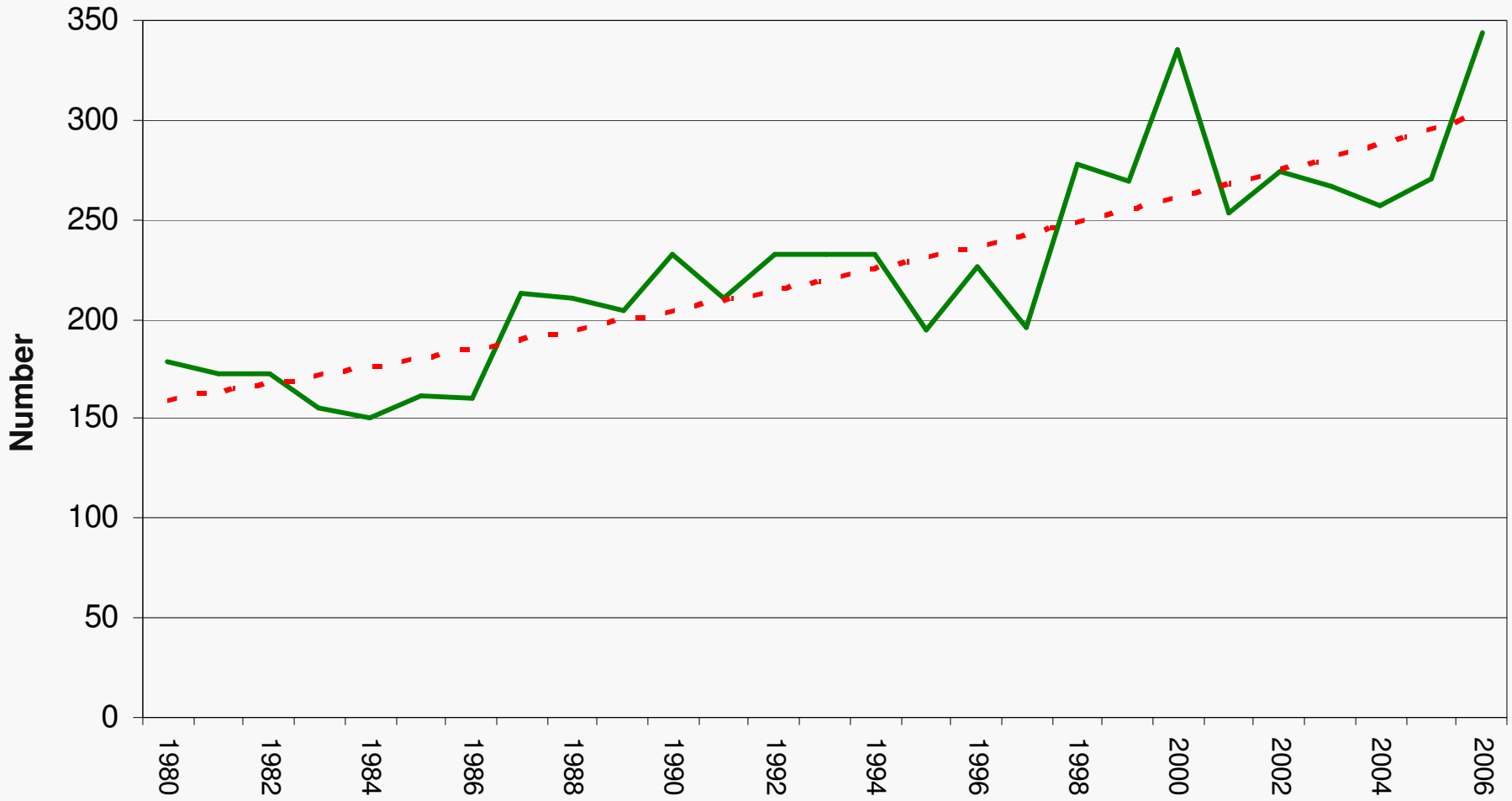

2005, a Year of Weather Extremes

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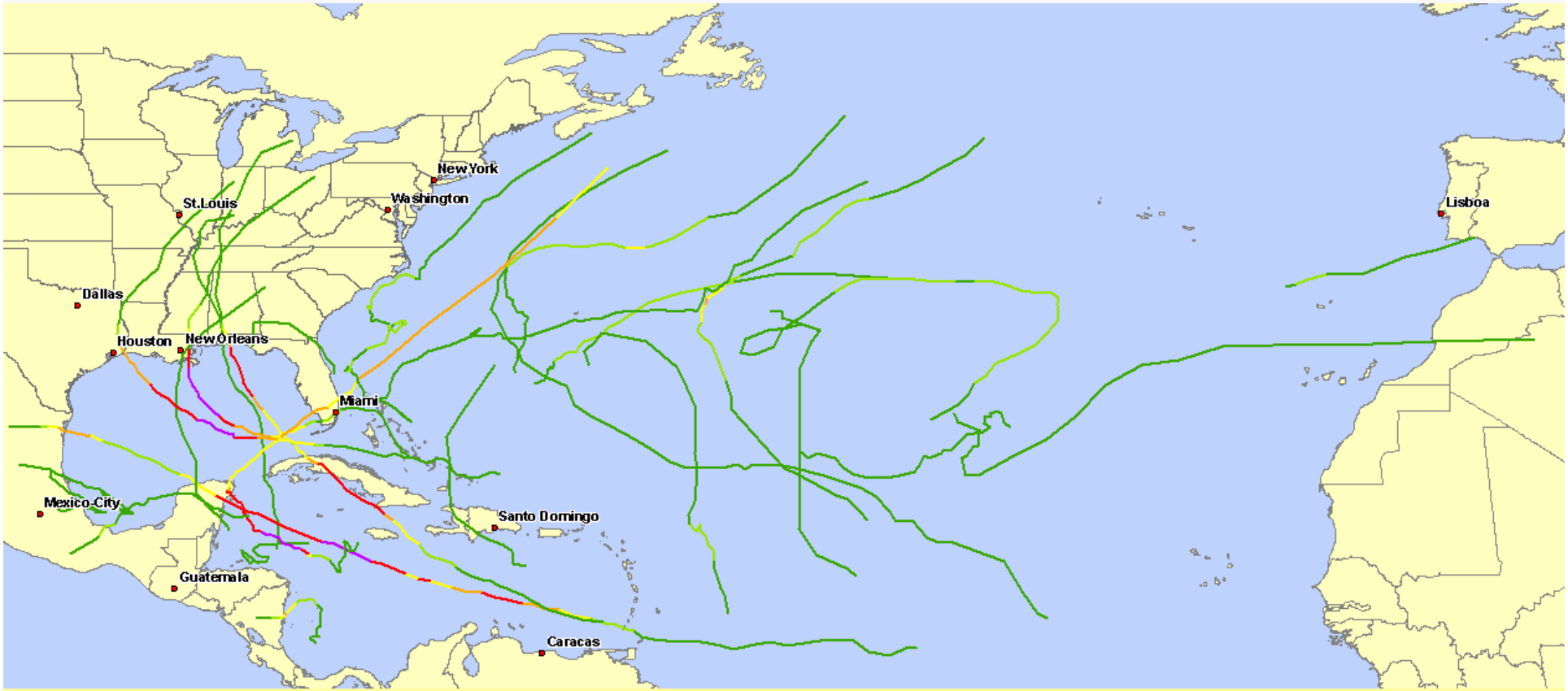
Never before since the beginning of records (1850) have so many named tropical storms occurred in the North Atlantic basin in one season:
28, of which 15 with hurricane strength
(old absolute record 21 in 1933, resp. 12 in 1969)



Events of extreme heat, drought and mass movements globally 1980 – 2006

Number of events – trend line

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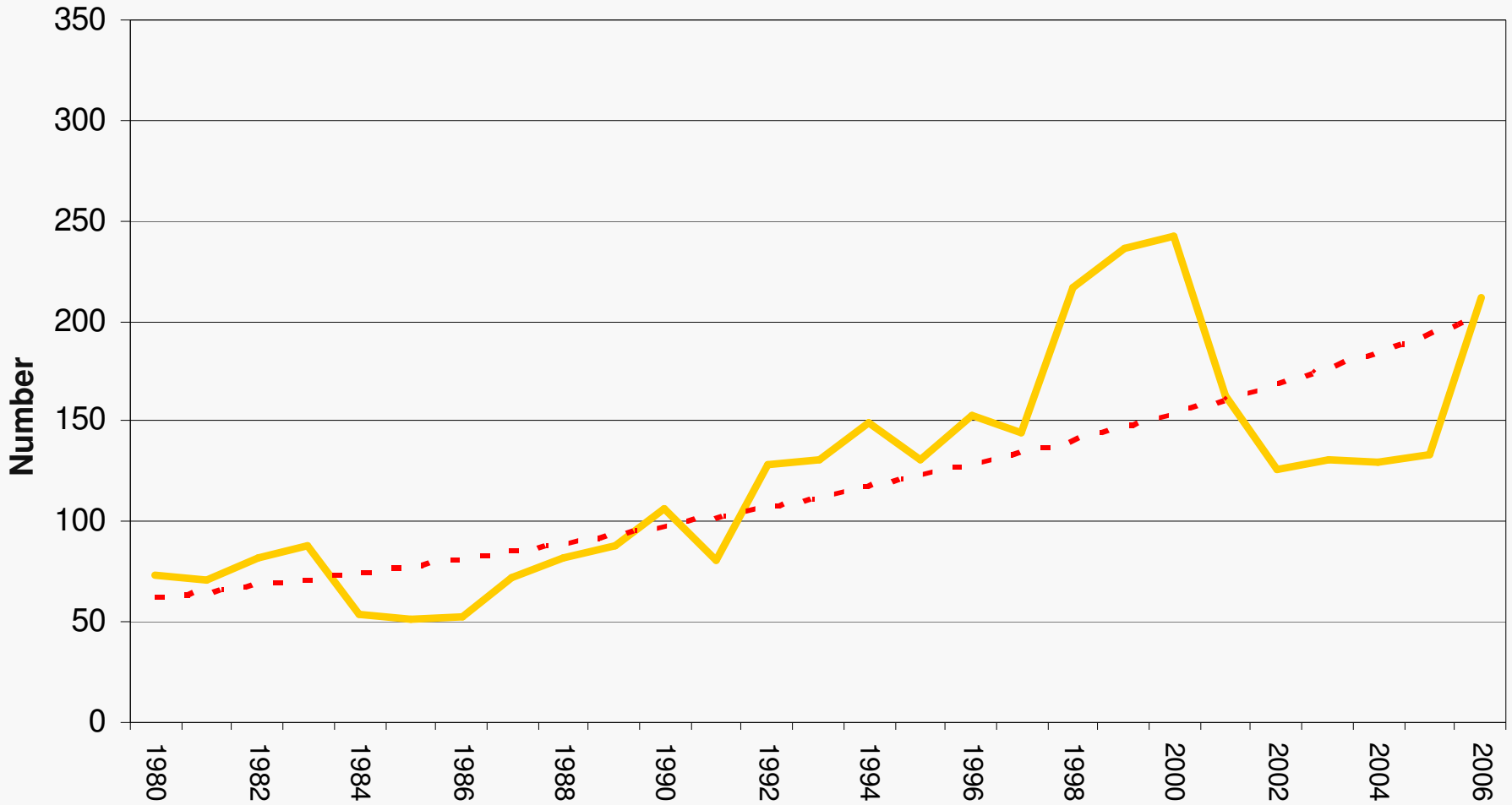

Earthquake catastrophes globally 1980 – 2006

Number of events – trend line

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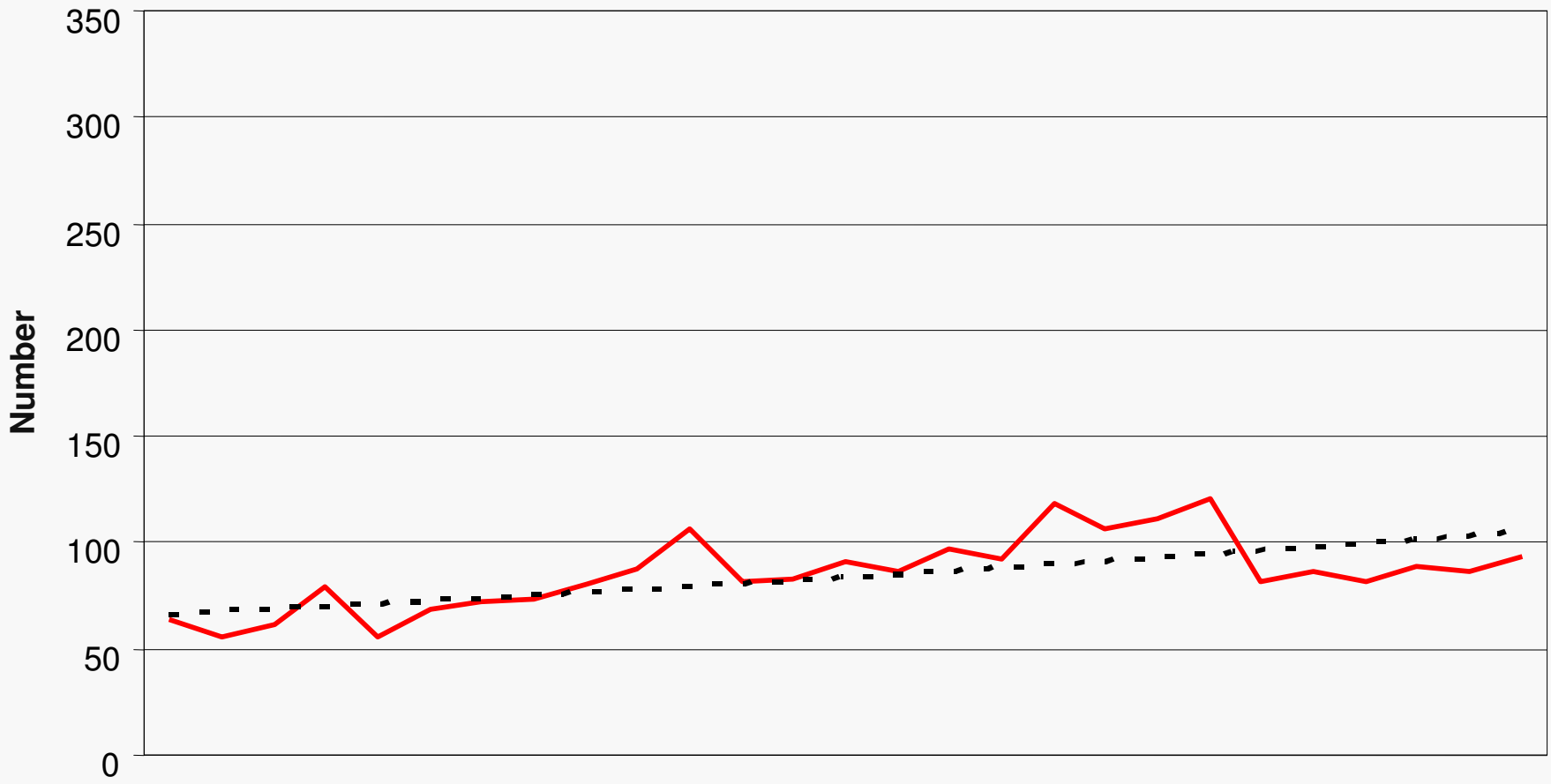

Great Weather Disasters 1950 – 2006 – Overall and insured losses

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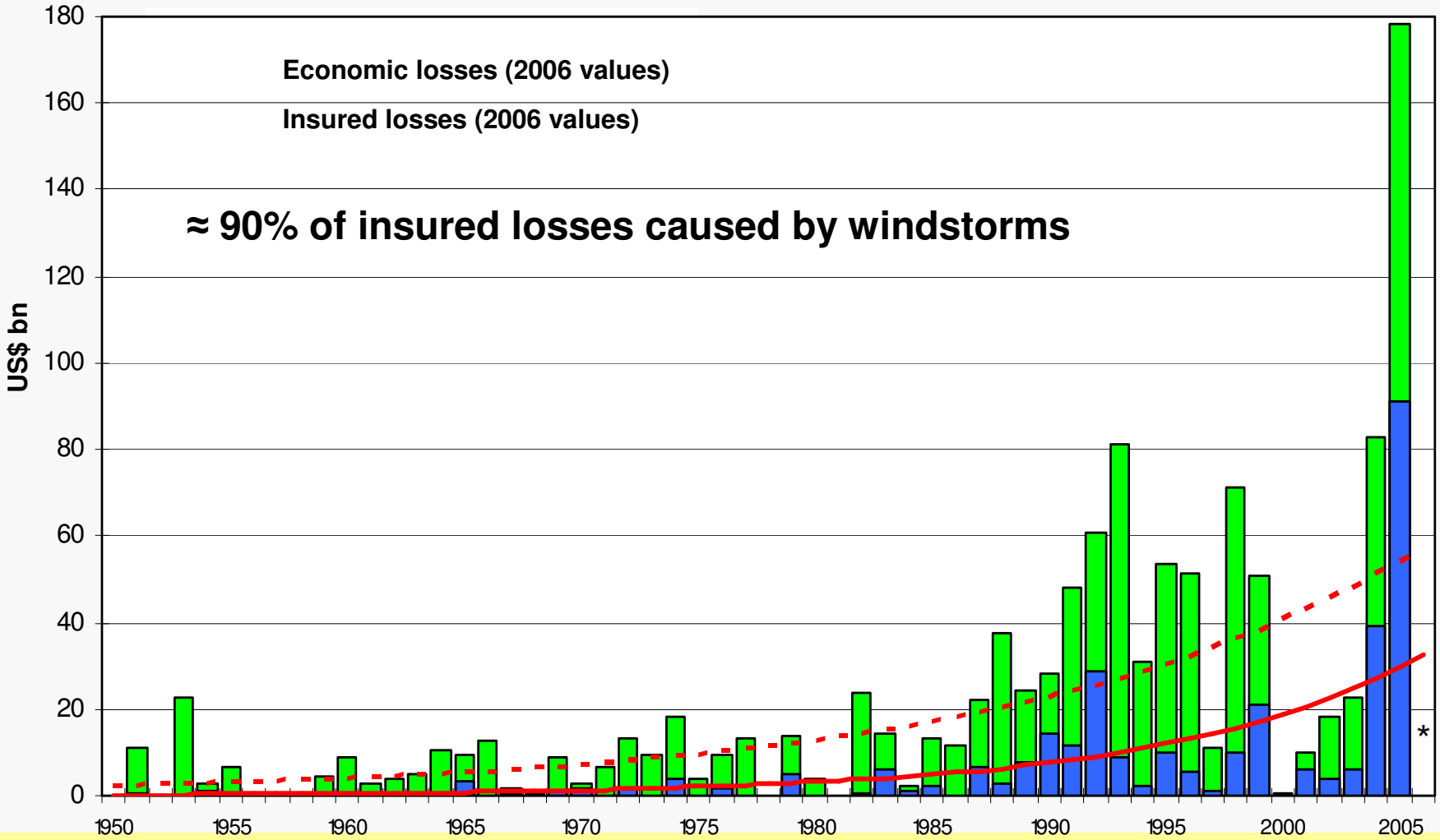

* According to the definition criteria there was no Great Weather Disaster in 2006.

Great Natural catastrophes in economies at different stages of development

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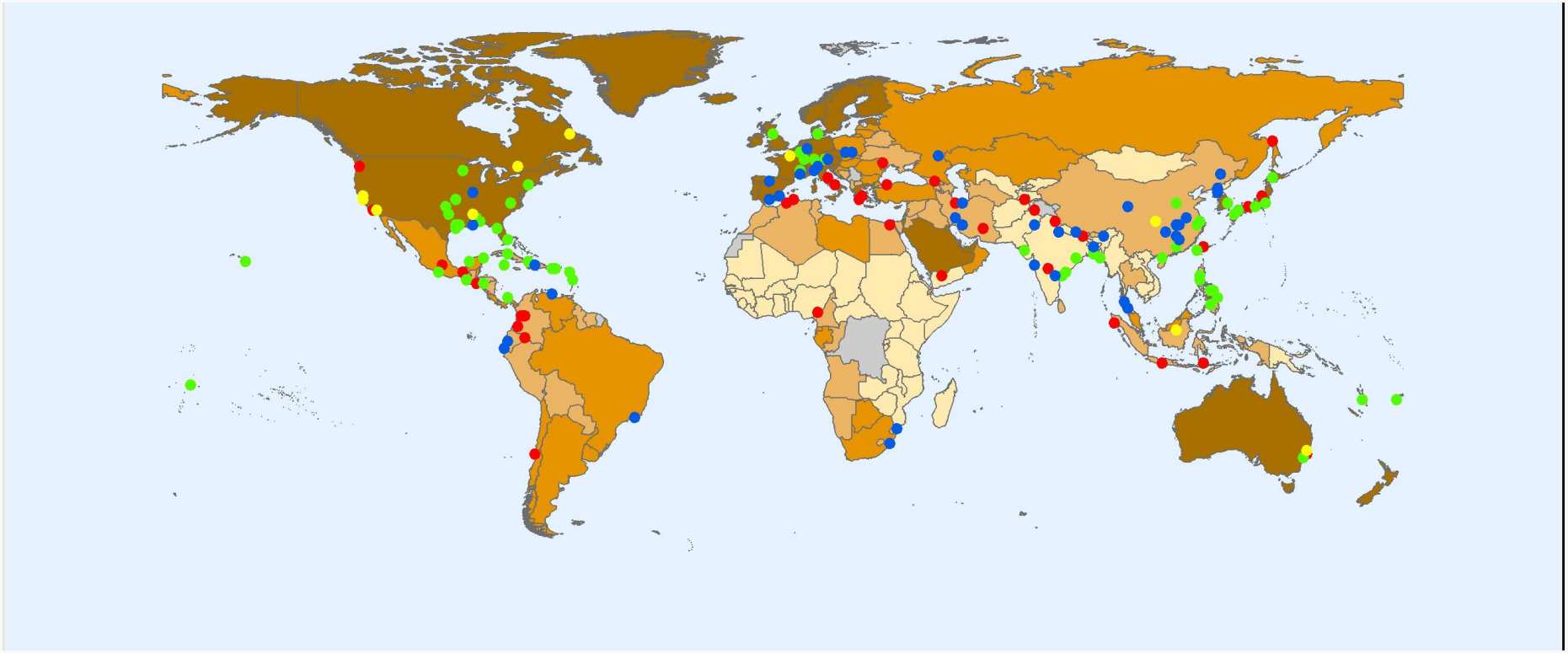

Great natural disasters 1980-2006

- ! Earthquake, tsunami, volcanic eruption
- ! Windstorm
- ! Flood
- ! Extreme temperatures (e.g.: heatwave, wildfire), mass-movement (e.g. avalanche, landslide)

Income groups (GNI* in US$)

Low income	(<905 US$)
Lower middle income	(906-3,595 US$)
Upper middle income	(3,596-11,115 US$)
High income	(>11,116 US$)
Unclassified	

*GNI= gross national income

Source: © 2007 Münchener Rückversicherungs-Gesellschaft, Geo Risks Research, NatCatSERVICE (Income groups according to the definition of the worldbank)

Scientific Evidence of a Link between Global Warming and Extreme Events

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- It is very likely (CL >90%) that human influence has already at least doubled the risk of a heat wave exceeding the magnitude of the European heat wave 2003 (Stott et al., Nature 2004).

- Major tropical storms both in the Atlantic and the Pacific region have already increased since the 1970s in duration and intensity by about 50 percent (Emanuel, Nature 2005; Webster, Science 2005).

- Due to climate change the sea surface temperatures have increased already by 0.5°C (Barnett, Pierce, 2005, Science; Santer et al., PNAS, 2006).

Observed changes in sea surface temperatures

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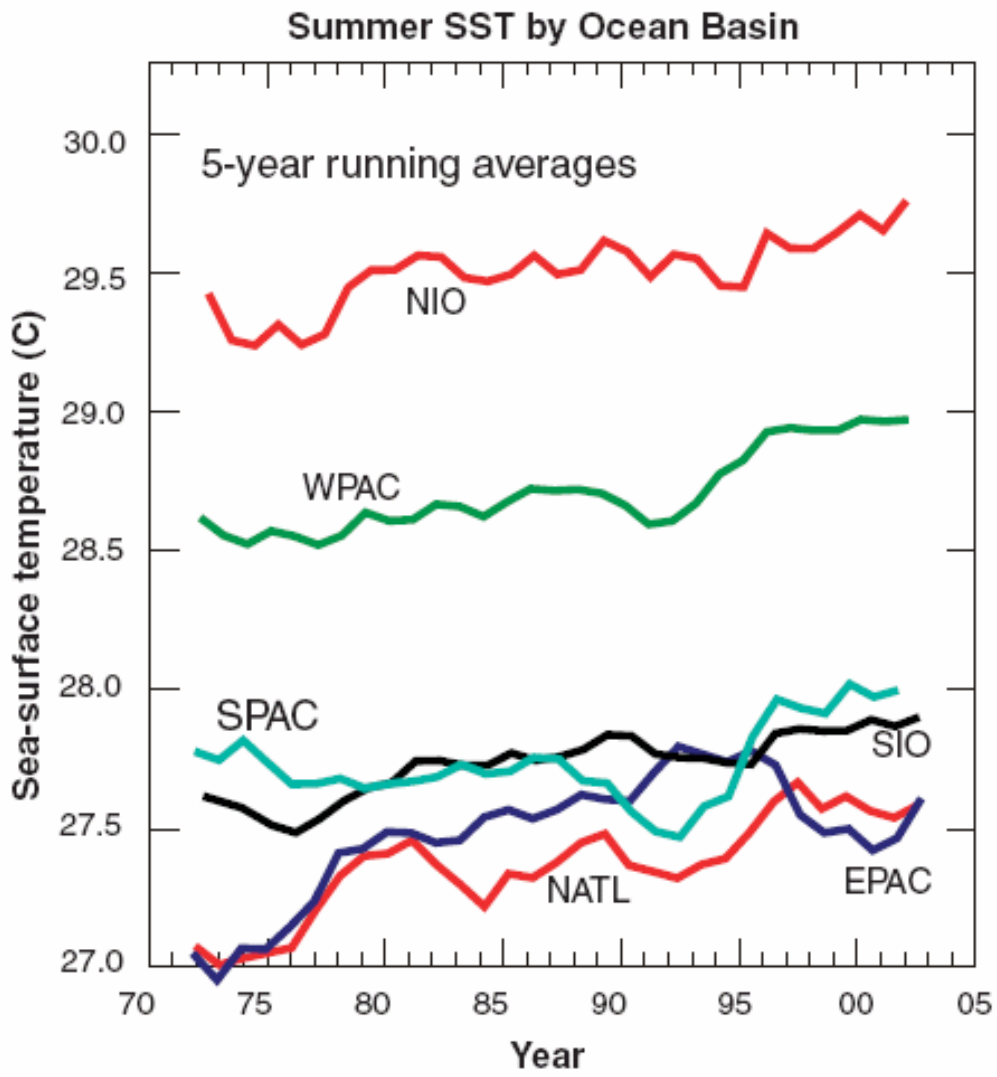

NATL = North Atlantic
WPAC = West Pacific
SPAC = South Pacific
EPAC = East Pacific
NIO = Northern Indic
SIO = Southern Indic

Source: Webster et al. (2005), Science, 309

Scientific Evidence of a Link between Global Warming and Extreme Events

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- It is very likely (CL >90%) that human influence has already at least doubled the risk of a heat wave exceeding the magnitude of the European heat wave 2003 (Stott et al., Nature 2004).
- Major tropical storms both in the Atlantic and the Pacific region have already increased since the 1970s in duration and intensity by about 50 percent (Emanuel, Nature 2005; Webster, Science 2005).
- Due to climate change the sea surface temperatures have increased already by 0.5°C (Barnett, Pierce, 2005, Science; Santer et al., PNAS, 2006).
- Of all the factors only the steady increase in sea surface temperatures over the last 35 years can account for the rising strength of storms in six ocean basins around the world (Webster et al., Science 2006).

Climate Change and Extreme Weather Events (IPCC, 2007)

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Phenomenon[a] and direction of trend	Likelihood that trend occurred in late 20th century (typically post 1960)	Likelihood of a human contribution to observed trend[b]	Likelihood of future trends based on projections for 21st century using SRES scenarios
Warmer and fewer cold days and nights over most land areas	*Very likely*[c]	*Likely*[d]	*Virtually certain*[d]
Warmer and more frequent hot days and nights over most land areas	*Very likely*[e]	*Likely (nights)*[d]	*Virtually certain*[d]
Warm spells/heat waves. Frequency increases over most land areas	*Likely*	*More likely than not*[f]	*Very likely*
Heavy precipitation events. Frequency (or proportion of total rainfall from heavy falls) increases over most areas	*Likely*	*More likely than not*[f]	*Very likely*
Area affected by droughts increases	*Likely* in many regions since 1970s	*More likely than not*	*Likely*
Intense tropical cyclone activity increases	*Likely* in some regions since 1970	*More likely than not*[f]	*Likely*
Increased incidence of extreme high sea level (excludes tsunamis)[g]	*Likely*	*More likely than not*[f,h]	*Likely*[i]

very likely > 90% **likely >66%** **more likely than not > 50%**

Development of weather catastrophes 1980 – 2006 in economies at different stages of development

Number of events

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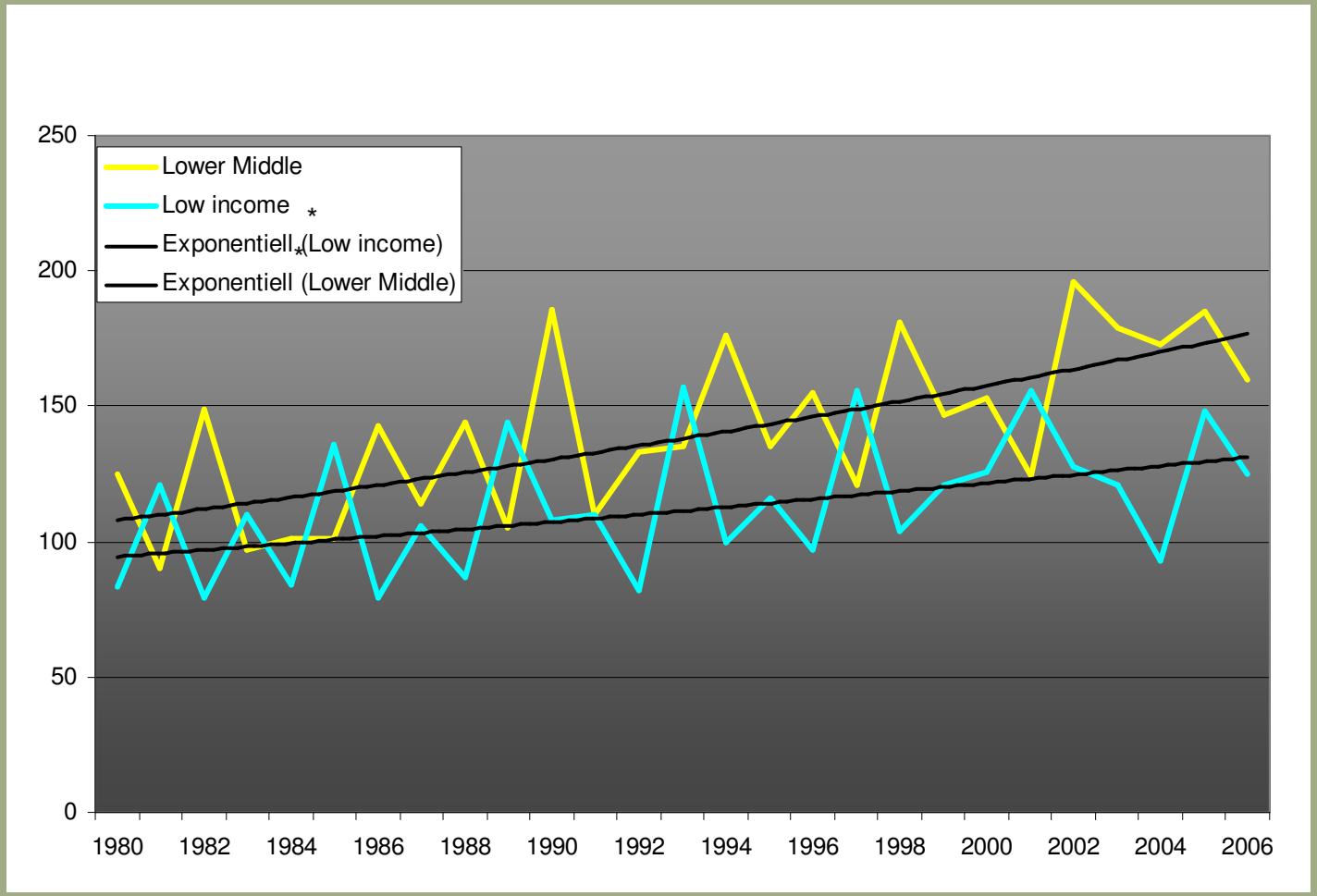

*Classification as per World Bank, 2007

GDP per capita < 905 US$
GDP per capita > 906 – 3,595 US$

Losses compared to annual GDP

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Losses in different countries in the Caribbean due to the 2004 hurricane season compared to the annual GDP

- Dom. Republik: 1.9 %
- Bahamas: 10.5 %
- Jamaica: 8.0 %
- Grenada: 212.0 %
- Cayman Islands: 183.0 %

Source: UN/ECLAC Study http://www.reliefweb.int/rw/RWB.NSF/db900SID/EVIU-68QEKZ?OpenDocument

Global distribution of insurance premiums per capita

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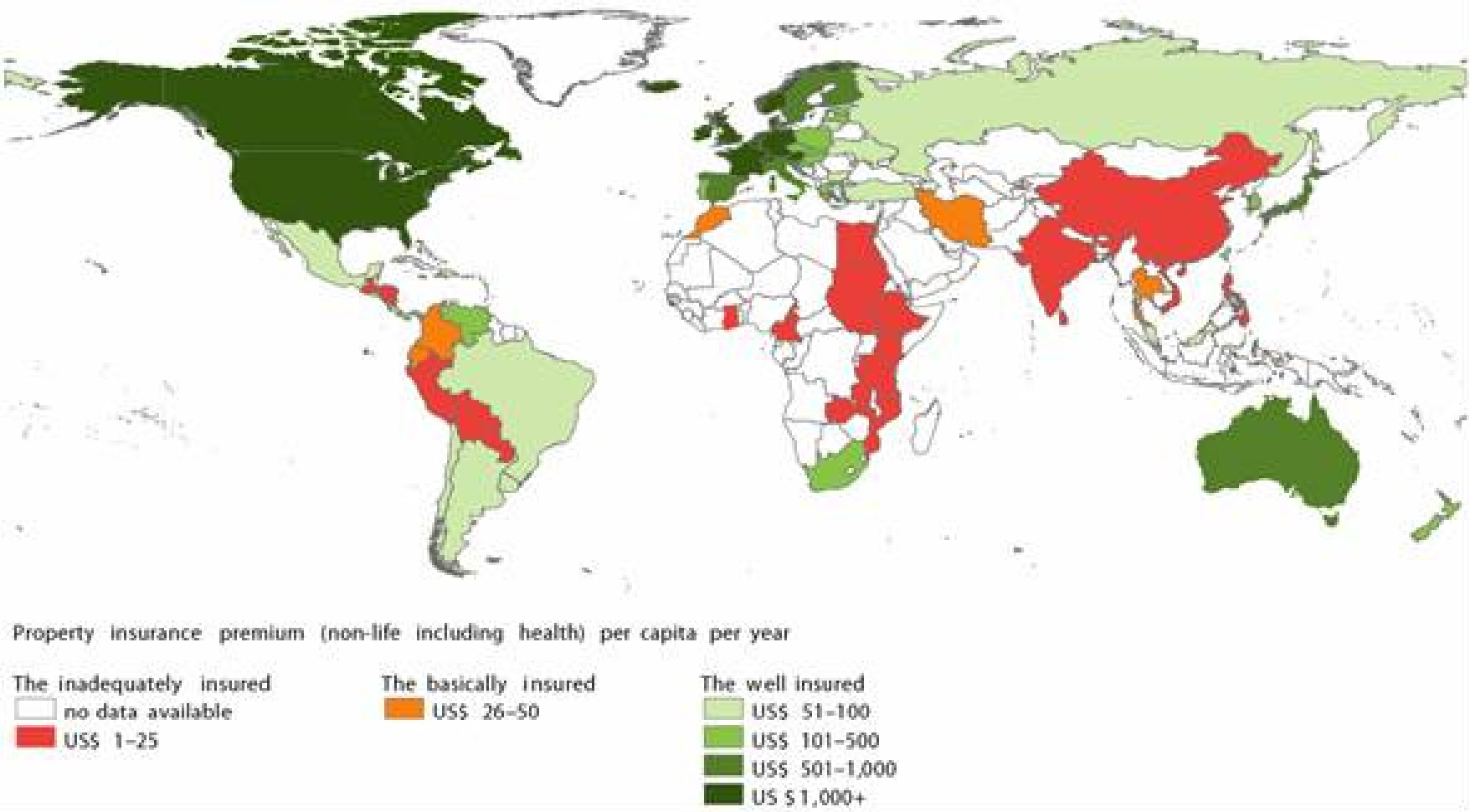

Limitation for Donor Aid

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Donor aid has been a major source of risk financing for most disaster-prone developing countries. Reliance on this source of funding has major risks:

- Donor aid is not a contractual obligation -> subject to considerable political uncertainty
- The amount of overall donor aid remained rather stable overtime as a percentage of donor countries' GDP, economic losses caused by natural disasters have grown at a much more rapid pace compared to the increase of the donors' GDP
- The ratio of development funding, which had to be used for emergency relief by the developing countries has risen from 2% at the end of the 1980s to 9% in the last years (source OECD, 2005).

Climate Insurance: Basics

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Article 4.8 of the UN Framework Convention on Climate Change

8. In the implementation of the commitments in this Article, the Parties shall give full consideration to what actions are necessary under the Convention, including actions related to funding, insurance and the transfer of technology, to meet the specific needs and concerns of developing country Parties arising from the adverse effects of climate change and/or the impact of the implementation of response measures, especially on:

Article 3.14 of the Kyoto Protocol

14. Each Party included in Annex I shall strive to implement the commitments mentioned in paragraph 1 above in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties, particularly those identified in Article 4, paragraphs 8 and 9, of the Convention. In line with relevant decisions of the Conference of the Parties on the implementation of those paragraphs, the Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first session, consider what actions are necessary to minimize the adverse effects of climate change and/or the impacts of response measures on Parties referred to in those paragraphs. Among the issues to be considered shall be the establishment of funding, insurance and transfer of technology.

Foundation of MCII in April 2005 in Munich
Institutions represented in MCII

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- Germanwatch
- IIASA
- Munich Re and Munich Re Foundation
- Potsdam Institute for Climate Impact Research (PIK)
- United Nations University
- UNFCCC
- World Bank
- Independent experts

Munich Climate Insurance Initiative Objectives

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MCII strives to fulfill four objectives

1. **Develop insurance-related solutions to help manage the impacts of climate change especially in developing countries**.
2. **Conduct and support pilot projects for the application of insurance- related solutions.**
3. **Promote insurance-related approaches in cooperation with other organisations and initiatives.**
4. **Identify and promote loss reduction measures.**

Climate Policy, Special Issue
Volume 6, Number 6, 2006

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Climate Insurance: Basics

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- Cover of only large loss events (threshold to be defined)?
- Both sovereign as well as individual losses should be included
- Based on a compensatory scheme
- The scheme cannot cover the whole amount of losses due to weather related disasters as only part (currently certainly relatively small, but probably increasing) can be attributed to global warming.
- There are two ways to limit indemnification to these additional losses:
  - to indemnify all losses but only of real extreme events (beyond a certain percentile of the historic distribution) or
  - to only indemnify a certain percentage (representing the average global warming attribution) of the losses.

Climate Insurance: Basics

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- Indemnification should be linked to prior implementation of adaptation measures having been defined by the authority managing the climate insurance pool.
- A certain percentage, e.g up to one third, of the money out of the insurance pool should be assigned to such measures. Recent scientific results show, that every dollar invested in prevention pays back many fold in loss reductions.
- Current and probably also future problem: quantification of attribution of global warming to weather related disasters.
- Perhaps the emerging scientific discipline “probabilistic attribution science” can solve such problems (Myles Allen: “A probabilistic, risk-based approach to risk attribution for extreme weather events”)

Climate Insurance: How much money needed?

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- Level of current annual total economic losses caused by weather related natural catastrophes:
  100 US$ bn (0,2% of global GDP of 48 US$ trn)
- Ratio of losses in developing countries: 7% of global losses
- Ratio of global warming attribution: rough estimate 20%
- Funds needed per year: 100 US$ bn x 7% x 20% = 1.4 US$ bn
- 2006 total global CO_2 emissions: 30 bn tons
- Costs of climate change insurance currently approx.
  5 US ct per ton CO_2

A very rough estimate!!!

Next Activities of MCII

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- Foundation of a legal body (Association, Verein)
- Election of a Board
- Opening of a Secretariat at United Nations University in Bonn
- Recruitment of a General Secretary (sponsored by Munich Re)
- Speaking slot at Plenary Session at COP 13 in Bali
- Side Event at COP 13 in Bali

Conclusions

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- There is hardly any doubt anymore that climate has been changing already and will do so even faster in the near future
- The Munich Re NatCatSERVICE data show significant trends of increasing frequencies of weather related disasters worldwide and the losses caused by them
- Recent scientific studies provide more and more evidence that there is a causal link between global warming and increasing natural catastrophe hazard
- In reference to the findings above further increasing weather related losses have to be expected in the future

Conclusions contd.

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- Almost all regions on this globe will be affected by the increase of natural catastrophes. While the wealthy countries will be able to cope with this by means of insurance solutions and state funding, the poorest countries will suffer most

- The increasing natural catastrophe damages in poor countries will consume increasing ratios of the donor money of development funding, delaying their further development

- New insurance related systems are necessary to get these countries, where currently almost no insurance is available, out of the global warming trap

- MCII is working on solutions to provide expertise on insurance related mechanisms to cover losses due to climate change, especially in developing countries