Is there a Rational Basis to the Extremist View of Climate Change?

THE 2008 INTERNATIONAL CONFERENCE ON CLIMATE CHANGE

MARCH 2 - 4, NEW YORK, USA

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Main drivers of the climate debate

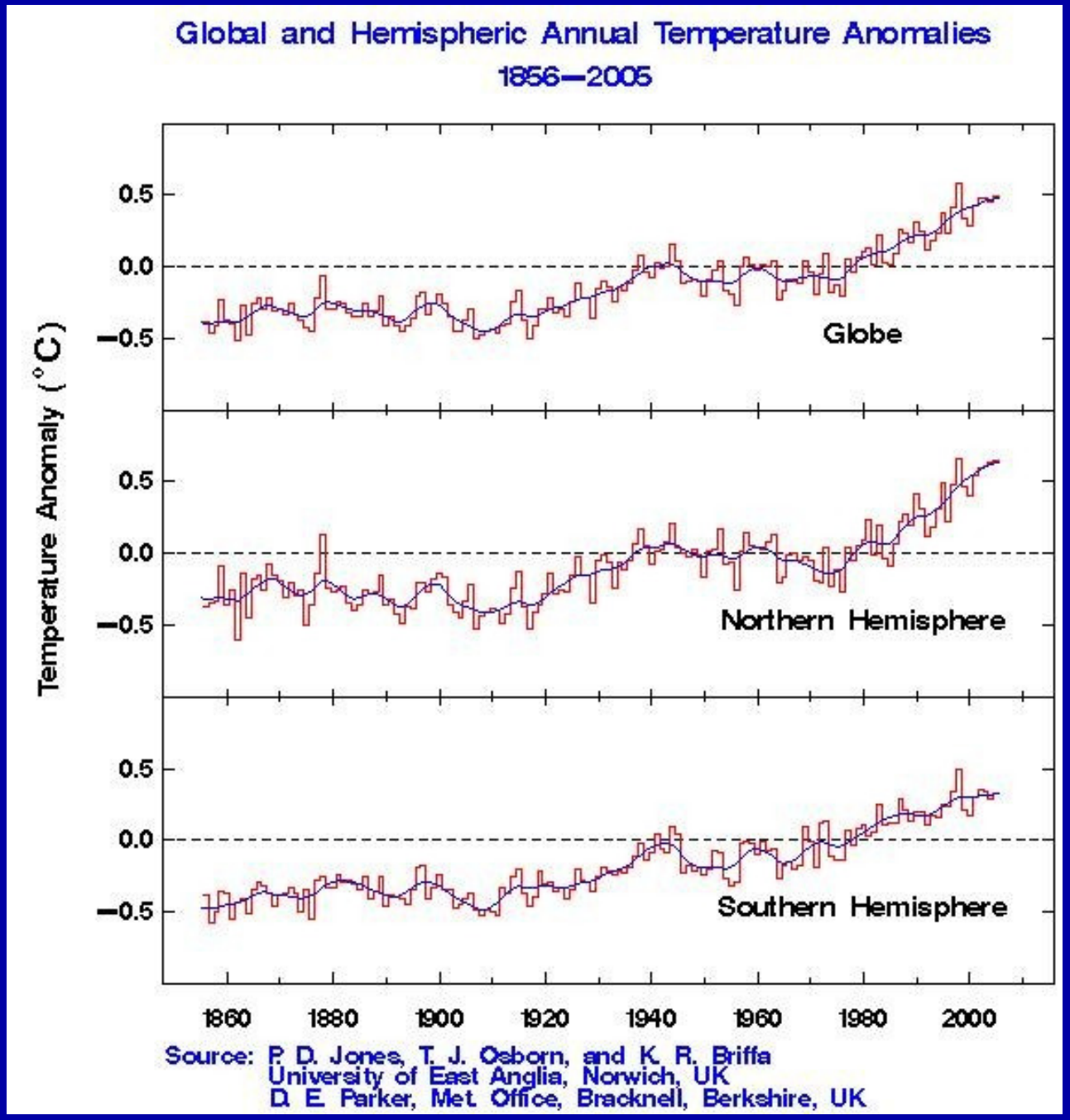
- Published opinion and the public's perception on climate change appears to be largely influenced by alarmist statements and reports in the mass media
- Two prominent recent examples are Al Gore's movie "An Inconvenient Truth" and the "Stern Review on the economics of climate change"
- In a democratic society published opinion and public perception are the main drivers for political action – not indisputable scientific facts
- Cases in point are the European Union's "Climate Change Strategy" of 10 January 2007 and the "Green package" of 23 January 2008", but also some regional activities in the US and proposed action by US legislative bodies
- Those policy decisions and proposals have been justified by the extremist view on climate change
- Both "AIT" and "Stern" have been thoroughly analyzed and discredited as a one-sided, extremist view of the world unsuited for policy decisions

Some of the key elements of the extremist view

- There is a significant chance of a temperature increase greater than 3℃ by 2100
- Observed global warming in the last few decades is entirely due to man-made global warming
- Significant increase of extreme weather and climate events with future warming (as eg Hurricanes, Tornados, wind-storms, extreme precipitation events, droughts)
- Extreme events have already increased as a result of man-made global warming
- There is a significant chance of a large sea-level rise of several meters (caused by partial melting of Greenland and/or Antarctica)

Is there a significant chance of a temperature increase greater than 3℃ by 2100?

- Projected warming by 2100 depends to a large extent on assumed socio-economic factors as eg population growth, economic growth, energy use
- Key element in mainstream climate model projections is a large positive feedback between CO_2/water vapour/clouds, leading to 2 X CO_2 projections of about 3 ℃, about triple basic 2X CO_2 radiative forcing
- For the presently observed equivalent CO_2 concentration (CO_2 plus other ghg) the forcing is about 75 per cent of a CO_2 doubling
- Should have resulted in a warming of close to 1.5℃ (or more for climate sensitivities above 3℃); adjusted for oceanic slowing
- Observed past 100 years .8, last 30/50 years .5 ℃, only last 30/50 years are being ascribed to ghg
- Even if all of that warming was due to ghg, only about 1/3 of modelled
- Even if present trends of ghg concentrations, ghg forcing and global temperature increase continued to 2100, temperatures would only increase by 1.5+/-.5℃; due to the logarithmic dependence temperatures would only go up linearly even if CO_2 concentrations continue to increase exponentially


Global and Hemispheric Annual Temperature Anomalies
1856–2005
Temperature Anomaly (°C)
0.5
0.0
−0.5
Globe
Northern Hemisphere
Southern Hemisphere
1860
1880
1900
1920
1940
1960
1980
2000
Source: P. D. Jones, T. J. Osborn, and K. R. Briffa
University of East Anglia, Norwich, UK
D. E. Parker, Met. Office, Bracknell, Berkshire, UK

„Projected average global surface warming at the end of the 21st century is 1.1 – 6.4 °C “

	IPCC 1990 SA90	IPCC 2001 SRES	IPCC 2007 SRES	Observed 1987 - 2006
CO_2 Concentration (increase in % pa)	.80	.36 -.96	.36 - .96	.45)1
CH_4 Concentration (increase in % pa)	.87	- .12 - .78	-.12 - .78	.30)2
Greenhouse Forcing (in W m^{-2} dec^{-1})	.75	.41 - .91	.41 - .91	.37)3
Projected Temperature Increase (°C per dec)	.30	.14 - .58	.11 - .64	.15 +/- .05)4

)1 From Mauna Loa data
)2 Higher in the 1980s, lower since 1990, no increase since 1999 following IPCC, 2007
)3 Higher in the 1980s, lower in the 1990s and 2000s, following Hansen and Sato, 2004;
)4 Lower value is radiosonde and satellite data of troposphere 0 - 8 km, higher value surface data

Growth Rates of GHG Forcing (Wm-2 year-1)

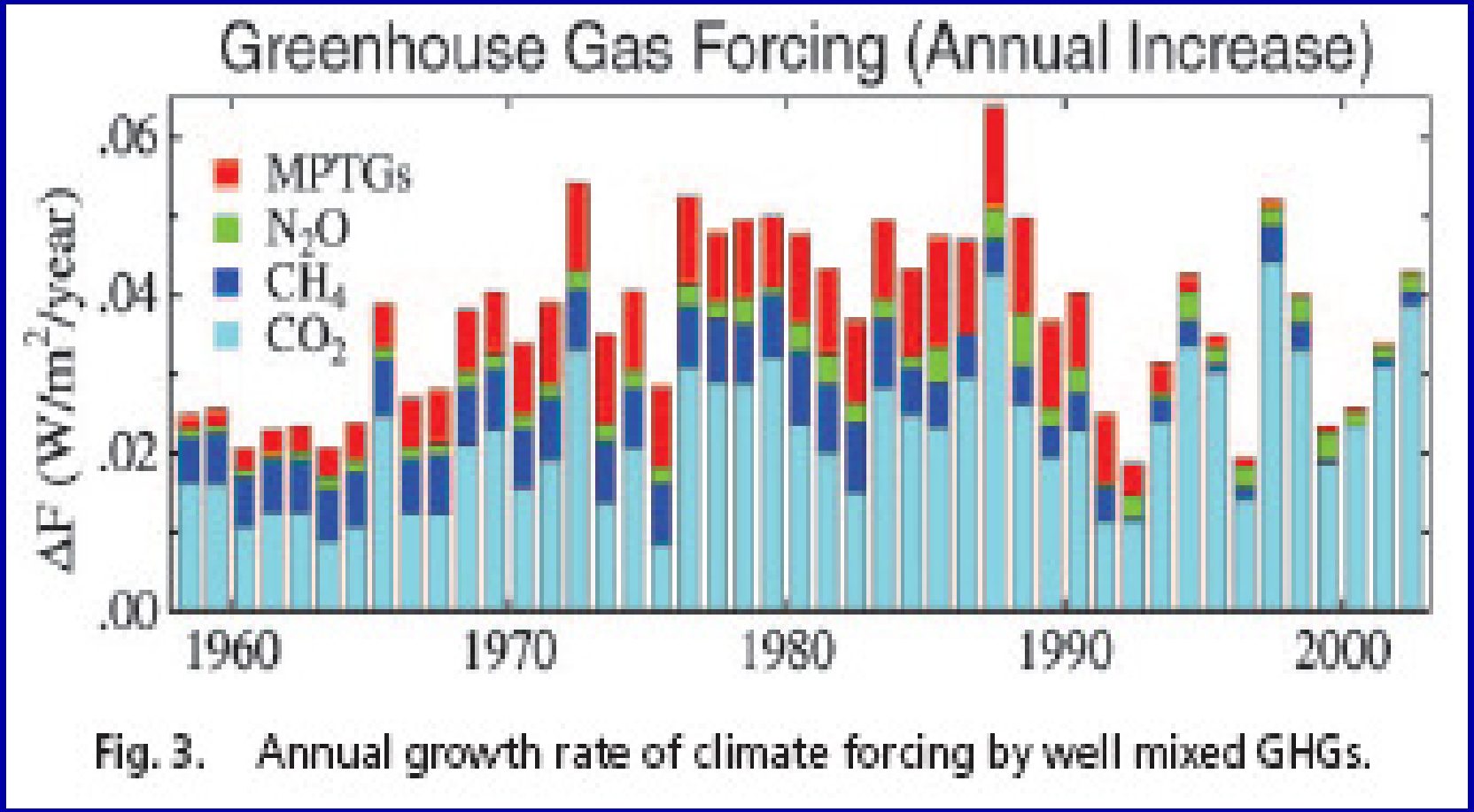


Fig. 3. Annual growth rate of climate forcing by well mixed GHGs.

Source: Hansen und Sato 2004

Is sulphate cooling a realistic explanation of the difference between observed/modelled temperature trends?

- About 90 per cent of sulphur emissions/sulphate load occur in the NH, predominantly the ML's (US, Europe, South and East Asia)
- According to mainstream modelling, cooling effect strongest there
- Should result in larger warming trends SH than NH, particularly over land
- Not observed: Largest warming in recent decades ML's and HL's of NH, small/insignificant warming SH
- Sulfate cooling heuristic assumption: Cancellation of two unknowns with opposite signs; hypothetical and speculative; no firm scientific basis. Not entirely impossible but not very plausible
- Follows general trend in climate debate: Hypotheses that support models are stressed, countervailing evidence is played down by scientists and the media

Other explanations for differences observed/modelled

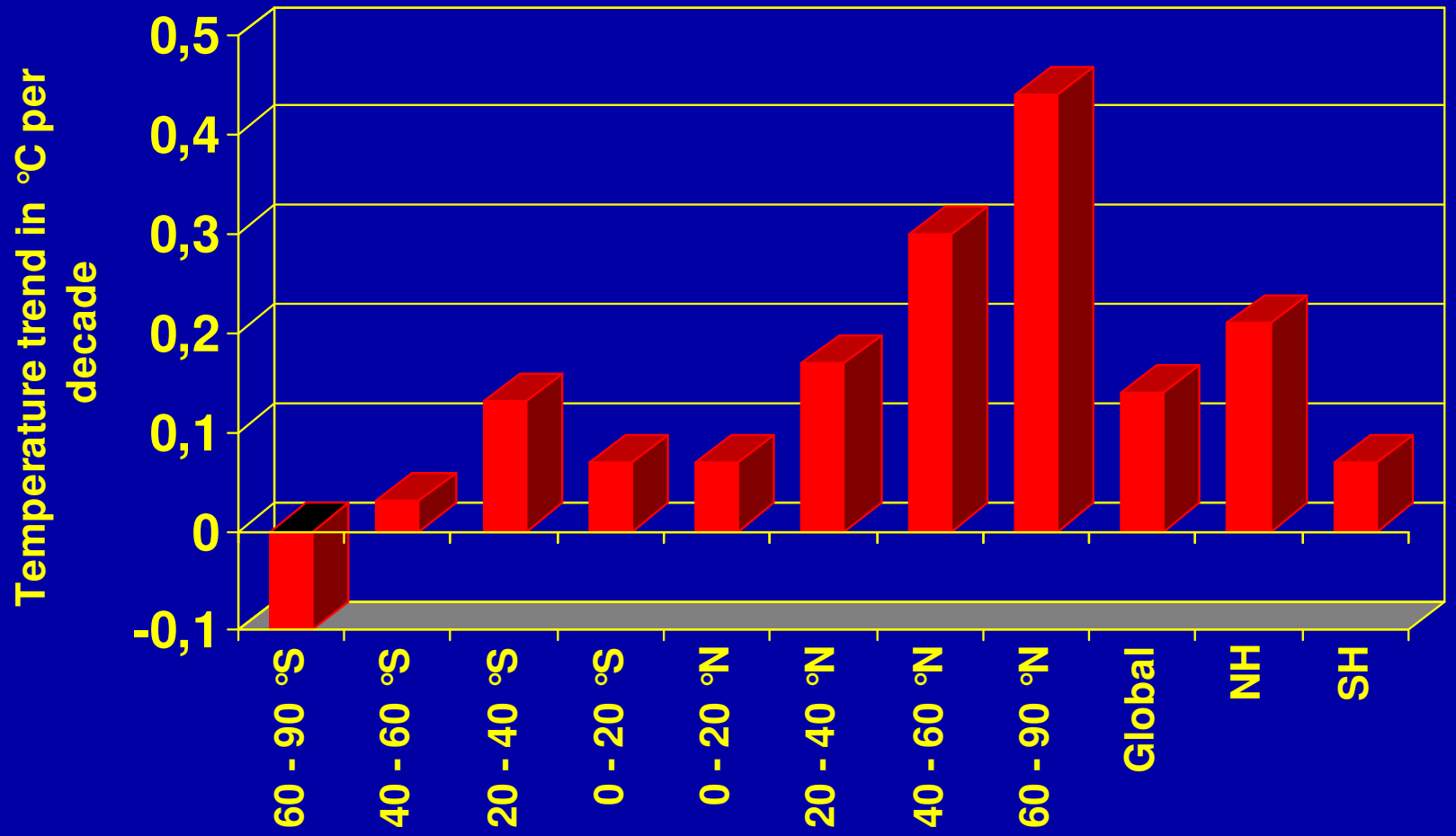
- Water vapour feedback may not be as large as modelled, especially in the tropics
- Cloud feedback/effects may not be as large as modelled

Is the observed warming in recent decades entirely due to man-made global warming?

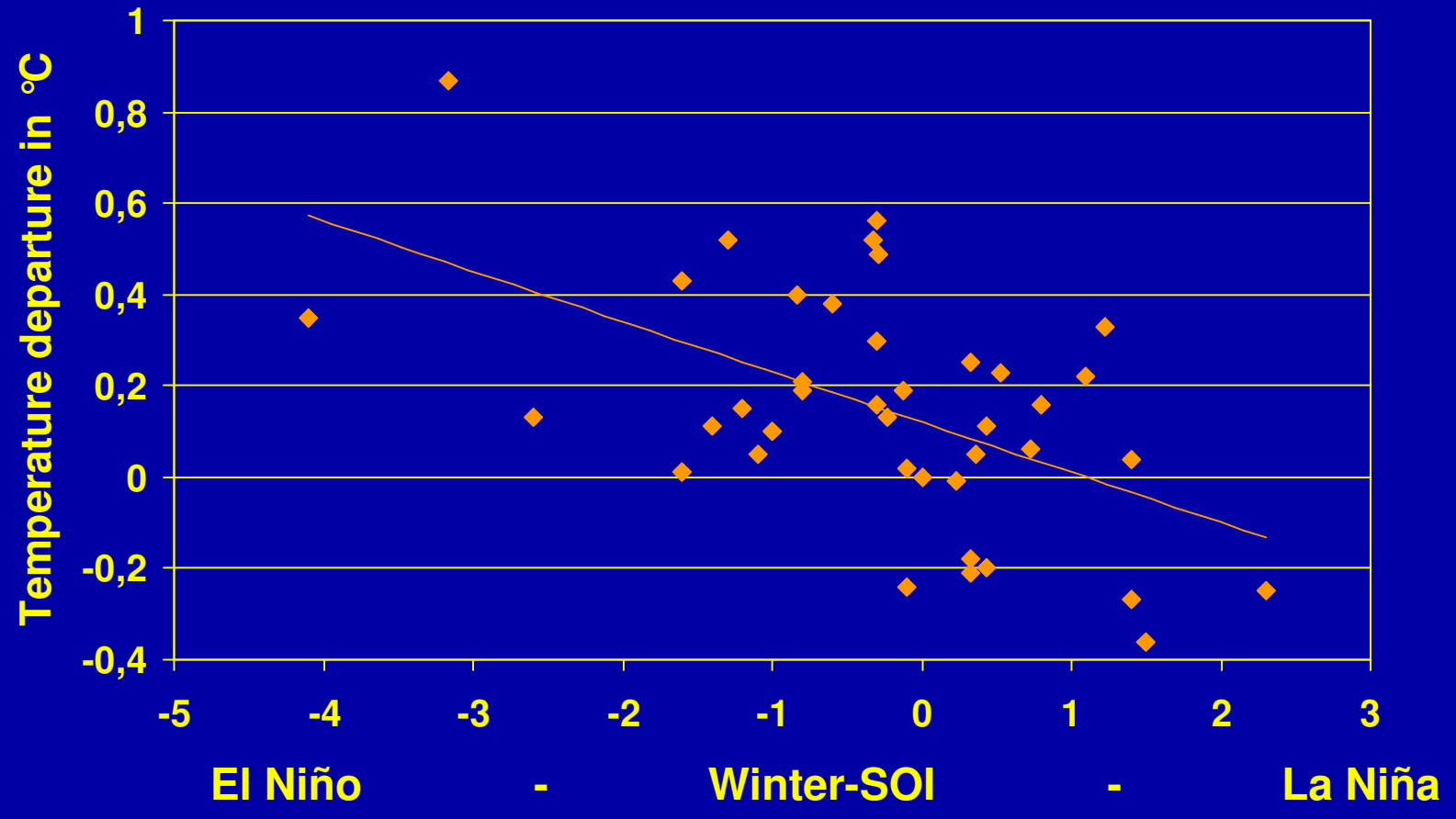
- Warming during the first half of the 20th century natural causes, possibly solar
- Cooling 1950-1975 unrelated to ghg increase, possibly solar
- Warming over the last three decades was concentrated in the mid and higher latitudes of the NH, small to insignificant in the Tropics and SH since about 1980
- Appears to be influenced by ENSO variations (more frequent El Nino events 1977 – 2007 compared to the 1950s – 1970s)
- Appears to be influenced by the NAO/AO/NAM, more zonal flow in recent decades, wintertime warming interior continents (large surface, smaller free troposphere)
- Probably explains significant part of the NH temperature rise

MSU 2LT Satellite Temperature Trends 1979 - 2006;

Latitudinal Averages

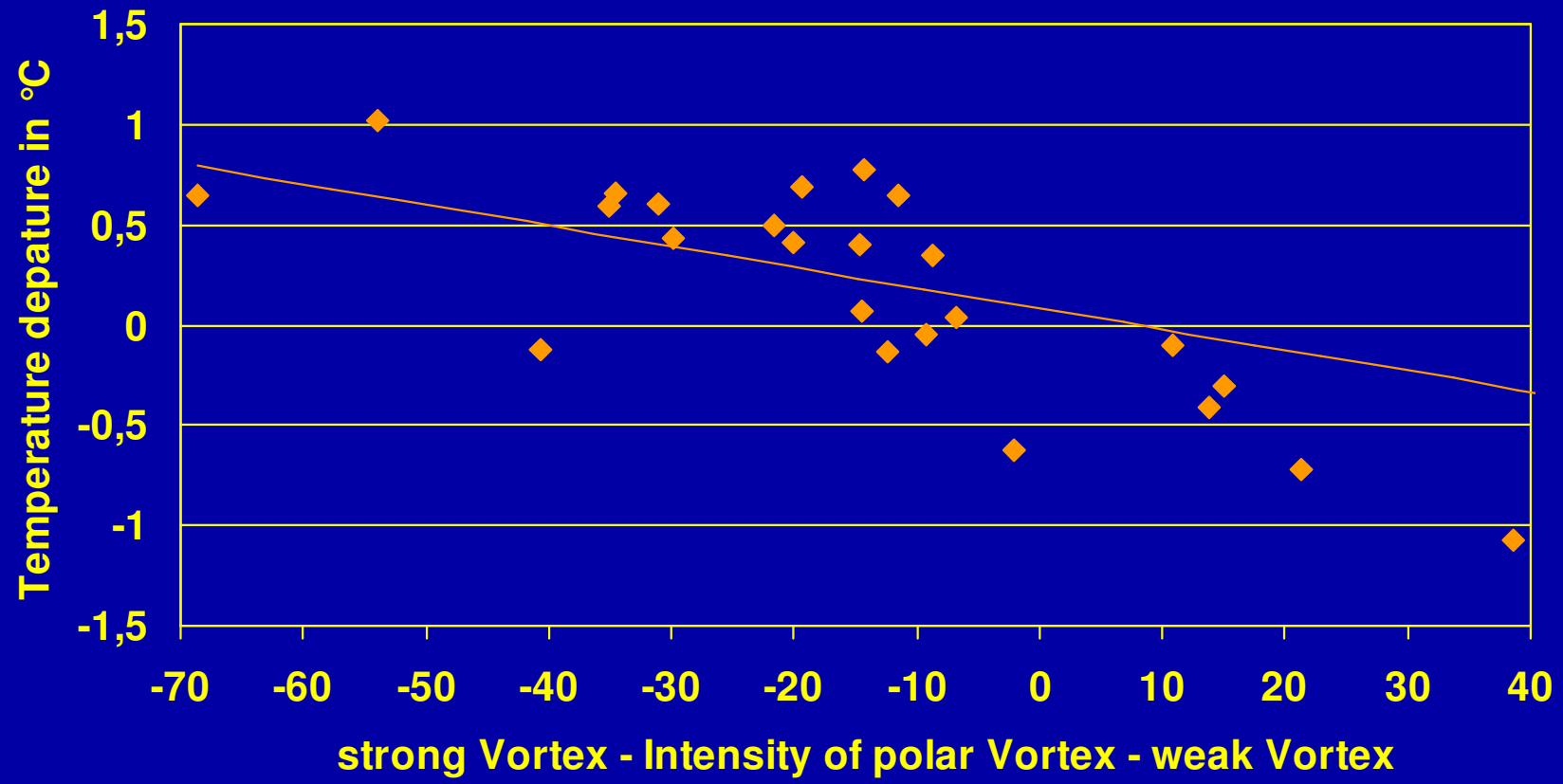


Tropospheric Temperatures 300/1000 in the Northern Hemisphere and SOI variations 1961 - 2000: Warm El Niños and cool La Niñas



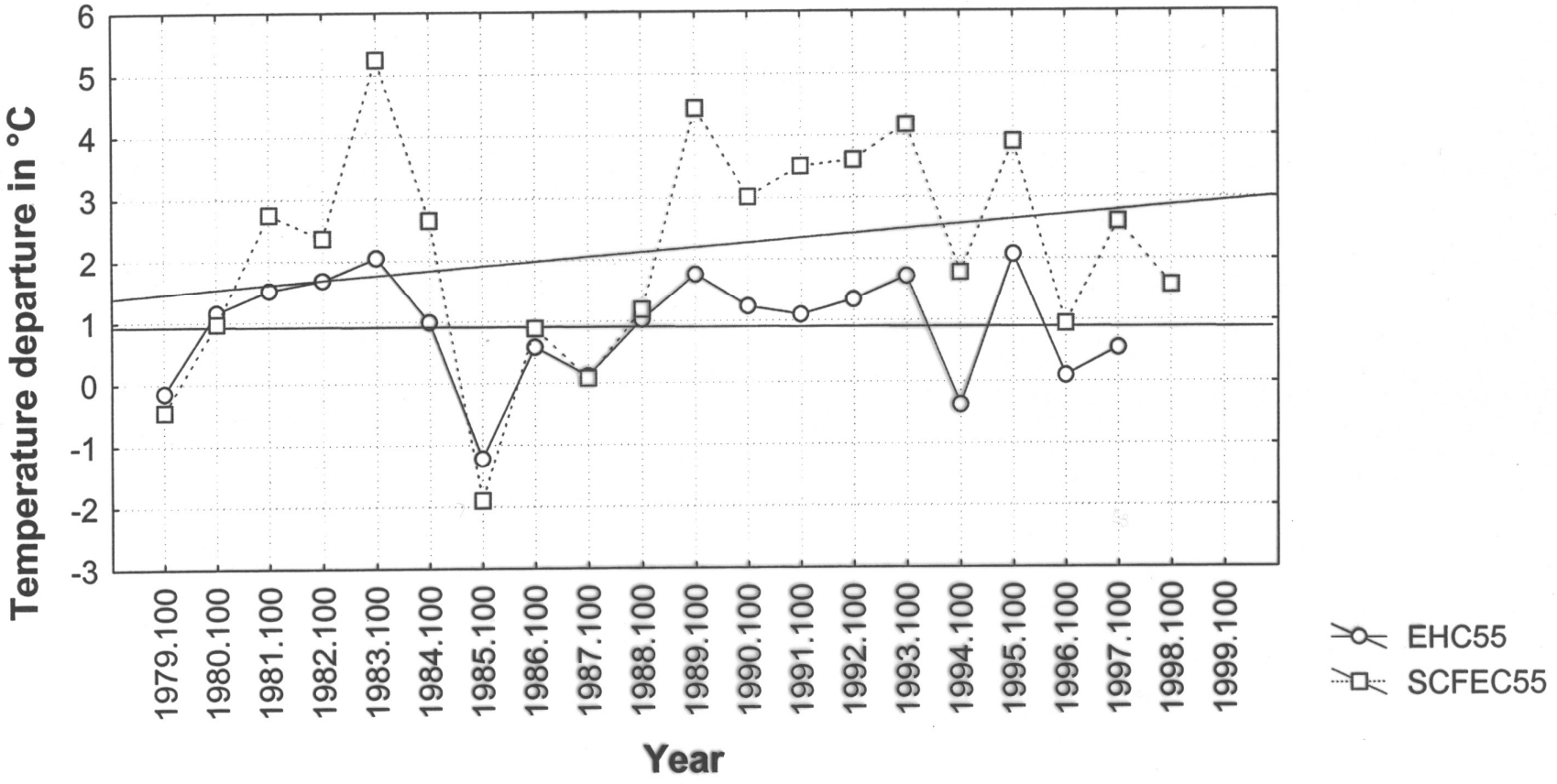
Data Source: Met. Inst. Free University of Berlin

Intensity of the Polar Vortex and Tropospheric Temperatures 300/1000 in the Mid-Latitudes 40 - 60 °N in Winter (1976 - 2000)



Data Source: Met. Inst. Free University of Berlin

Surface and upper air temperaure trends between 50 and 60 N over Eurasia in winter 1979 - 1998: Strong warming at the surface - no warming aloft



Data Source: Met. Inst. Free University of Berlin

Significant increase of extreme weather events (model projections)

- Model projections on increased frequency and severity of Hurricanes highly uncertain, does not entertain the view of definite frequency and intensity increases in a warmer world

- Countervailing effects of increasing static stability and vertical wind-shear to higher SST's in tropics and Hurricane regions

- Model projections on mid-latitude storm intensity in a warmer world highly uncertain, modelling errors larger than climate change signal

- Equator to pole temperature gradient main driver of mid-latitude storm intensity, projected to decrease, larger warming in higher latitudes than in mid and lower latitudes

Future changes in the frequency of tropical storms

Ratio (%) of number of storms in global warming experiment to number in control experiment

			Ocean basin					
model	reference	Global	NA	WNP	ENP	NI	SI	SWP
T106 JMA 10y	Sugi et al. 2002	**66**	**161**	**34**	33	109	**43**	**69**
T42 NCAR CCM2 10y	Tsutsui 2002	102	86	111	91	116	124	99
N144 HadAM3 15y	McDonald et al. 2005	**94**	**75**	**70**	**180**	**142**	110	**82**
T106 CCSR/NIES/FRCGC	Hasegawa and Emori 2005			96				
T106 JMA 10y	Yoshimura & Sugi 05	fewer						
T63 ECHAM5-OM	Bengtsson et al. 2006	94						
20km MRI/JMA	Oouchi et al. 2006	**70**	**134**	**62**	**66**	**48**	**72**	**57**

Red = significantly **more** tropical storms in the future simulation

Blue = significantly **fewer** tropical storms in the future simulation

Summary: fewer tropical cyclones globally in the future simulations, sign of regional changes varies between model and basin

Source: Ruth McDonald, 2006

Tropical Storms and Climate Change

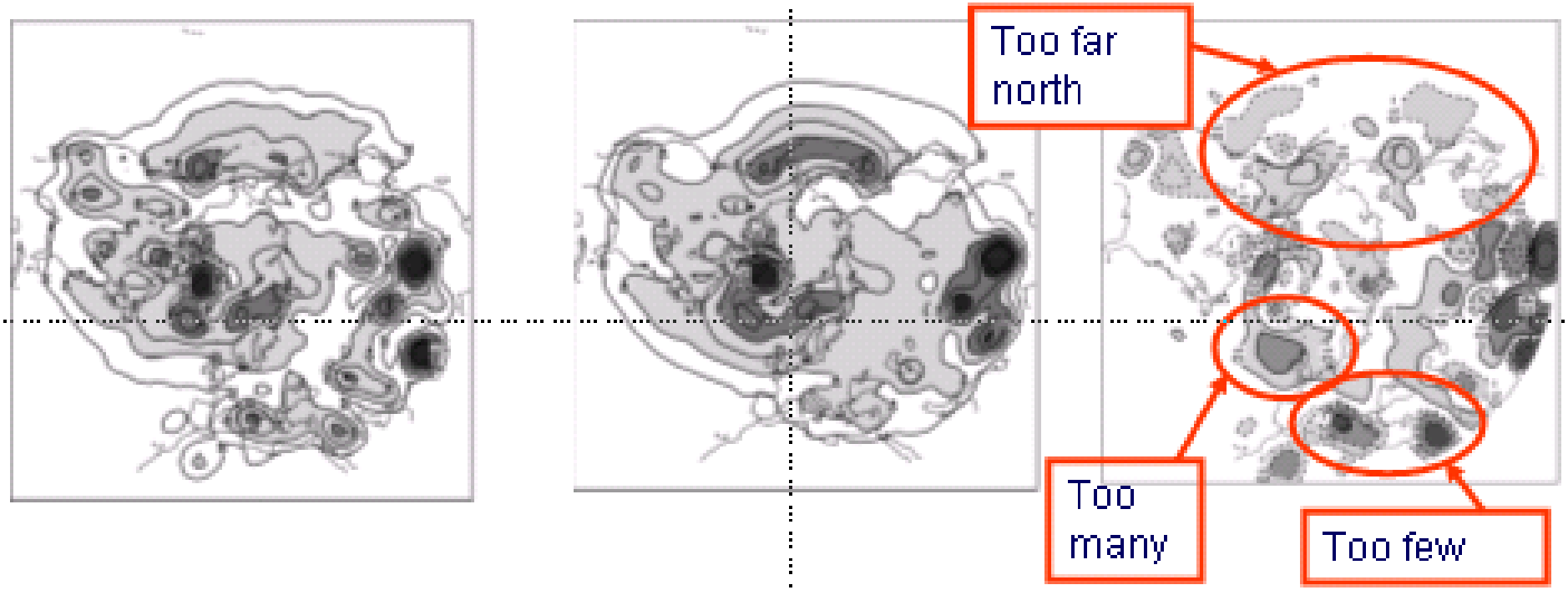
- There is a minor reduction in the number of tropical storms by some 6%
- There are no changes in the extremes of tropical storms in spite of increased tropical SST by 2-3°C
- There are marked changes in the regional tropical storm tracks which we suggest, analogues to ENSO, are driven by regional tropical SST anomalies

Simulation of mid-latitude storms by models:- Cyclone density

ERA

AMIP 13 Model Mean

Difference



number of cyclone events per 145,000 km² accumulated over nine 120 day winter periods for the Northern Hemisphere

Lambert et al. (2002) Climate Dynamics

Source: Ruth McDonald, 2006

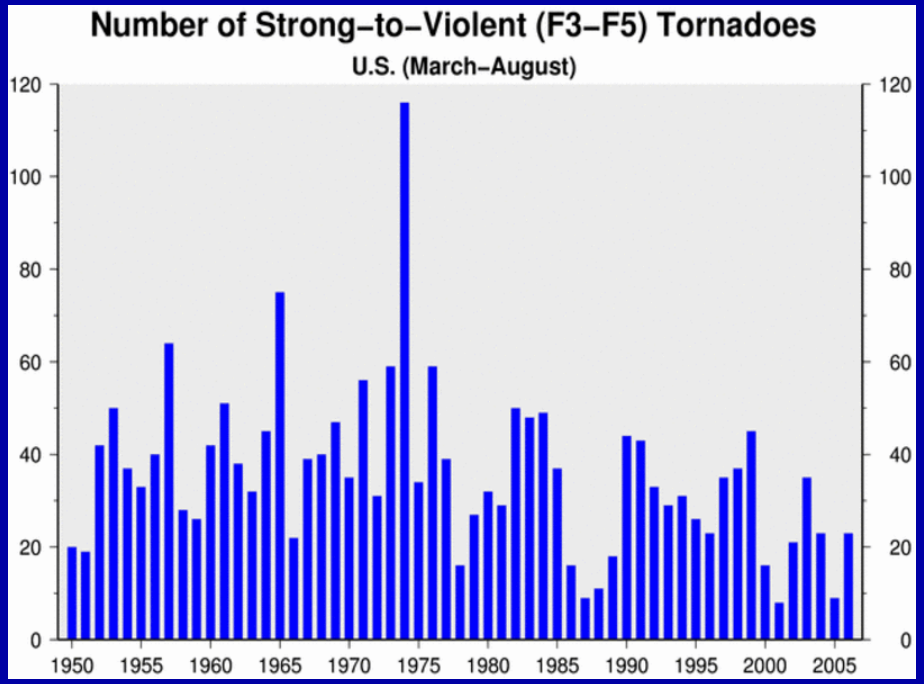
Summary

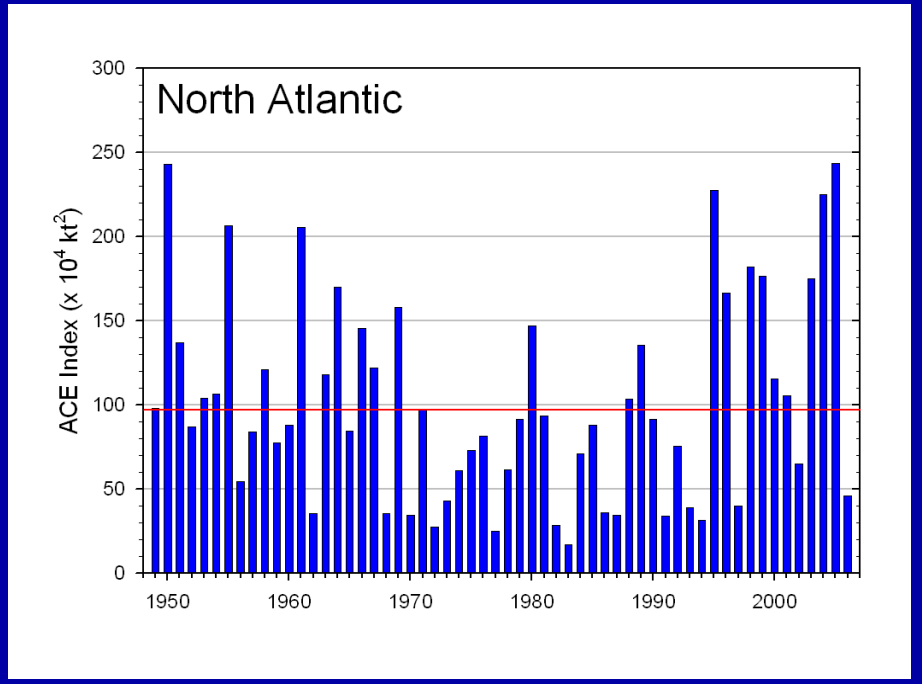
- All models have systematic errors in the simulation of cyclone tracks
- Cyclones tend to be too weak
- Errors often larger than climate change signal

Have extreme events already increased as a result of global warming?

- The media and some scientific studies seek to support the view some extreme events have already increased as a result of man-made global warming
- Definition and detection of extreme events difficult in time series of limited length, parameter dependent
- Incidence of strong Hurricanes (Cat. 3 – 5) in the Atlantic basin has increased since the mid 1970s, but decreased between the 1940s and the 1970s, no long-term increase
- No global increase since the 1980s
- No increase in severe Tornados in the US since the 1950s
- Slight increase in severe precipitation events in US, but unrelated to temperature increase
- No increase in extreme precipitation events in Germany (despite warming there)
- No increase in severe wind-storms in Germany (despite warming there)
- No general increase of summer droughts in Germany and the US

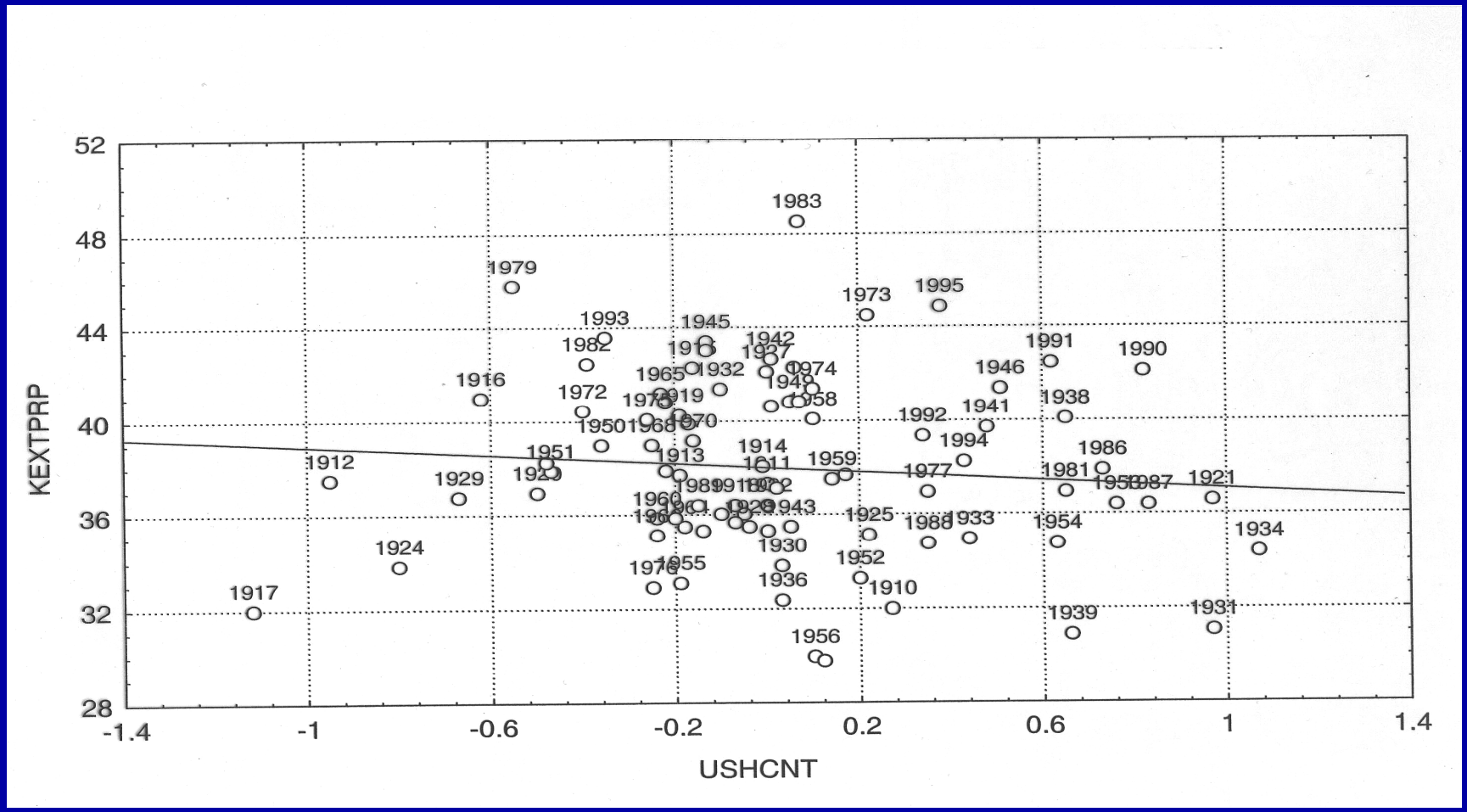
Extreme events (observations): Tornadoes and Hurricanes





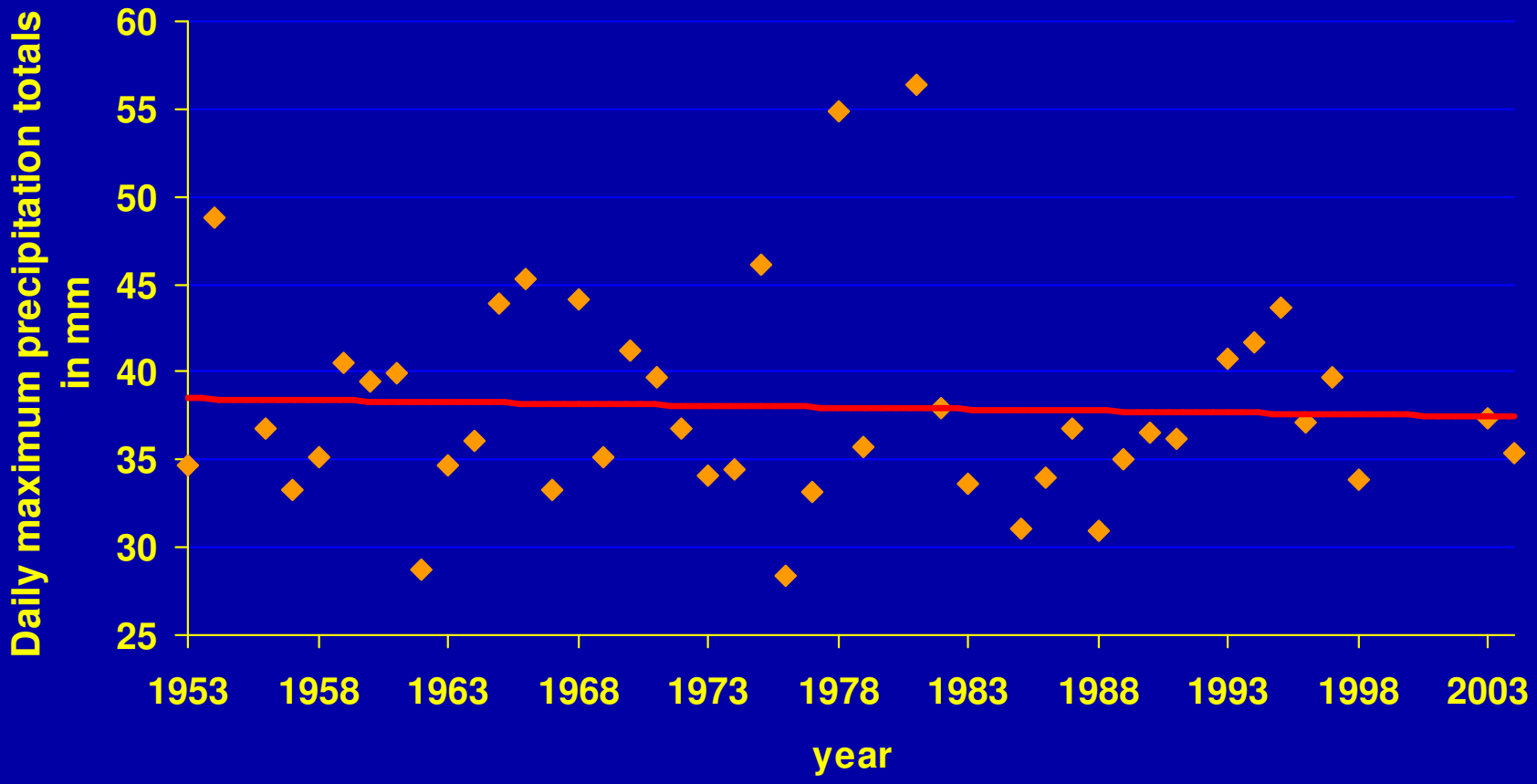
Source: US NOAA

Fraction of Annual Extreme Precipitation from Total (following Karl and Knight, 1998) as a Function of Annual US Historical Climate Network Temperatures



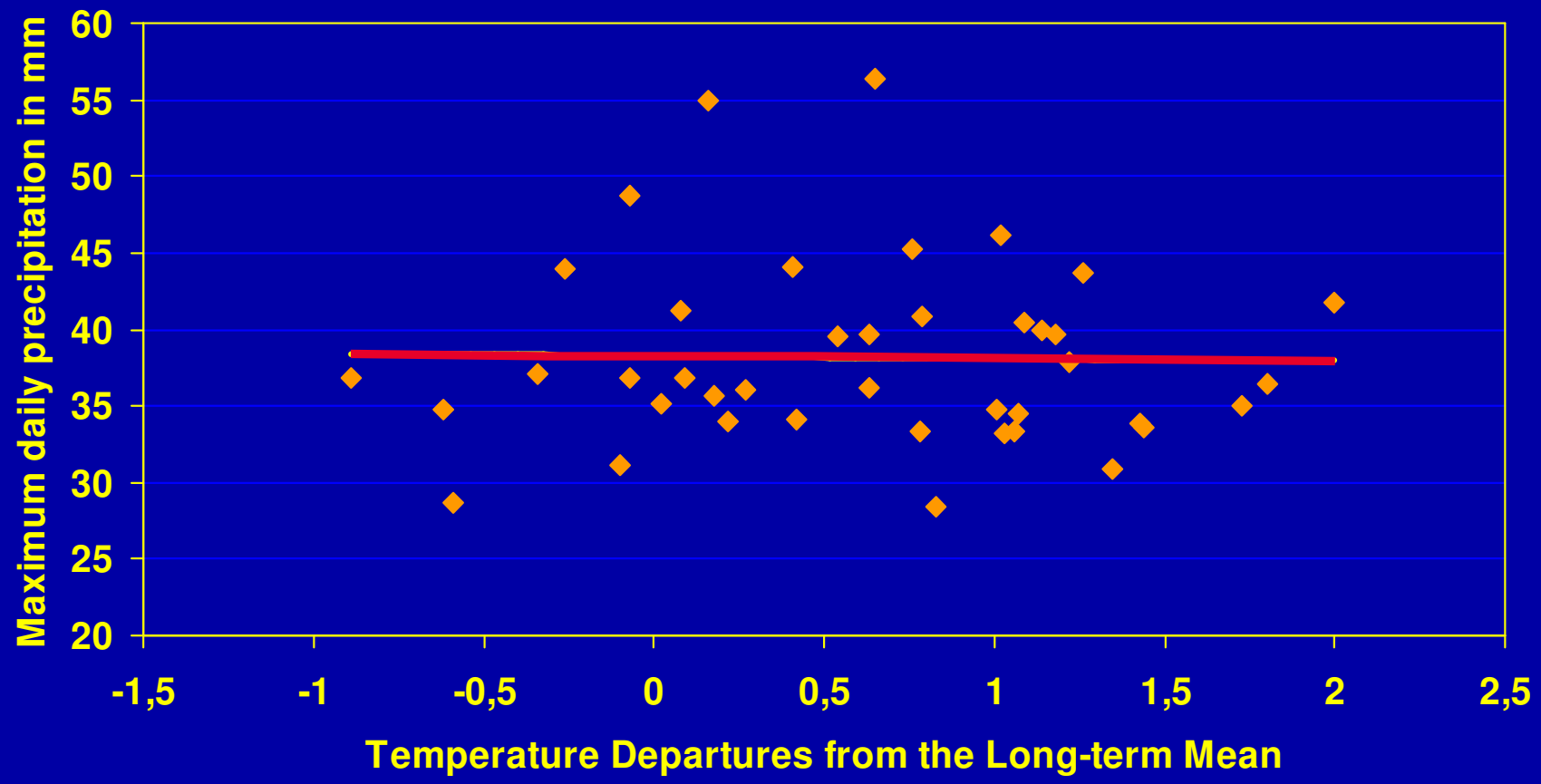
Temperature Departure from Long -Term Average (contiguous US)

Trends of extreme precipitation in Germany since 1953



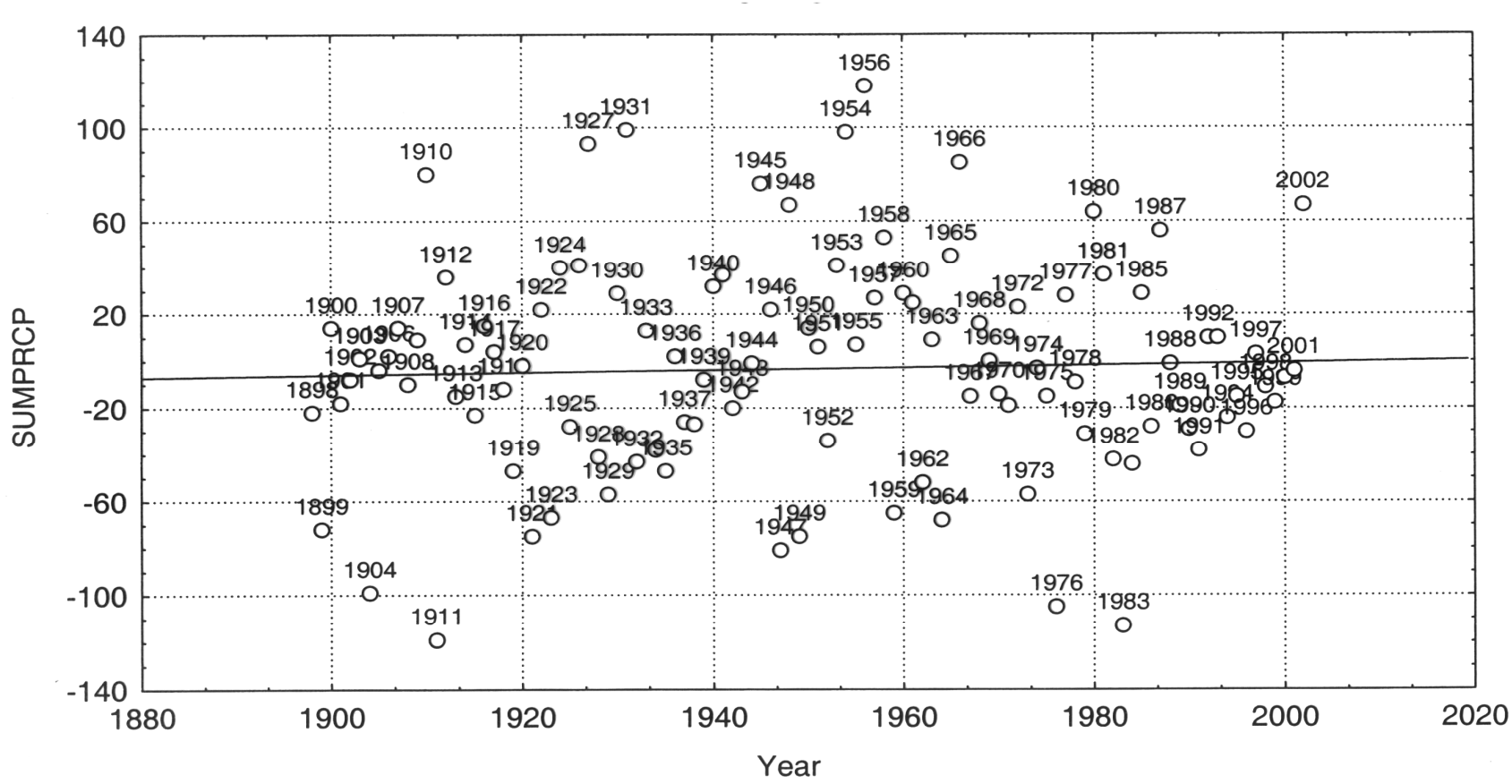
Source: German Weather Service, Annual Climatological Data

Annual Average Temperatures vs. Extreme Precipitation in Germany since 1953



Source: German Weather Service, Annual climatological data

JJA precipitation departures in Germany 1900-2002: no long-term trends (in mm)



Data Source: Linke und Baur, Meteorologisches Taschenbuch, and up-dates by Met. Inst. Free University of Berlin

Is there a significant chance of a large sea-level rise due to significant melting of Greenland and/or Antarctic ice?

- Projections of sea-level rise have continuously been scaled down since IPCC 1990
- Models generally project an increase in Antarctic ice mass, no melting
- Models project some melting of Greenland ice at the edges, but increase in Greenland's interior (altitude between 7,000 and 10,000ft), little net effect on sea-level rise, recent observed temperature rise over Greenland about the same magnitude as rise 1920 – 1930, should not be extrapolated into the future

Summary

- Most of the extremist claims about climate change have little or no scientific basis
- Observed climate change supports the view of a modest or even benign ghg related warming, at the very lower end of climate model projections, effects might well be positive, as eg on agriculture (CO_2 fertilization!)
- The rational basis for extremist claims about global warming may be a desire to generate scare scenarios to push for political action on global warming