Session II and III Impact Modeling（1）、（2）

Chaired by Harasawa (NIES)

1. Introduction of Impact Study :Harasawa
2. Impacts on South Asia : Prof. Lal
3. Progress of AIM/Impact Models
   - Dr. Takahashi
   - Profs Li and You
   - Mr. Jung
   - Dr. R. Bore (BogorAgri. Univercity, Indonesia)
   - Dr. Kapshe
   - Prof. Lal
4. Discussion

Introduction of Impacts Study

Projects / Subject	Central Env. Council (Int'l Strategy)	S-3 Low Carbon Society 2050 (MoE P)	S-4 Strategic Impacts Research (MoE P)	IPCC AR4 (Impacts, Adaptation, Vulnerability)	Global Warming Initiative (CSTP, 2006～)	NIES Global Warming Research (FY 2006-2011)
Stabilization and Impacts/Risk	2℃、475ppm, 50% GHG cut in 2050	←+ burden sharing	Impact Map, Function			New GW Research Prog.
Impacts Detection						Integrated Impacts Monitoring
Extreme events Impacts			Extreme Events and Impacts (B-12)	Ch.10 Asia		
Adaptation	Adaptation Strategy Plan		Impacts and Adaptation (B-52)	Ch.17 Adaptation		NIES next Research Plan
Scenario				Next IPCC Scenario,GEO 4		NIES, MoE, IR3S
Data : Climate Model, etc.				Impact vs. Temp. and Impacts		

Impact/Policy

Monitoring Network

Climate Risk Man.

Heat Stress

Agri. Impact

Water Impact

Office for Coordination of Climate Change Observation (OCCCO)

Office for Coordination of
Climate Change Observation, Japan (MOE&JMA)

JAPANESE

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Supporting and coordinating earth observation
- towards a better understanding of the collective picture of climate change -

Office for Coodination of Climate Change Observation(OCCCO)'s activities include (1) investigating the need for climate change observations, (2) enhancing the accessibility of observation data, and coordinating the use of observational platforms in collaboration with the Scientific Working Group, (3) conventing meetings, and (4) managing public relations activities.

The Office for Coordination of Climate Change Observation (OCCCO), located in the Center for Global Environmental Research (CGER) of the National Institute for Environmental Studies (NIES), supports the activities of JACCO.

The objective of the Japanese Alliance for Climate Change Observation (JACCO) is to develop a comprehensive and integrated climate change observation system that takes user needs into consideration. In order to achieve this objective, JACCO will (1) identify requirements for climate observations based on the need for monitoring and prediction of climate change, (2) coordinate the observation plans of each organization so that the whole observation system meets the requirements in the most efficient and effective manner, and (3) issue annual implementation plans for climate change observation by the relevant organizations. Through comprehensive climate change observation with a sustainable observational system, collection of comprehensive observational data, and improved access to the data, it will become possible to capture and predict the direct and indirect effects of climate change on a more timely basis.

NEWS

2006-12-04 2nd Asian Water Cycle Symposium will be held on 9-10 January 2007

2006-11-24 GEOSS-AP Symposium will be held on 11-12 January 2007

Ministry of Environment (MOE)

Japan Meteorological Agency (JMA)

Center for Global Environmental Research (CGER)

National Institute for Environmental Studies (NIES)

Understanding and Attributing Climate Change

- FAR, 1990

  … The size of this warming is broadly consistent with predictions of climate models, but it is also of the same magnitude as natural climate variability. Thus the observed increases could be largely due to this natural variability; alternatively this variability and other human factors could have offset a still larger human-induced greenhouse warming. The unequivocal detection of the enhanced greenhouse effect from observations is not likely for a decade or more.

- SAR, 1995

  The balance of evidence suggests a discernible human influence on global climate.

- TAR, 2001

  … most of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations.

- AR4、2007

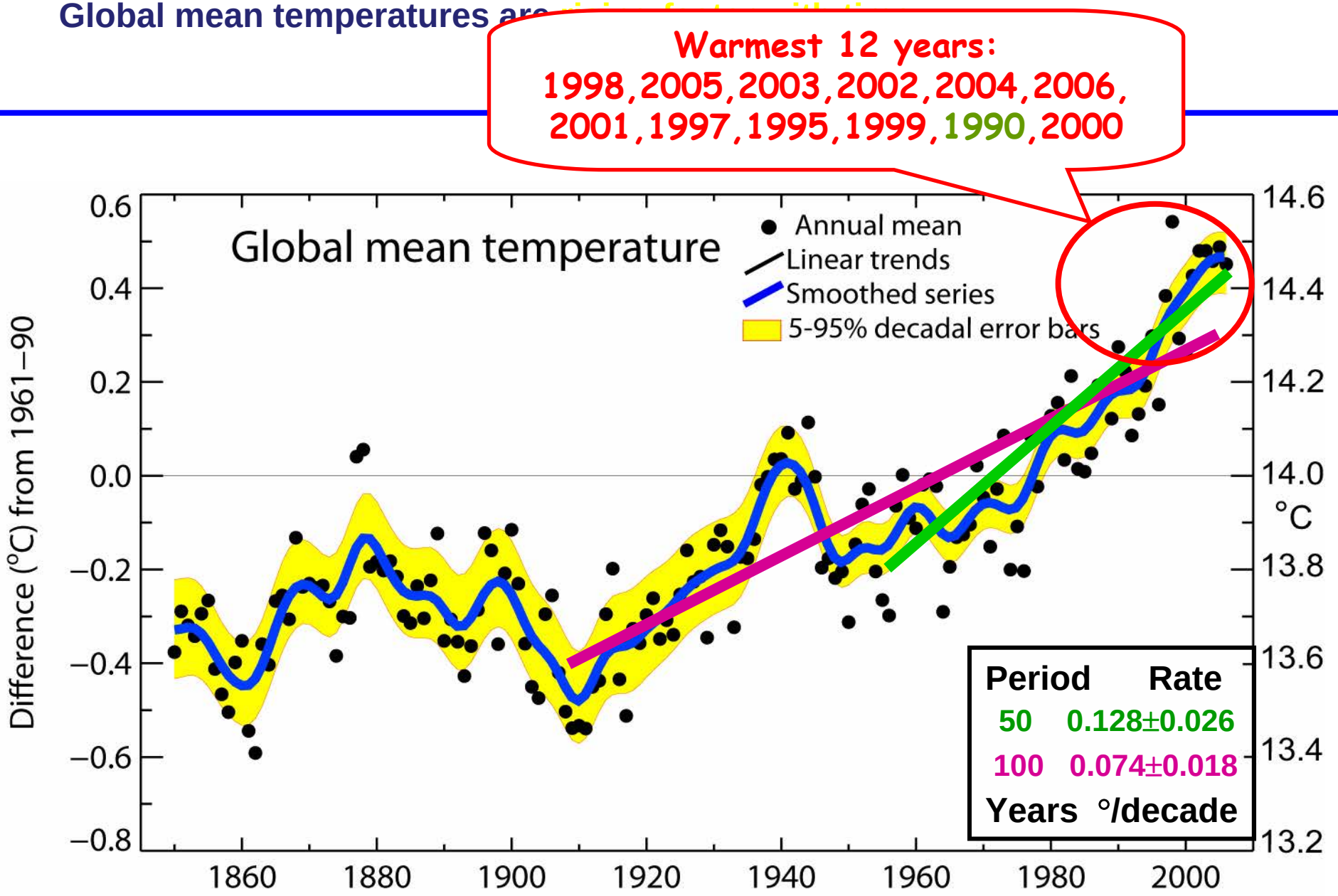
  Most of the observed increase in globally averaged Temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations.

Direct Observations of Recent Climate Change

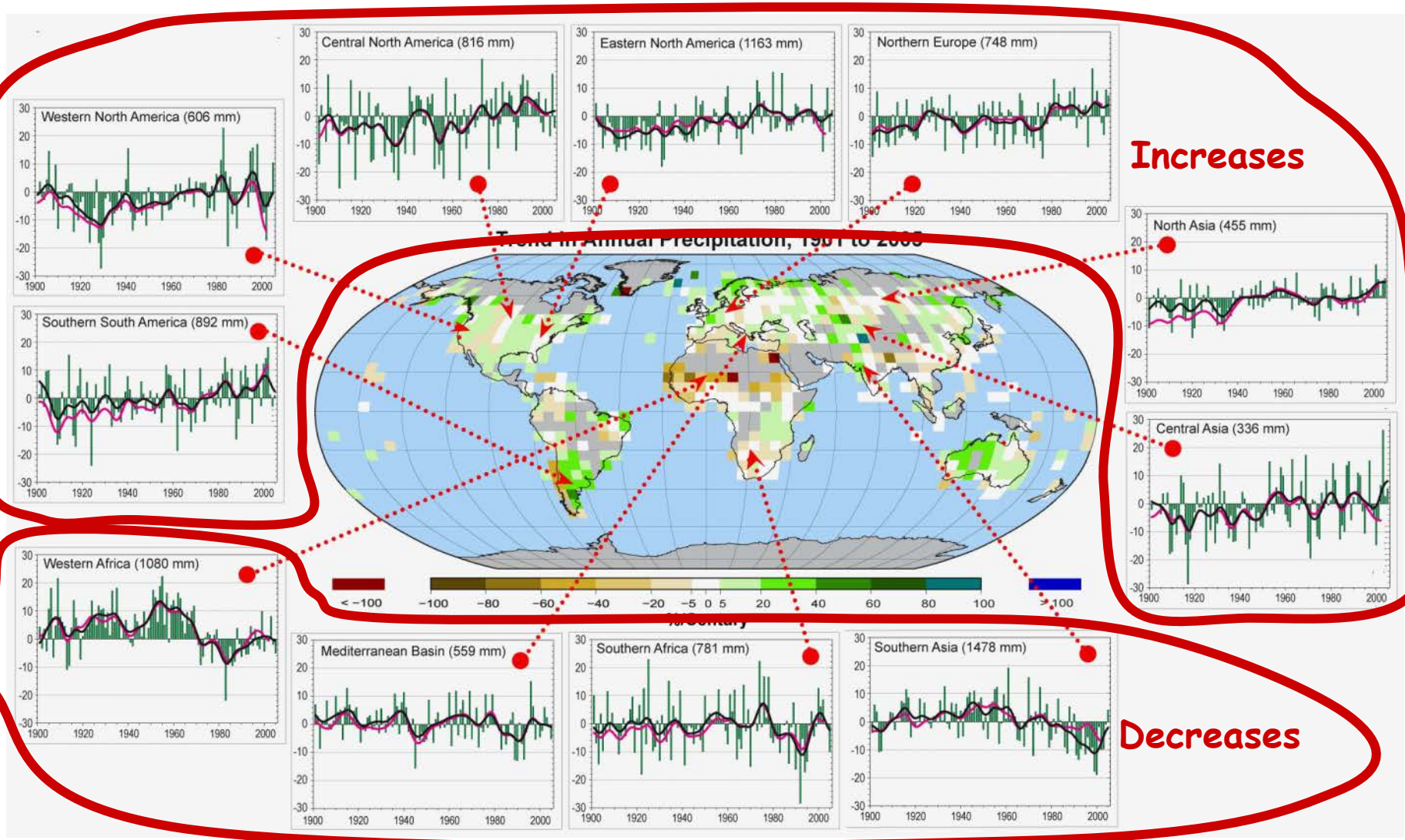
At continental, regional, and ocean basin scales, numerous long-term changes in climate have been observed. These include:

- Changes in Arctic temperatures and ice,
- Widespread changes in precipitation amounts, ocean salinity, wind patterns
- and aspects of extreme weather including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones

Global mean temperatures are



Land precipitation is changing significantly over broad areas



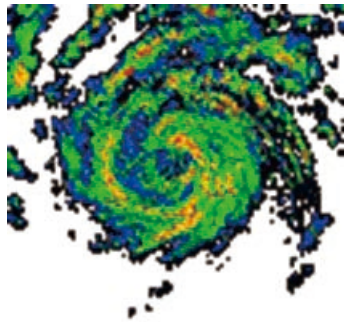
Smoothed annual anomalies for precipitation (%) over land from 1900 to 2005; other regions are dominated by variability.

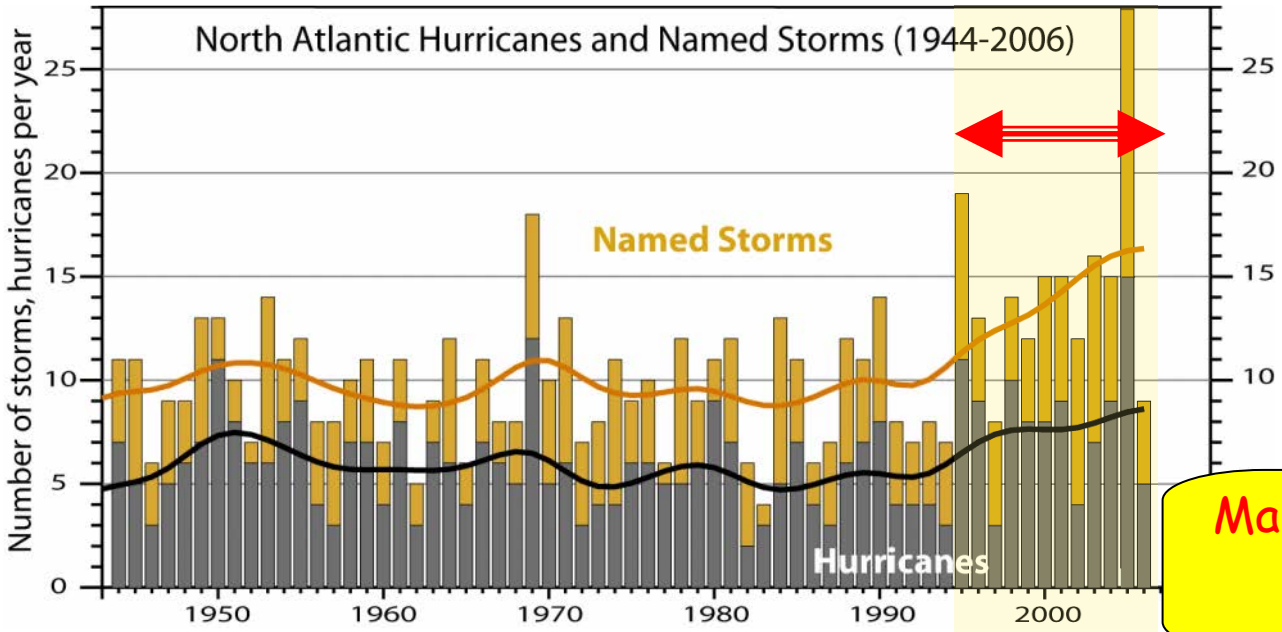
Table SPM-1. Recent trends, assessment of human influence on the trend, and projections for extreme weather events for which there is an observed late 20th century trend.

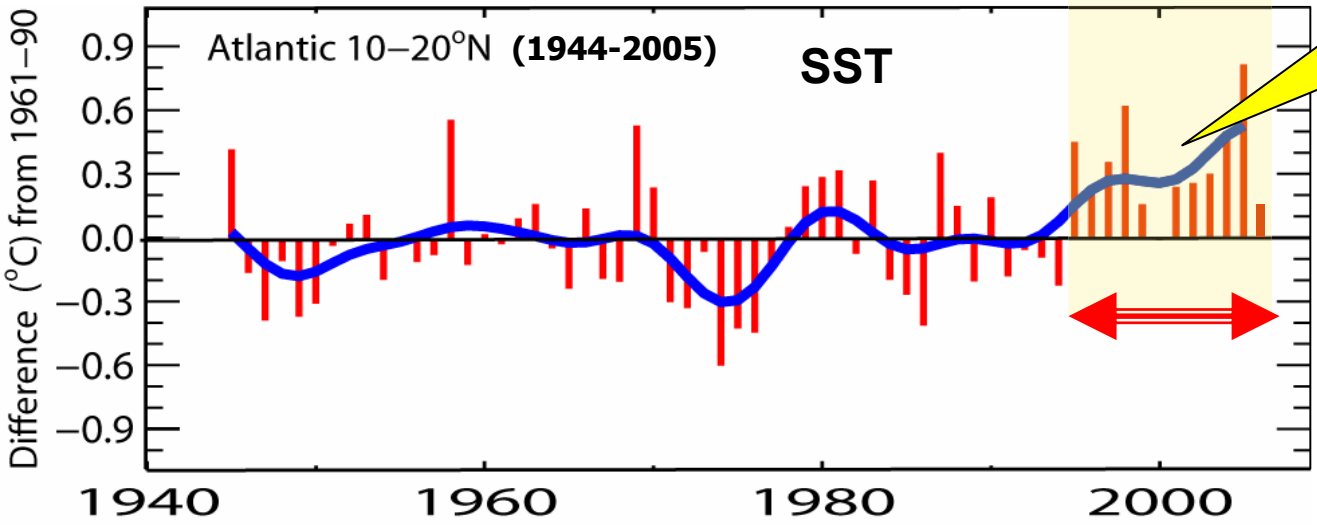
Phenomenon[a] and direction of trend	Likelihood that trend occurred in late 20th century (typically post 1960)	Likelihood of a human contribution to observed trend [b]	Likelihood of future trends based on projections for 21st century using SRES scenarios
Warmer and fewer cold days and nights over most land areas	*Very likely* [c]	*Likely* [e]	*Virtually certain* [e]
Warmer and more frequent hot days and nights over most land areas	*Very likely* [d]	*Likely (nights)* [e]	*Virtually certain* [e]
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]

Notes:

North Atlantic hurricanes have increased with SSTs

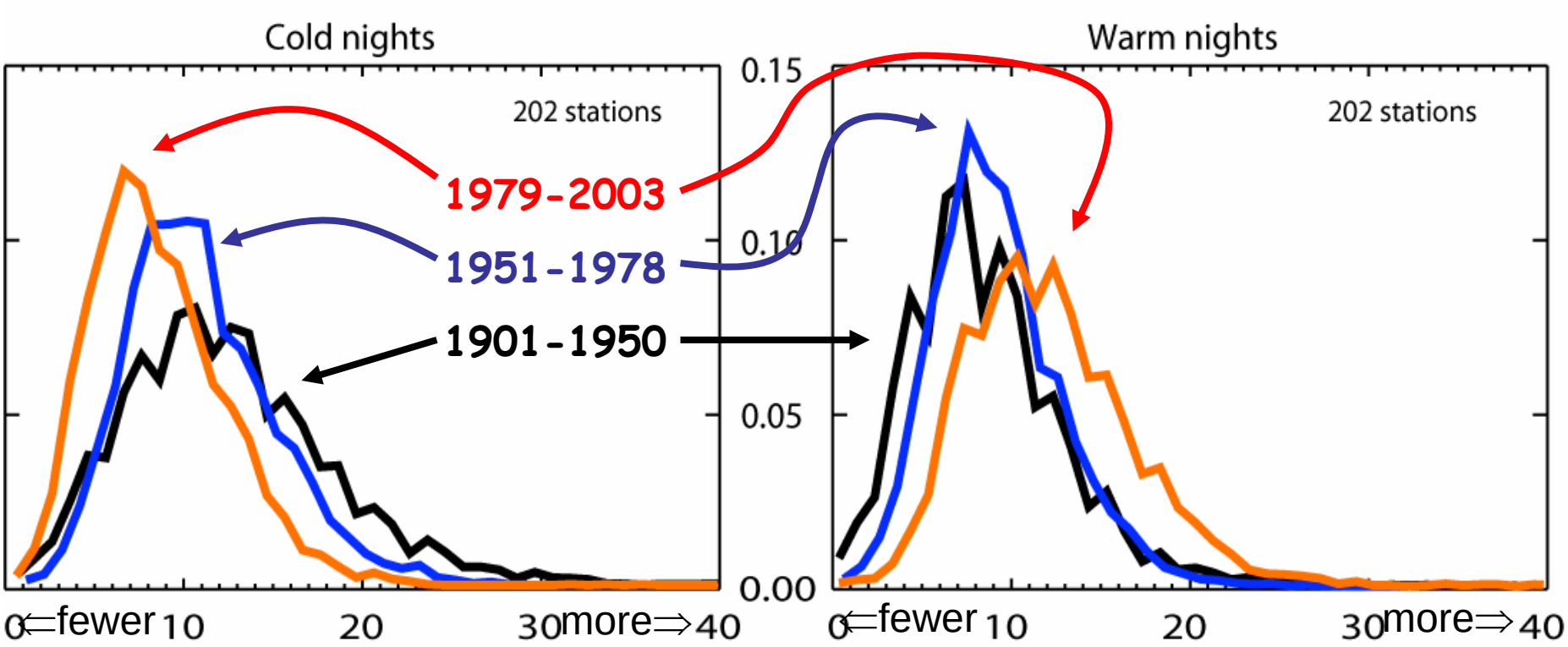






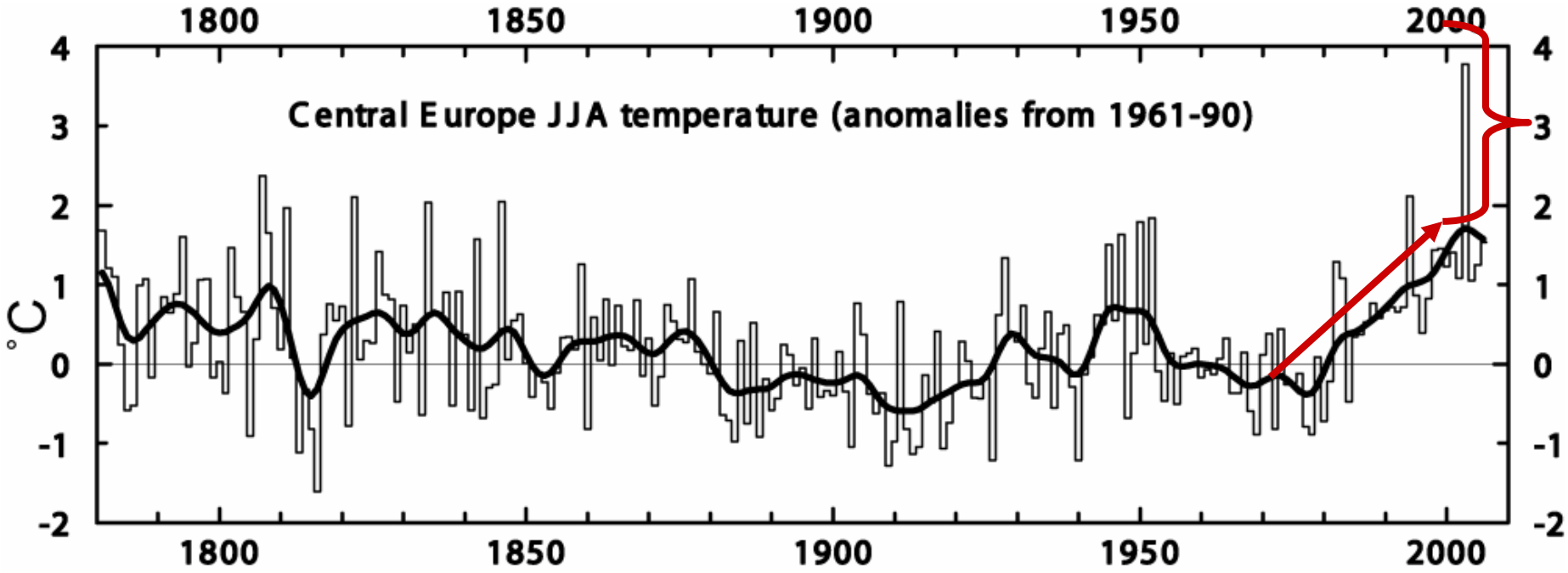
Marked increase after 1994

Warm nights are increasing; cold nights decreasing



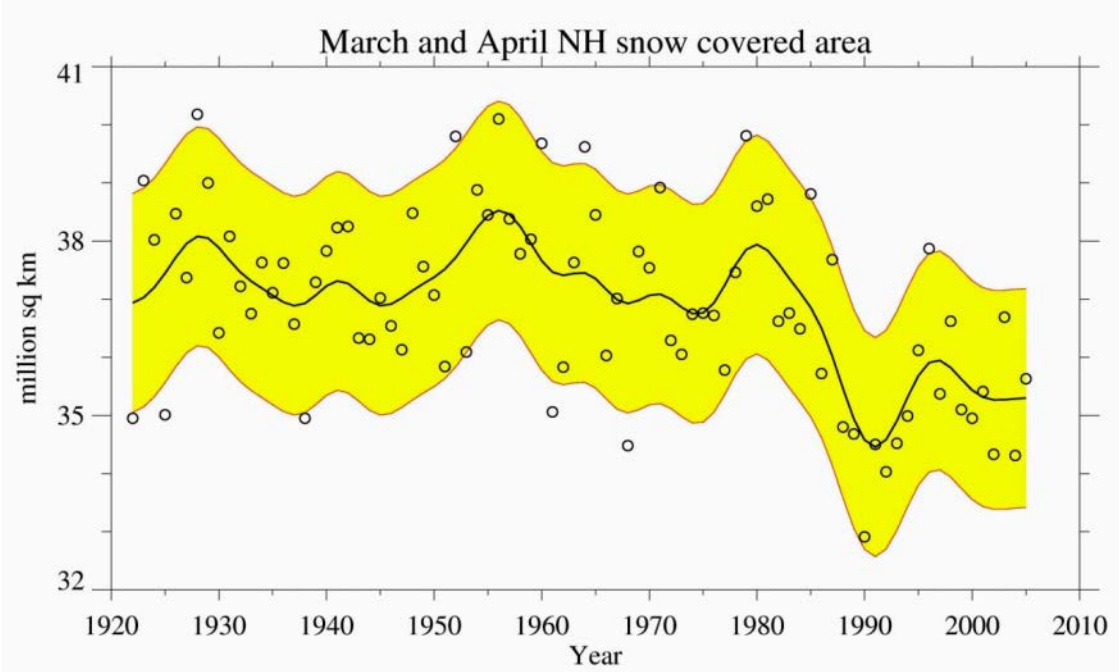
Frequency of occurrence of cold or warm temperatures for 202 global stations for 3 time periods:
1901 to 1950 (black), 1951 to 1978 (blue) and 1979 to 2003 (red).

Heat waves are increasing: an example

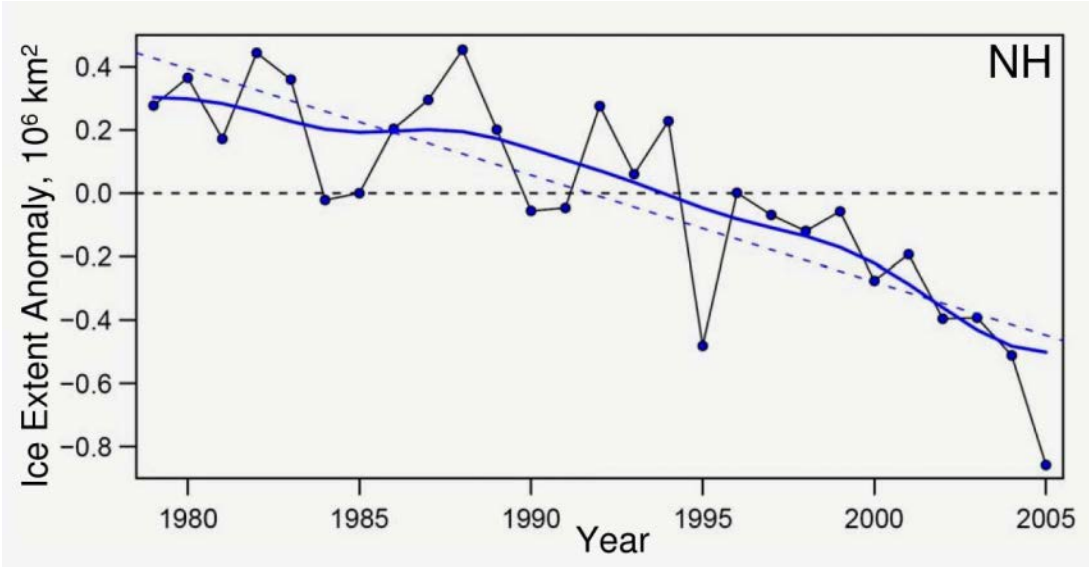


Extreme Heat Wave
Summer 2003
Europe

Snow cover and Arctic sea ice are decreasing

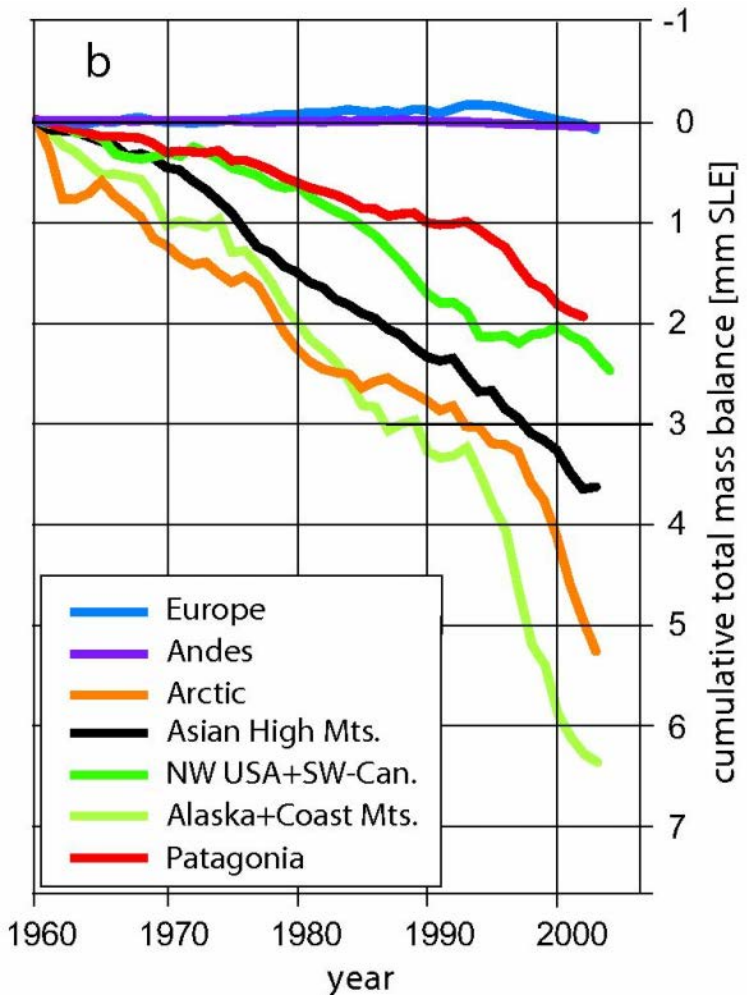


Spring snow cover shows 5% stepwise drop during 1980s

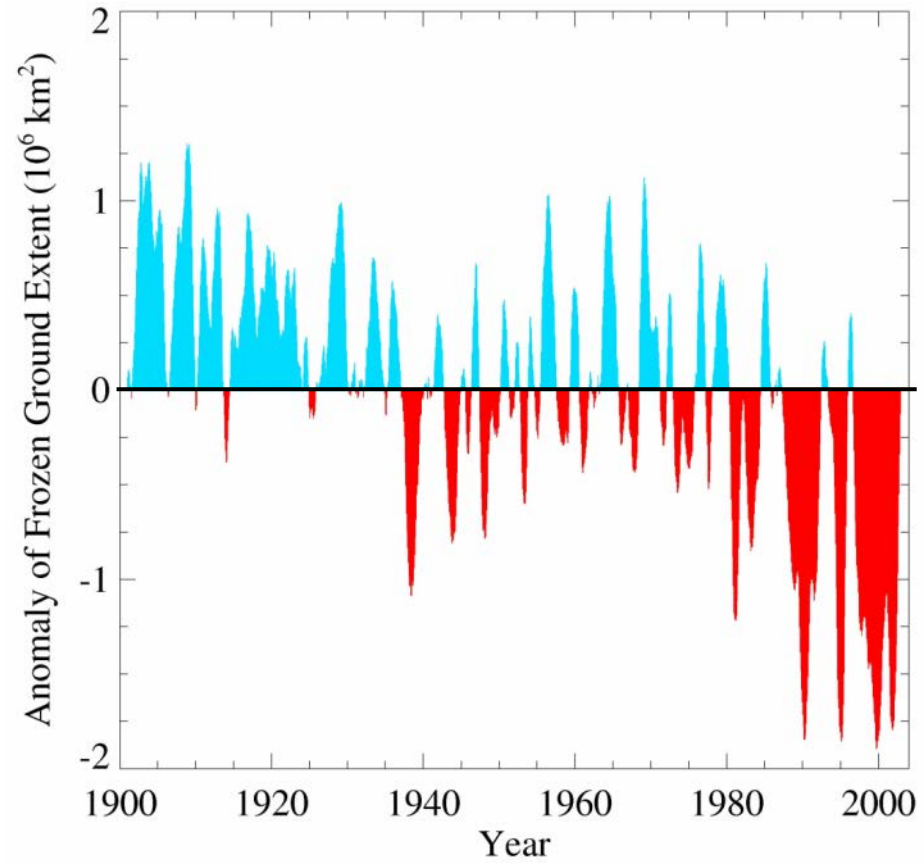


Arctic sea ice area decreased by 2.7% per decade (Summer: -7.4%/decade)

Glaciers and frozen ground are receding



Increased Glacier retreat since the early 1990s

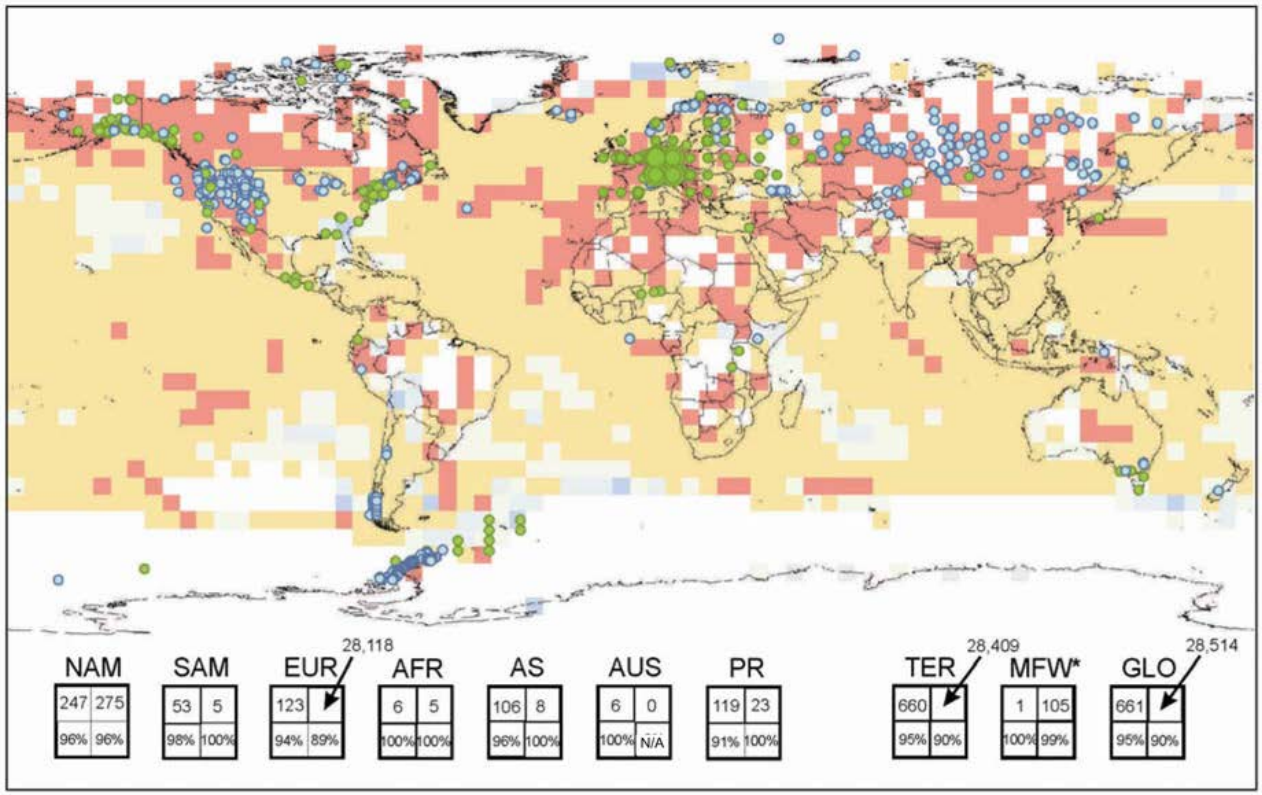


Area of seasonally frozen ground in NH has decreased by 7% from 1901 to 2002

IPCC WG2 Topics

- Emerging Impacts of Global Warming in the World (Detection of impacts)
- Compilation of Impacts Data and Knowledge for Stabilization and Major Vulnerability Issues
- Extreme Events and Global Warming (Europe Heatwave, Hurricane Katrina)
- Large Scale Extreme Events
- Acidification of Ocean
- Adaptation and Mitigation
- Global Warming and Sustainable Development

Figure SPM-1. Locations of observed changes in physical systems (cryosphere, hydrology, and coastal processes) and biological systems (terrestrial, marine, and freshwater biological systems), for studies ending in 1990 or later with at least 20 years of data, shown together with surface temperature changes for 1970-2004.



Observations

- Physical systems (cryosphere, hydrology, coastal processes)
- Biological systems (marine, freshwater, and terrestrial)

Temperature change °C
1970-2004

-2.0 -1.0 -0.2 0.2 1.0 3.5

Europe**

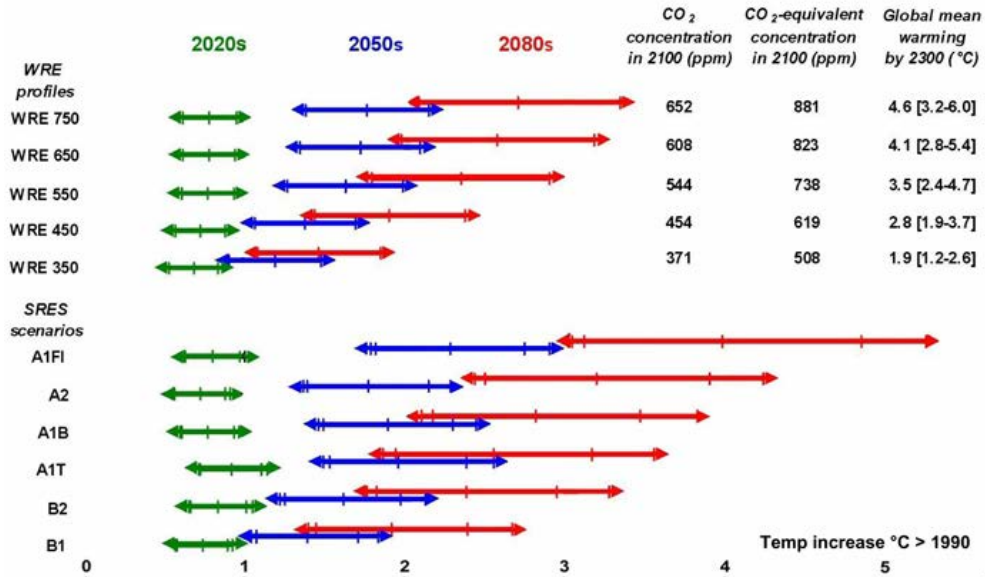
- 1-30
- 31-100
- 101-800
- 801-1200
- 1201-7500

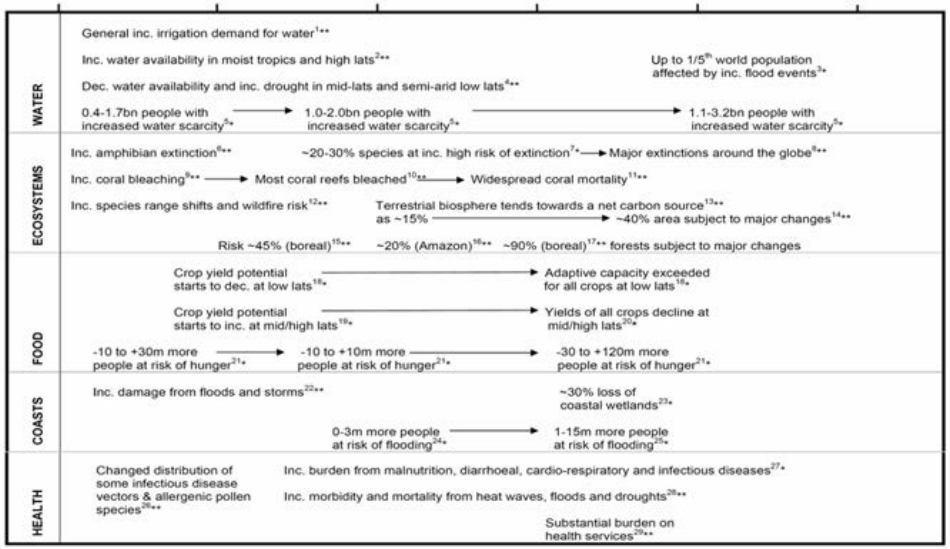
Physical	Biological
# significant observed changes	# significant observed changes
% of significant changes consistent w/warming	% of significant changes consistent w/warming

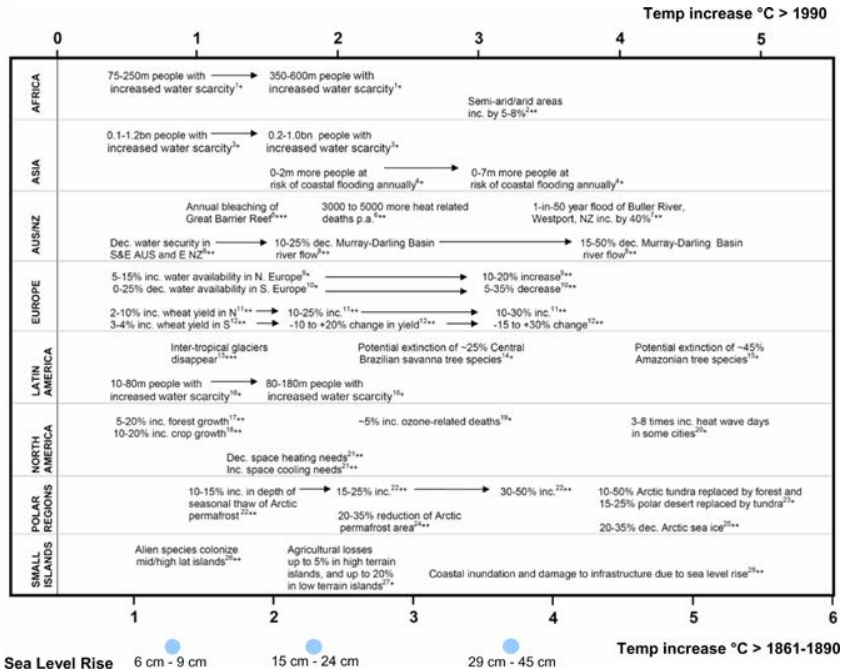
*Marine and Freshwater includes observed changes at sites and large areas in oceans, small islands, and continents.

**Dots in Europe represent 1 to 7500 observations.

Table SPM-1. Examples of global impacts projected for varying changes in global average surface temperature. All entries are recorded in the full Assessment.







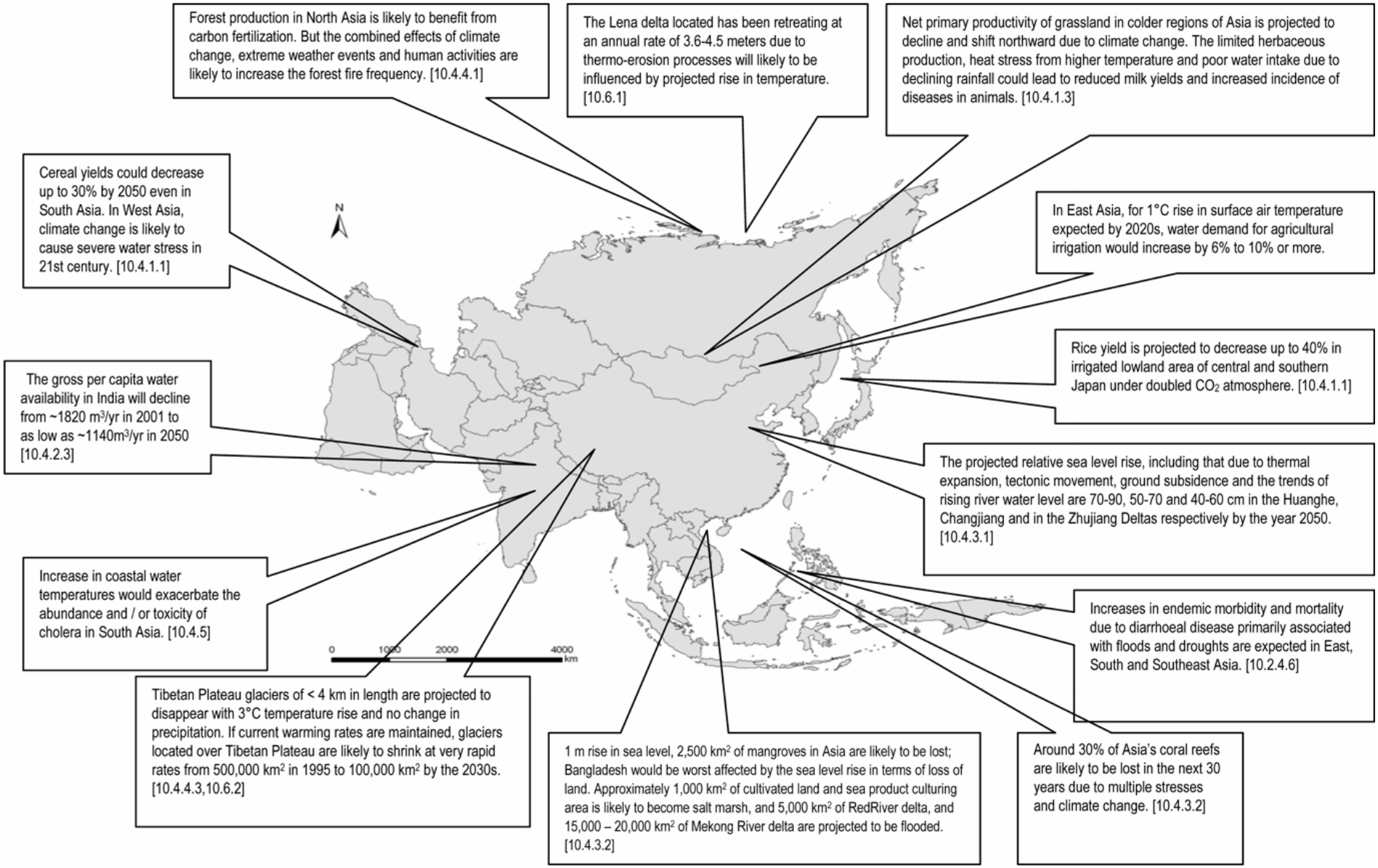


Figure 10.4: *Hotspots of key future climate impacts and vulnerabilities in Asia.*

IPCC WG2 AR4 Asian Chapter

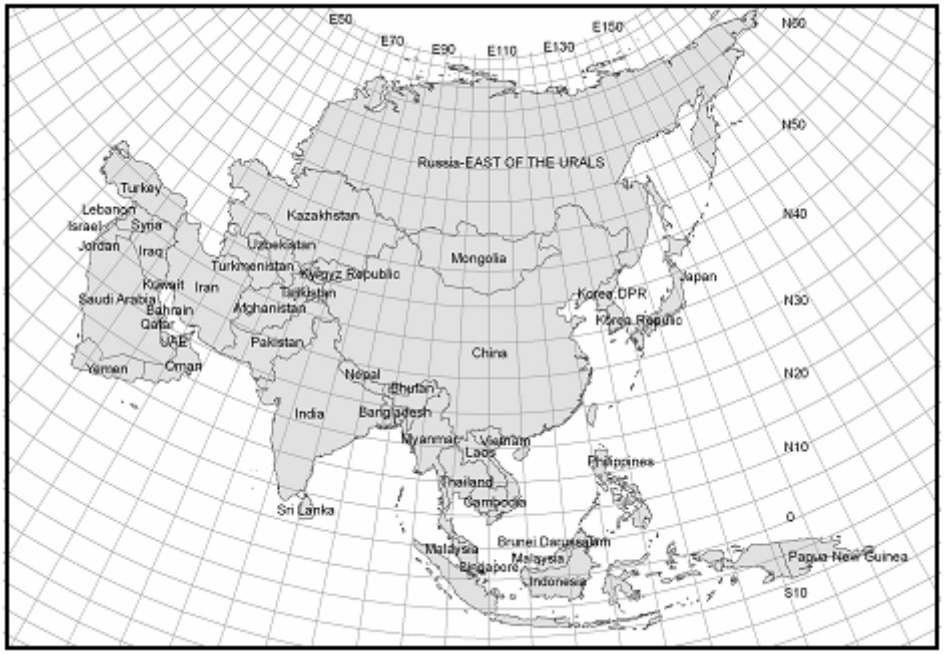


Table 10.11: *Vulnerability of key sectors to the impacts of climate change by sub-regions in Asia*

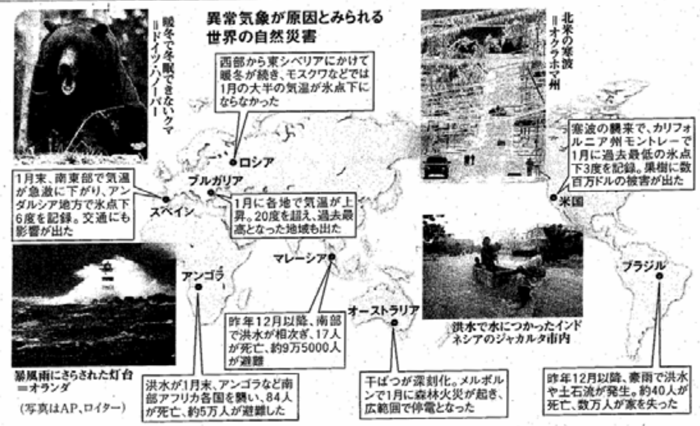
Sub-regions	Food and Fibre	Biodiversity	Water Resource	Coastal Ecosystem	Human Health	Settlements	Land Degradation
North Asia	+1 / H	-2 / M	+1 / M	-1 / M	-1 / M	-1 / M	-1 / M
Central Asia and West Asia	-2 / H	-1 / M	-2 / VH	-1 / L	-2 / M	-1 / M	-2 / H
Tibetan Plateau	+1/ L	-2 / M	-1 / M	Not applicable	No information	No information	-1 / L
East Asia	-2 / VH	-2 / H	-2 / H	-2 / H	-1 / H	-1 / H	-2 / H
South Asia	-2 / H	-2 / H	-2 / H	-2 / H	-2 / M	-1 / M	-2 / H
Southeast Asia	-2 / H	-2 / H	-1 / H	-2 / H	-2 / H	-1 / M	-2 / H

Vulnerability:
-2 – Highly Vulnerable
-1 – Moderately Vulnerable
0 – Slightly or Not Vulnerable
+1 – Moderately Resilient
+2 – Most Resilient

Level of Confidence:
VH - Very High
H - High
M - Medium
L - Low
VL - Very Low

国連4次報告

今世紀末には北極海の海氷が消え、暴風雨を伴う台風も増える……。地球温暖化が世界にもたらす影響を予測した国連「気候変動に関する政府間パネル（IPCC）」第1作業部会の最新報告書が2日、正式決定した。温室効果ガス＊を削減する京都議定書の約束期間が来年に迫るなか、今回の報告書は、一刻も早い対策実行を各国政府に求める内容となった。（パリ　渡辺覚、科学部　佐藤淳、本間雅江、本文記事1面）



地球温暖化に関する懸念が高まる中で、今冬は世界各地で異常気象が観測され、気候変動がだれにでも体感できる形で始まりつつあることを印象づけた。

米ニューヨーク州では1月上旬、平年値0度の最高気温が22度まで上昇し、半袖姿の市民も見かけた。それが1月中旬になると、米西部から中部にかけて異常低温となり、ワイオミング州では平年値を15度下回る氷点下26度を記録。カリフォルニア州では、異常低温によるオレンジなど農業被害が10億ドルに達した。

欧州は、秋以来の暖気流入の影響で、1月中旬までアルプスに雪が積もらなかった。ところが下旬、突然の寒波襲来で、独仏など欧州中部の広い範囲で大雪となった。

劇的な暖冬を経験したのは北極圏やロシア。モスクワの動物園では、ヒグマが冬眠できずに"不眠症"に陥ったほか、ウクライナの山岳地帯では空腹のクマが猟師を襲う事故も起こった。

夏の南半球も異常だった。オーストラリアは観測史上最悪の干ばつに見舞われ、南東部では牧草が育たず、一面に赤茶けた土が広がっている。シドニーなど沿岸部の大都市でも、水不足のため乗用車の洗車などを制限。クインズランド州政府は、リサイクル処理した下水を飲料水に再利用する決断を下した。

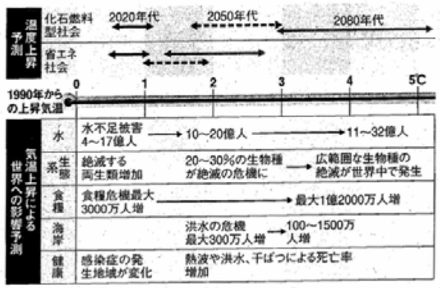
ケニア、ソマリア、エチオピアでは記録的な干ばつ。最大800万人が食糧支援を必要とした。砂漠化でアフリカ最大の淡水湖ビクトリア湖を始め多くの湖が縮小。象などの大型野生動物が、絶滅の危機にひんすると指摘する学者もいる。

異常気象には、各国の気象専門家も泣かされた。

韓国気象庁は1月31日、「国民の皆さんに不便をおかけし、申し訳ない。正確な予報が気象庁の存在価値だと肝に銘じる」と異例の謝罪。2度にわたって大雪予報がはずれ、国民から「あたらない気象予報」と厳しく批判された。

スキャナー SCANNER　牙をむく温暖化

暖冬 干ばつ 気候変動への警告か



解ける凍土

21世紀の後半に入るころには、北極の氷は晩夏になると、ほぼ完全に消えてしまう――。今回の報告書が、こう予測した雪氷圏では、地球温暖化の影響はすでに現実になっている。

北極海に近いロシア・サハ共和国の町チェルスキー。ここでは昨年、11月に雨が降り、人々を驚かせた。夏には気温上昇で永久凍土が解け、電柱があちこちで倒壊、住民たちは停電の頻発に悩まされている。

チェルスキーに拠点を置くロシア科学アカデミー北東科学観測所によると、夏の平均気温は2000年以降、1980年代と比べて2度も高くなった。セルゲイ・ジーモフ所長は「海氷は以前より早く解け始め、凍り始めは遅くなった」と証言する。

北極海を挟みシベリアと向き合うアラスカも状況は同じ。米国立雪氷データセンターのテッド・スカンボス研究員によると、永久凍土が解け、その上に建つビルや道路が壊れたり、海氷が解ける期間が長くなった結果、海岸が波で浸食される被害も報告されている。

スカンボス氏は「現在、北極で観測されている海氷の減少は、我々の予測を超えたペースで進んでいる」と指摘している。

気温上昇 シナリオ別に明示

今回決定した第1作業部会の「世界全体への影響予測」に加え、4月に決まる第2作業部会の「地域ごとの影響予測」には、気候変動による被害者数や経済損失を数値で示した具体的な予測が膨大に盛り込まれる見込みだ。

それによると、日本では中部地方以西の米の収穫が最大40%減少し、本州の大半のスキー場で雪不足になるなどと予測。オーストラリアやニュージーランドでは2～3度の気温上昇で、熱波による年間死者数が今より3000～5000人増えるとした。

さらに、4～5度上昇すると、北極圏の永久凍土が20～35%消滅する恐れがあるなどと警告している。

中でも注目すべきは、気温上昇に伴う影響がいつどのように起こるのかを、石油や石炭など化石燃料を使い続ける社会や省エネ型転換社会などのシナリオ別に明示して見せたことだ＝表＝。

たとえば、すべてのシナリオで、わずか十数年後には気温が1度弱上昇すると予測。その時、水不足に直面する人口は現在より4～17億人増加し、洪水や台風などによる被害も増える恐れがあるとし、温暖化は遠い未来の話ではないことを示している。

今の消費 子孫にツケ

地球温暖化防止の対策が一向に進まない。個々の研究からは「いつ」「何が」「どのように」起こるのかが見えにくいからだろう。その点、今回の報告書案は、20年後、50年後、80年後に何が起こりうるのかを具体的に示した。自らの生活を守るためにも、まず関心を持ち、いまのエネルギー消費が老後や子孫にツケを回すだけであることを認識すべきだろう。節電や近所への自動車の使用を控えるなど、身近な所にもできることはたくさんある。（本間）

温室効果ガス ＊　地表から出ていく熱（赤外線）を吸収し、気温を上げる働きをする気体の総称。人間活動によって、その大気中濃度が急上昇しており、温暖化の主な原因とされている。京都議定書では、二酸化炭素やメタンなど6種が削減対象。

Call for immediate action to stabilize the climate
~An urgent appeal from scientists to citizens~

February 2, 2007

Motoyuki Suzuki Chairman, Central Environment Council

Akimasa Sumi Professor,
Transdisciplinary Initiative for Global Sustainability,
Integrated Research System for Sustainable Science,
The University of Tokyo,
(IPCC Working Group I Chapter 8 Lead Author)

Hideo Harasawa Division Director,
Social and Environmental Systems Division,
National Institute for Environmental Studies
(IPCC Working Group II Chapter 10 Coordinating Lead Author)

Hiroki Kondo Senior researcher,
Frontier Research Center for Global Change,
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The University of Tokyo

Kiyoshi Takahashi Senior researcher,
Climate Risk Assessment Research Section,
Center for Global Environmental Research,
National Institute for Environmental Studies
(IPCC Working Group II Chapter 17 Lead Author)

Masataka Watanabe Professor,
Department of Environmental Information, Keio University

Nobuo Mimura Professor/Director,
Institute for Global Change Adaptation Science, Ibaraki University
(IPCC Working Group II Chapter 16 Coordinating Lead Author)

Ryoichi Yamamoto Professor,

1

Management,

2

hat will lead industry and the
transition to a “low carbon

emissions, not only through
vements in the products and
s is an important duty and, as
ith a long-term perspective to

ulate national targets for the
now leadership in greenhouse
uments that are effective in
policy targets need to be
ent upon the government to
arbon society.”
responsibility and should also
by proactively responding to

nmitment period of the Kyoto
be integral to ensure that
that a framework that entails
s, including the United States,
on with this, a socioeconomic
mestically and which rewards
ssions needs to be forged.
l all, to rethink their lifestyles
elp lead the world toward our
act now, we can still save the

6

Development and Application of AIM/Impacts

- AIM/Impact – Global Model

  Advanced Model: Water Resources, Health, Food

  (Land Use Model?)

- AIM/Impact [Country]

  AIM/Impact–Korea, China, India

- AIM/Impact [Policy]

  Stabilization, Temp., Emission Pathway, Overshoot

  Beyond Kyoto Strategy

- Adaptation Strategy
- Climate Risk Management
- Model Application:

  -Sustainable Society: Vision and Scenario

  -Integration of Impacts model to Climate Model