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OESCHGER CENTRE
CLIMATE CHANGE RESEARCH

IPCC WG1: The Physical Science Basis

Latest Findings (an incomplete choice)

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CO_2 : Higher levels and faster rise

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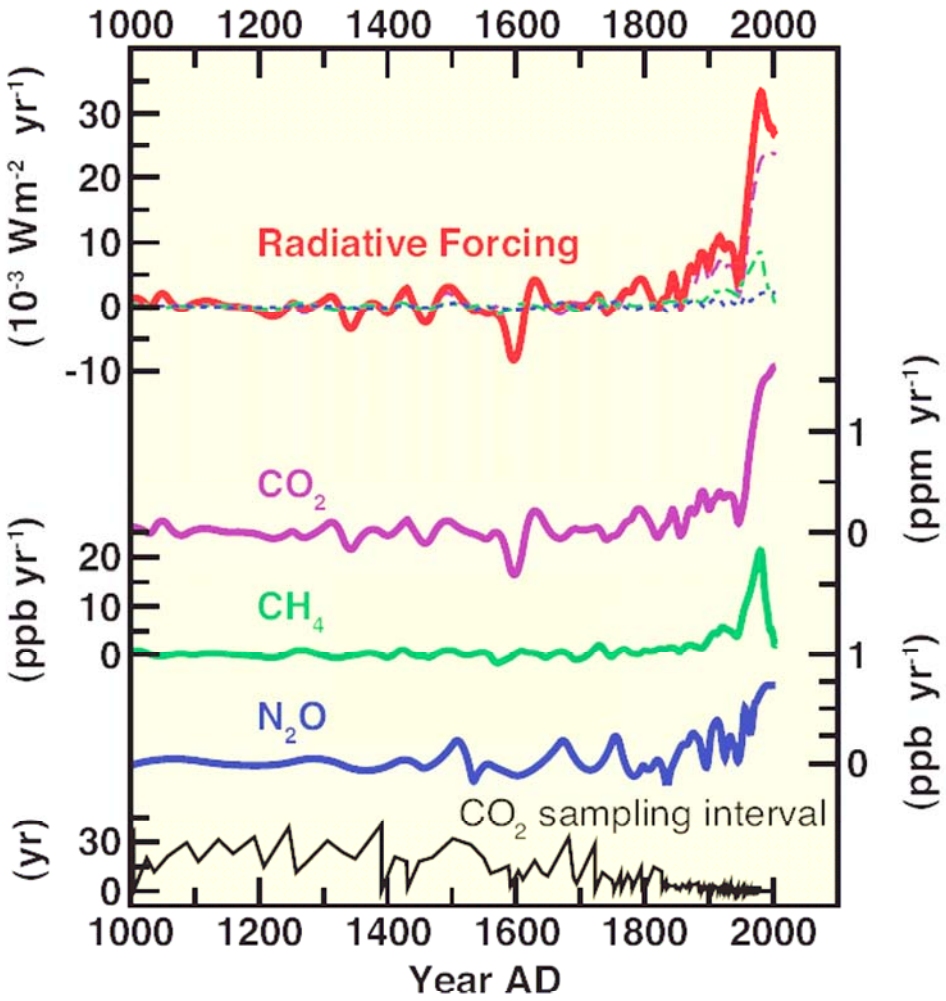

(Joos & Spahni, 2008)

Rates of greenhouse gas increase is now more than 100 times higher than during the last 20,000 years

Greenhouse gases over the past 800,000 years

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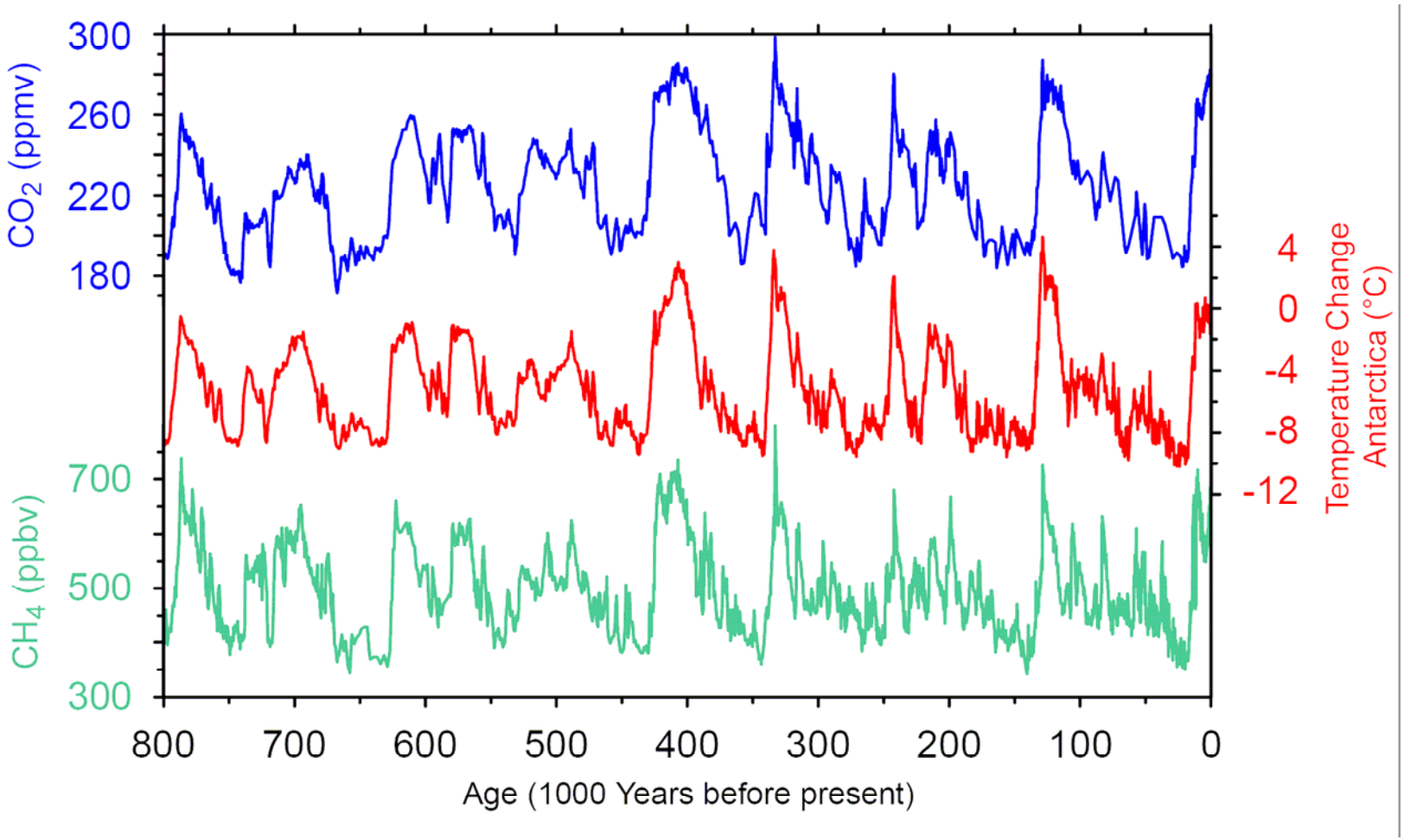

(Lüthi et al., 2008; Loulergue et al., 2008)

Abrupt change and interhemispheric connections

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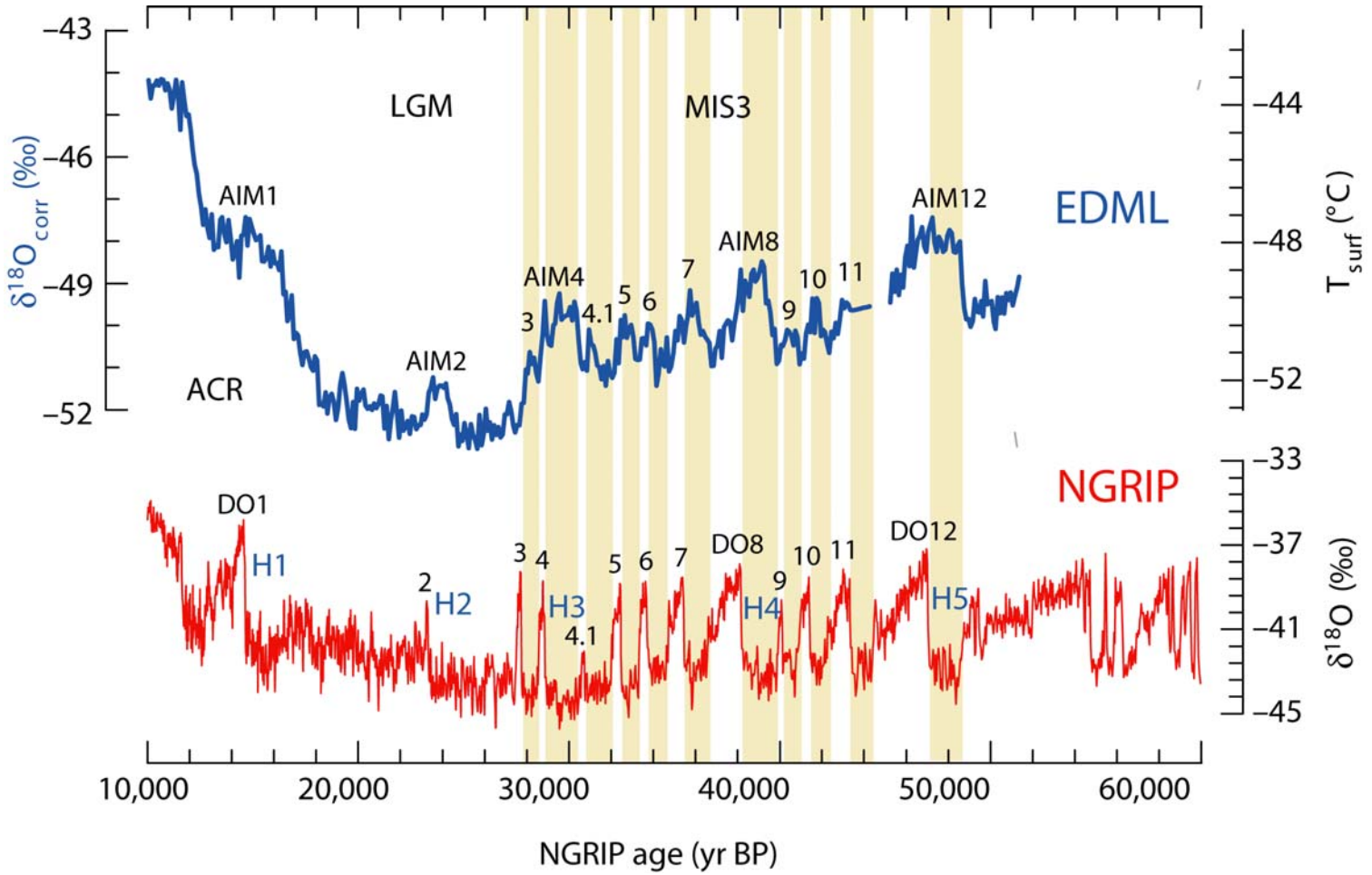

(EPICA, 2006)

Abrupt changes and surprises in the climate system

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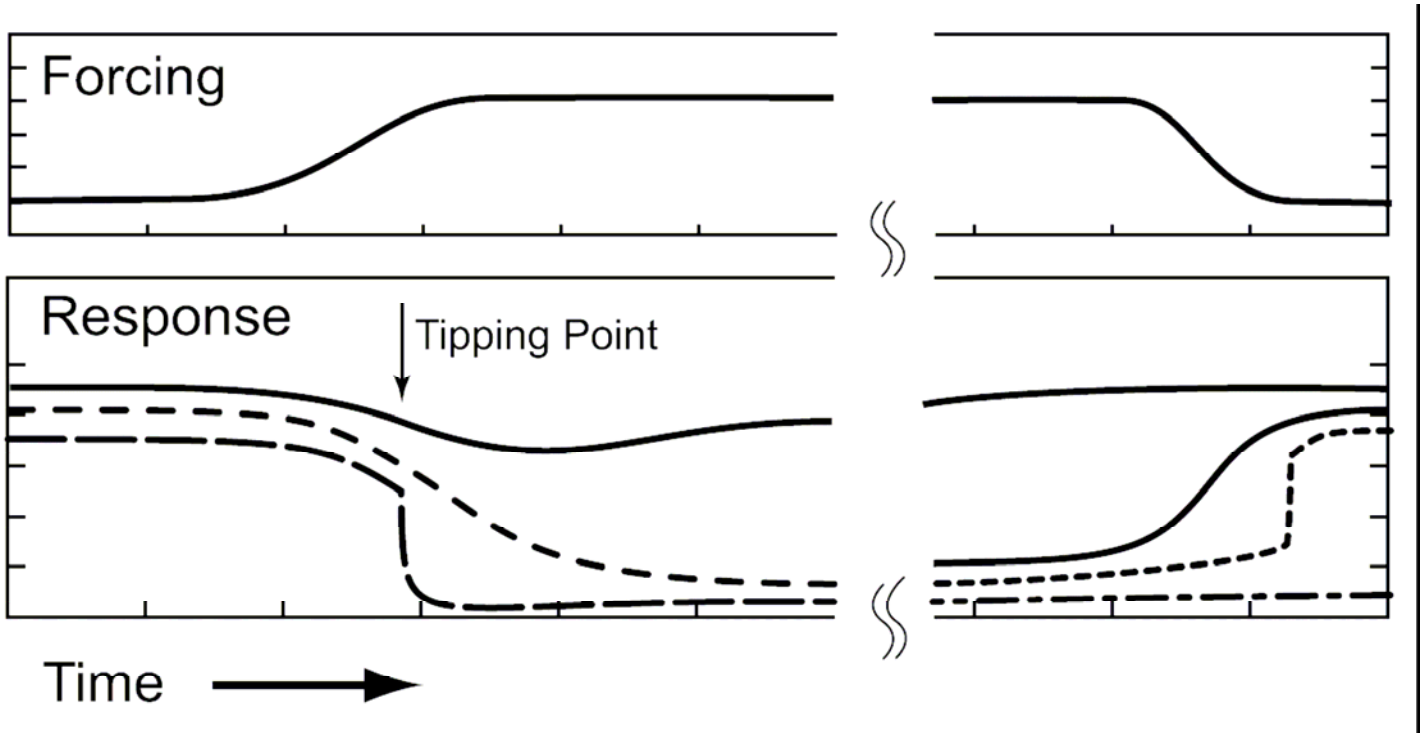

(IPCC, 2007, Box 10.1)

Tipping points may produce climate changes that are much faster than the forcing; changes may be irreversible

Collection of potential „tipping elements“

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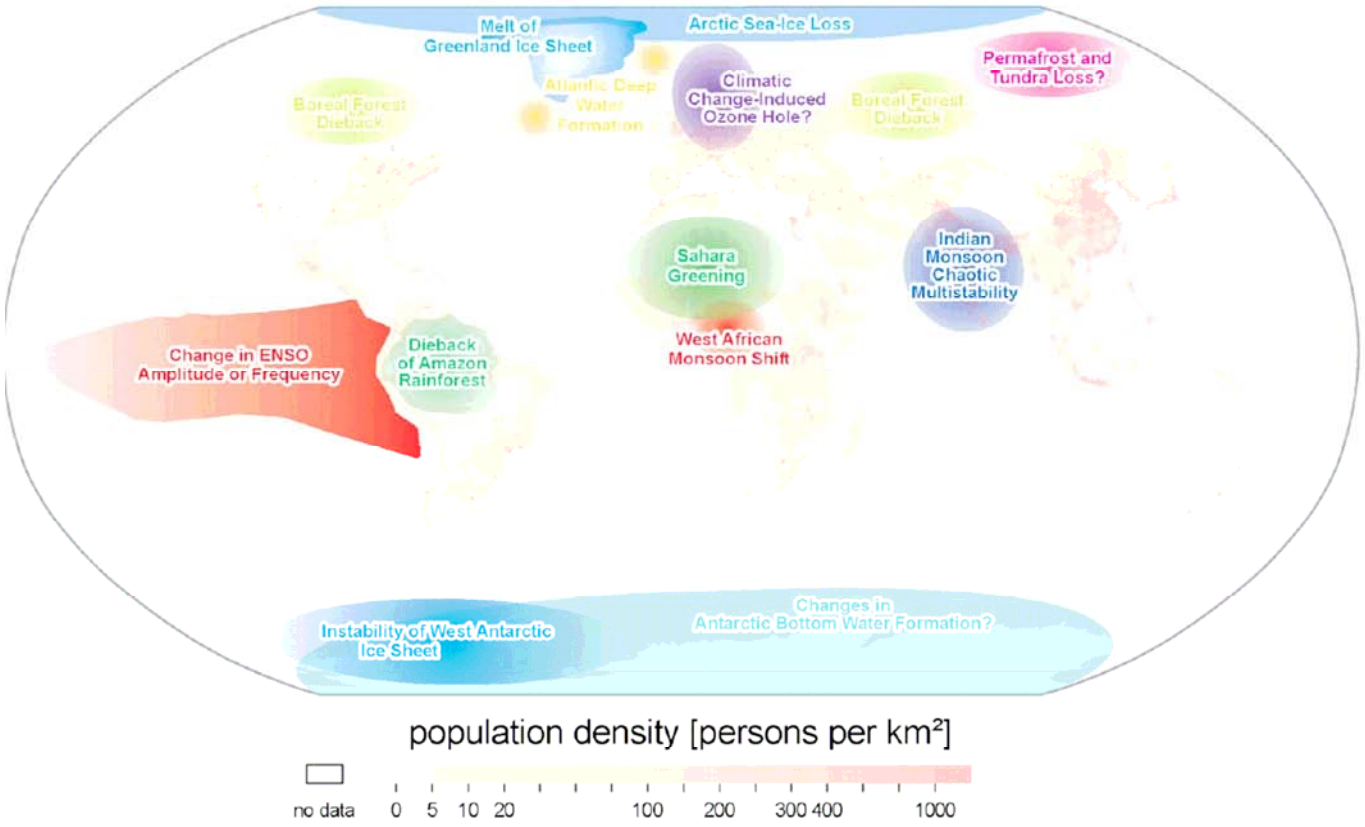

(Lenton et al., 2008)

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Very likely reduction of the Atlantic MOC

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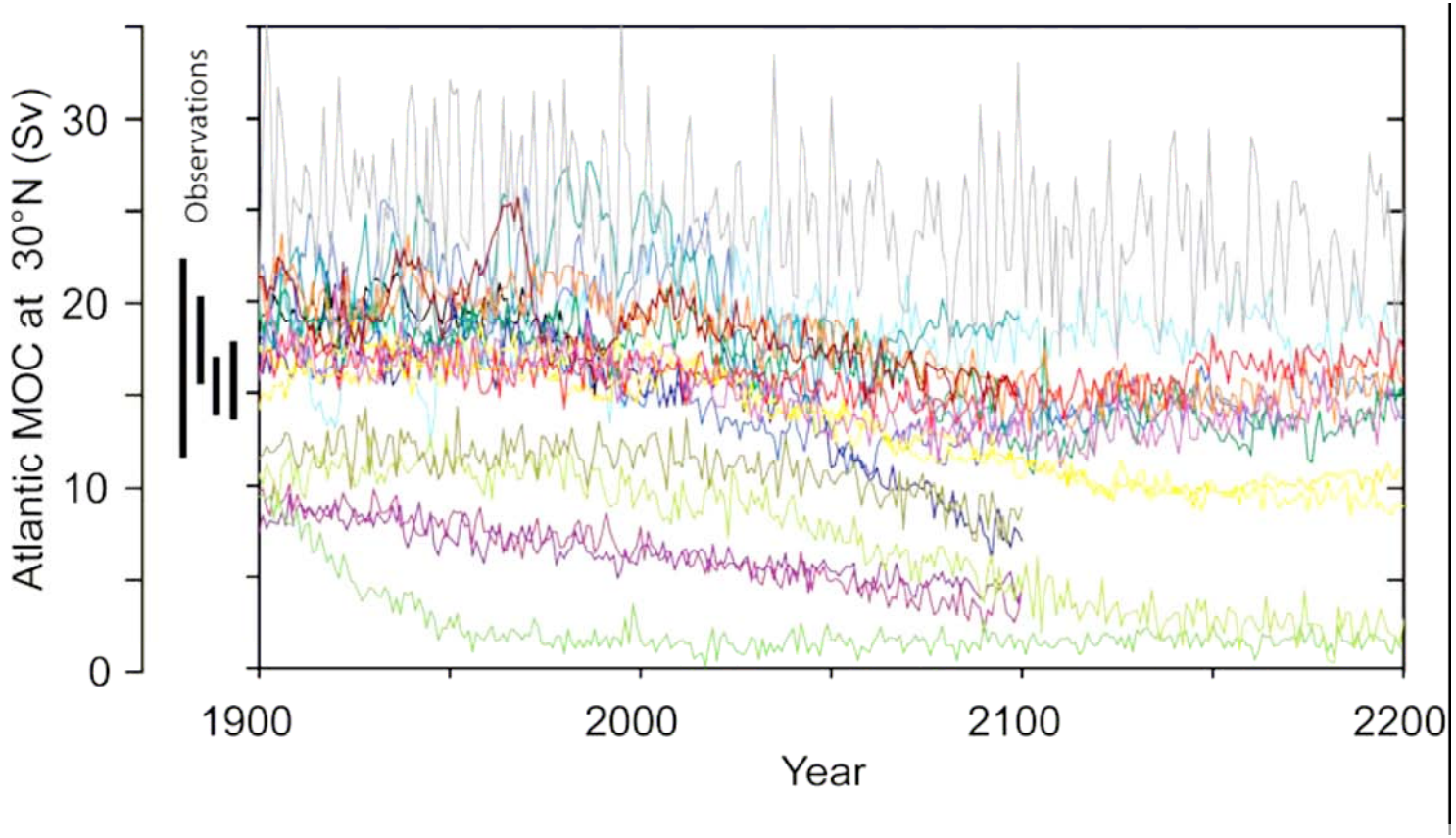

(IPCC, 2007, Fig. 10.15)

Very likely reduction of the Atlantic MOC

Very unlikely an abrupt reduction or collapse of the MOC

Observed natural variability of MOC at 26.5°N

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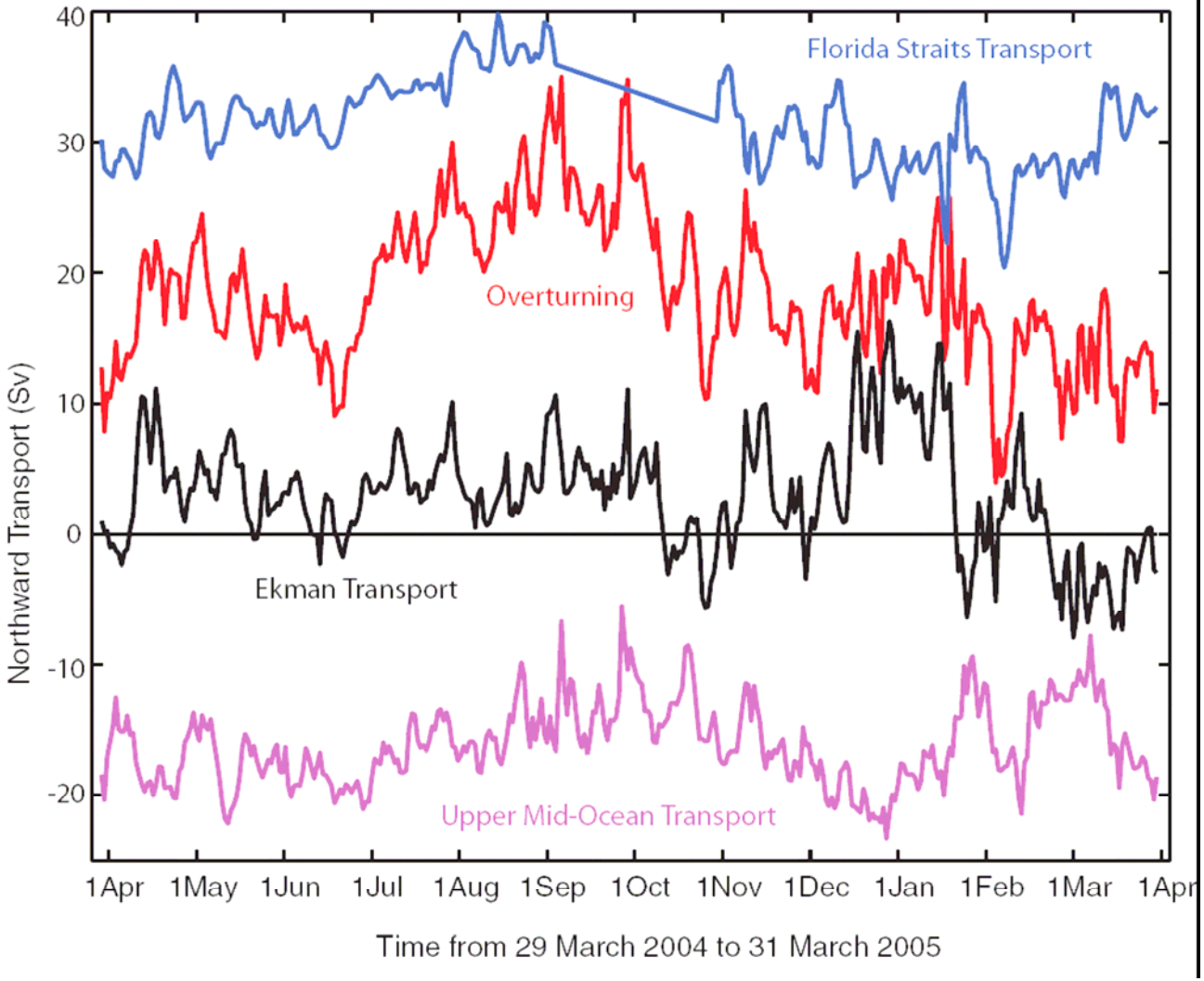

(Cunningham et al., 2007)

„Forecasts“ of MOC variations

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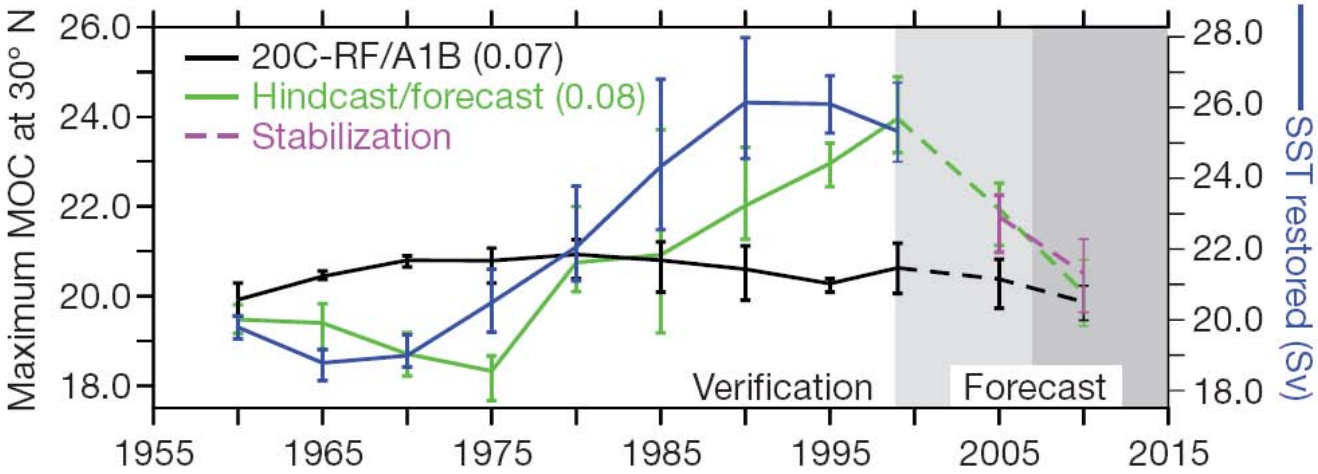

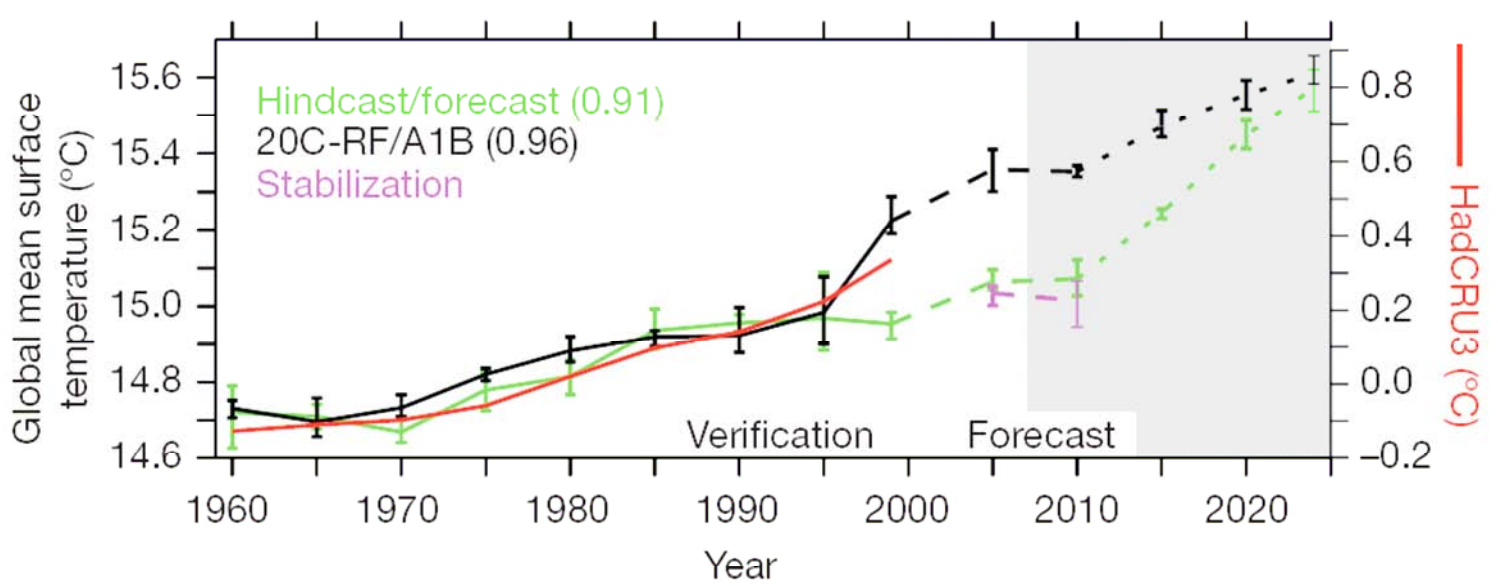

(Keenlyside et al., 2008)

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Summer sea ice extent 2007: A record low

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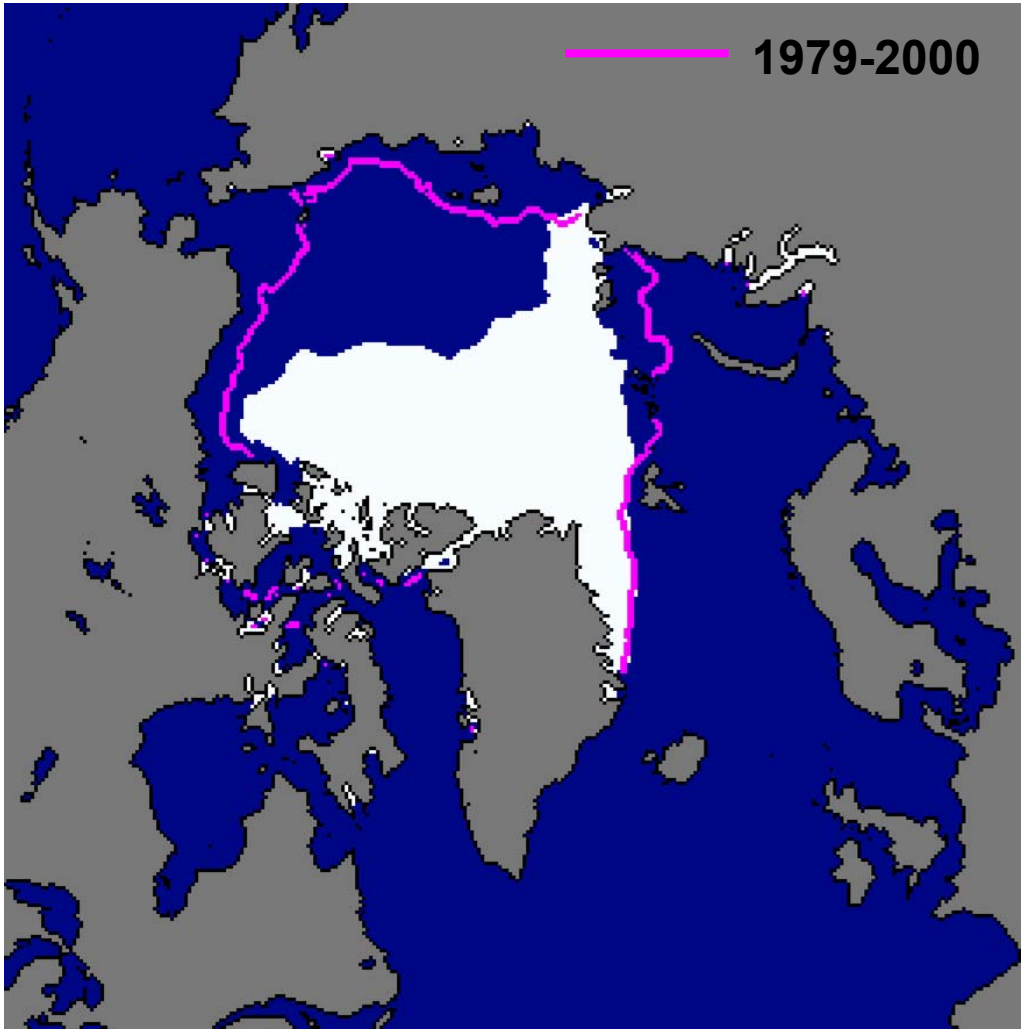

Record 2007:

collapse or natural

variability ?

Arctic sea ice reduces rapidly

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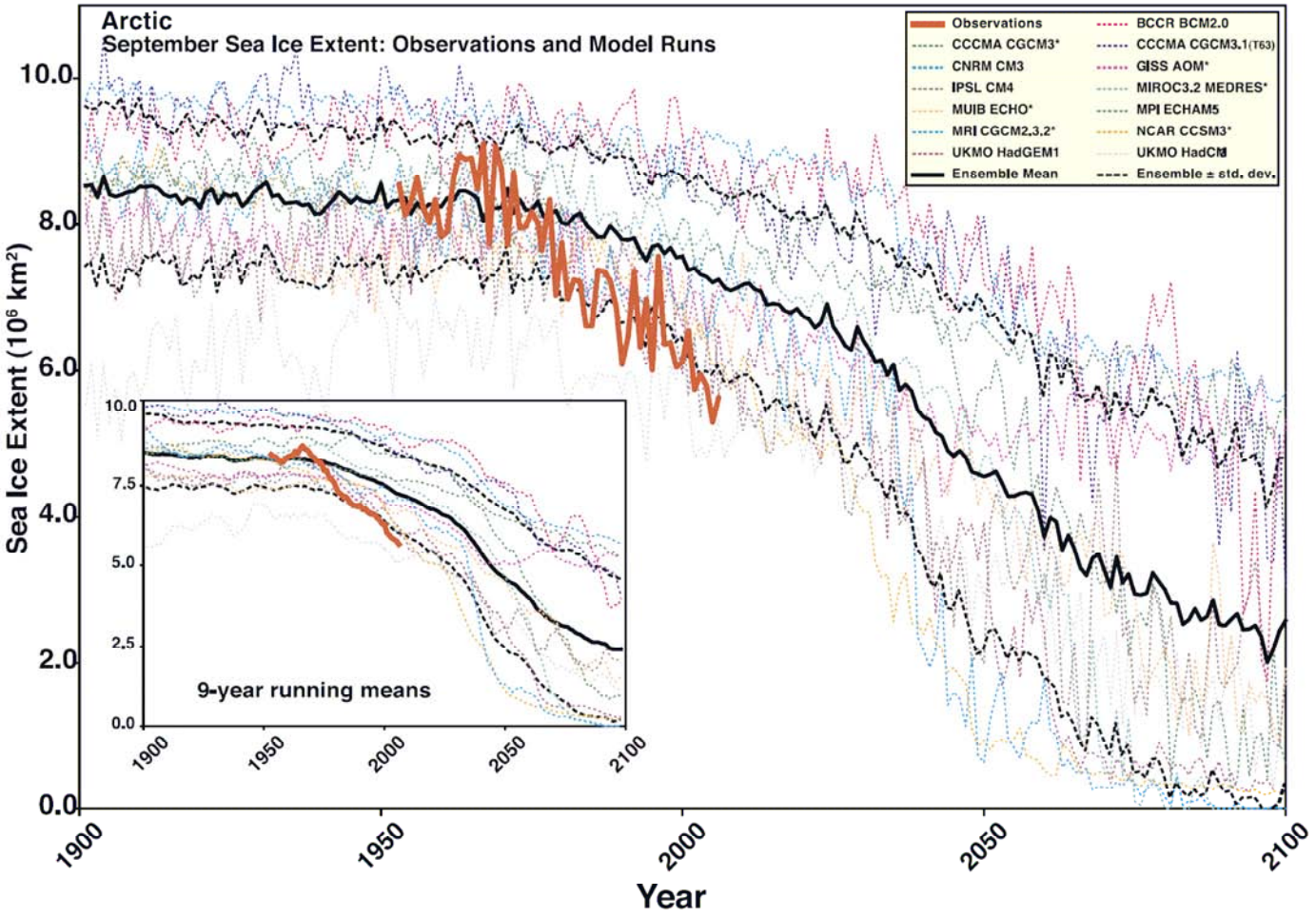

(Stroeve et al., 2007)

Simulated reductions of Arctic summer sea ice

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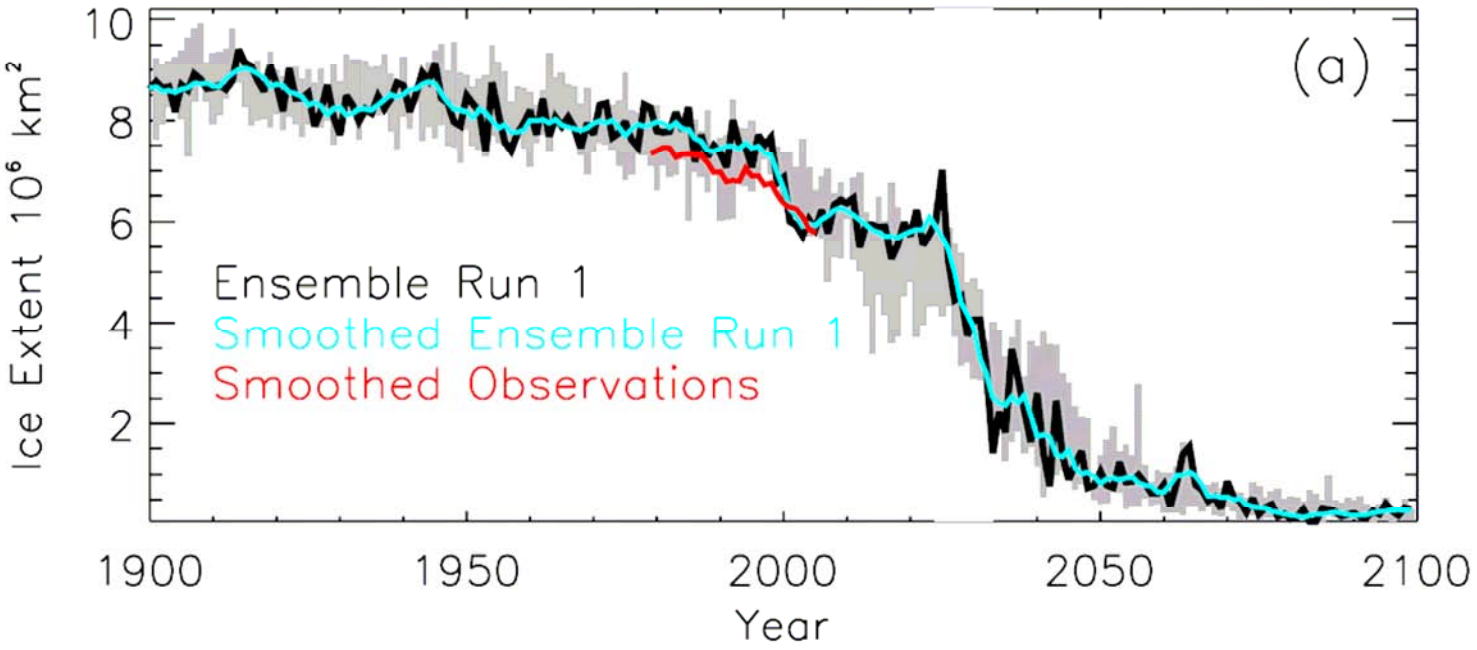

(Holland et al., 2006)

Decade-long rapid decrease of summer sea ice

„4 times larger than comparable observed trends“

Arctic sea ice reduces rapidly

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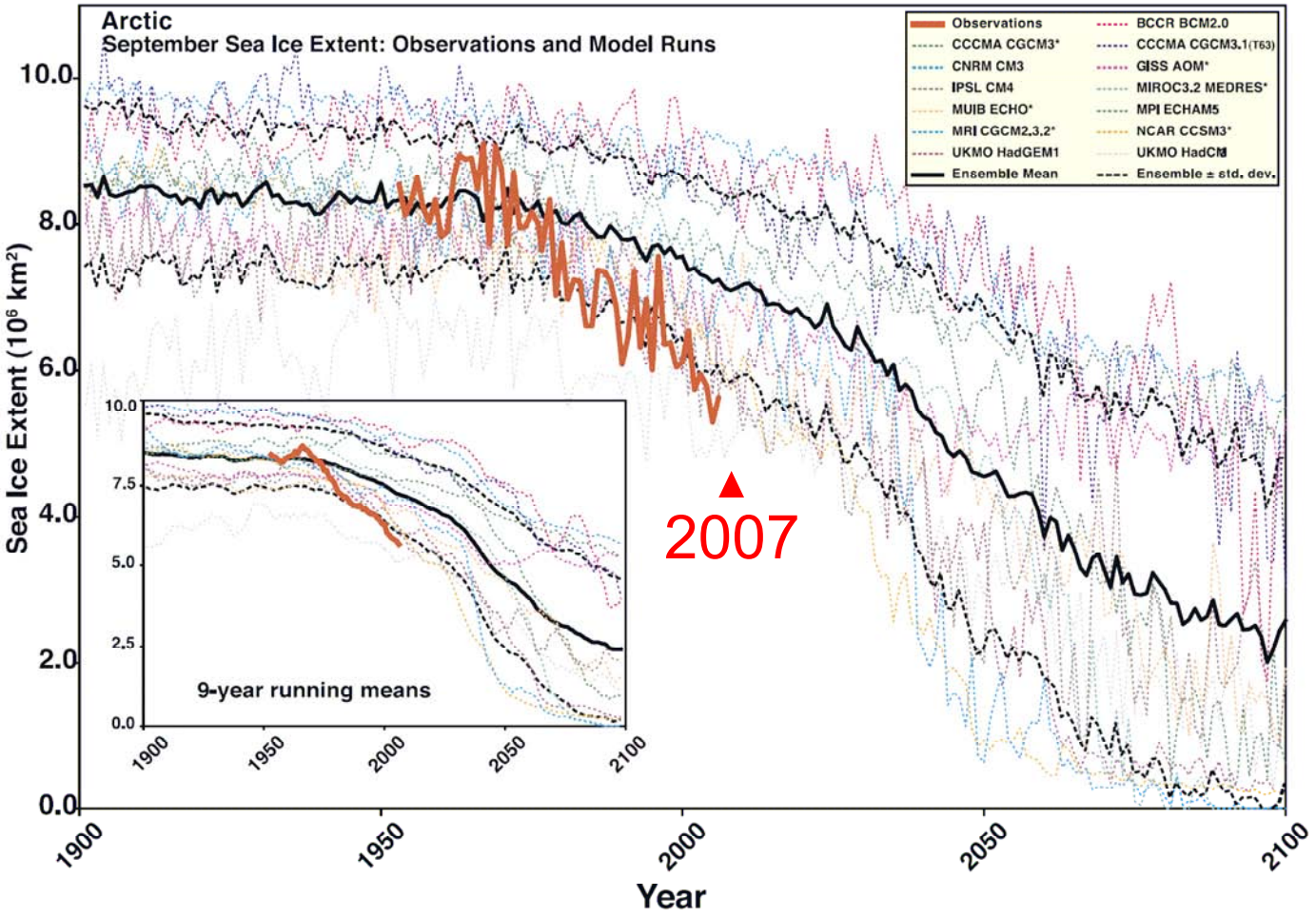

(Stroeve et al., 2007)

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Temperature threshold in Greenland mass balance

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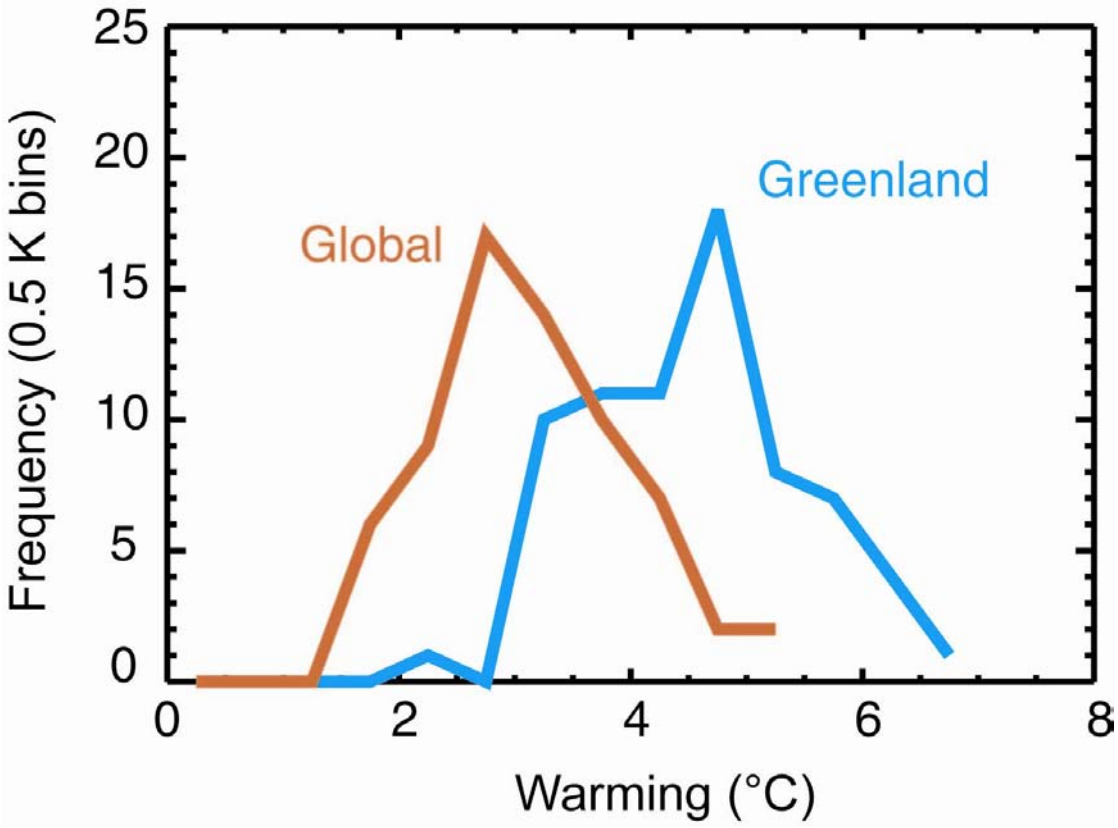

(Gregory & Huybrechts, 2006)

"For sustained warmings above this threshold, it is likely that the ice sheet would eventually be eliminated."

Mechanisms of ice sheet acceleration

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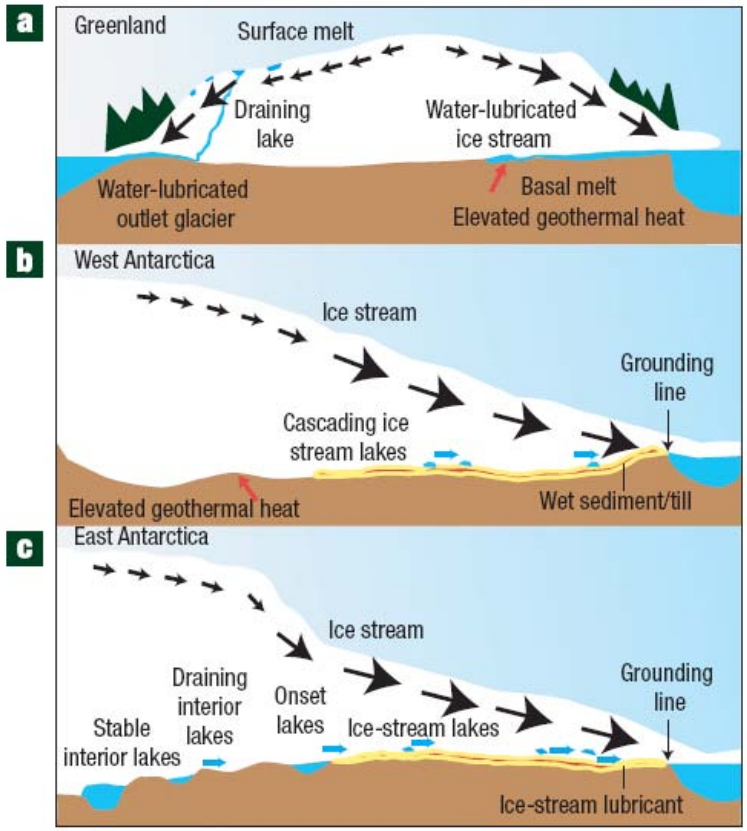

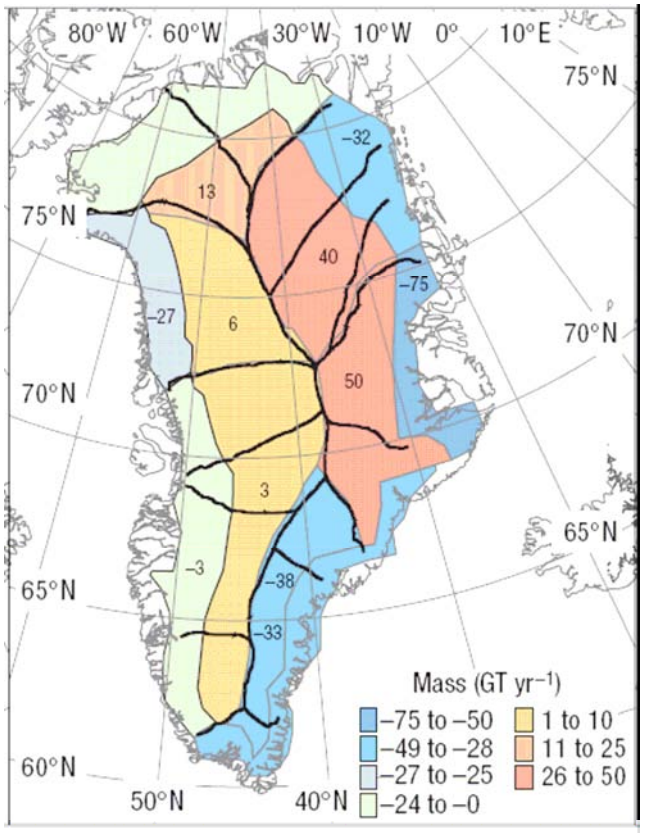

(Bell, 2008)

Seasonal acceleration of ice Greenland flow

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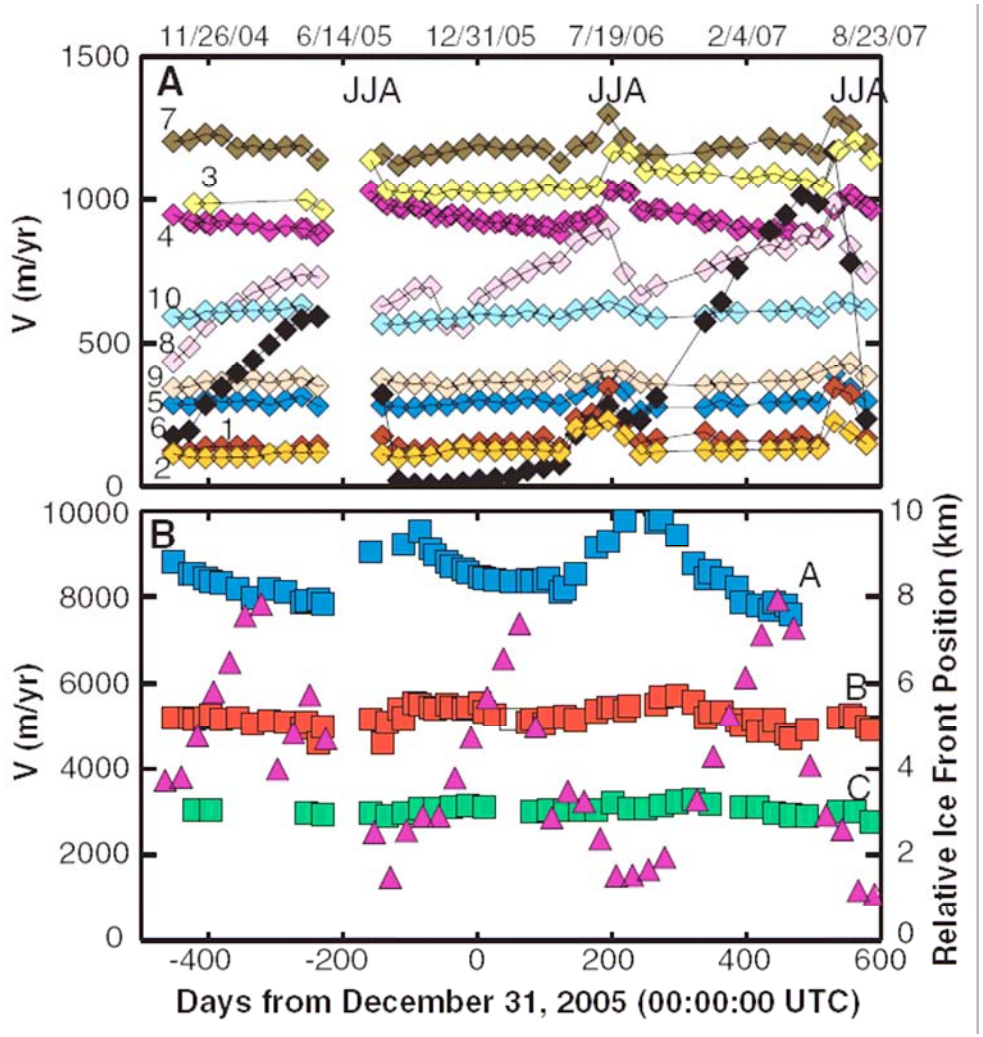

(Joughin et al., 2008)

Seasonal melt produces speed-up with substantial but not catastrophic effects

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Conclusions and Outlook

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- Essential new observations and paleoclimate reconstructions permit a more reliable quantification of natural ranges
- Better ocean circulation components in comprehensive models is required to project decadal variations
- Better understanding of local ice sheet mechanisms in order to reduce uncertainties in long-term sea-level projections
- Carbon cycle changes and feedbacks are likely substantial in both ocean and terrestrial systems