Loss of mass from the Greenland and Antarctic ice sheet and sea level rise

Based on the Extended Summary of "The Greenland Ice Sheet in a Changing Climate"

Arctic Council, AMAP SWIPA (Snow, Water, Ice and Permafrost in the Arctic)

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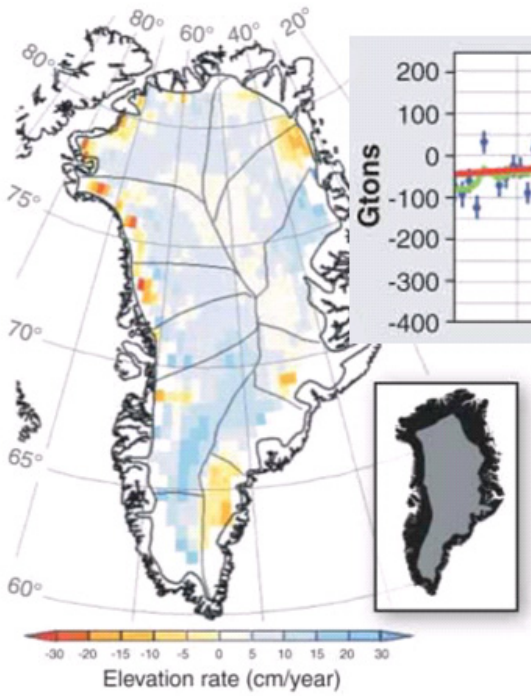
Konrad Steffen (USA), Jonathan Bamber (UK), Martin Truffer (USA), Mark Fahnestock (USA), Shawn Marshall (Canada), Jens H. Christensen (Denmark), Erik Buch (Denmark), Minik Rosing (Denmark), and Carl E. Bøggild (Norway).

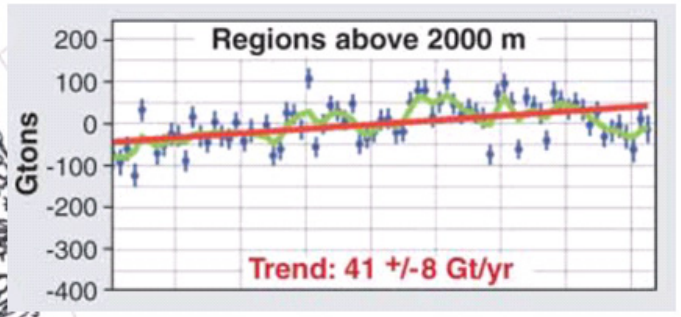
Surface Mass Balance				Sea Level Rise	
Snow fall (acc.)	Run off (melt)	Ice Discharge	Tot. Mass Bal.	Greenland	Global Eust.
550 ↗ 60					

Bold: 50 year averages (Gt/yr)

Trends: Last 15 year averages (Gt/yr)

NGRIP Photo Archieve





Johannessen et al, Science 2005

Satellite Remote Sensing
ERS-1 and ERS-2

AMAP

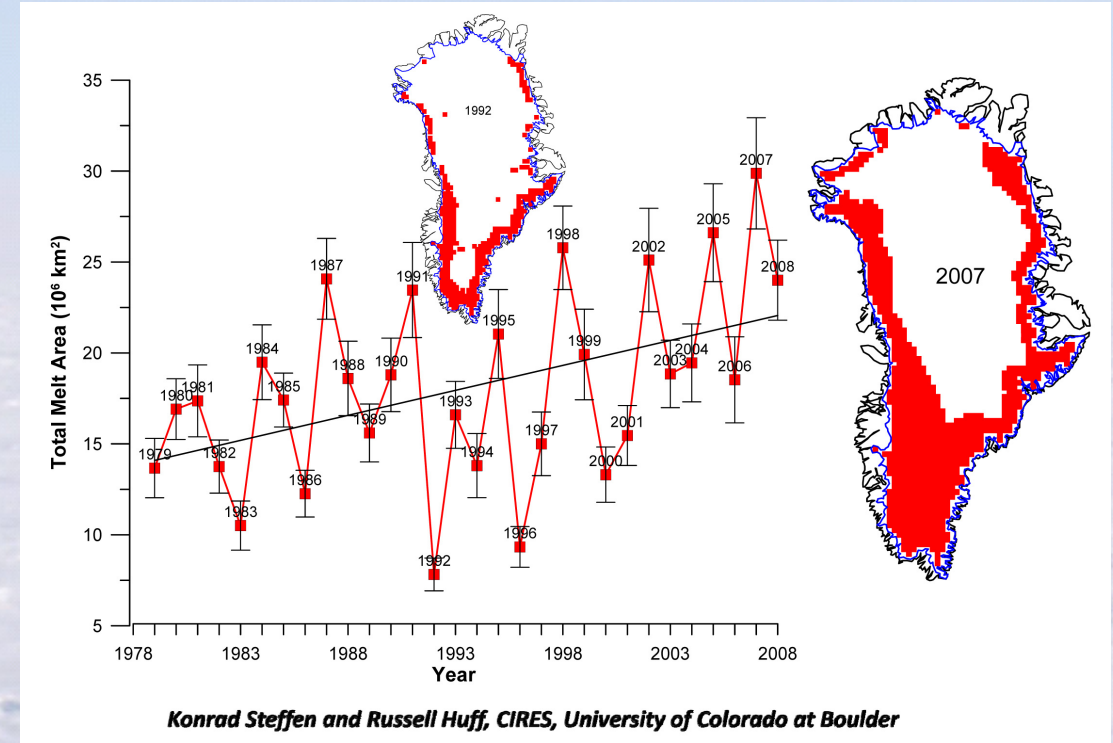
Surface Mass Balance				Sea Level Rise	
Snow fall (acc.)	Run off (melt)	Ice Discharge	Tot. Mass Bal.	Greenland	Global Eust.
550 ↗ 60	**250** ↗ 100				

Bold: 50 year averages (Gt/yr)

Trends: Last 15 year averages (Gt/yr)

Passive microwave satellite observations

R. Braithwaite, U. Of Manchester



Konrad Steffen and Russell Huff, CIRES, University of Colorado at Boulder

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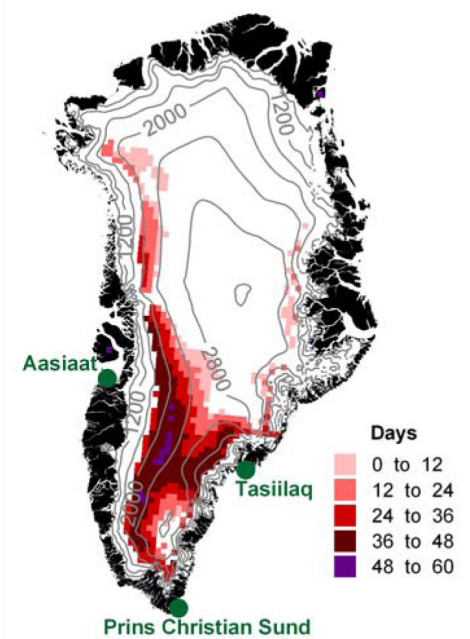
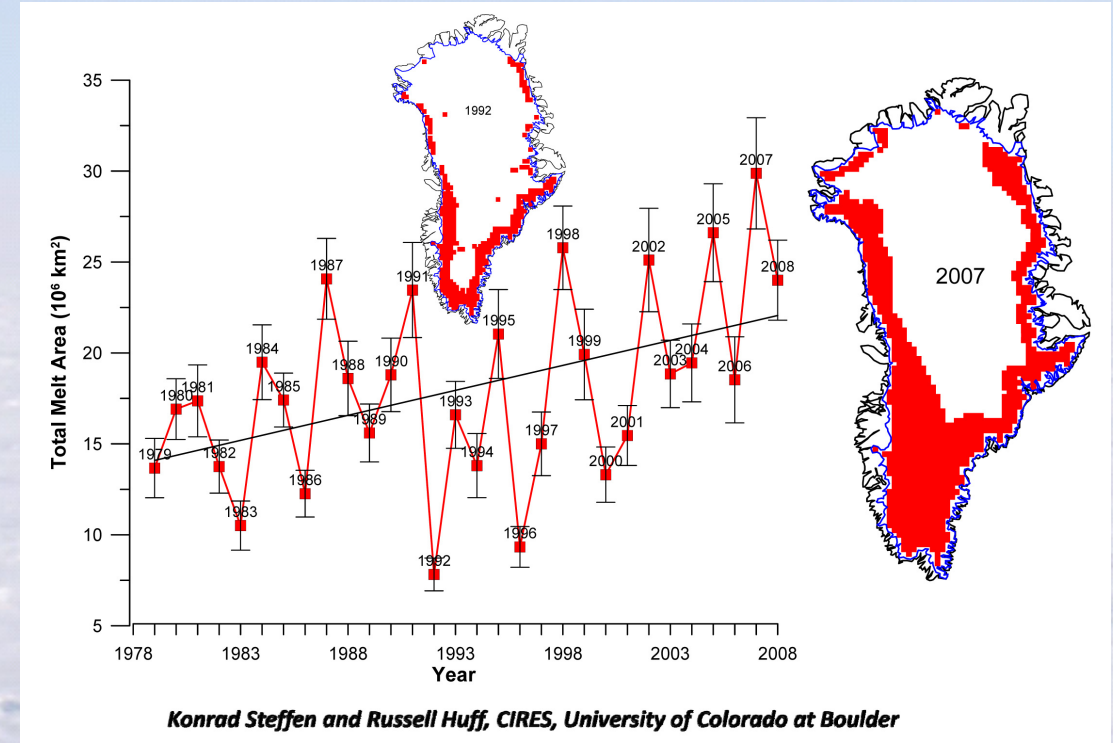


Mote, GRL, 2007

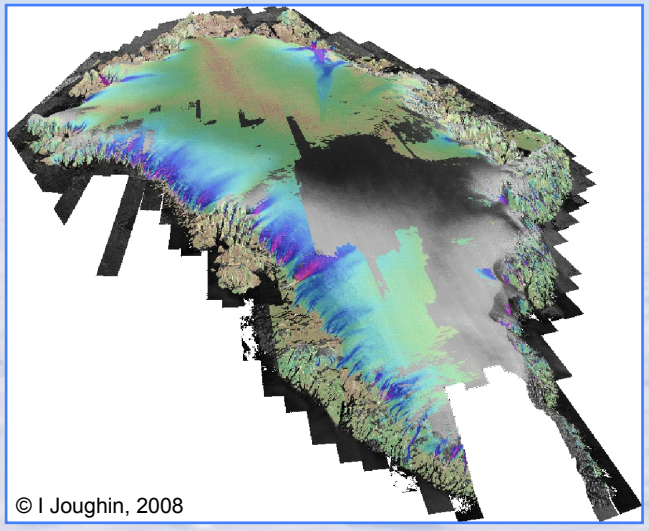


Surface Mass Balance				Sea Level Rise	
Snow fall (acc.)	Run off (melt)	Ice Discharge	Tot. Mass Bal.	Greenland	Global Eust.
550 ↗ 60	**250** ↗ 100	**330** ↗ 100			

Bold: 50 year averages (Gt/yr)

Trends: Last 15 year averages (Gt/yr)

Satellite radar interferometry



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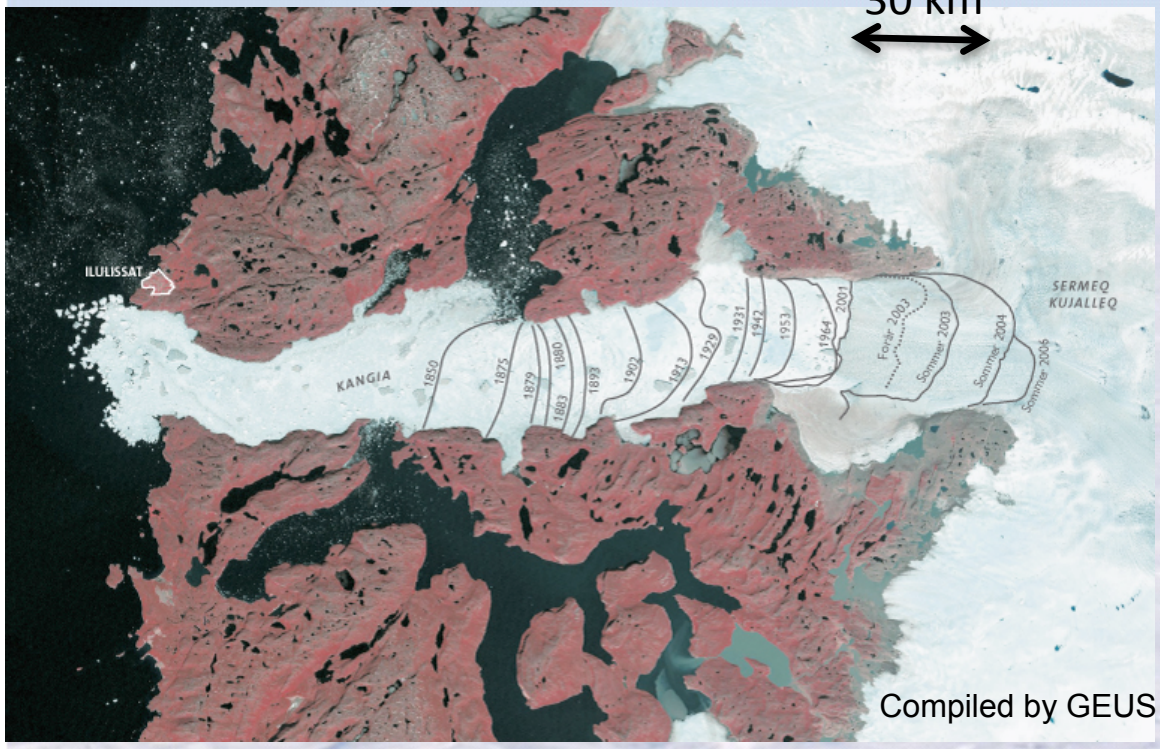
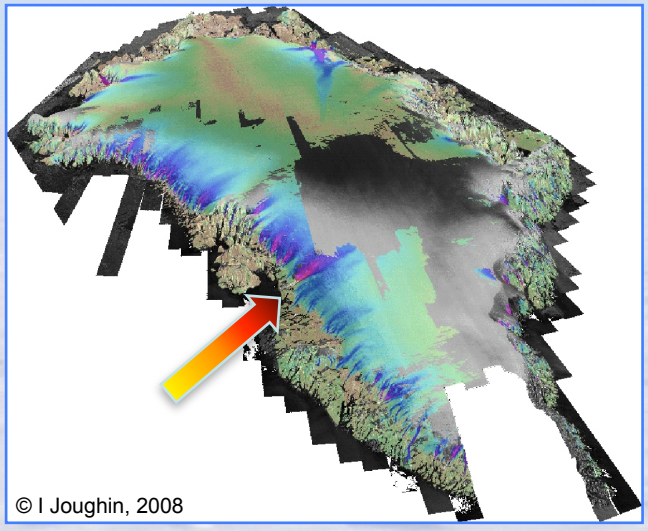


Compiled by GEUS

Satellite radar interferometry



© I Joughin, 2008

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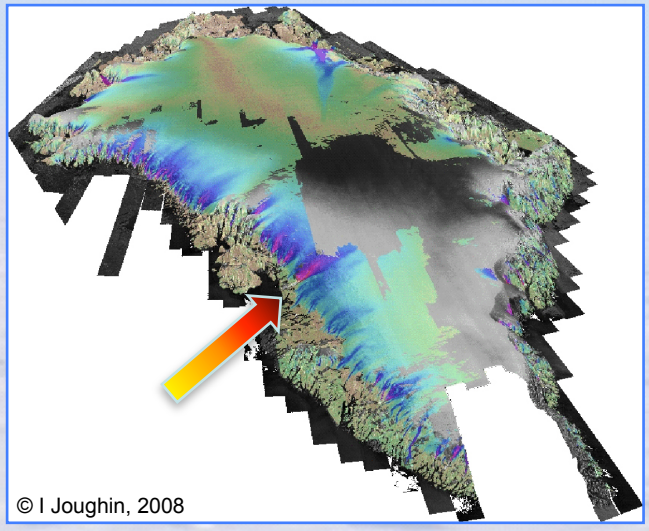

Jakobshavn Isbræ, Jason Admundsen

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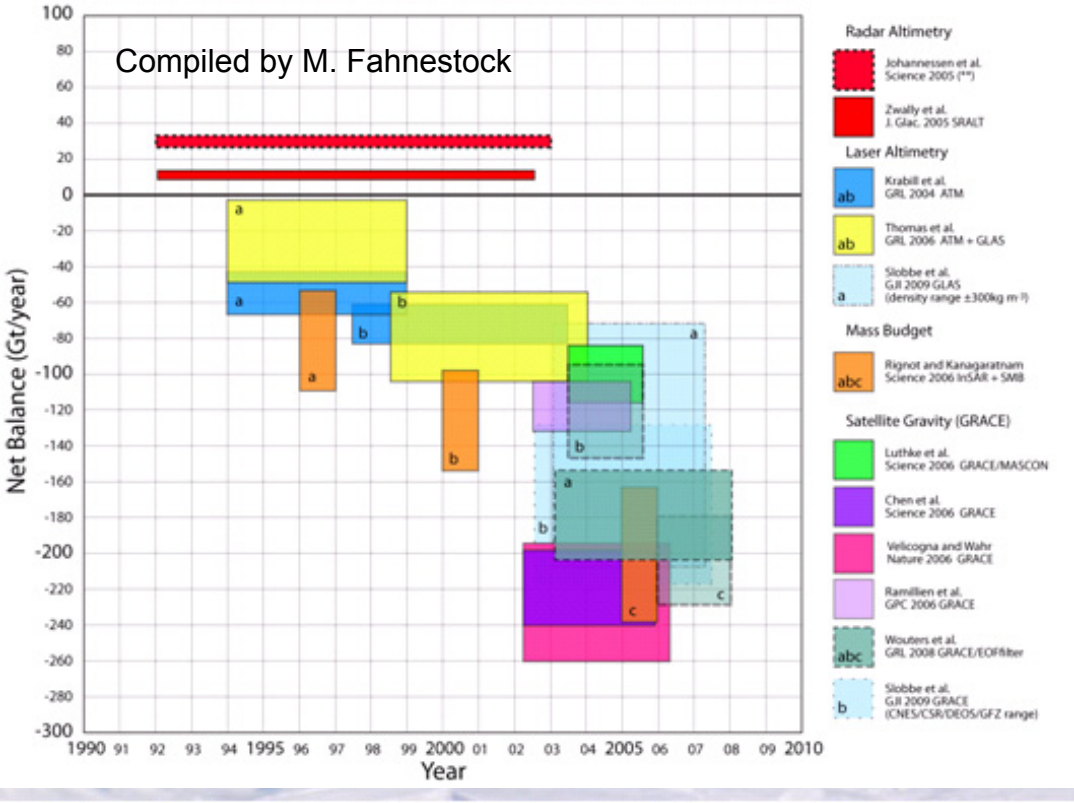
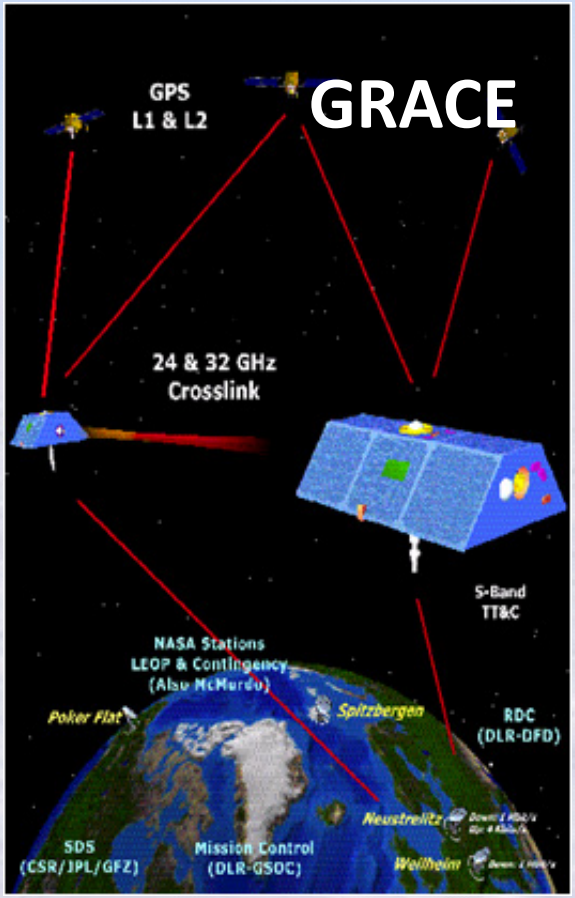
Surface Mass Balance				Sea Level Rise	
Snow fall (acc.)	Run off (melt)	Ice Discharge	Tot. Mass Bal.	Greenland	Global Eust.
550 ↗ 60	**250** ↗ 100	**330** ↗ 100	**-30** ↘ -130	**0.3-0.5 mm/yr**	

Bold: 50 year averages (Gt/yr)

Trends: Last 15 year averages (Gt/yr)

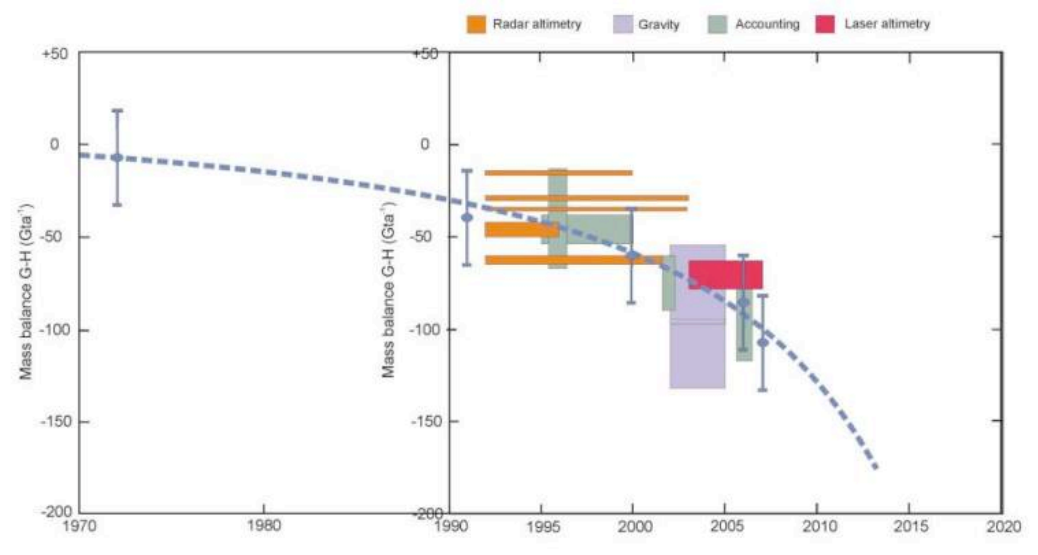




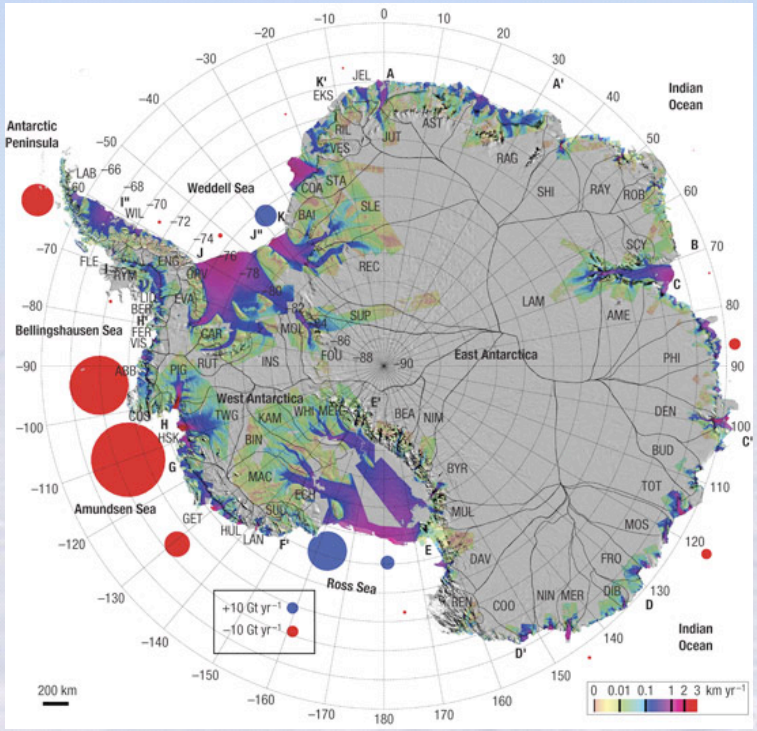
Surface Mass Balance				Sea Level Rise	
Snow fall (acc.)	Run off (melt)	Ice Discharge	Tot. Mass Bal.	Greenland	Global Eust.
550 ↗ 60	**250** ↗ 100	**330** ↗ 100	**-30** ↘ -130	**0.3-0.5 mm/yr**	**2** ↗ 1 **mm/yr**

Bold: 50 year averages (Gt/yr)

Trends: Last 15 year averages (Gt/yr)



D. Vaughan, BAS, Cambridge



E. Rignot, Nature Geoscience, 2008

Global eustatic sea level rise includes thermal expansion and contributions from glaciers and ice caps,and Antarctic and Greenland ice sheets.

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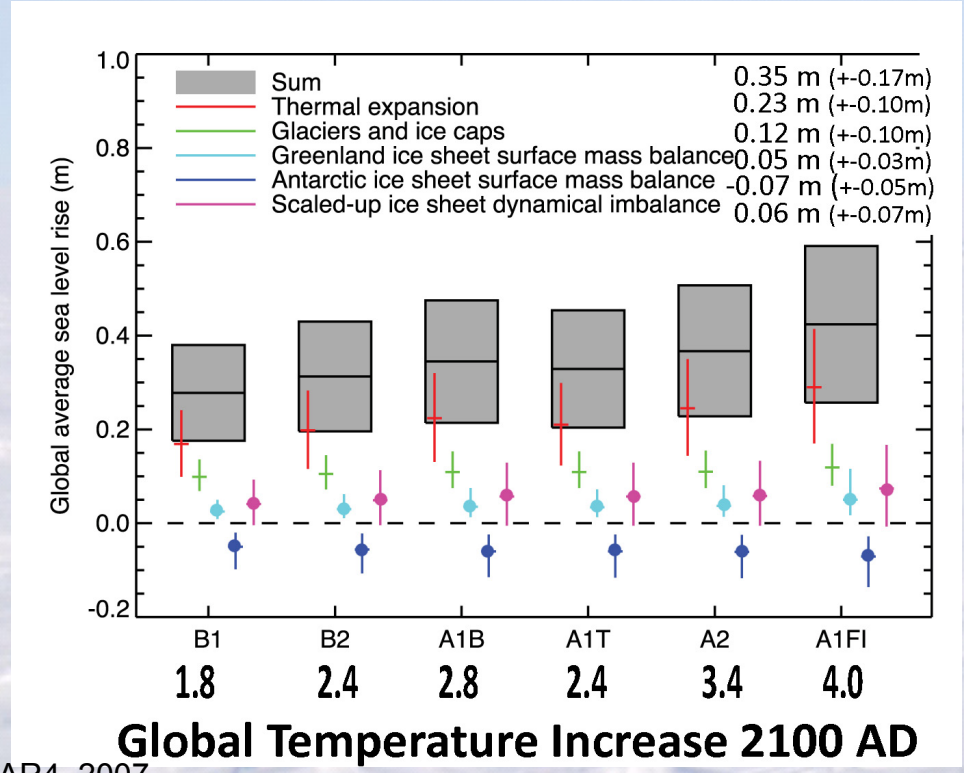

Global Temperature Increase 2100 AD

IPCC AR4, 2007

Future Predictions

2100 AD (IPCC 2007):

Greenland SLR: **0.05 m**

Global SLR: **0.35 m**

2100 AD (AMAP 2009):

Greenland SLR:

Global SLR:

3000 AD (AMAP 2009):

Greenland SLR:

Global SLR:

Surface Mass Balance				Sea Level Rise	
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550 ↗ 60	**250** ↗ 100	**330** ↗ 100	**-30** ↘ -130	**0.3-0.5 mm/yr**	**2** ↗ 1 **mm/yr**

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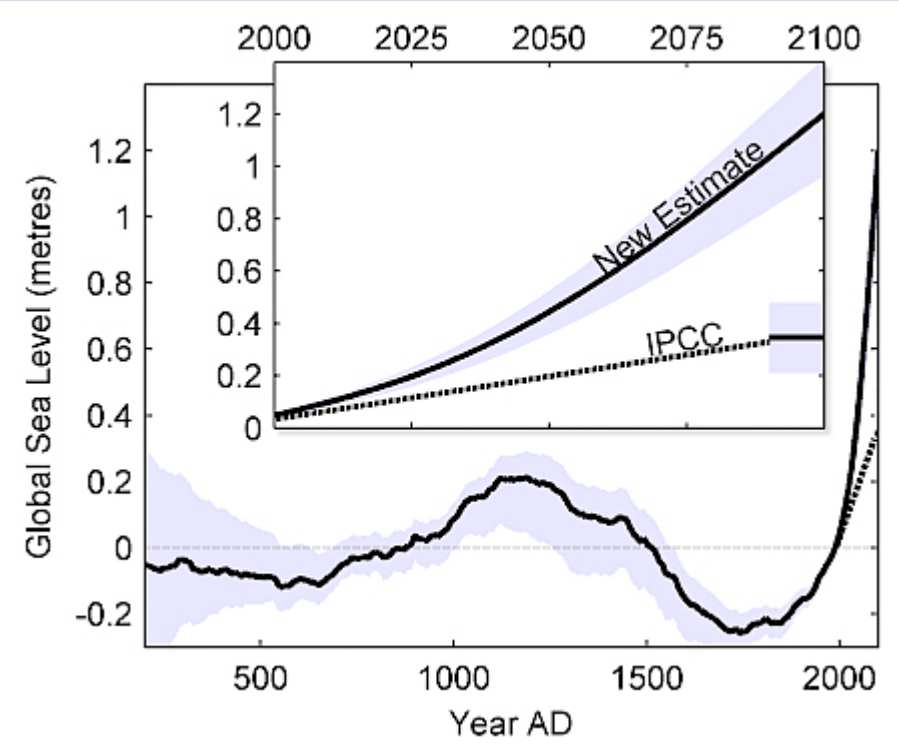


A. Grindsted, Climate Dynamics, 2009

Future Predictions

2100 AD (IPCC 2007):

Greenland SLR: **0.05 m**

Global SLR: **0.35 m**

2100 AD (AMAP 2009):

Greenland SLR: **0.14 m**

Global SLR: **1 m**

3000 AD (AMAP 2009):

Greenland SLR:

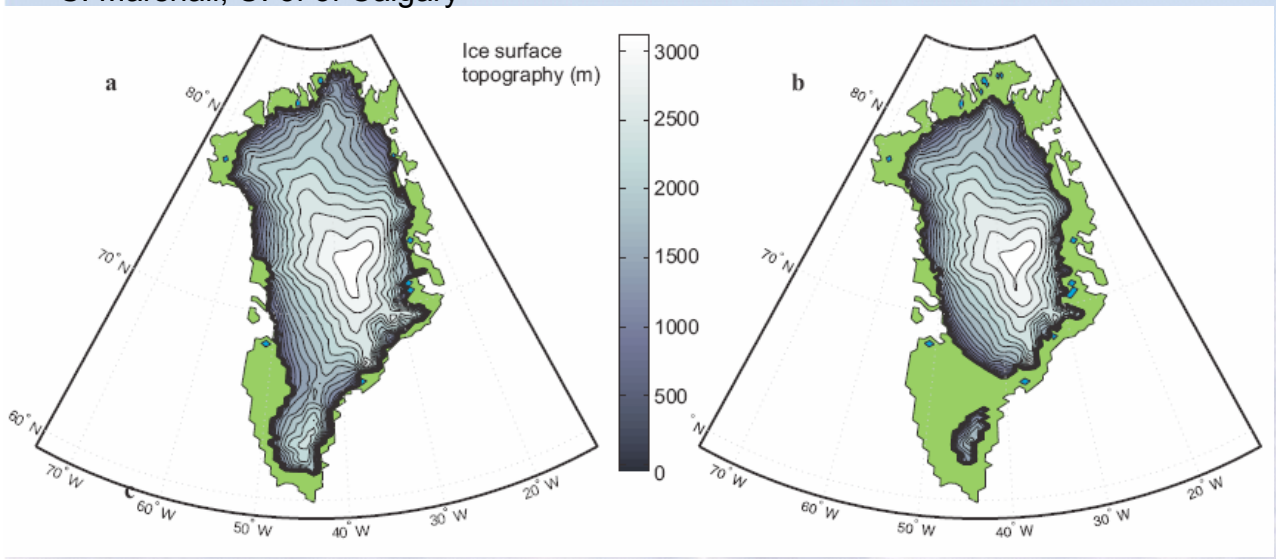
Global SLR:

Surface Mass Balance				Sea Level Rise	
Snow fall (acc.)	Run off (melt)	Ice Discharge	Tot. Mass Bal.	Greenland	Global Eust.
550 ↗ 60	**250** ↗ 100	**330** ↗ 100	**-30** ↘ -130	**0.3-0.5 mm/yr**	**2** ↗ 1 **mm/yr**

Bold: 50 year averages (Gt/yr)

Trends: Last 15 year averages (Gt/yr)

S. Marshall, U. of of Calgary



3000 AD: +4 °C

3000 AD: +8°C

Future Predictions

2100 AD (IPCC 2007):

Greenland SLR: **0.05 m**

Global SLR: **0.35 m**

2100 AD (AMAP 2009):

Greenland SLR: **0.14 m**

Global SLR: **1 m**

3000 AD (AMAP 2009):

Greenland SLR: **1-3 m?**

Global SLR: **5 m?**

The Greenland Ice Sheet in a Changing Climate

AMAP

The Greenland and Antarctic Ice Sheets are the 'awakening giants' and increased melt and ice discharge can seriously increase the predicted mean sea level rise in the next century.

The extended summary is from the forthcoming scientific and peer-reviewed publication 'The Greenland Ice Sheet in a Changing Climate" to be published by AMAP in November 2009 before the COP15 meeting in Copenhagen.

The Greenland Ice Sheet in a Changing Climate

AMAP