Global Sea Level Rise: What's Happening with the Polar Ice Sheets and Warming Global Temperatures?

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Coastal NH Climate Summit: The Many Faces of Adaptation

13 May 2016

University of New Hampshire

climate solutions new england

Prepared by:
Science and Technical Advisory Panel,
New Hampshire Coastal Risks & Hazards Commission
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Lead Authors:
Matt Huber (UNH), Kevin Knuuti (US ACE),
Mary Stampone (UNH and NH Climate Office)

Global sea levels have been rising and are expected to continue rising well beyond the end of 21st century.

External Reviewers:
Kerry Emanuel (MIT)
Stephen Gill (US NOAA)
Robert Kopp (Rutgers University)

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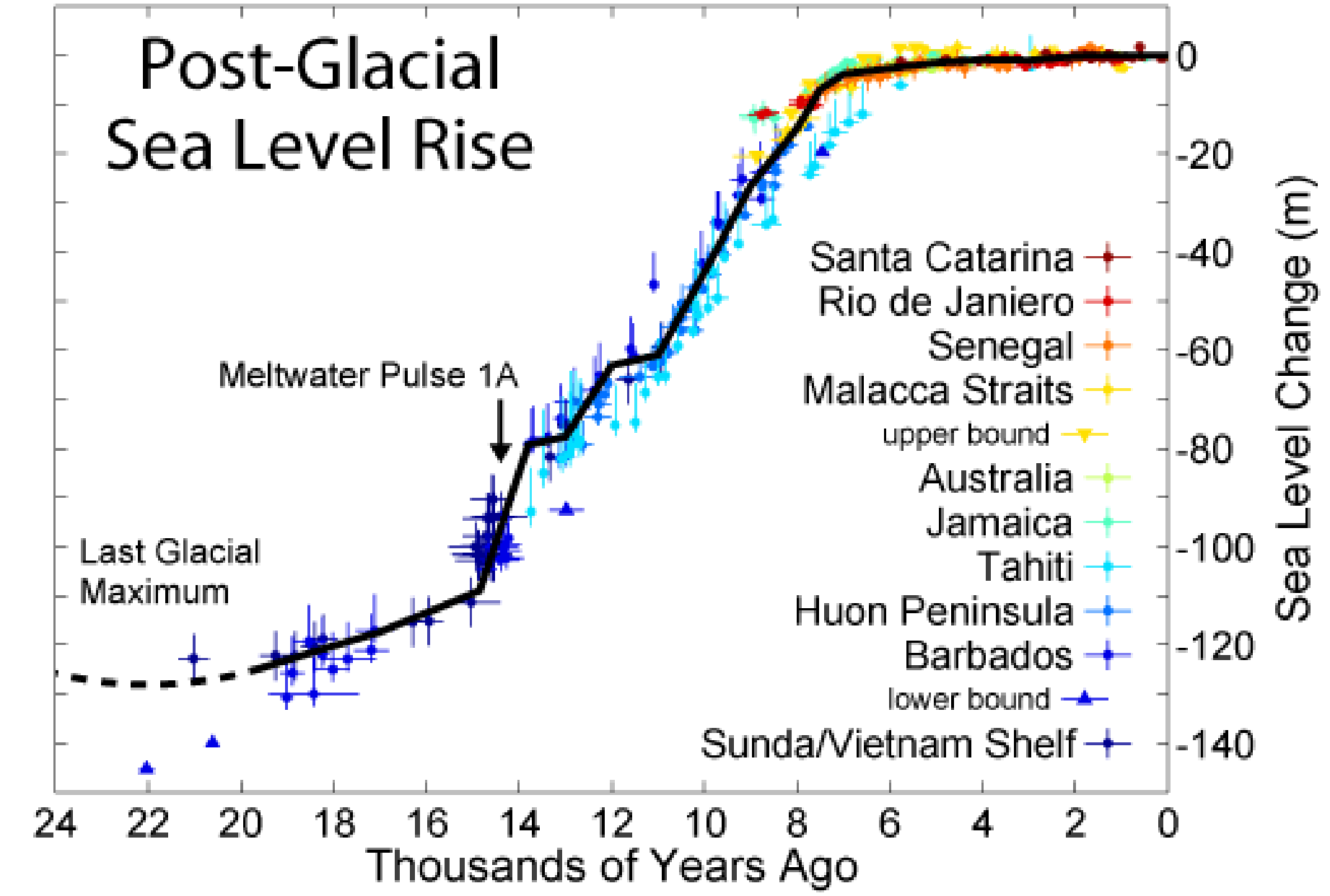
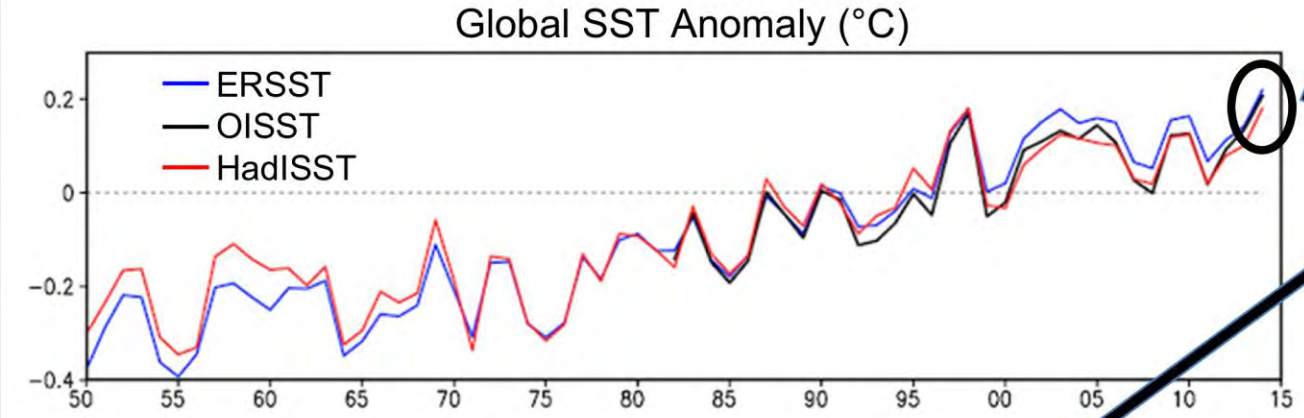
6.1 Science Recommendations

GOAL 1 is to research, understand, establish, and use the best available science about current and future coastal hazards in New Hampshire relating to storm surge, sea-level rise, and extreme precipitation.

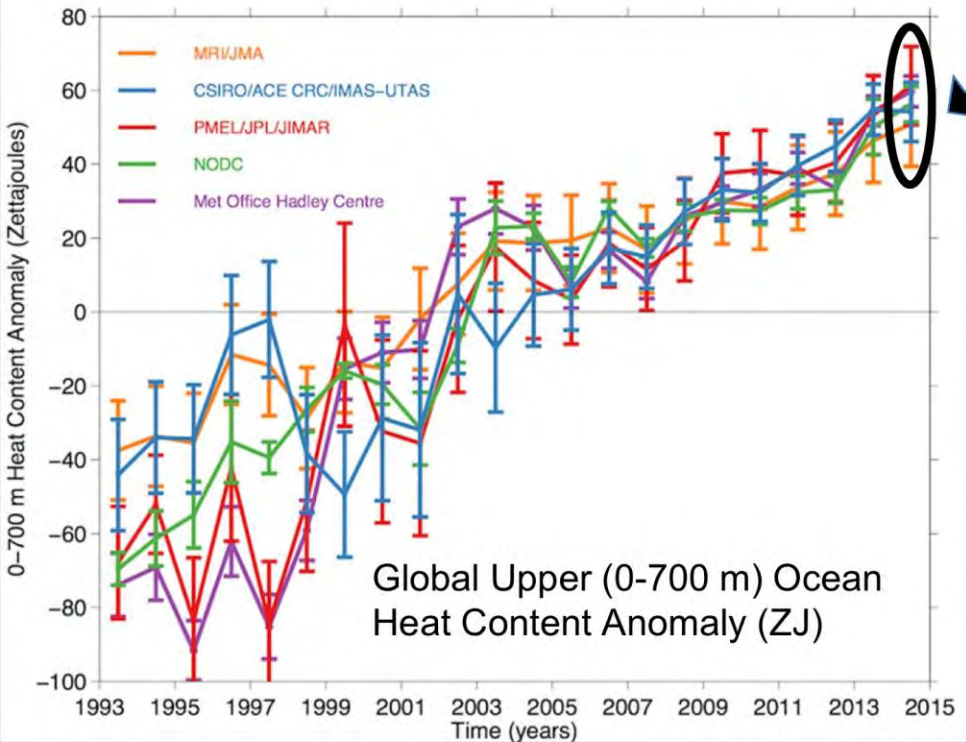


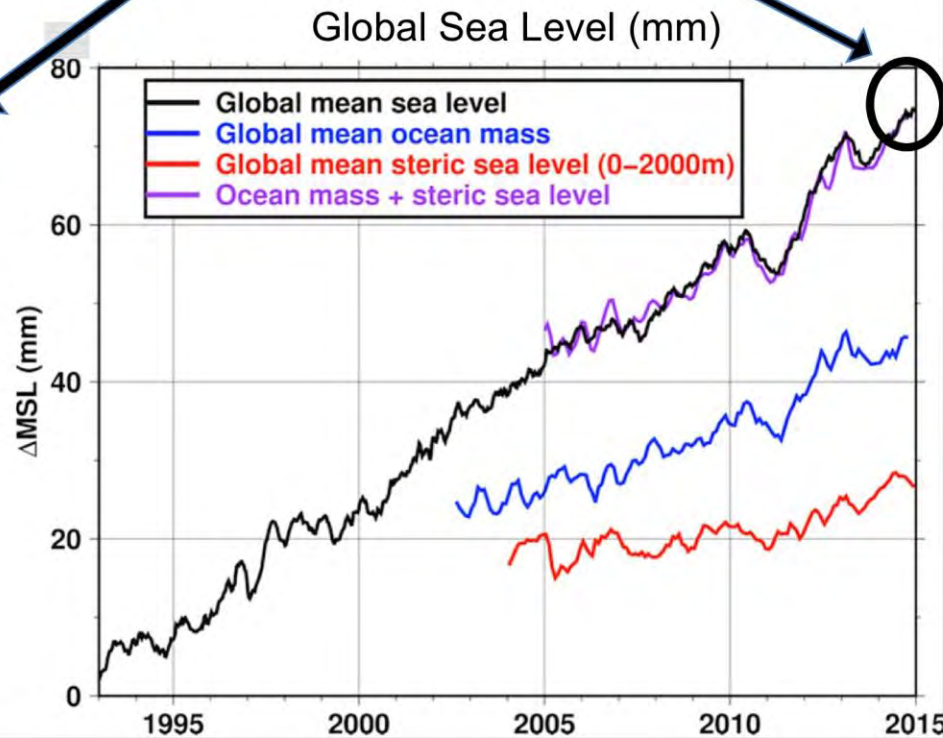
Fleming et al. 1998, Fleming 2000, & Milne et al. 2005

Seas Warm, Land Ice Melts, and Waters Rise

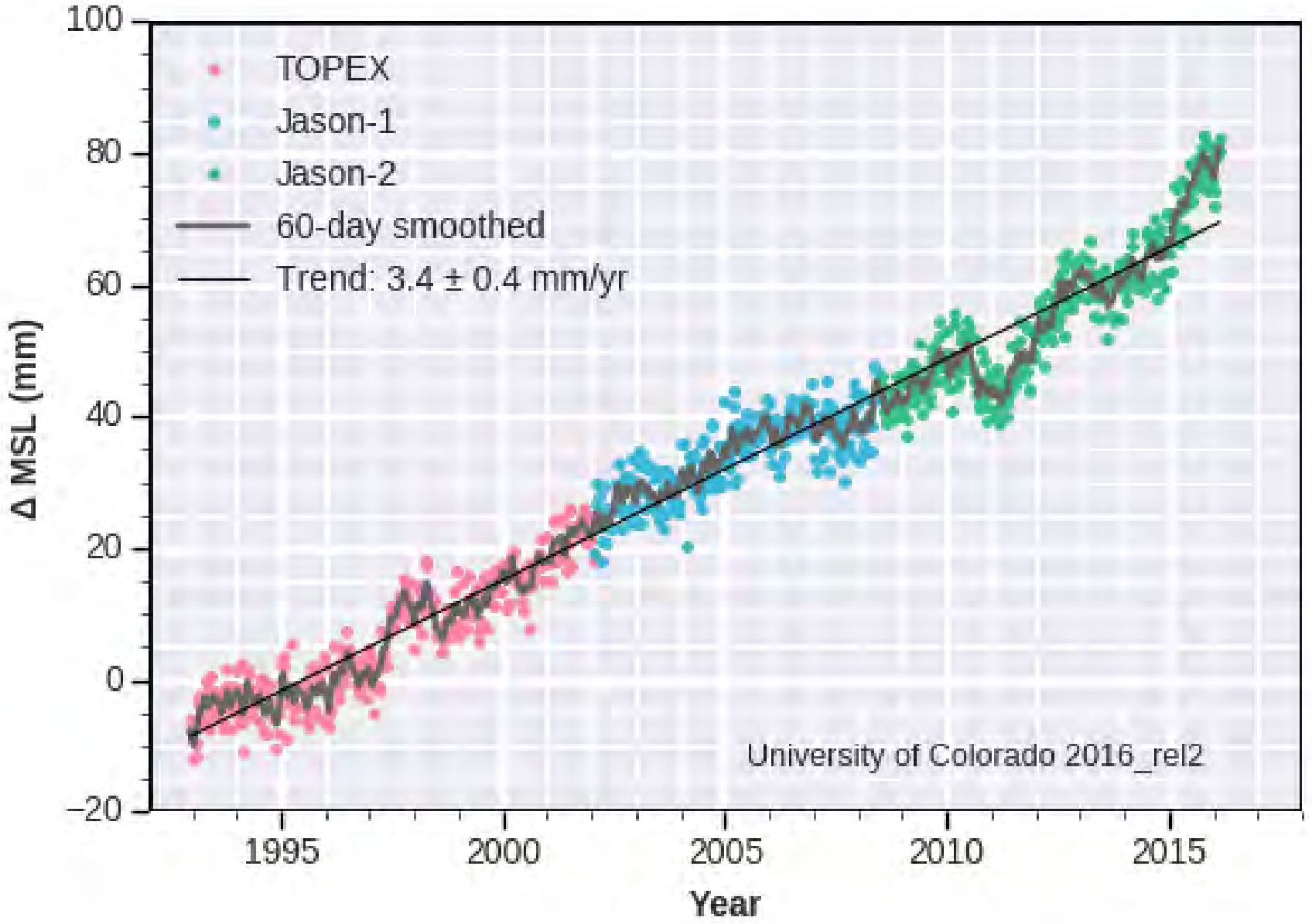


- 2014 Sea Surface Temperature warmest in 2 of 3 analyses.
- 2014 Upper (0-700 m) Ocean Heat Content Anomaly. highest in 4 of 5 analyses
- 2014 Sea Level record high.



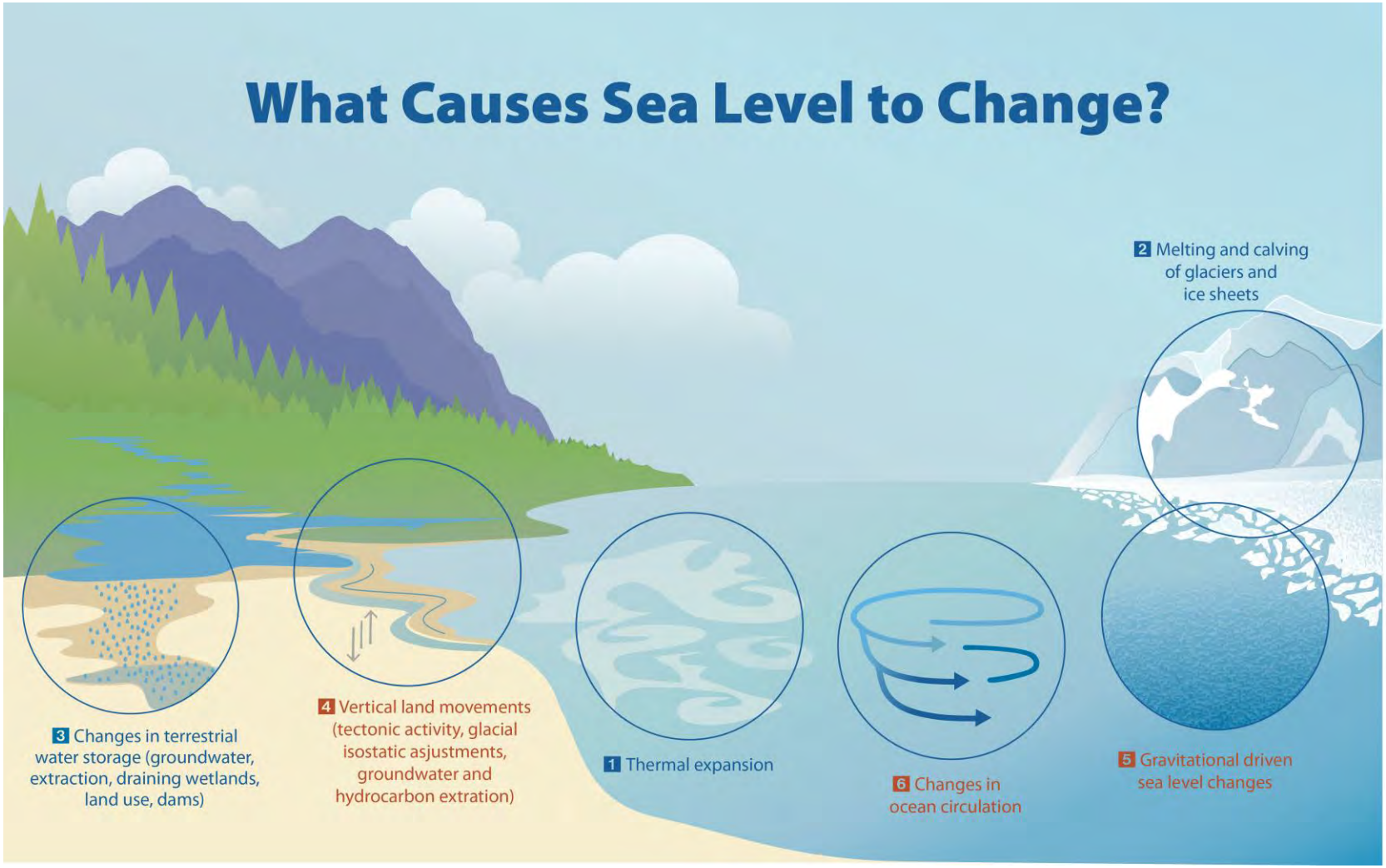


Global Mean Sea Level from Satellite Radar Altimeters (TOPEX & Jason)

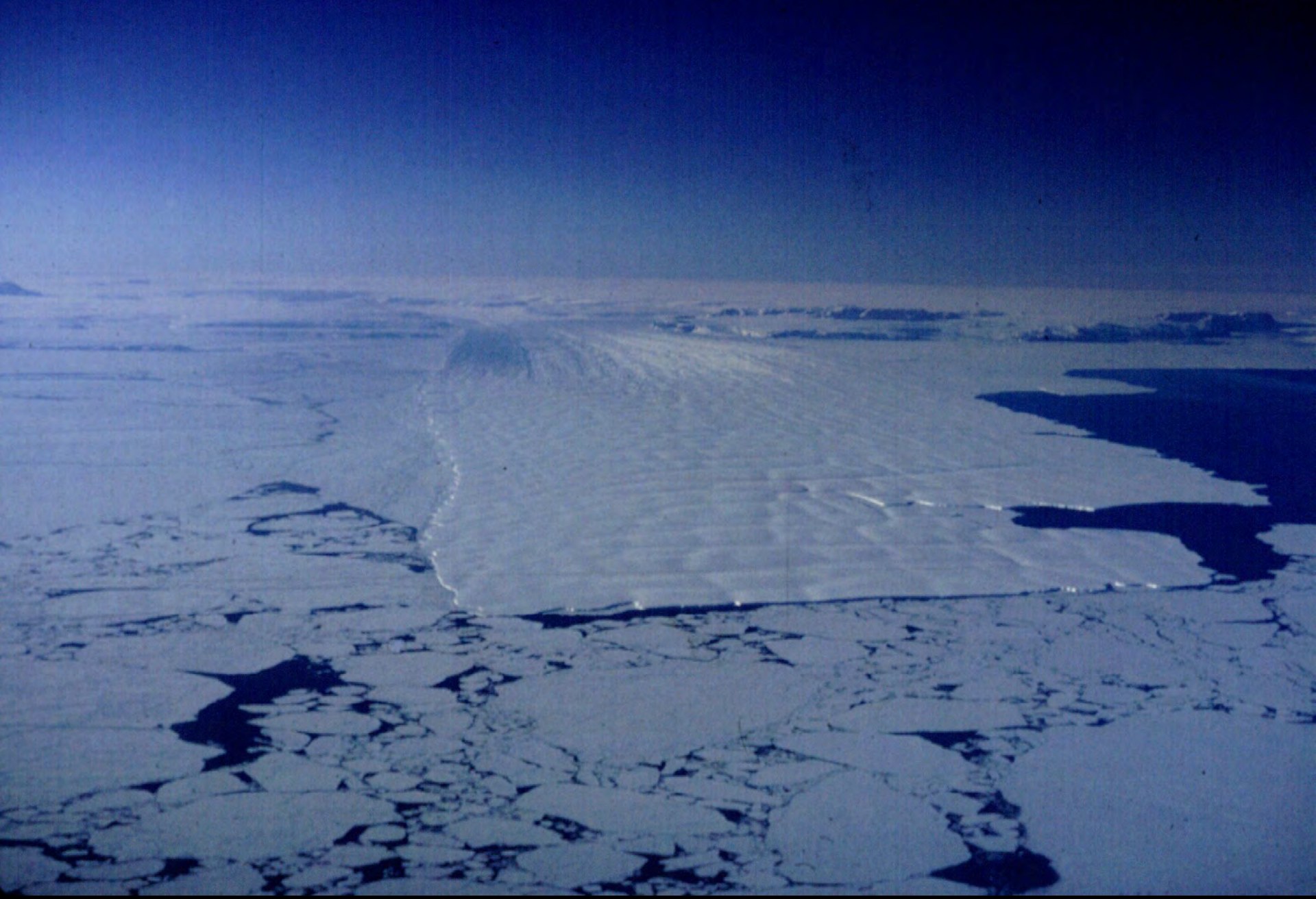


Seasonal signals removed, glacial isostatic adjustment corrected

http://sealevel.colorado.edu



1. Thermal Expansion
2. Glaciers and Ice Sheets
3. Terrestrial Water Storage
4. Vertical Land Movements
5. Gravity Effects
6. Dynamic component

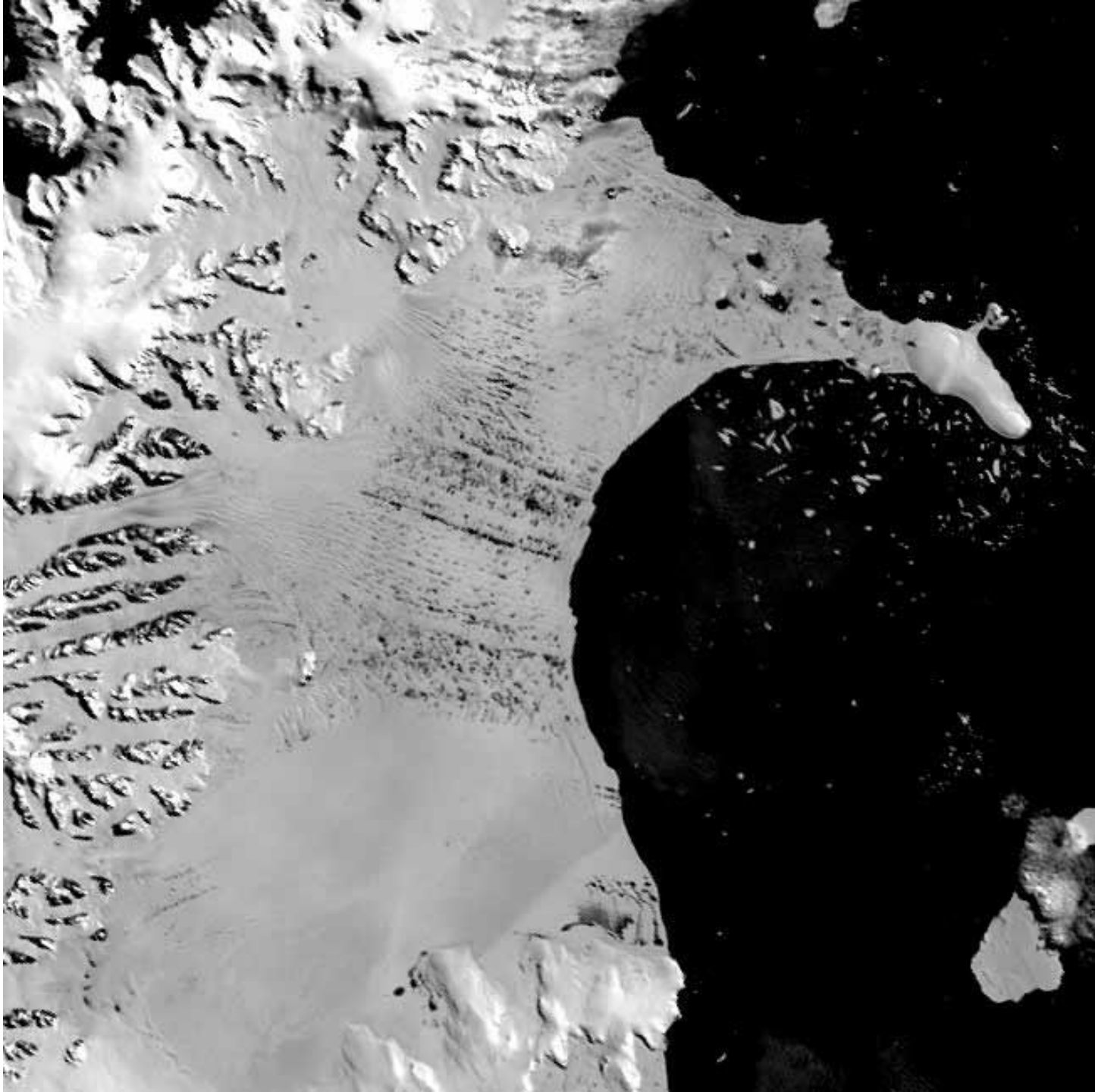



Weddell Sea
Larsen Ice Shelf
Queen Maud Land
Filchner Ice Shelf
Ronne Ice Shelf
Amery Ice Shelf
Antarctic Peninsula
Bellings-hausen Sea
90° W
South Pole
East Antarctic Ice Sheet
90°E
Transantarctic Mountains
West Antarctic Ice Sheet
Amundsen Sea
Ross Ice Shelf
Wilkes Land
Ross Sea
70°S
180°
Magnetic South Pole


Size of
Rhode Island

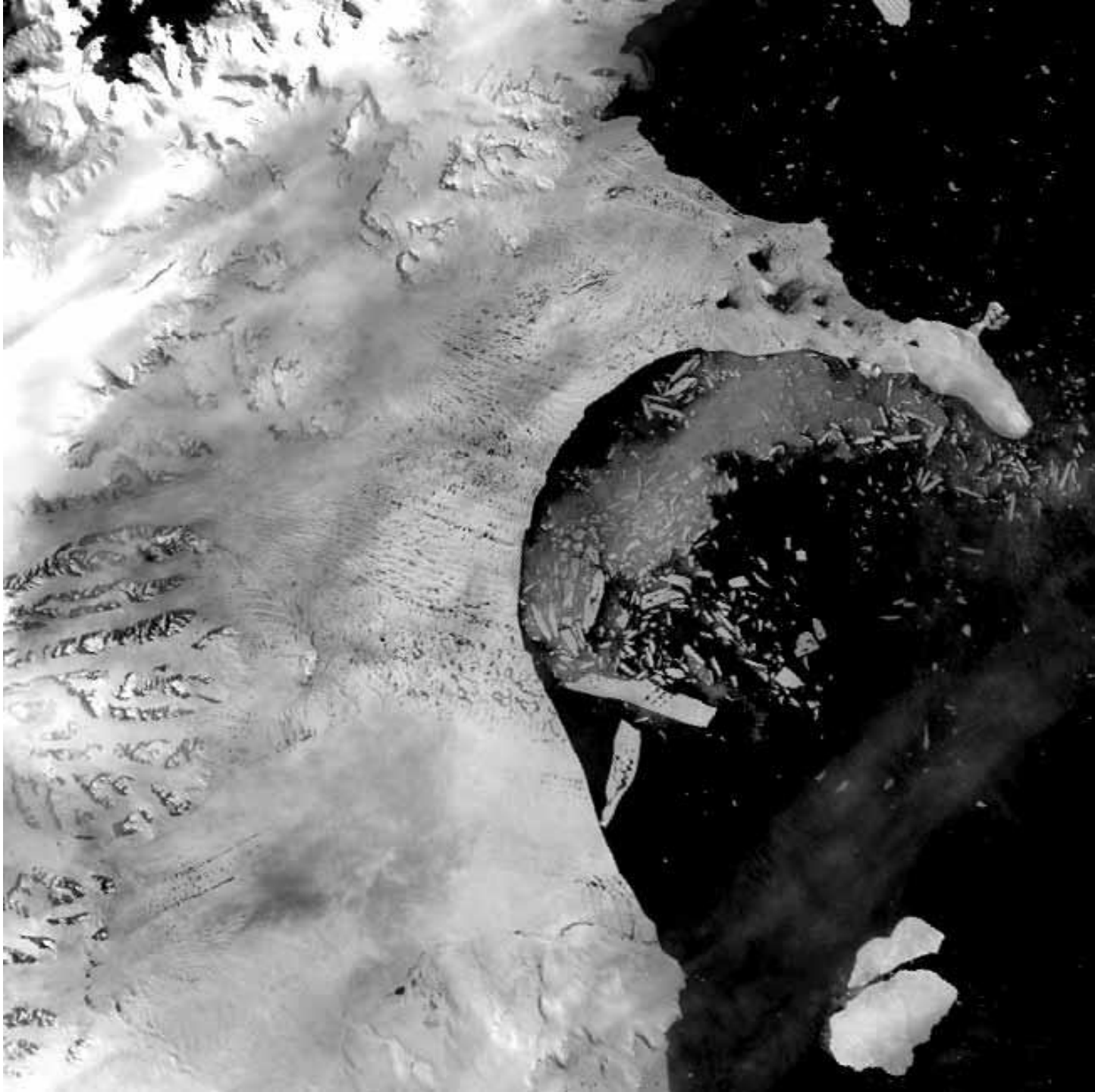
LarsenB Ice Shelf
Antarctica
Peninsula

31 January 2002



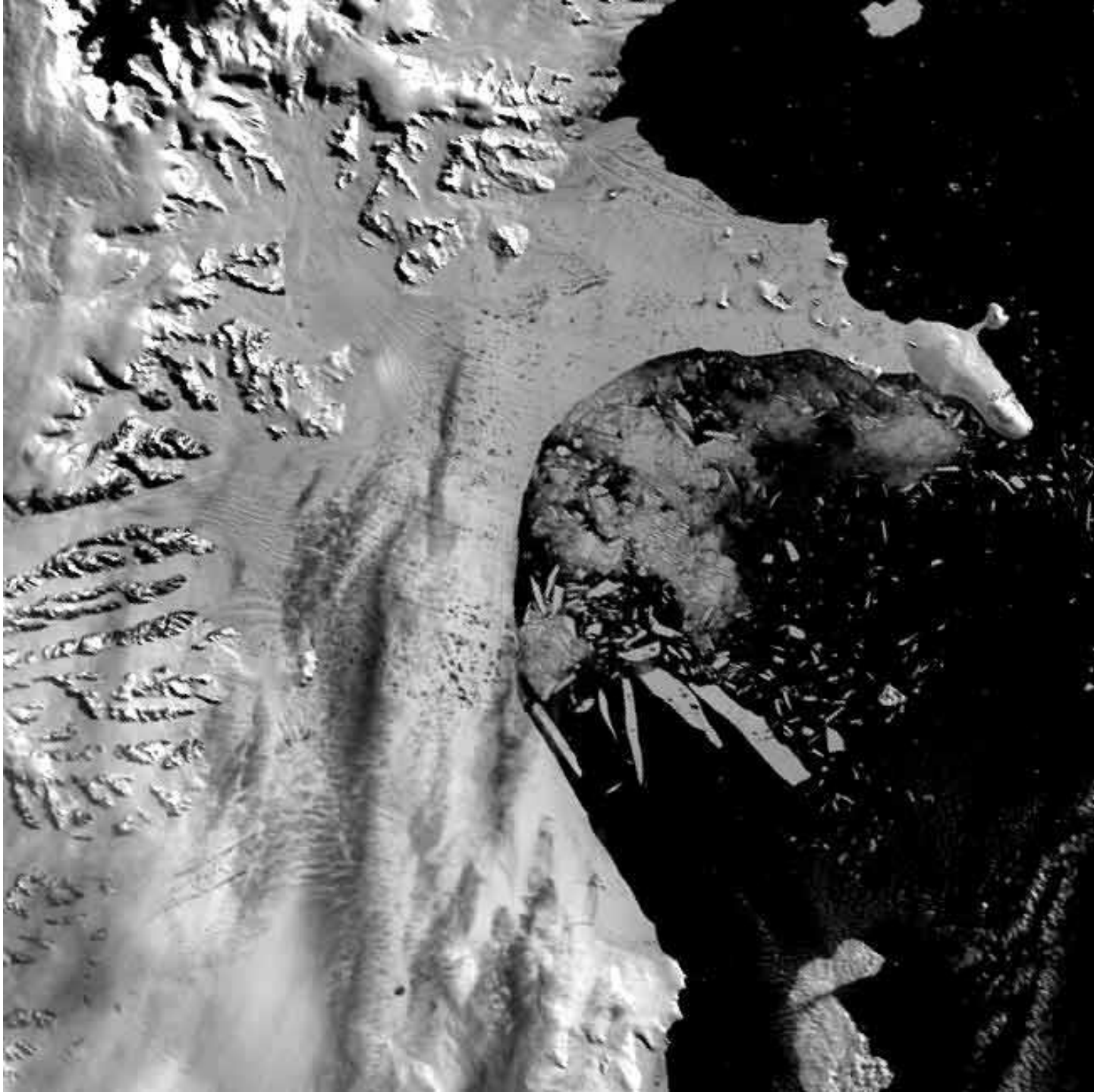
LarsenB Ice Shelf
Antarctica
Peninsula

17 Feb 2002



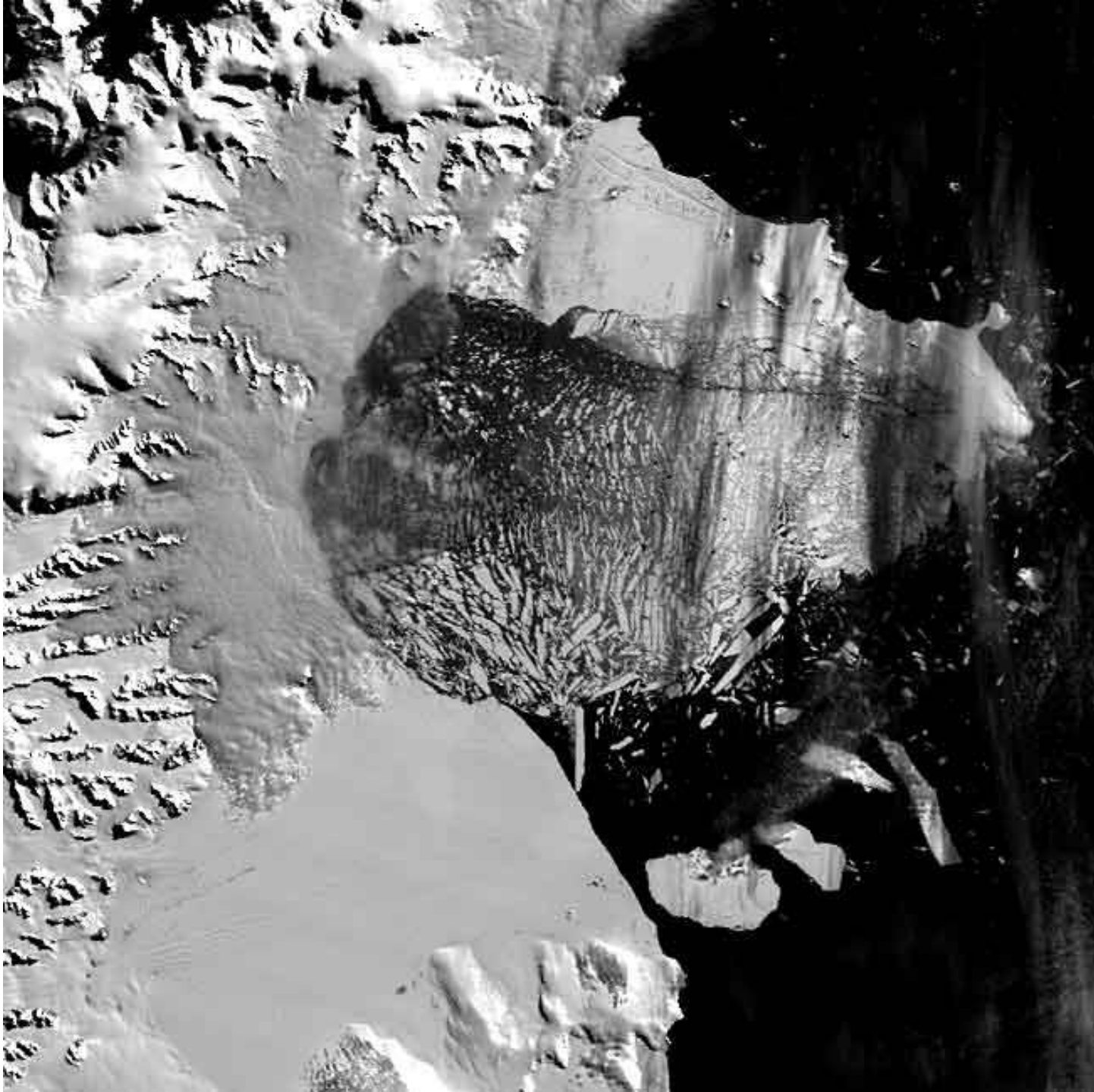
LarsenB Ice Shelf
Antarctica
Peninsula

23 Feb 2002

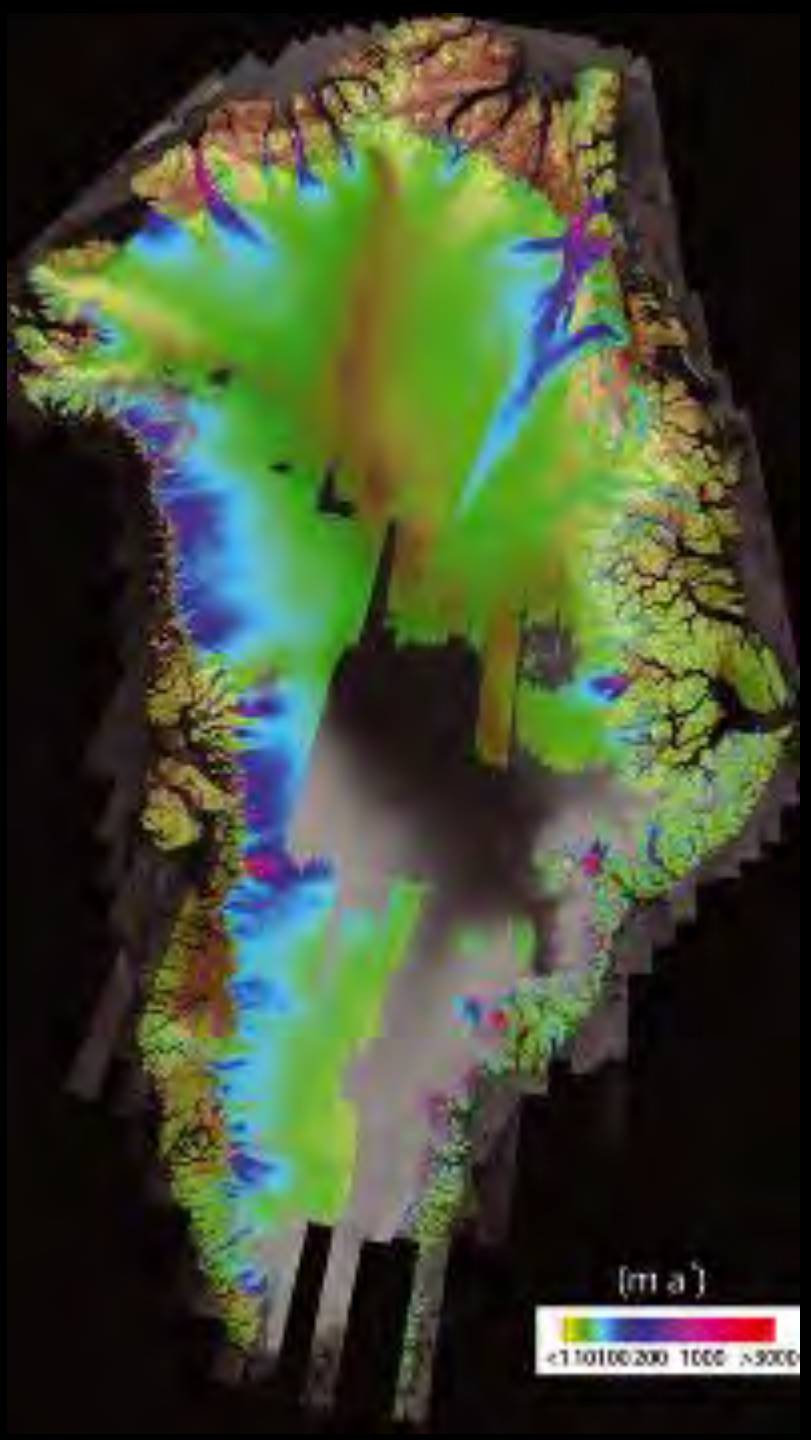


LarsenB Ice Shelf
Antarctica
Peninsula

5 March 2002

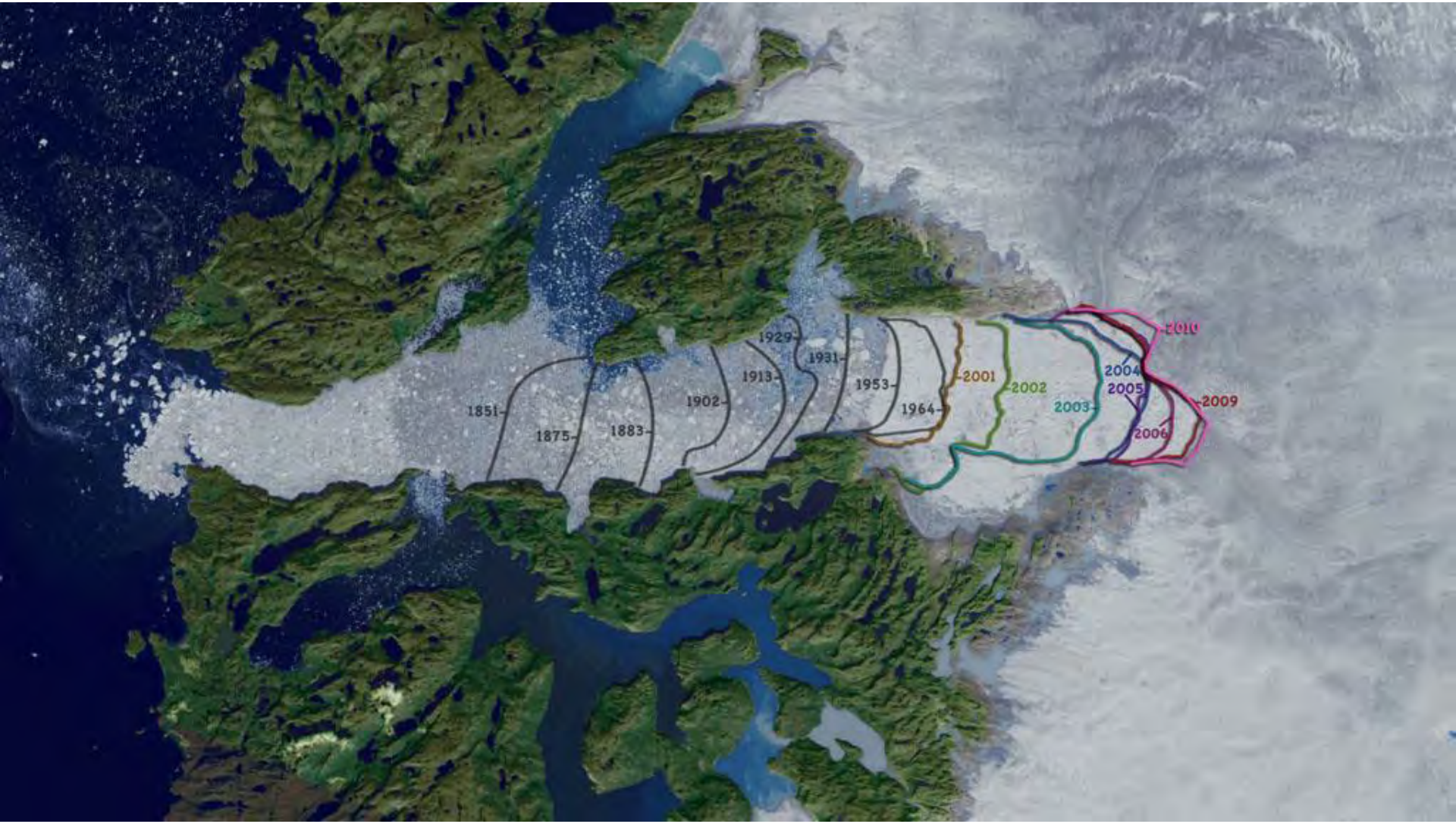


Flow Velocity Greenland Ice Sheet 2005-2006



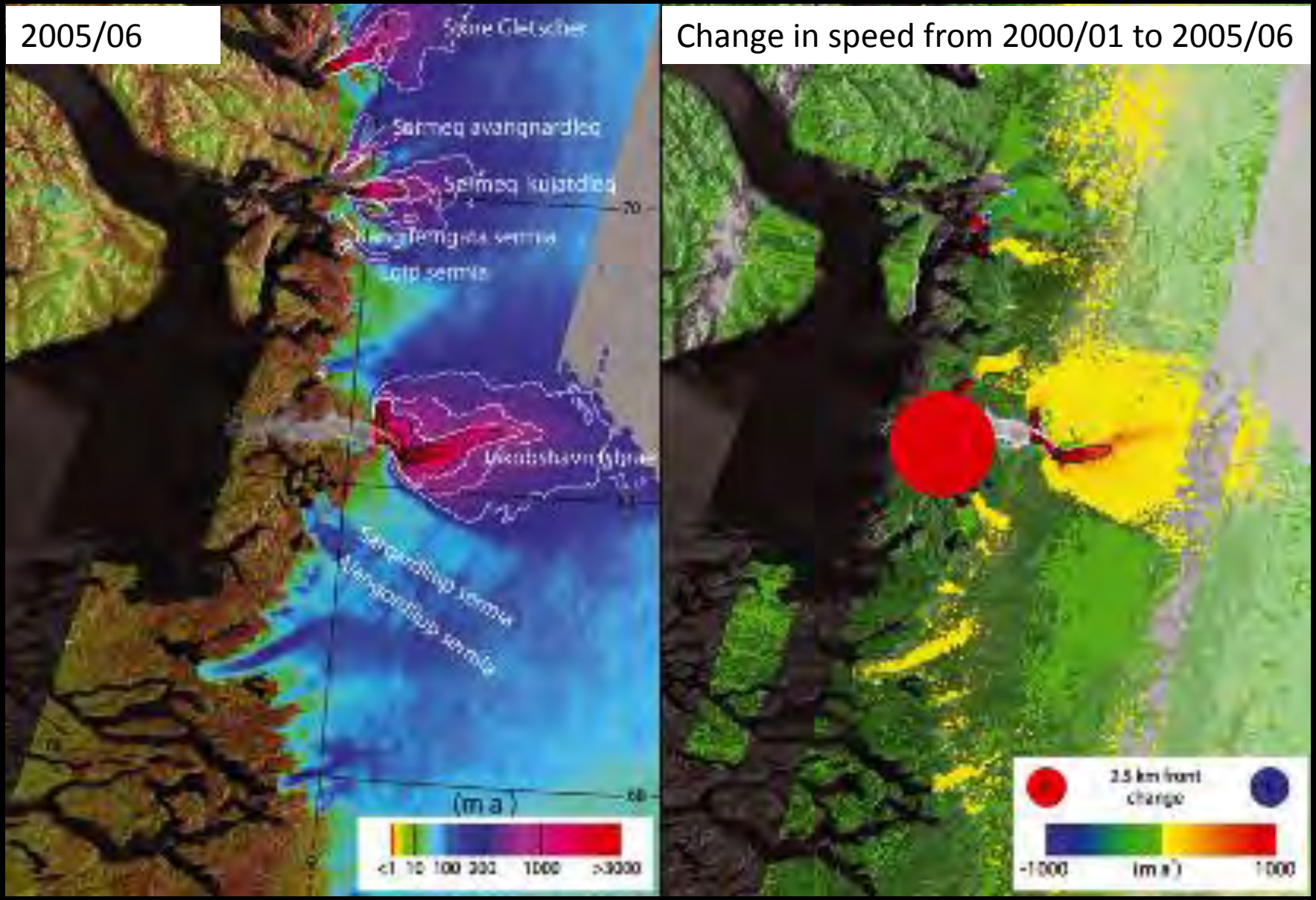
Joughin et al. (2010) Journal of Glaciology, 56, 415-430.

Jakobshavn Glacier: Retreat 2001-2009



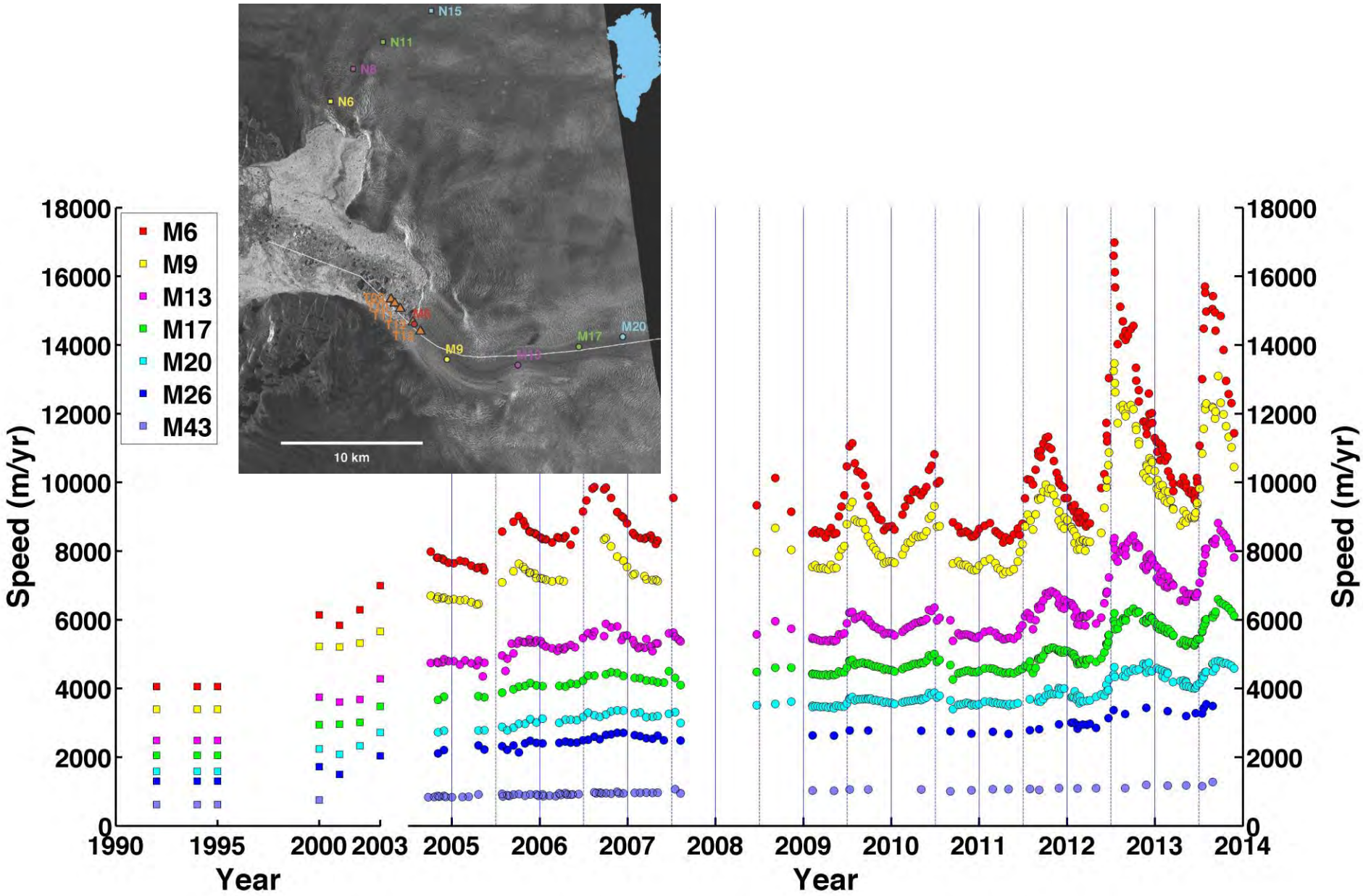
http://svs.gsfc.nasa.gov

Flow Velocity of Jakobshavn Glacier



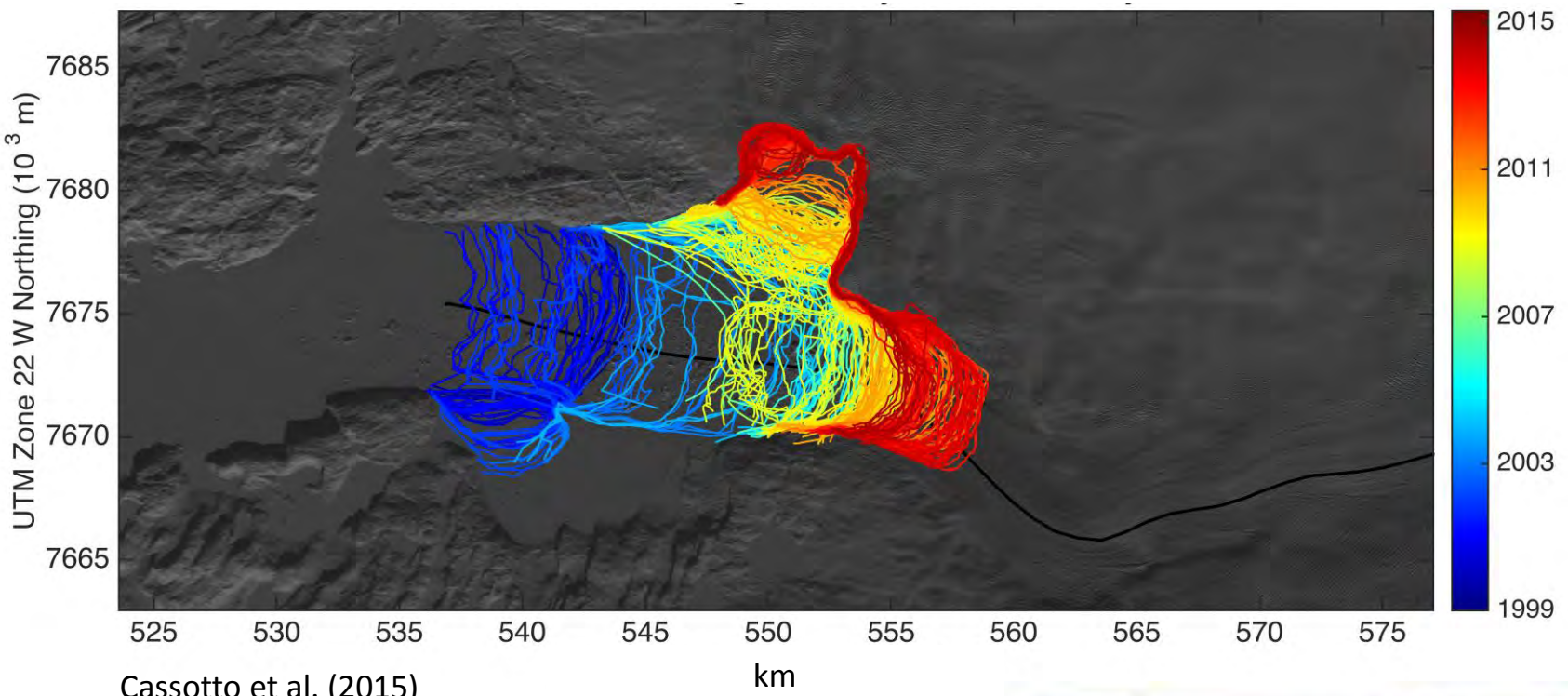
Joughin et al. (2010) Journal of Glaciology, 56, 415-430.

Jakobshavn Glacier: Dramatic Increase in Surface Velocity since 2000

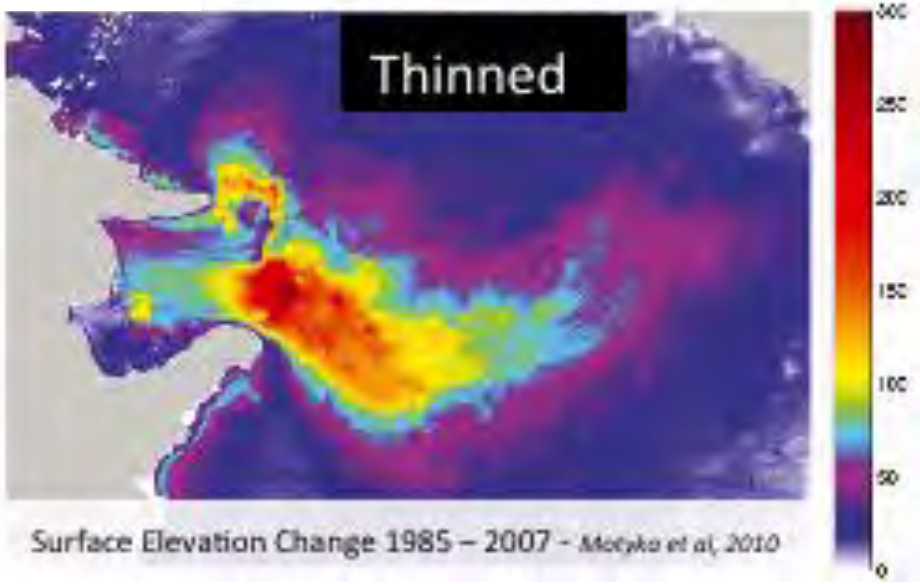


Joughin et al. (2012) JGR 117; (2014) The Cryosphere 8, 209–214.

Jakobshavn Glacier: Retreat 1999 – 2015 > 17 km

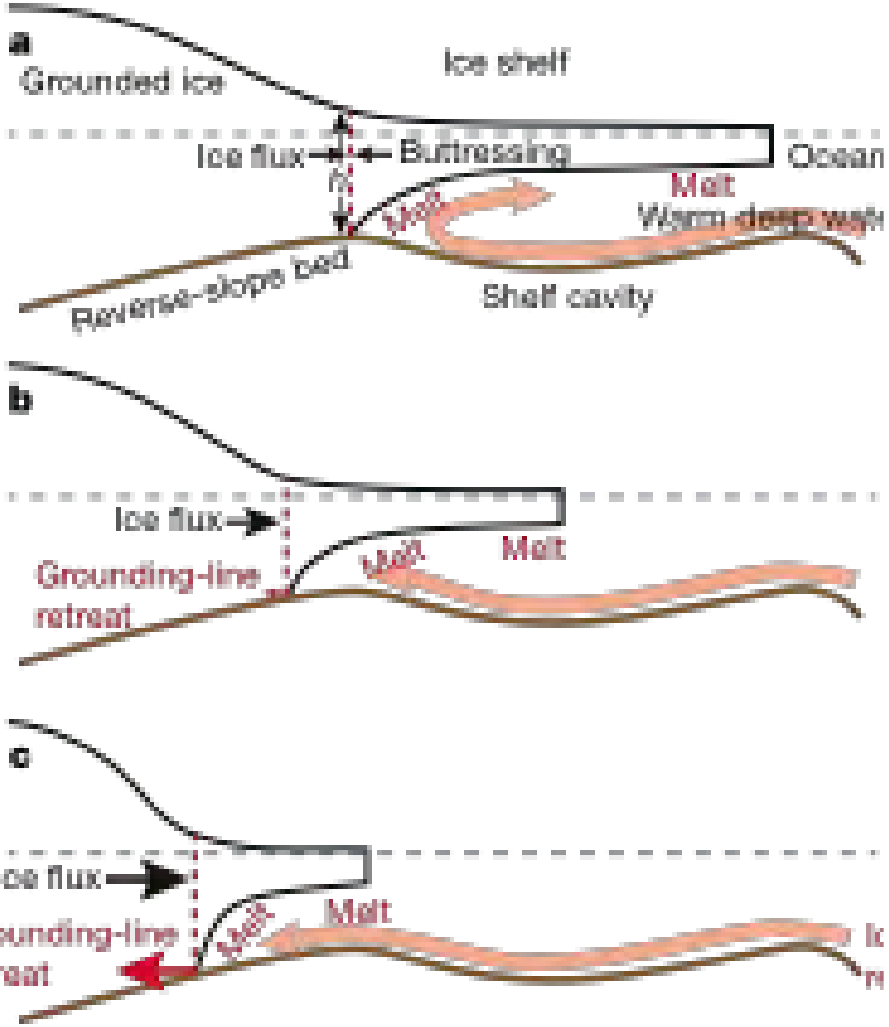


Cassotto et al. (2015)
J. Glaciology.



Motyka RJ et al (2010)
J. Glaciology.

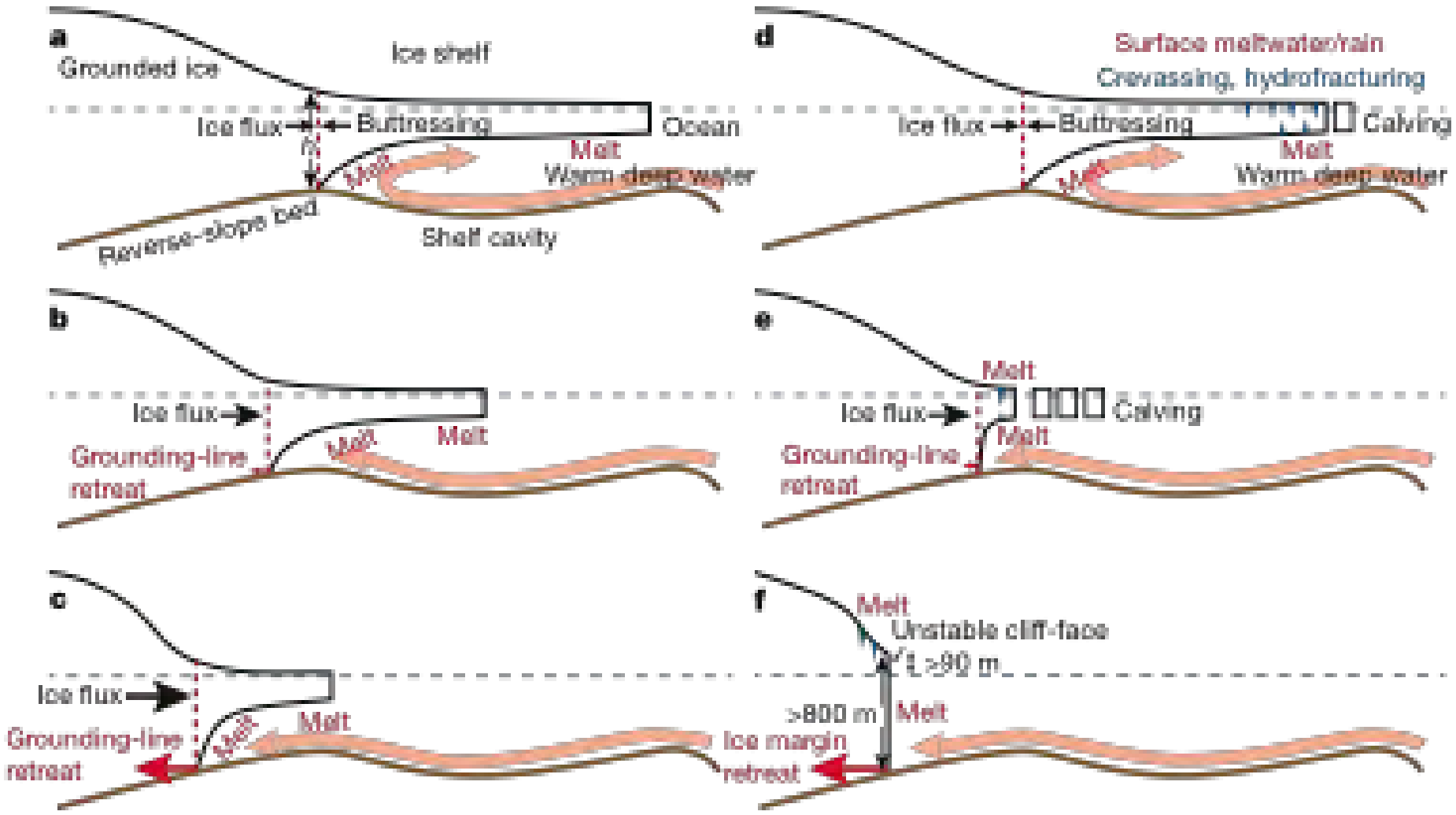
Marine Ice Sheet Instability



DeConto & Pollard (2016) Contribution of Antarctica to past and future sea level rise. Nature 531

Marine Ice Sheet Instability

Marine Ice Cliff Instability

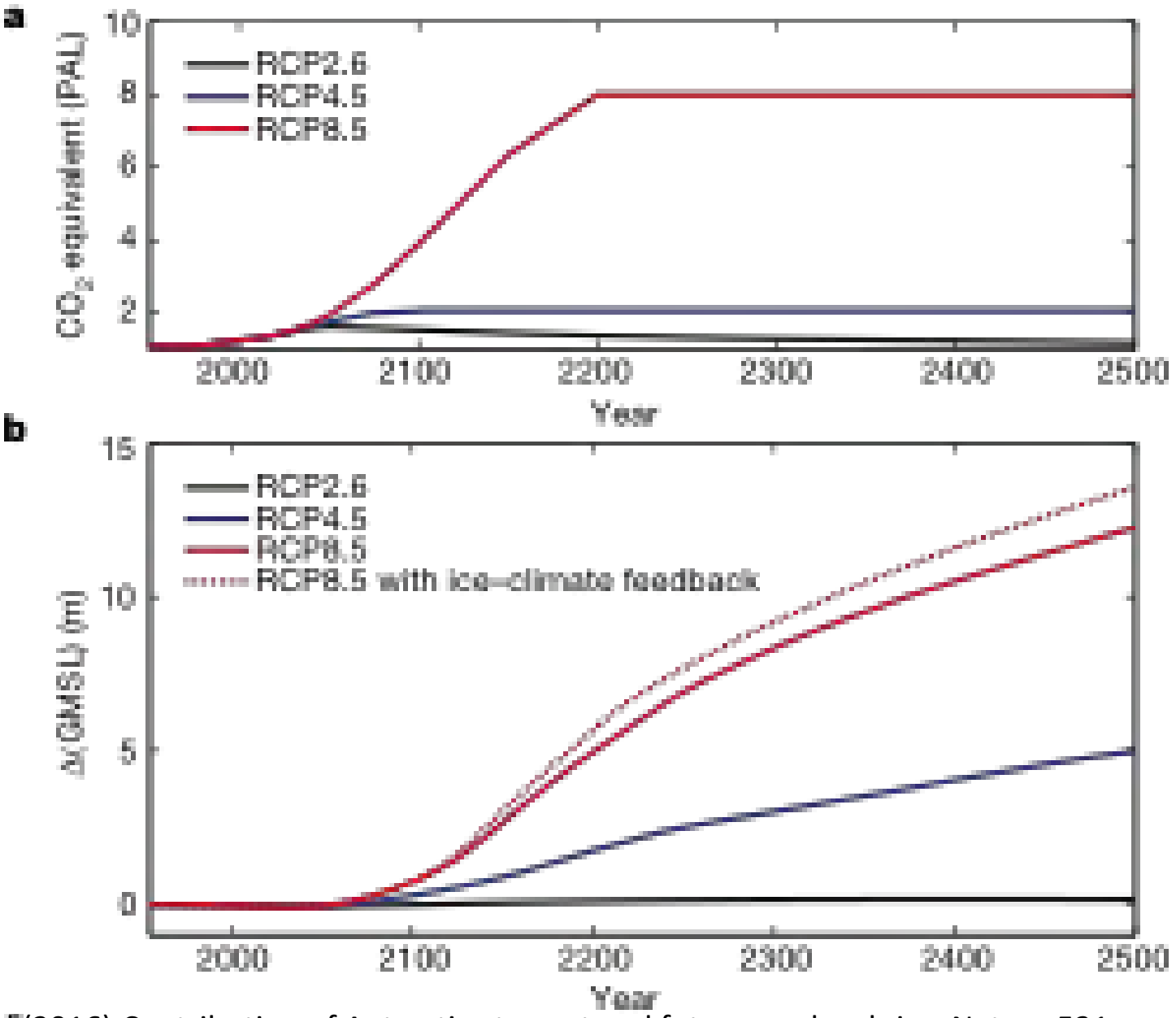


DeConto & Pollard (2016) Contribution of Antarctica to past and future sea level rise. Nature 531

Long-term Antarctica Contribution to SLR

CO2 eq. forcing (x preindust. atm. level)

Antarctica contribution to SLR



DeConto & Pollard (2016) Contribution of Antarctica to past and future sea level rise. Nature 531

Sea Level Rise, Storm Surges, and Extreme Precipitation in Coastal New Hampshire: Analysis of Past and Projected Trends

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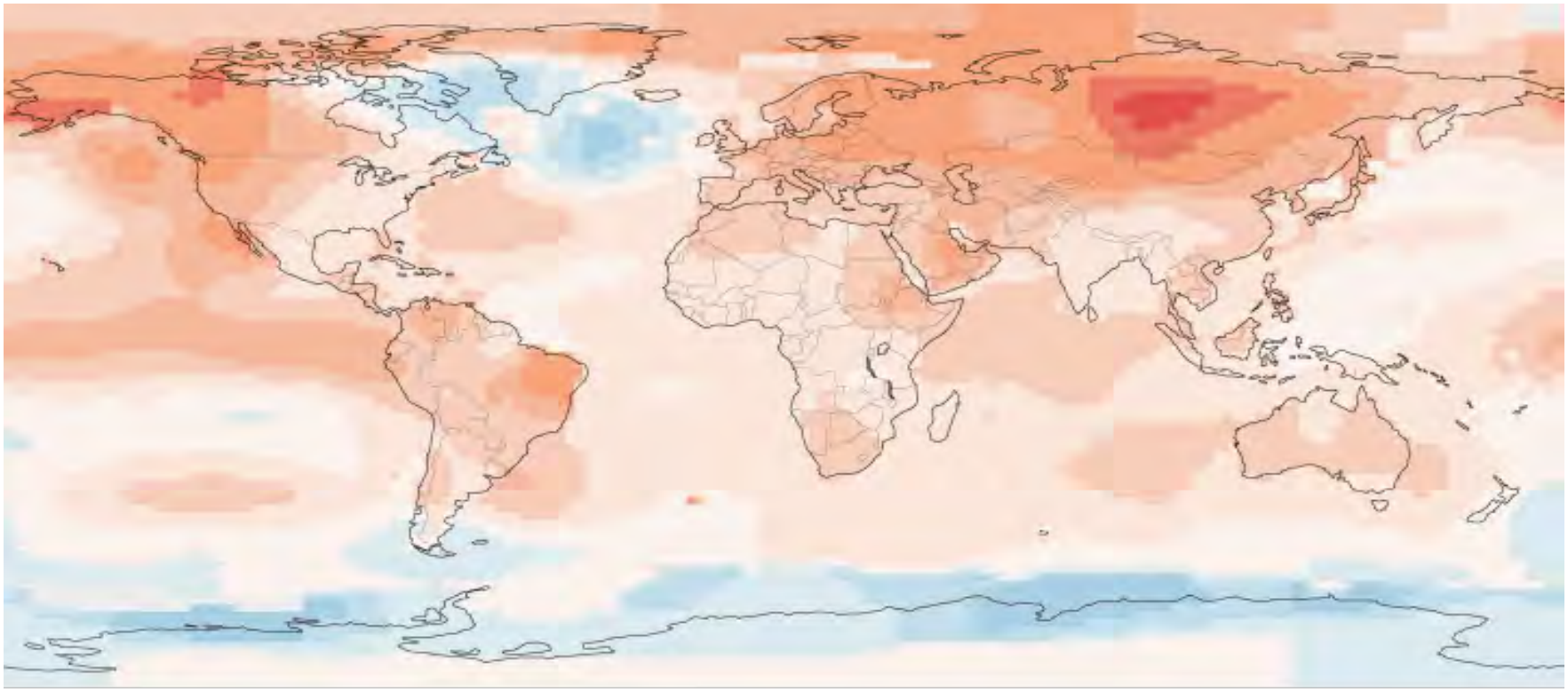
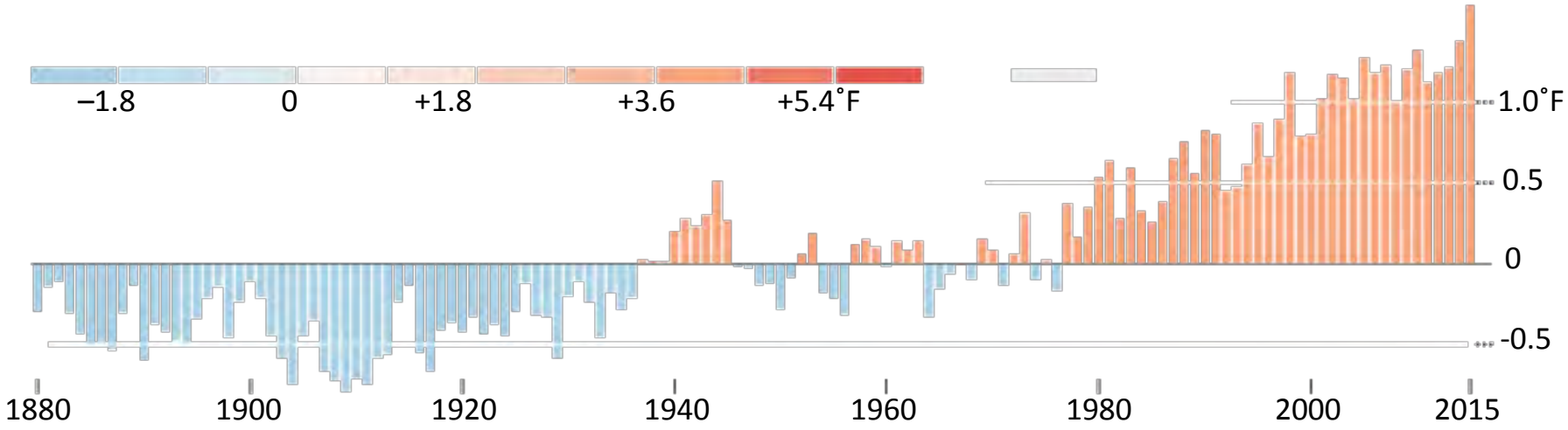
Petermann Glacier, Northern Greenland, July 2012

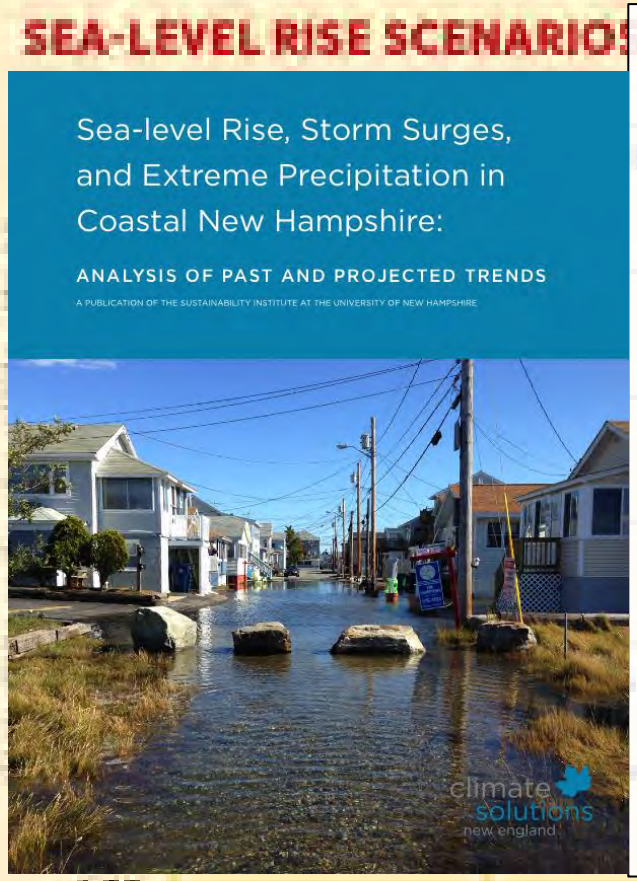
NASA/M. Studinger

Average Global Surface Air Temperatures 1880 – 2015 (From NASA GISS)





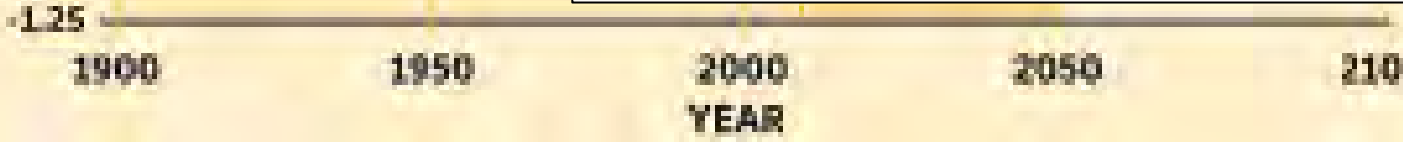
Global Mean Sea Level Rise (SLR) Scenarios
US National Climate Assessment



Where there is little tolerance for risk, communities should *commit* to:

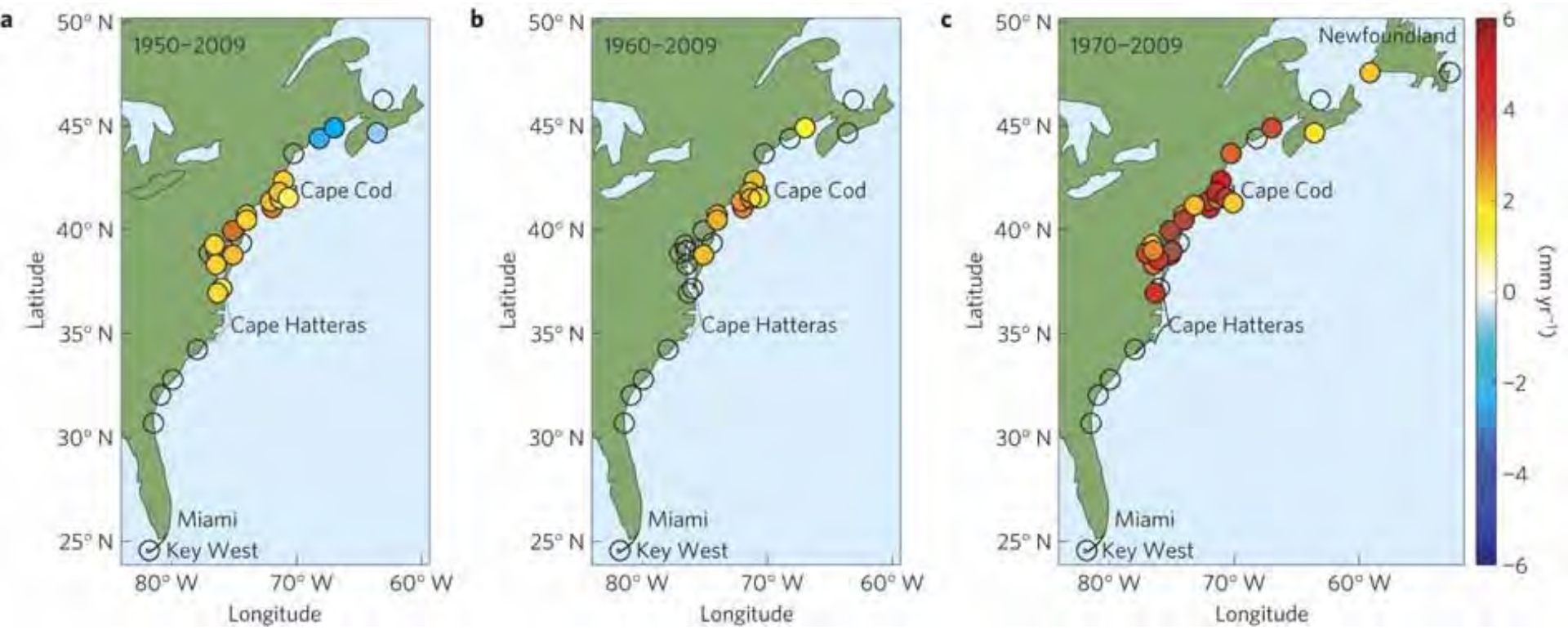
manage for **1.3** feet of SLR, but be prepared to manage for as much as **2.0** feet of SLR by 2050;

manage for **4.0** feet of SLR, but be *prepared* to manage for as much **6.6** feet of sea level rise by 2100.



Hotspot of accelerated sea-level rise on the Atlantic coast of North America

Sallenger, Doran & Howd (2012) Nature Climate Change 2, 884–888.



Chasing Ice video:
https://www.youtube.com/watch?v=hC3VTgIPoGU