

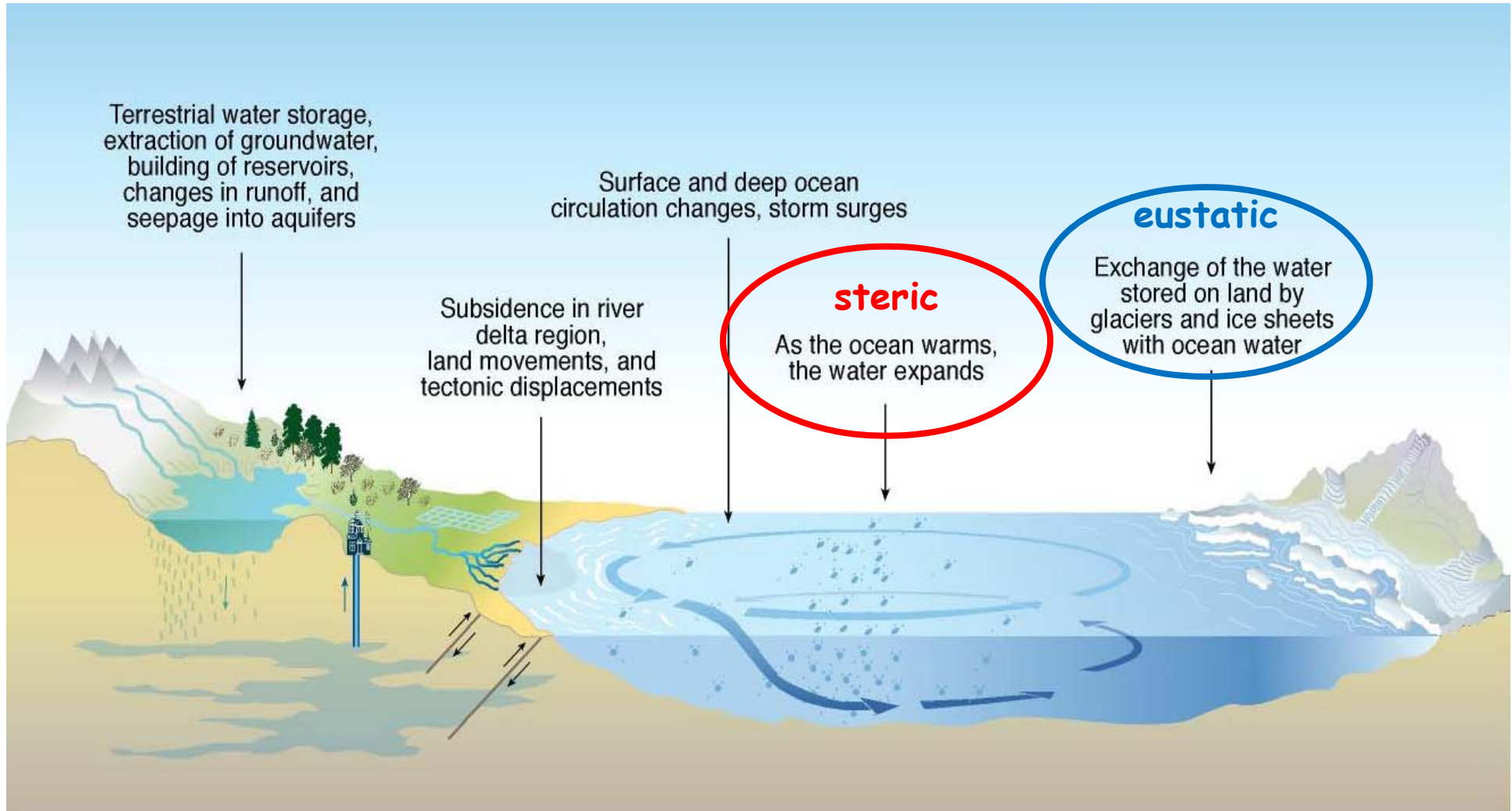
Sea Level Change and Mass Loss from Glaciers and Ice Sheets

Peter Lemke

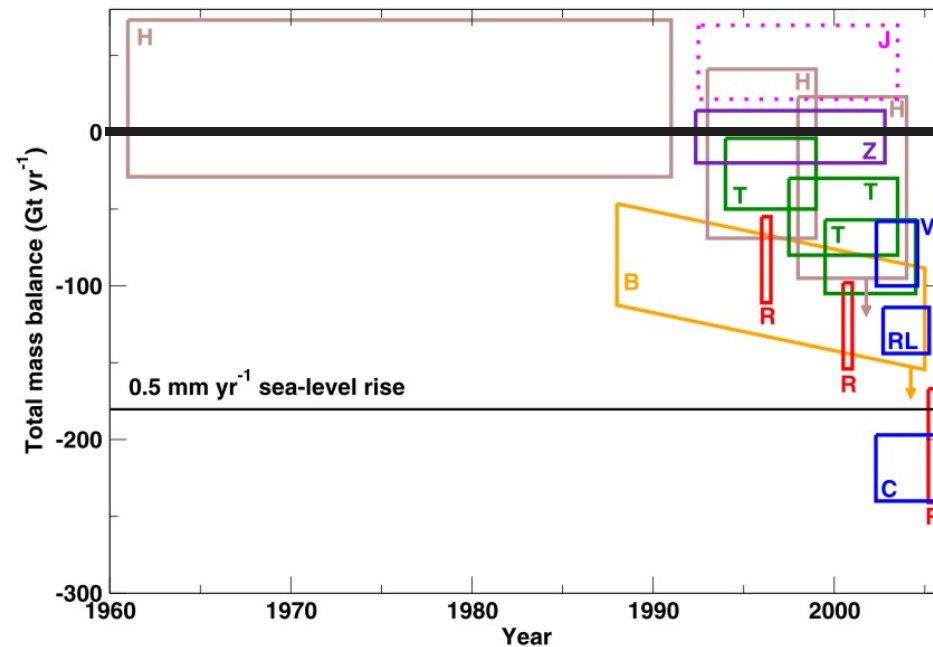
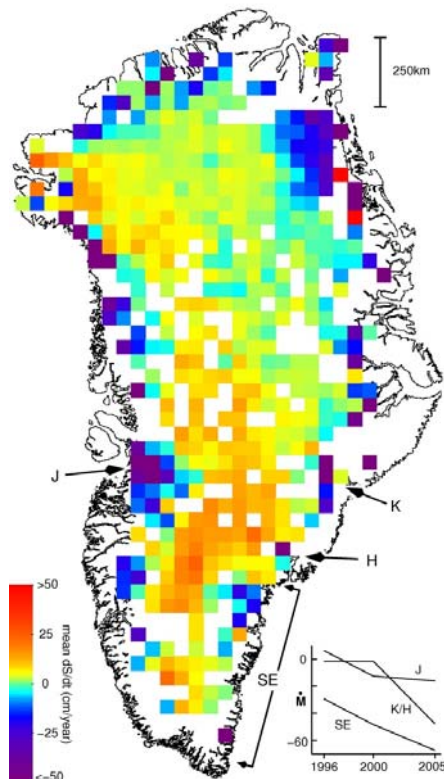
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What Causes Sea Level to Change?



Greenland ice sheet is shrinking



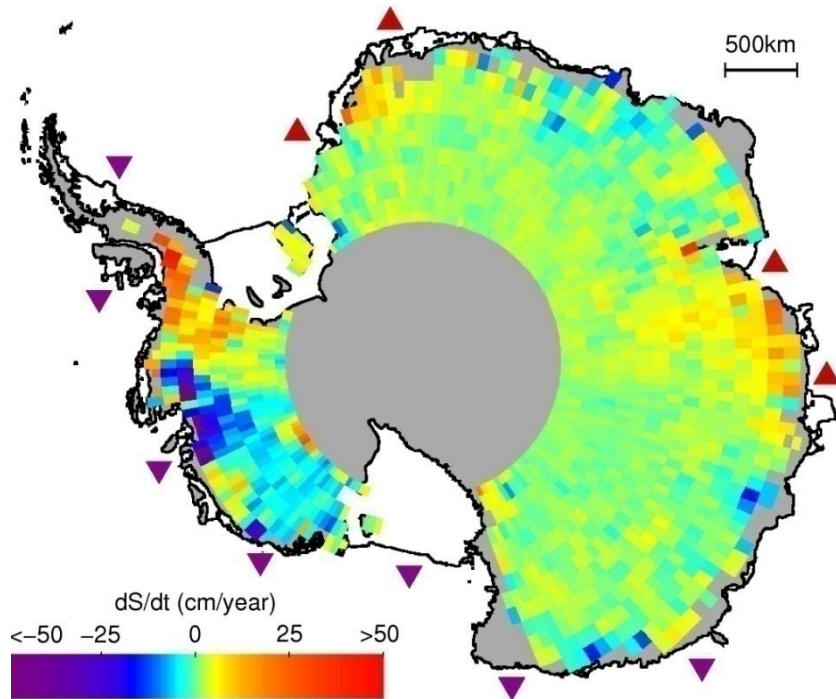
Greenland gains mass in the interior, but loses more at the margins.

Greenland mass loss is increasing
Loss: glacier discharge, melting

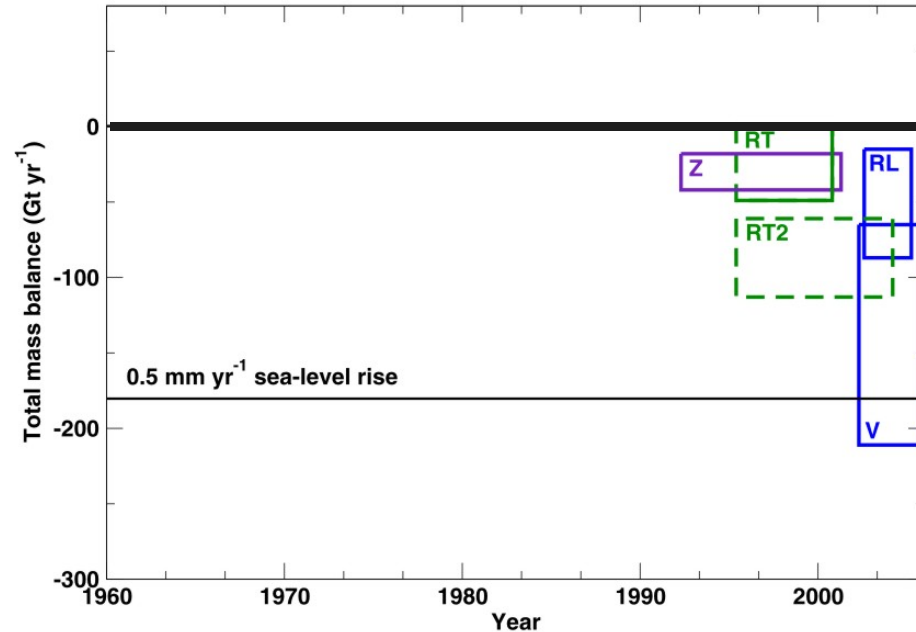
New (2012): Ice loss has doubled

Lemke et al. (2007) IPCC AR4, Chapter 4

Antarctic ice sheet is shrinking



New (2012):
Ice loss has increased



Antarctic ice sheet loses
mass mostly through
increased glacier flow

Lemke et al. (2007) IPCC AR4, Chapter 4

Contribution of the cryosphere to sea level rise

Table SPM-1. Observed rate of sea level rise and estimated contributions from different sources. {5.5, Table 5.3}

| Source of sea level rise | Rate of sea level rise (mm per year) | |
|---|--------------------------------------|------------------------|
| | 1961 – 2003 | 1993 – 2003 |
| Thermal expansion | 0.42 ± 0.12 | 1.6 ± 0.5 |
| Glaciers and ice caps | 0.50 ± 0.18 | 0.77 ± 0.22 |
| Greenland ice sheet | 0.05 ± 0.12 | 0.21 ± 0.07 |
| Antarctic ice sheet | 0.14 ± 0.41 | 0.21 ± 0.35 |
| Sum of individual climate contributions to sea level rise | 1.1 ± 0.5 | 2.8 ± 0.7 |
| Observed total sea level rise | 1.8 ± 0.5 ^a | 3.1 ± 0.7 ^a |
| Difference (Observed minus sum of estimated climate contributions) | 0.7 ± 0.7 | 0.3 ± 1.0 |

1.2 ± 0.4 mm/Year

**New data:
3.2 mm/year**

**New data for land ice melt
~1.8 mm/year**

Table note:

^aData prior to 1993 are from tide gauges and after 1993 are from satellite altimetry

Glaciers: 0.9 mm/a; GIS: 0.6 mm/a; AIS: 0.3 mm/a

Thanks for your attention

