ICE CHANGES IN ANTARCTICA, THE HIMALAYAS AND OTHER MOUNTAIN GLACIER REGIONS

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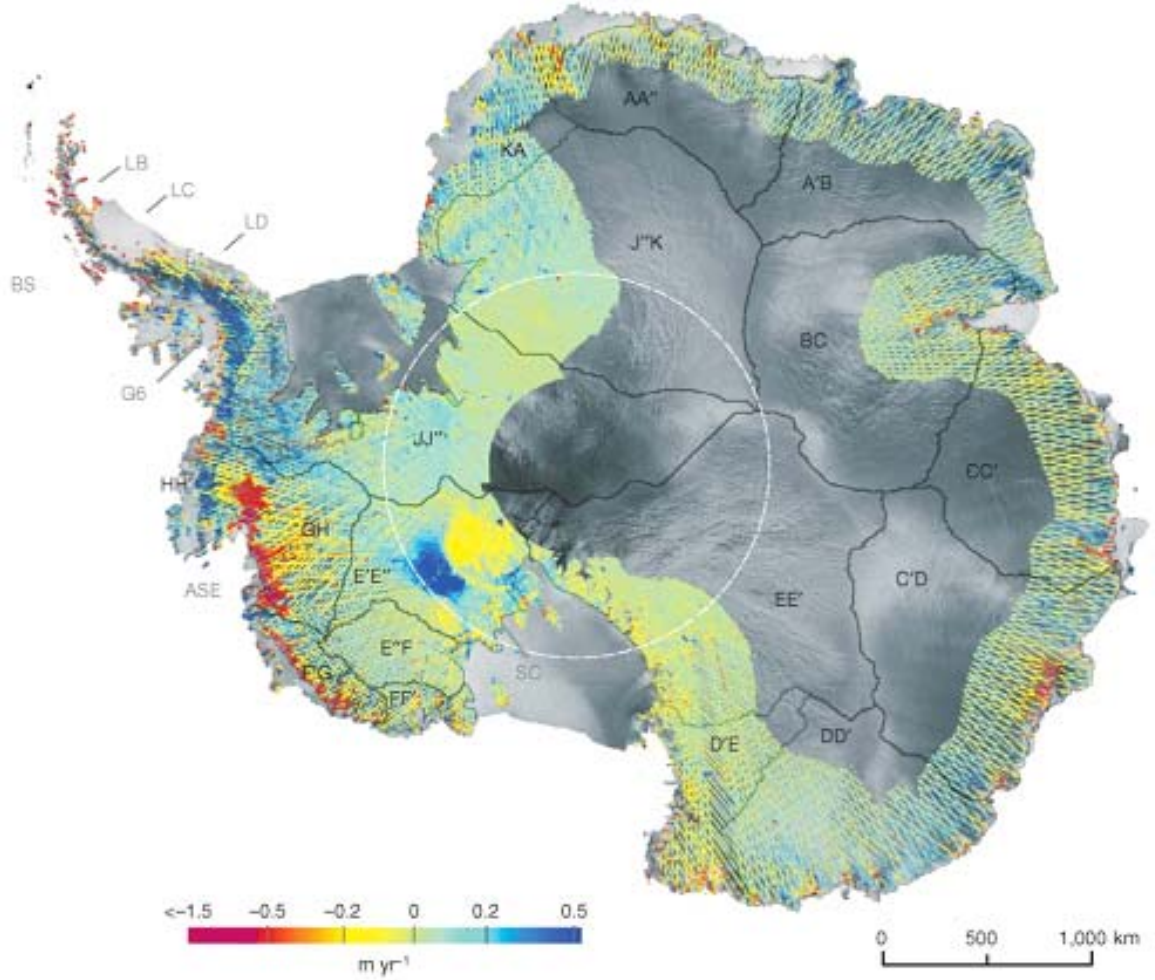
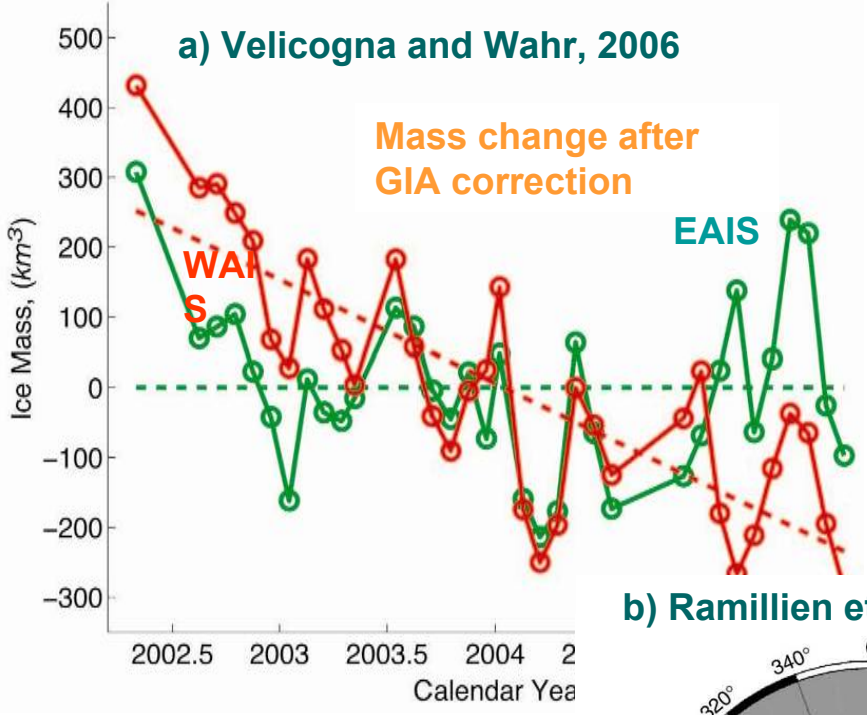
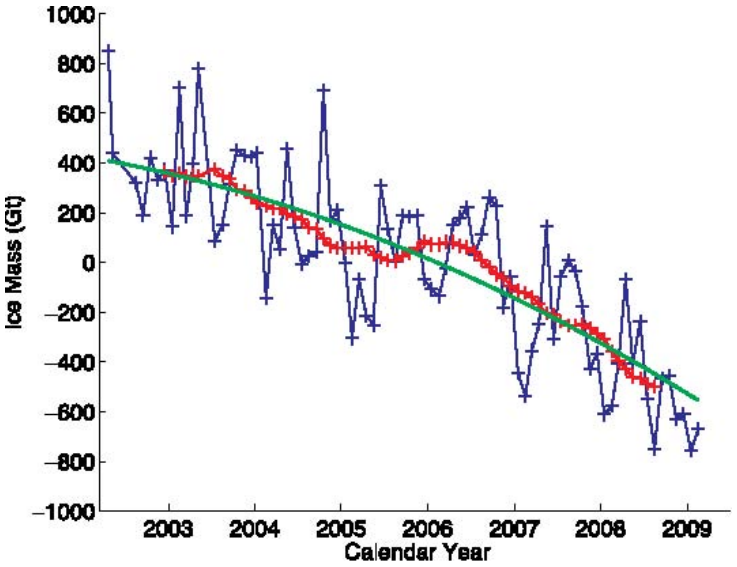
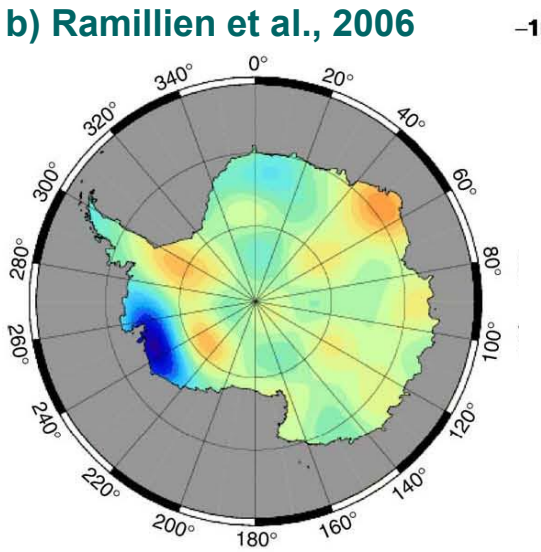
Rate of **change of the surface elevation** of the Antarctic Ice Sheet from satellite laser altimetry during the period 2003-2007 (Pritchard et al., 2009)

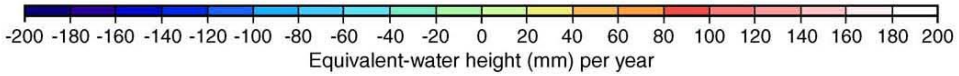


Antarctic Estimates from GRACE



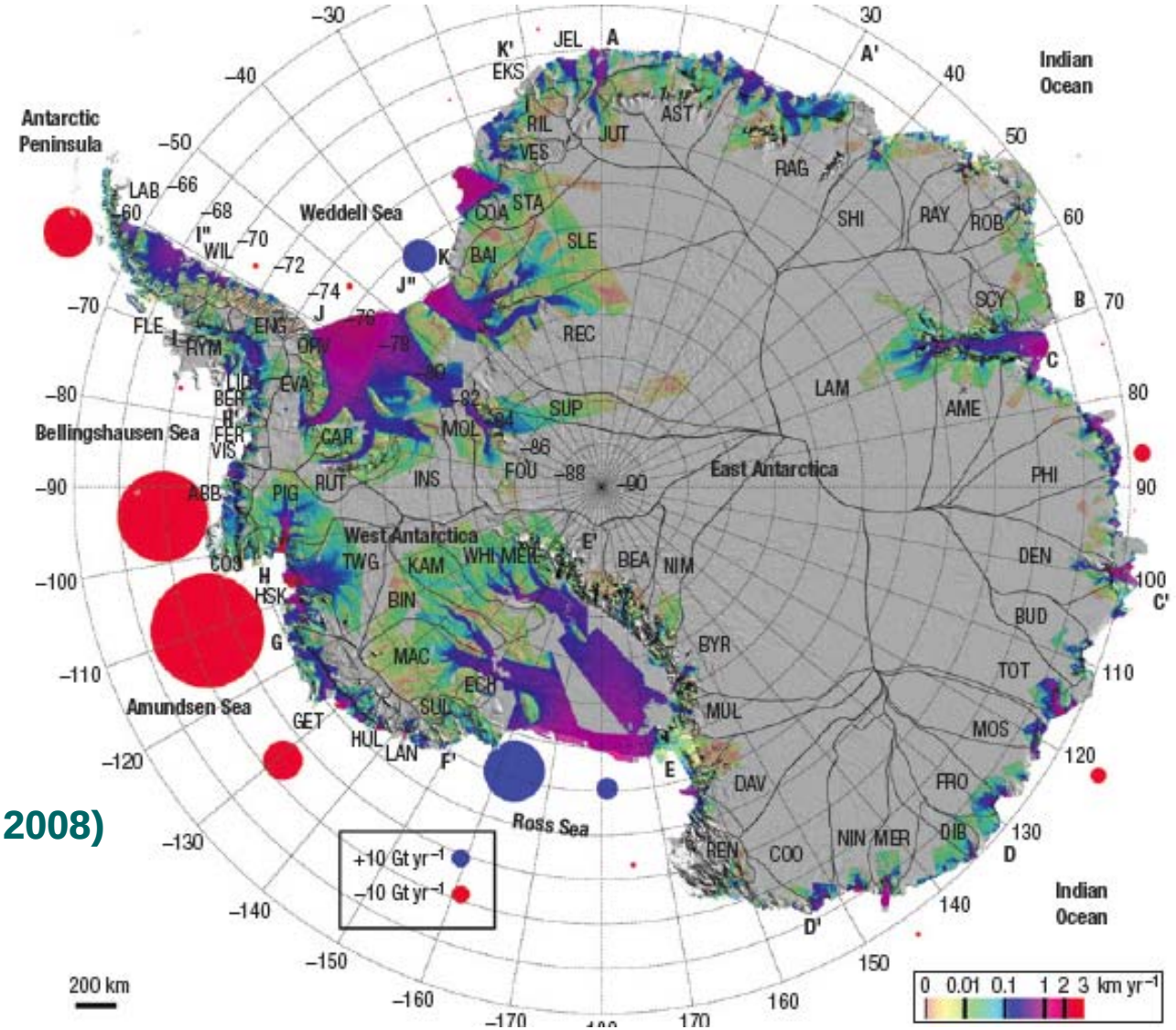






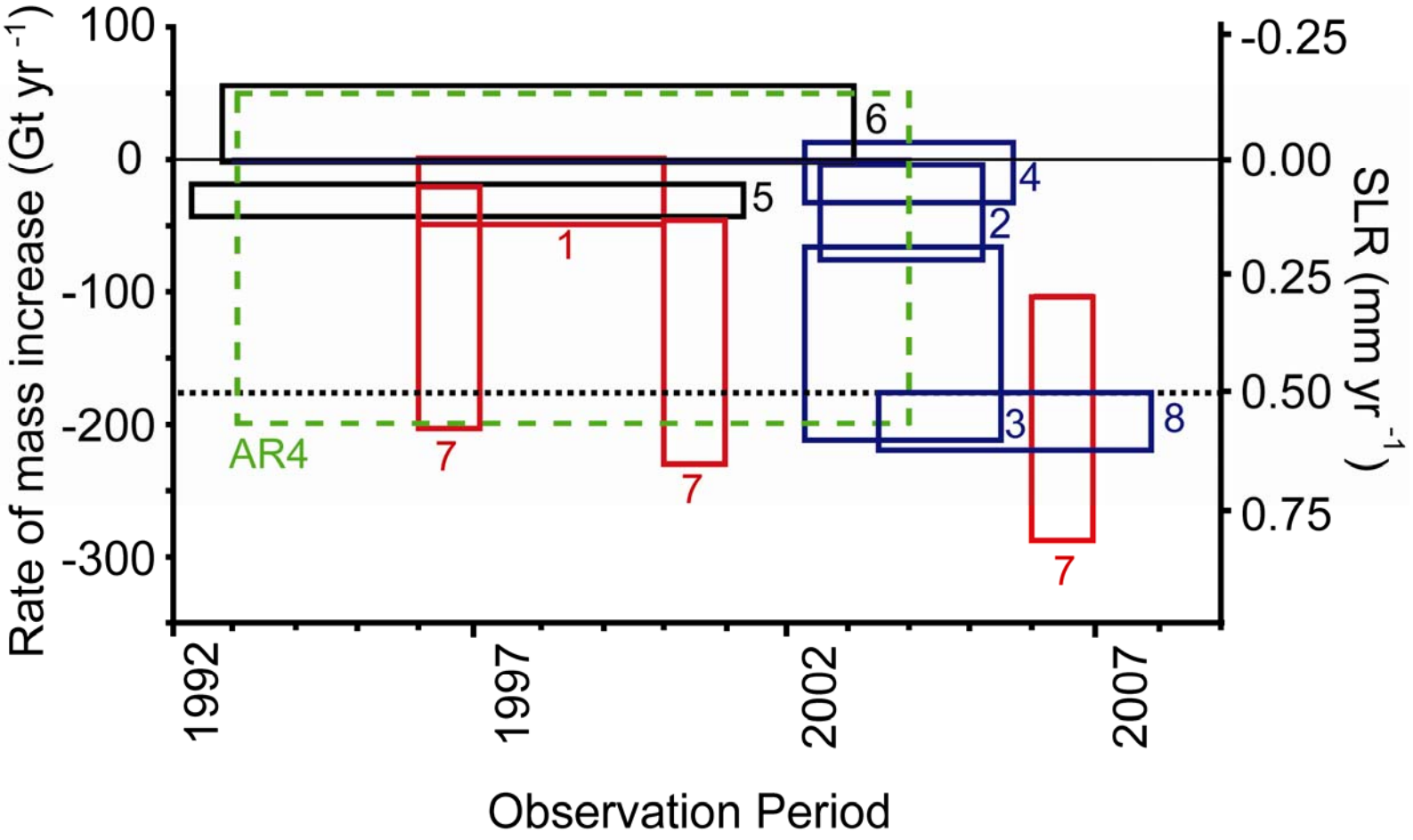
Time series of Antarctic mass change estimated monthly from GRACE data. The green quadratic trend suggests a slight acceleration in loss

Mass Loss from Flux Estimates



Rignot et al. (2008)

Antarctic Ice Sheet and Sea Level Rise



Copenhagen Diagnosis (2011)

0.5-0.6 mm SLE/yr (±40%)

Causes, and Future Antarctic Mass Loss

a. The loss from Antarctica is occurring almost solely from **increased ice discharge** into the ocean.

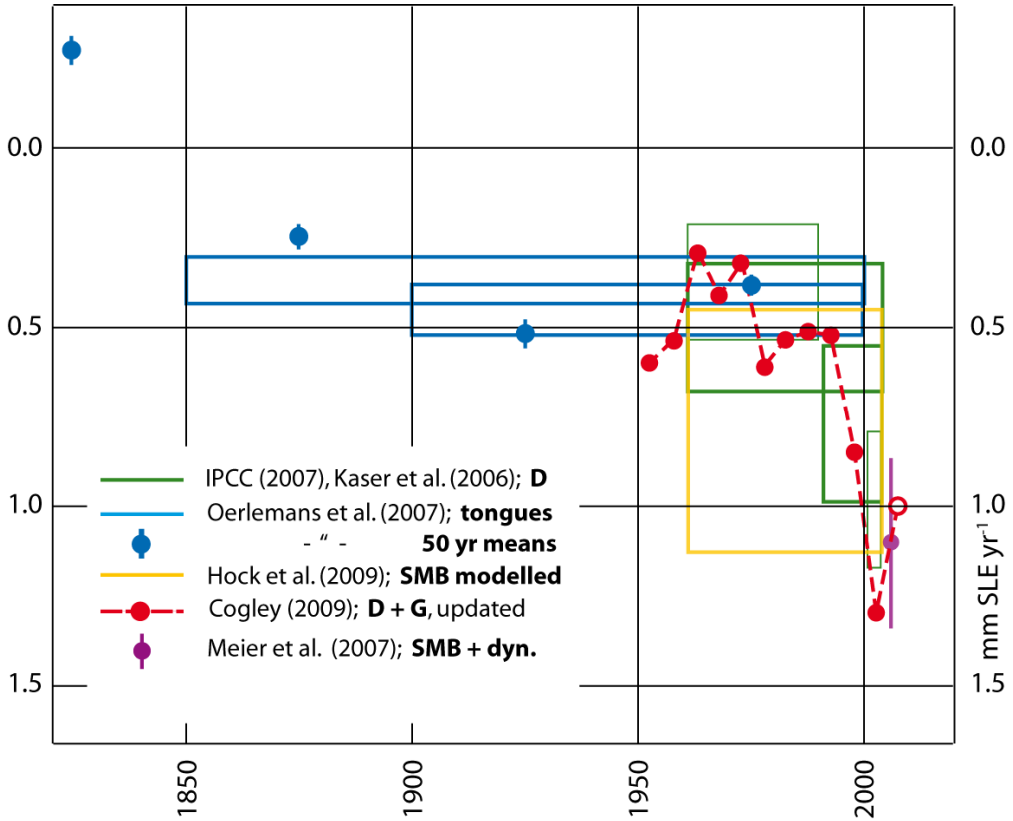
b. The cause is not well understood. One strong possibility is **thinning of floating ice shelves from a warmer ocean**, or **changed ocean circulation**, leading to acceleration of the grounded ice behind.

c. Extensive **sub-glacial water** in the form of lakes and **active drainage systems** has recently been discovered under the ice sheet. The **impact** of these on ice sheet dynamics is **not clear**.

d. **Acceleration** of the rate of **loss from Antarctica** over the next century is a strong **possibility** (e.g. Marine Ice Sheet instability). Accurate **projections** however **cannot** be made **without** better understanding of some of the **dynamic processes.**

e. A number of major **IPY projects** addressed these problems, and will contribute substantially to improving ice sheet projections.

Glaciers and Sea Level Rise



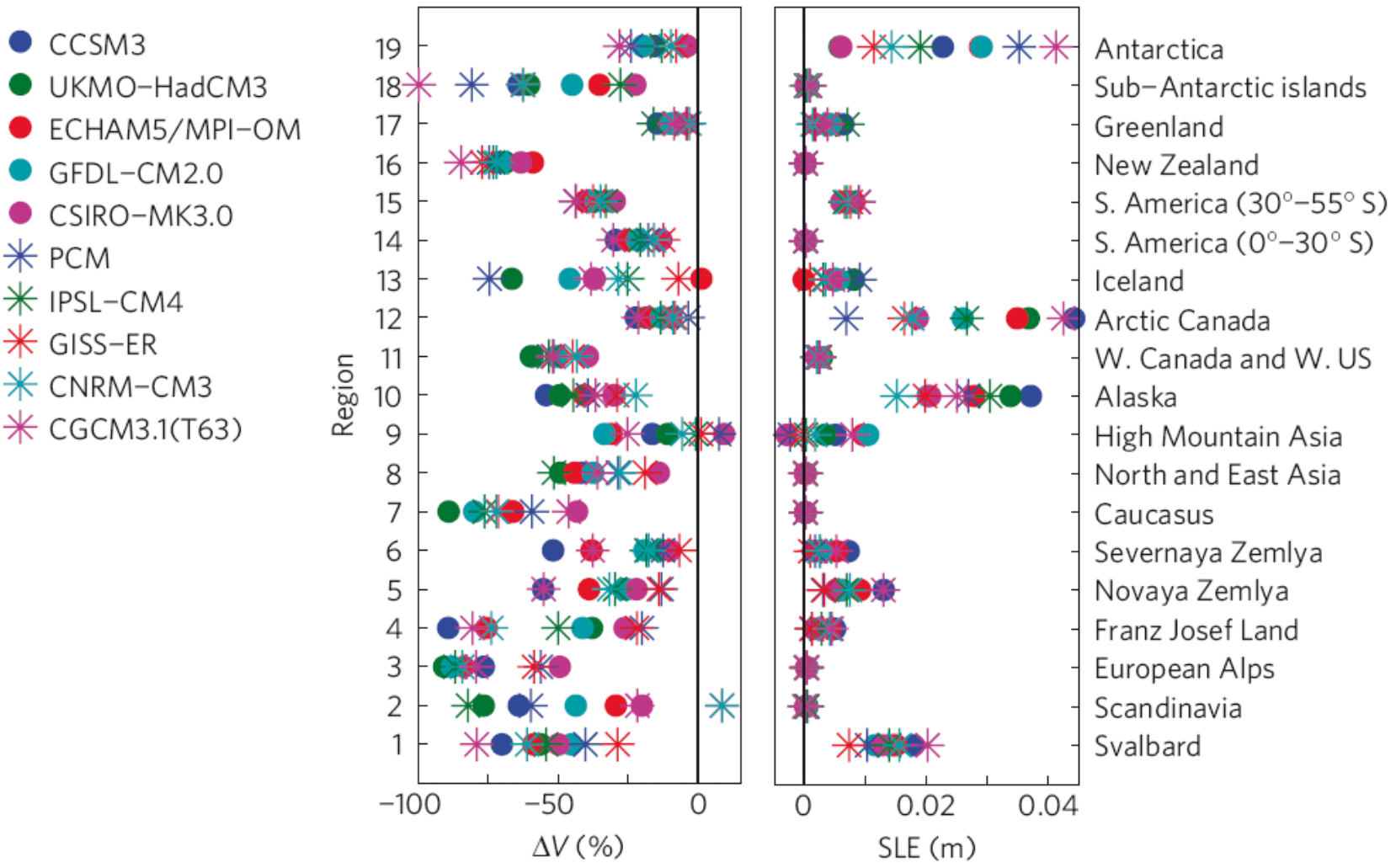
1.2 mm SLR/yr

Copenhagen Diagnosis (2011)

- glaciers out of balance with present climate: **~18 cm SLR**
- GL and AA ice sheets out of balance

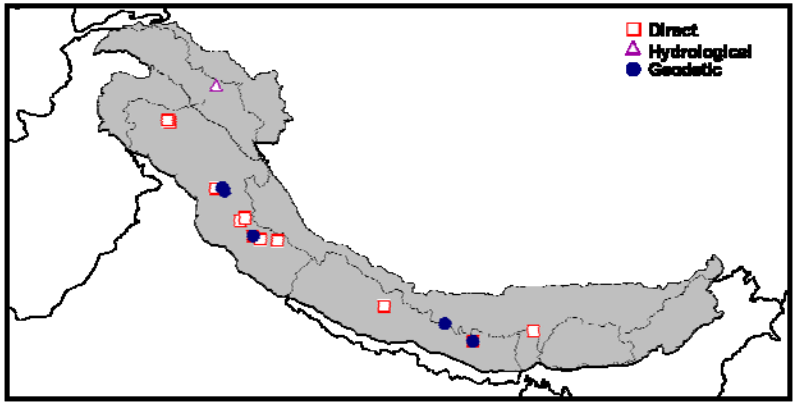
SLR: 1 + m until 2100
…. and more meters to come in following centuries

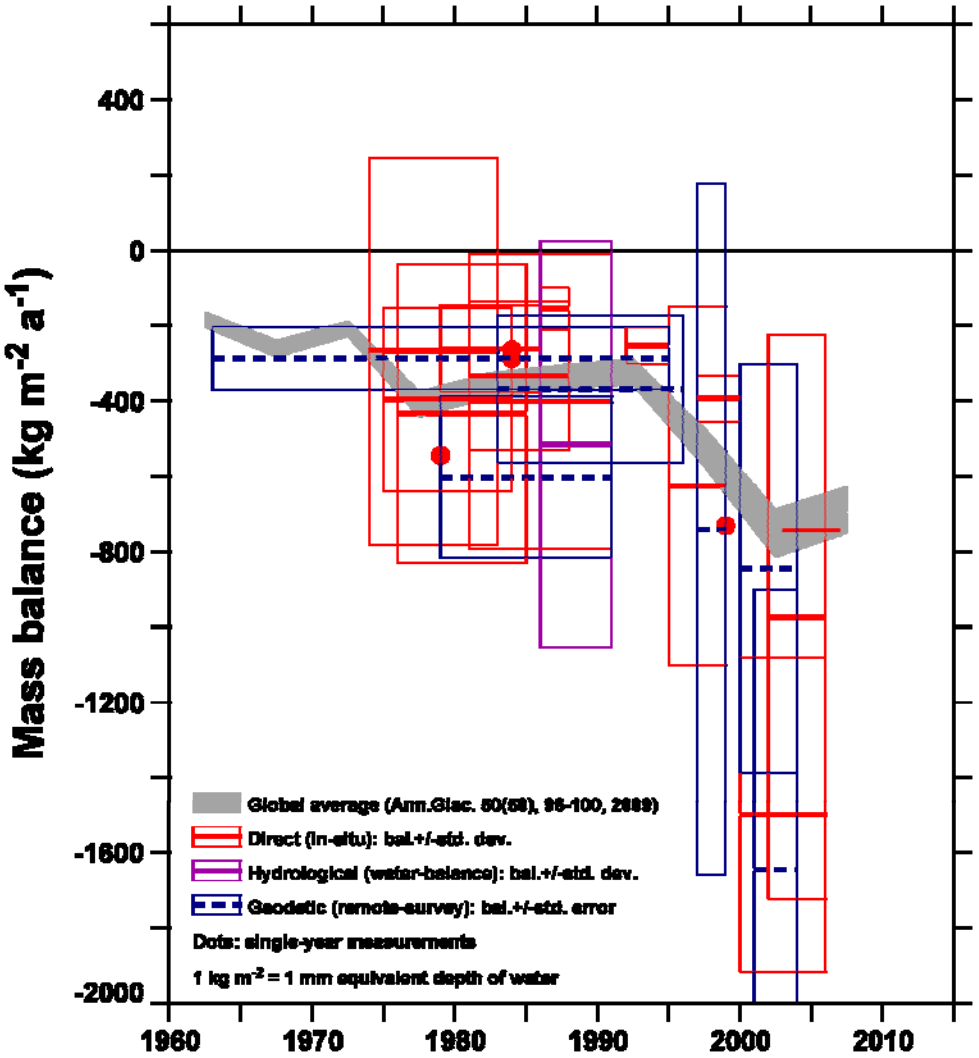
VOLUME REDUCTION AND SEA-LEVEL EQUIVALENT (SLE) UNTIL 2100 FOR 16 REGIONS



Radić & Hock (2011)

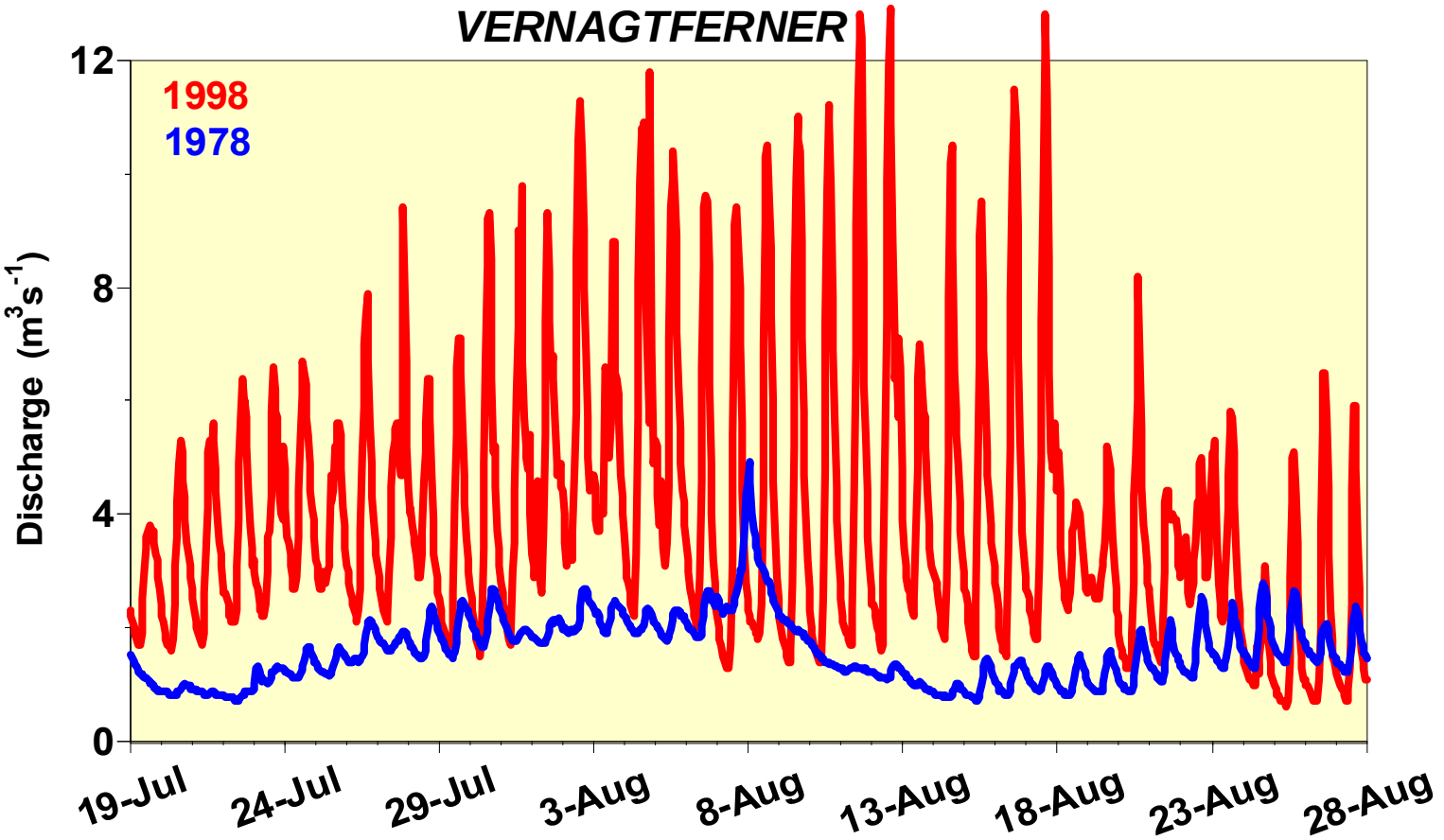
HIMALAYA





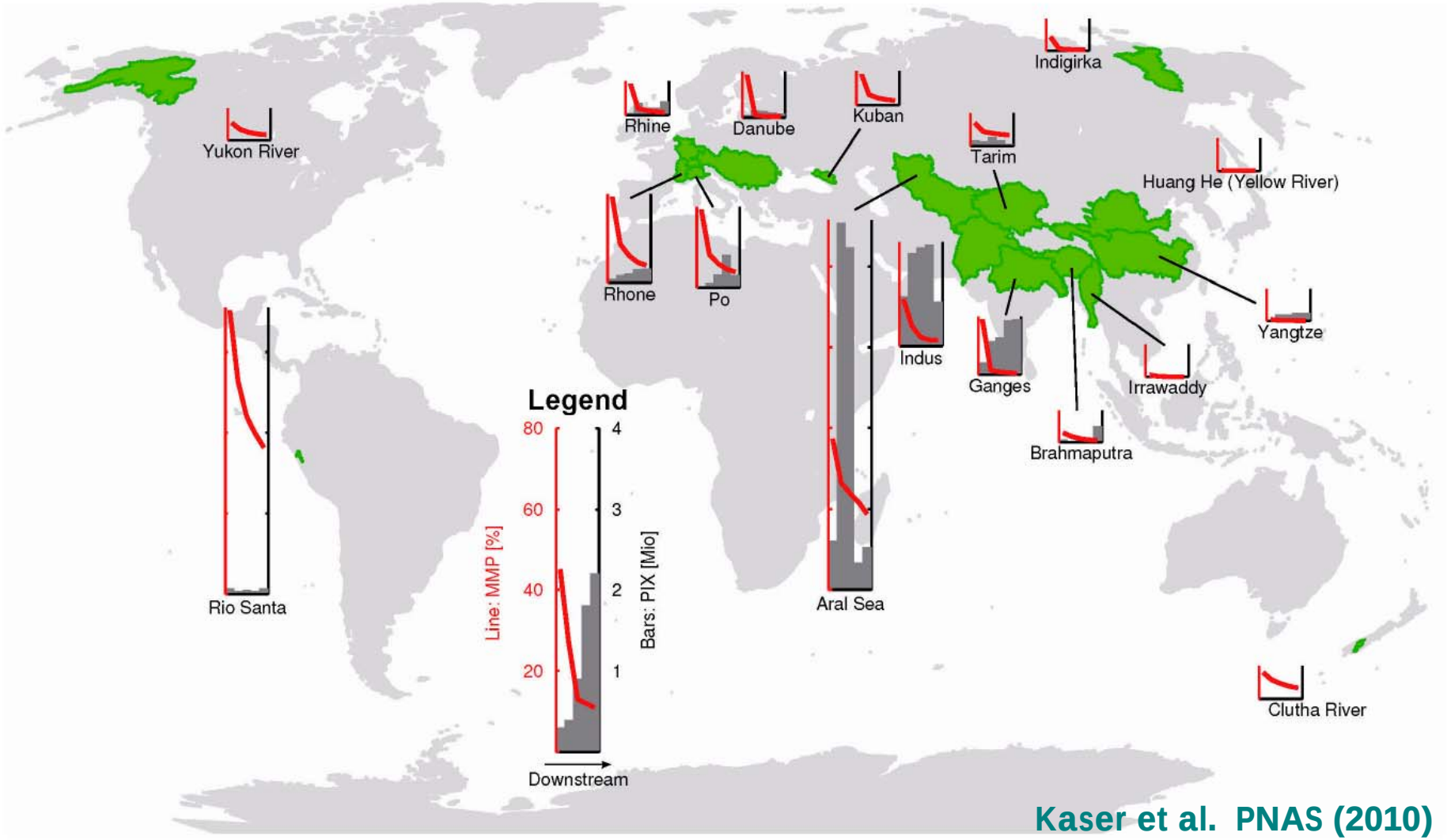
Cogley, AnnGlac 52(59) (accepted)

GLACIER RUNOFF



Courtesy: **Bayerische Akademie der Wissenschaften**, Glaziologische Kommission

Glaciers and Regional Water Availability



Kaser et al. PNAS (2010)

Glaciár Artesonraju, Cordillera Blanca, Peru © B. Marzeion (2010)