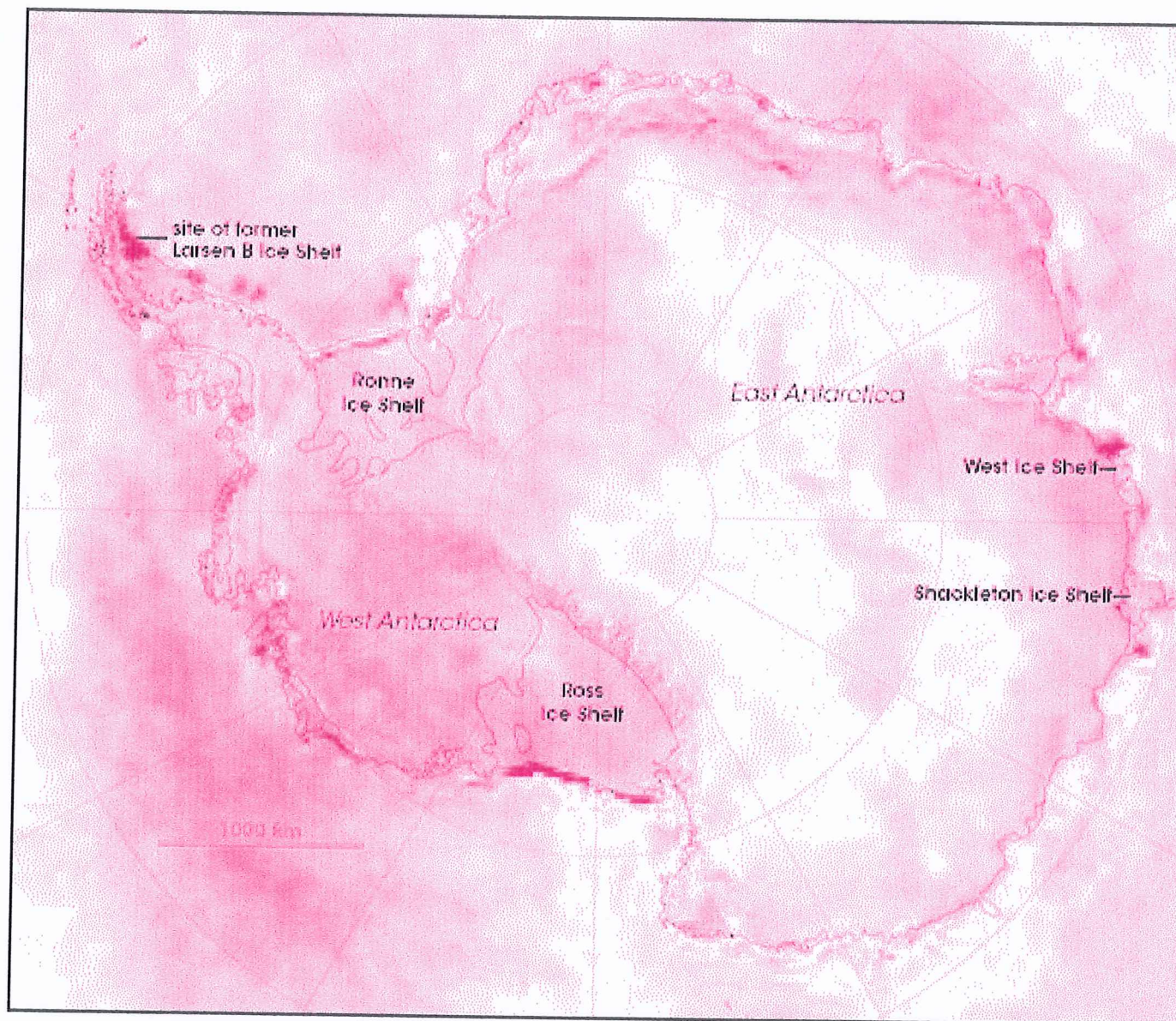
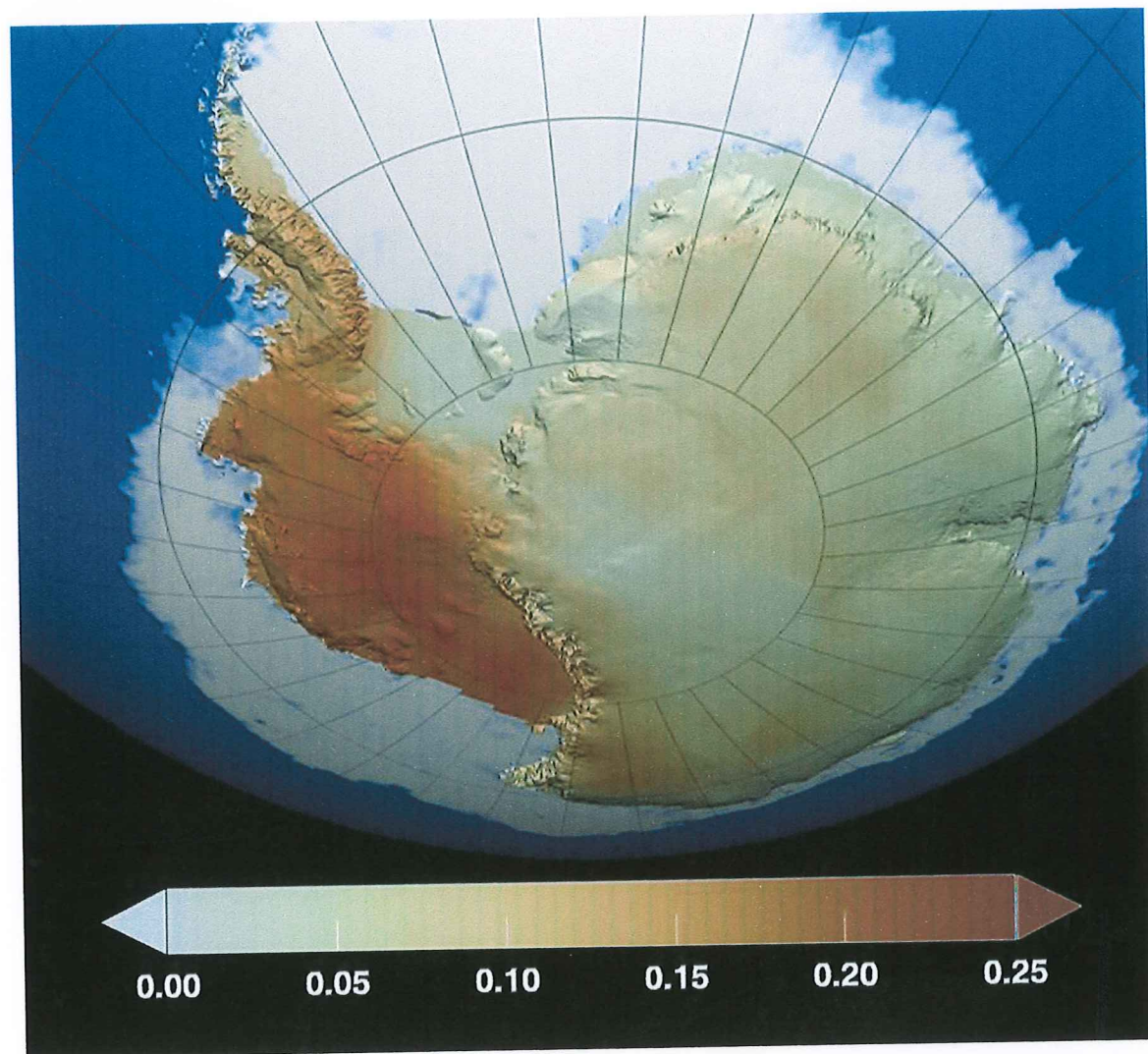
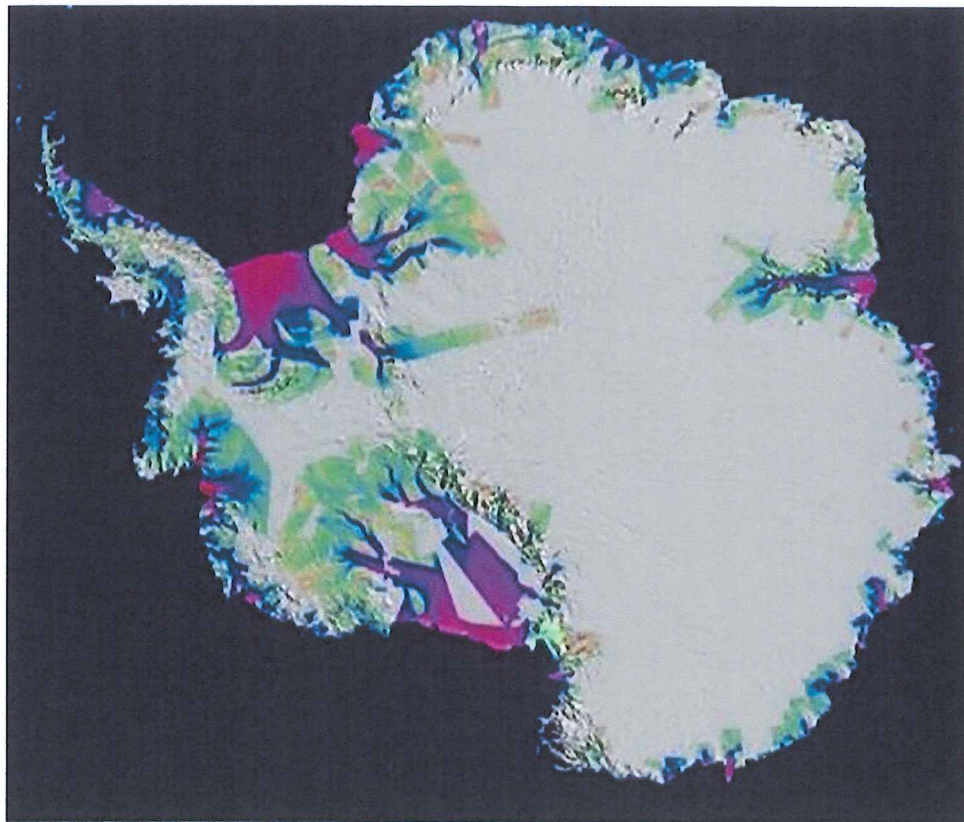


http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=17838

	
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EXHIBIT	4
DATE RECEIVED	22/4/09
INQUIRY	545 E 21





Antarctic ice loss between 1996 and 2006, overlaid on a Moderate Resolution Imaging Spectroradiometer (MODIS) mosaic image of Antarctica. The colors indicate the speed of the ice loss. Purple/red is fast. Green is slow. (Credit: NASA)

Recent Antarctic ice mass loss from radar interferometry and regional climate modelling

Eric Rignot^{1,2,3}, Jonathan L. Bamber⁴, Michiel R. van den Broeke⁵, Curt Davis⁶, Yonghong Li⁶, Willem Jan van de Berg⁵ & Erik van Meijgaard⁷

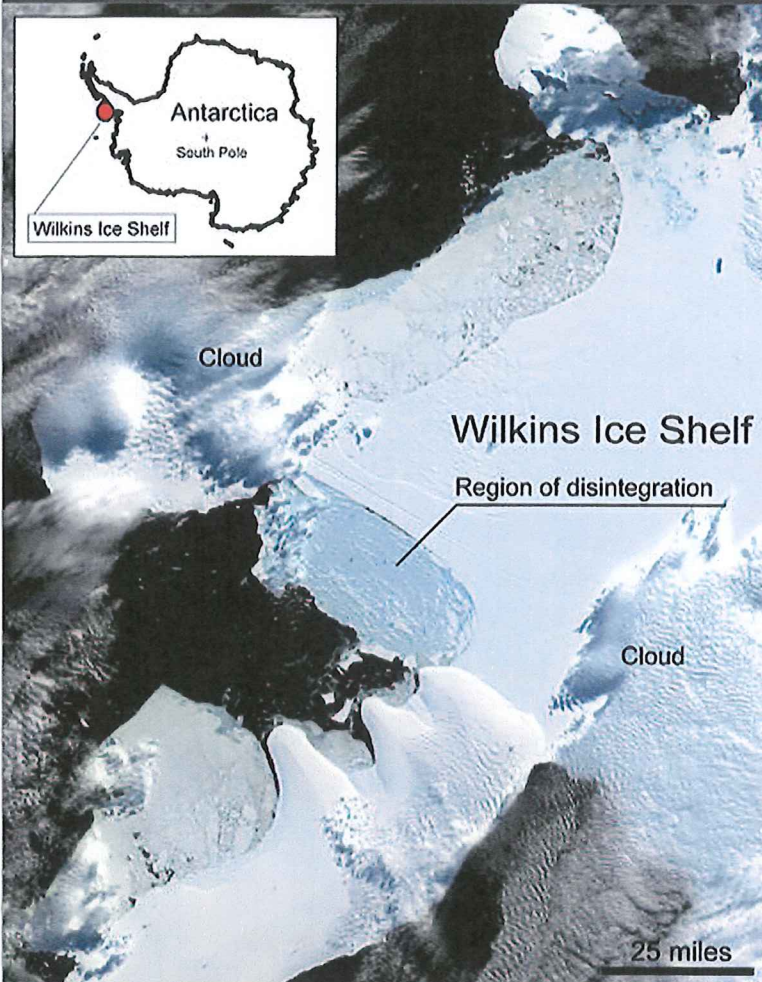
Large uncertainties remain in the current and future contribution to sea level rise from Antarctica. Climate warming may increase snowfall in the continent's interior^{1, 2, 3}, but enhance glacier discharge at the coast where warmer air and ocean temperatures erode the buttressing ice shelves^{4, 5, 6, 7, 8, 9, 10, 11}. Here, we use satellite interferometric synthetic-aperture radar observations from 1992 to 2006 covering 85% of Antarctica's coastline to estimate the total mass flux into the ocean. We compare the mass fluxes from large drainage basin units with interior snow accumulation calculated from a regional atmospheric climate model for 1980 to 2004. In East Antarctica, small glacier losses in Wilkes Land and glacier gains at the mouths of the Filchner and Ross ice shelves combine to a **near-zero loss of 4.61 Gt yr⁻¹**. In West Antarctica, widespread losses along the Bellingshausen and

Amundsen seas **increased the ice sheet loss by 59% in 10 years to reach 132.60 Gt yr⁻¹ in 2006. In the Peninsula, losses increased by 140% to reach 60.46 Gt yr⁻¹ in 2006.** Losses are

concentrated along narrow channels occupied by outlet glaciers and are caused by ongoing and past glacier acceleration. Changes in glacier flow therefore have a significant, if not dominant impact on ice sheet mass balance.

ScienceDaily (Jan. 24, 2008) — Ice loss in Antarctica increased by 75 percent in the last 10 years due to a speed-up in the flow of its glaciers and is now nearly as great as that observed in Greenland, according to a new, comprehensive study by NASA and university scientists. In a first-of-its-kind study, an international team led by Eric Rignot of NASA's Jet Propulsion Laboratory, Pasadena, Calif., and the University of California, Irvine, estimated changes in Antarctica's ice mass between 1996 and 2006 and mapped patterns of ice loss on a glacier-by-glacier basis. They detected a sharp jump in Antarctica's ice loss, from enough ice to raise global sea level by 0.3 millimeters (.01 inches) a year in 1996, to 0.5 millimeters (.02 inches) a year in 2006.

March 6, 2008



February 28, 2008



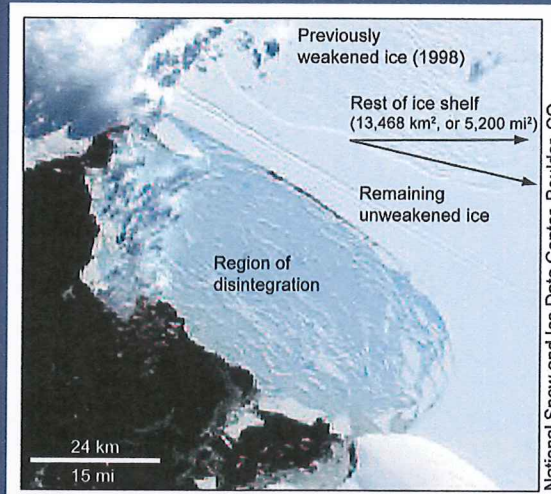
February 29, 2008



March 8, 2008



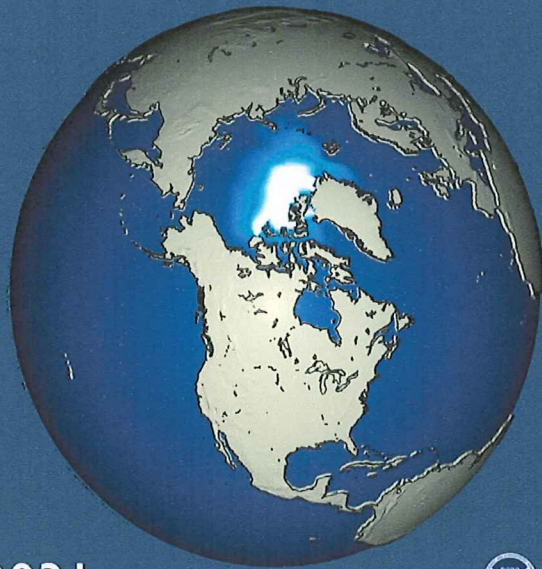
National Snow and Ice Data Center, Boulder, CO



National Snow and Ice Data Center, Boulder, CO

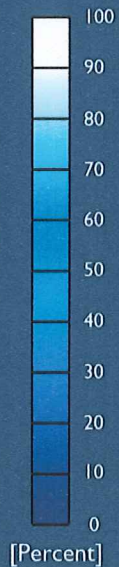


NOAA GFDL CM2.1 Model Simulation: SRES A1B Scenario

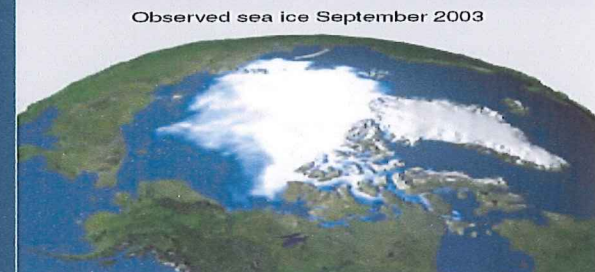
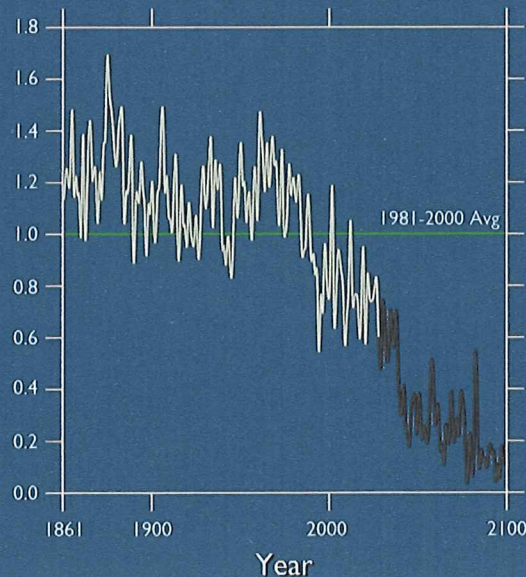


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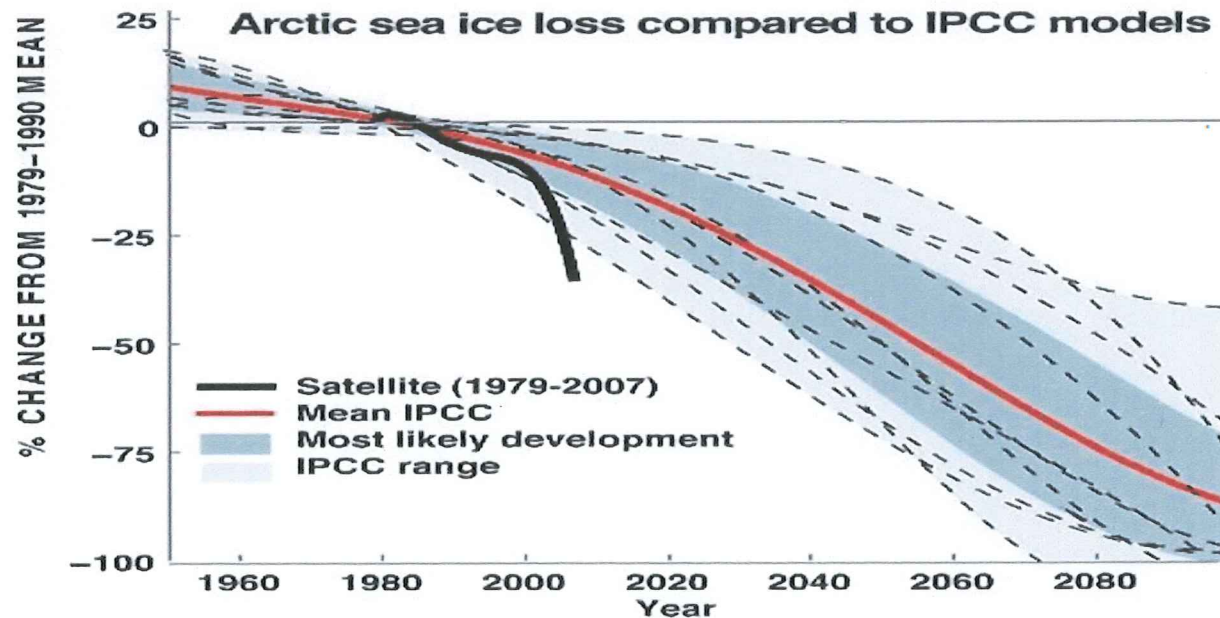
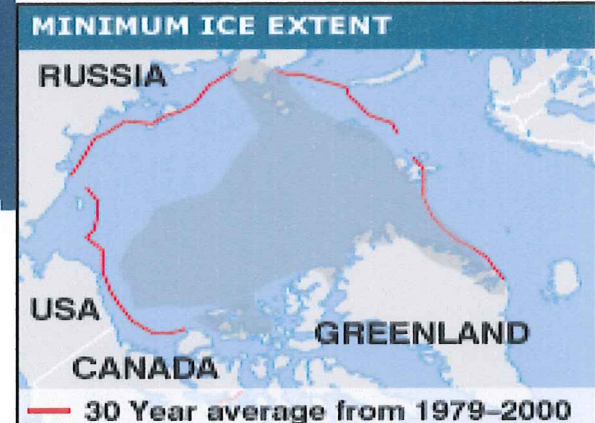
Aug Sept Oct Avg Sea Ice Concentration



Fractional Arctic Wide Sea Ice Concentration



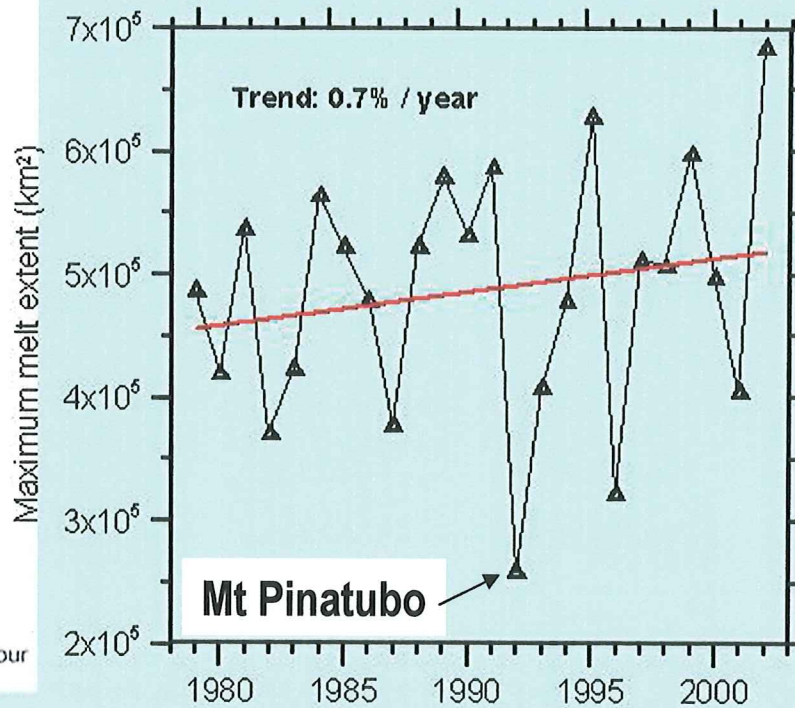
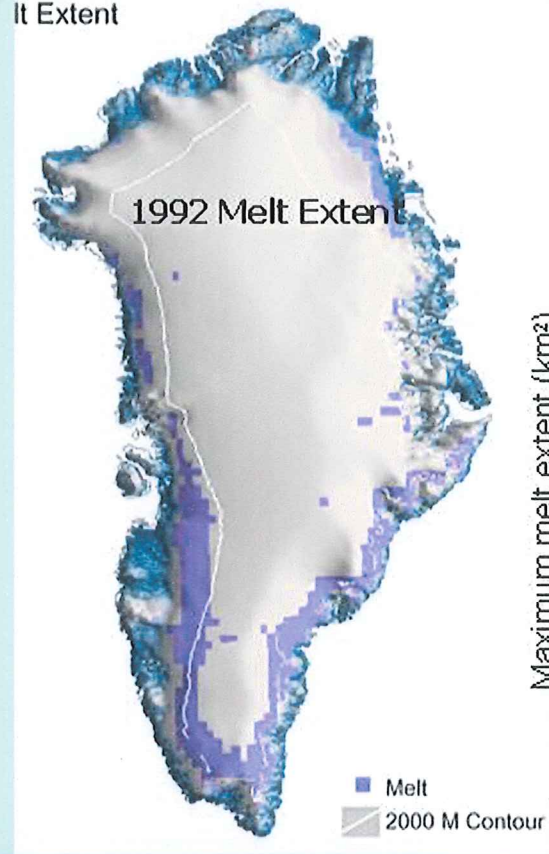
Source: Arctic Climate Impact Assessment (ACIA), 2004. Impacts of a Warming Arctic.



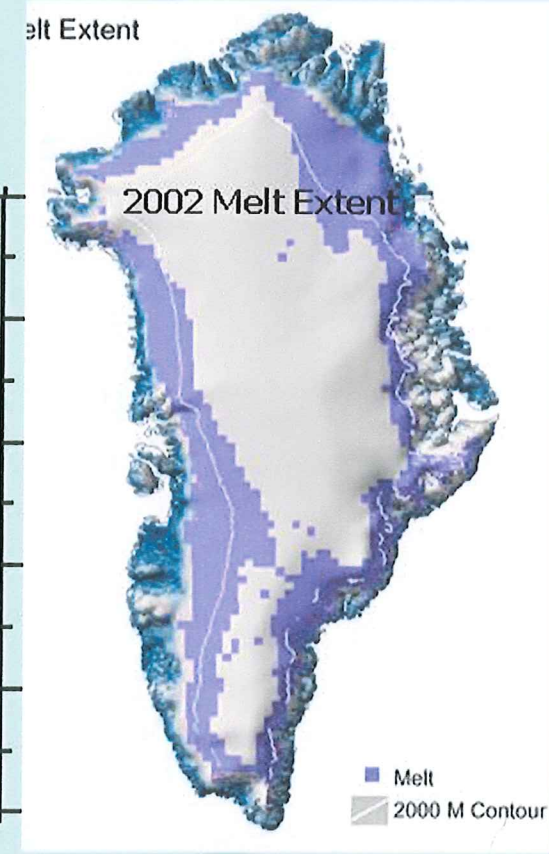
Melting of Ice over Greenland: 1992 - 2002

Passive Microwave derived maximum melt extent

1992 Melt Extent



2002 Melt Extent



Average melt increase 16% from 1979 to 2002

Data from Konrad Steffen and Russell Huff, University of Colorado

