Abstract submission for Symposium on Interactions of Ice Sheets and Glaciers with the Ocean, June 2011, Scripts

Thickening and Thinning of Antarctic Ice Shelves and Tongues and Mass Balance Estimates

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Previous analysis of elevation changes for 1992 to 2002 obtained from measurements by radar altimeters on ERS-1 and 2 showed that the shelves in the Antarctic Peninsula (AP) and along the coast of West Antarctica (WA), including the eastern part of the Ross Ice Shelf, were mostly thinning and losing mass whereas the Ronne Ice shelf also in WA was mostly thickening. The estimated total mass loss for the floating ice shelves and ice tongues from ice draining WA and the AP was 95 Gt a^{-1}. In contrast, the floating ice shelves and ice tongues from ice draining East Antarctica (EA), including the Filchner, Fimbul, Amery, and Western Ross, were mostly thickening with a total estimated mass gain of 142 Gt a^{-1}. Data from ICESat laser altimetry for 2003-2008 gives new surface elevation changes (dH/dt) with some similar values for the earlier and latter periods, including -27.6 and -26.9 cm a^{-1} on the West Getz ice shelf and -42.4 and -27.2 cm a^{-1} on the East Getz ice shelf, and some values that indicate more thinning in the latter period, including -17.9 and -36.2 cm a^{-1} on the Larsen C ice shelf, -35.5 and -76.0 cm a^{-1} on the Pine Island Glacier floating, -60.5 and -125.7 cm a^{-1} on the Smith Glacier floating, and -34.4 and -108.9 cm a-1 on the Thwaites Glacier floating. Maps of measured dH/dt and estimated thickness change are produced along with mass change estimates for 2003 - 2008.