Measuring Changes in the Vicinity of the Seal Nunataks Ice Shelf Remnant from Imagery and Altimetry

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Abstract
Acquisition and analysis of a combination of repeated imagery and ICESat laser altimetry has enabled the ongoing losses from the northern Larsen B ice shelf remnant to be assessed. The remnant, the Seal Nunataks ice shelf (SNIS), has four ICESat tracks that cross it as well as adjacent tracks that cross Robertson Island (RI) and the margin of the Antarctic Peninsula. The available altimetry data from ICESat (2003-2009) shows that elevation losses increase from west to east across the SNIS. Ice elevation losses suggest mean ice shelf thinning rates of up to 1.7 m a^{-1} and reveal processes continuing to impact the shelf remnant. The derived mean ice shelf thickness losses are dependent on firn compaction and inferred density values but along with the average elevation losses measured for RI's grounded ice suggest the magnitude of local ice losses. Asymmetric changes across RI indicate that strongly sloping terrain can influence ice loss depending on slope aspect sufficiently to impact overall mass balance estimates. Imagery analysis using Landsat 7 and ASTER images acquired during 2001-2013 shows that ice area losses continued on the shelf remnant after the Larsen A break up in early 1995 and the Larsen B collapse in early 2002. The largest losses (~340 km^2) occurred on the north side of the remnant in late 2004 into 2005 [Shuman et al., 2011] with small losses along the remaining margins. Despite a slight regional cooling in recent years and more persistent sea ice in the area, the SNIS is still retreating past its pinning points. In contrast to SNIS, RI has experienced minor ice area losses that are consistent with most of it being grounded and is less directly impacted by ocean interactions compared to the shelf remnant. Together, these data sets provide additional insights about ongoing ice losses in the Larsen A/B area.

- Ice-ocean interaction *(Surfin' USA)*
    - everywhere else (*Promised Land)*