Title: LeConte Glacier, Alaska: Submarine Melting and Proglacial Fjord Dynamics in September 2012

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Submarine melting has been increasingly implicated as a controlling factor in the stability of GrIS outlet tidewater glaciers and floating tongues. An oft referenced paper describing such a connection in Alaska, concerned research done over a decade ago at LeConte Glacier (Motyka et al, 2003). We returned to LeConte Glacier in Sept 2012 and conducted extensive hydrographic surveys over a four day period. We used regularly spaced CTD casts and ADCP (600 kHz and 150 kHz) current measurements to parameterize a 1.2 km wide, 200 m deep fjord cross-section, located about 2 km from the calving terminus. Simultaneously, we monitored the emergent outflow plume at the terminus using time-lapse photography. A major rain event transpired during the second survey day, thus the surveys captured the influence of changing freshwater discharge on melting and inner fjord dynamics. Our results confirm strong submarine melting (1.4 to 2.4 $x10^6$ m^3/d, equivalent to 10 to 17 m/d w.e. terminus ice melt), driven by high rates of subglacial freshwater discharge (9 to 34 $x10^6$ m^3/d), and by thermal forcing of ~ 8° C. The outgoing plume favored the north side of the fjord, averaged about 450 m in width with a thickness of 30 to 50 m from the surface to the plume base. Peak currents ranged from 40 cm/s prior to the rain event to 70 cm /s following the event. These results have implications for modeling the effects that future warming and increased runoff at GrIS may have on glacier dynamics at the ice-ocean interface.