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Recognition of long period waves in Antarctic glacial marine (ice shelf) sediments.

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New information continues to be revealed regarding the role of long period waves in the dynamics of ice shelf grounding lines and the coupling between surrounding oceans and floating/grounded ice. While tidal forces (of both diurnal and fortnightly periods) are most readily observed to change flow velocity at the grounding line, other periods related to storm surge and tsunami events are also of interest. However, the short period of direct observation limits our understanding of the longer term role that these, potentially higher amplitude, waves might have on grounding line systems.

Yet it is theoretically possible that higher amplitudes in the wave forcing may induce changes in the grounding line dynamic that are larger than the currently observed perturbations in flow velocity. One way of examining this issue is to study the periodicity recorded in glacial marine sediments that are found beneath ice shelves and/or surrounding grounding line systems. Such records are now available; as from the Larsen B and A ice shelves whose disintegration has provided direct access to core sites near to, and across their recent grounding lines. Sediment traps have also been recovered from long period deployments (+ 1 year) near ice shelves and grounding line systems. Periodicity in sediment cores is revealed by the frequency and character of primary laminations (alternating texture and/or composition) and physical properties (such as water content). Sediment cores from the Larsen system reveal pronounced sub-mm scale laminations that are too infrequent to be annual cycles of sedimentation (i.e. varves). For instance we record only 200 laminations in the entire 40 cm record of the last 10 ka. The laminated facies are clearly proximal to the grounding line, as more distal ice shelf sediments are homogenous and nearly structureless. A model is put forward that explains the laminations in relation to the propagation of long period (high amplitude) waves beneath the Larsen Ice Shelf. Such waves are likely to have

induced short term instabilities in the grounding line zone that led to increased sediment release, from beneath grounding line cavities. Evidence in support of this model is provided from sediment trap records, water column studies in the Larsen region and high resolution sediment cores from fjords of the western side of the Antarctic Peninsula which clearly show a relationship to both tidal and storm surge periodicities.