Tidal Flexure and Associated Seismic Activity Near the Grounding Zone of Beardmore Glacier

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Near grounding zones, glacier behavior is significantly influenced by interactions with floating ice shelves. Thus, insights into the mechanical behavior and stability of ice shelves are required to understand the flow of ice sheets. We conducted a multi-faceted geophysical survey near the grounding zone of the Beardmore glacier in December 2013 to provide in situ constraints on physical processes relevant to understanding the interactions between floating and grounded ice. As observed in previous studies of the region, our GPS results record significant tidal flexure of the ice shelf as well as tidal modulation of flow speeds. Associated with this tidal deformation, we observe 100's of icequakes per day associated with the brittle deformation in the upper portion of the ice shelf. Seismicity rates peak during the rapid rising and falling of the tides, with only minimal seismicity near the daily low and high tides, when strain rates are minimal. The location of seismic events is concentrated near ridges in the surface topography that separate large melt channels we observed at the base of the ice shelf in our radar traverses. Thus, it appears that the melt induced structure of the ice shelf and tidal flexure regulate the plastic deformation in the upper portion of the ice shelf. These results highlight the interaction between tides, ocean processes, and the stability of ice shelves near grounding zones.

- everywhere else (*Promised Land)*