The influence of geological fabric on grounding line dynamics in the Amundsen Sea

Kirsty Tinto, Robin Bell, James Cochran

Lamont-Doherty Earth Observatory, Columbia University, Palisades, New York

Aerogeophysical surveys reveal a strong fabric in both the morphology and geology of the sea floor of the Amundsen Sea embayment. The shape and geological character of the ice bed and sea floor exert control on glacier behavior in a variety of ways. Troughs across the continental shelf, carved by past glacial advances, define the access routes for warm water towards the grounding line. Smaller scale features can affect both water mixing and ice dynamics near the grounding line and play a complex role in ice sheet stability. The geological character of the bed under grounded ice can also influence ice dynamics through basal friction and changes in geothermal heat flux.

Operation IceBridge has flown aerogravity surveys in West Antarctica since 2009, with the goal of mapping the bathymetry of the sea floor under floating ice, and understanding the geological setting of the ice sheet where ice is grounded. At the same time, the IceBridge instrument suite has monitored the thickness and surface elevation of the ice and reveals the grounding line changes in the region. We combine these observations from the Amundsen Sea, and identify morphological trends in both the bathymetry and geological fabric in the grounding zone region. We show that in spite of strong erosion, some geological features maintain a bathymetric expression that exerts strong control on the behavior of the grounding line. The resulting fabric is marked by ridges and troughs that define present day bed slopes and the pinning points that have stabilized the grounding line in the past.

Previous surveys have investigated trends in both offshore magnetic data (Gohl et al, 2013) and onshore gravity data (Diehl, 2008). Here we compare these trends with those from the present day grounding zone and demonstrate that even after significant erosion, the geological framework of the Amundsen Sea plays a persistent role in ice sheet stability.

Abstract submitted to: Ice-ocean interaction *(Surfin' USA)* - Amundsen Sea (*West Coast Blues)*