

Active-source seismology for imaging ice shelves and their cavities: revealing the goblins

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Floating ice shelves provide buttressing stresses that limit ice flow from ice sheets into the ocean. Where warm ocean currents come into contact with floating ice shelves, they can thin, leading to accelerations in ice discharge. These warm ocean currents are often topographically routed along lows in the seafloor, so there is strong interest in mapping seafloor topography beneath ice shelves. Ridges can block warm currents from accessing the ice, while channels can provide access of warm water to ice grounding zones. However, few tools are able to map seafloor bathymetry beneath ice shelves. Here we show examples of how active source seismology on the ice shelf surface can be used to map seafloor bathymetry. We show how these same techniques can give a rudimentary sense of ocean current structure. All examples come from Thwaites glacier in west Antarctica, a region of rapid change due to ocean-forced melt. We discuss how seafloor geometry may play a role in governing the future response of eastern Thwaites to ocean-forced melting, with implications for sea level rise from west Antarctica.