Glaciers generate extremely high rates of seismic activity. The largest signals are caused predominantly by iceberg calving at the terminus of tidewater glaciers. A recent surge in glacier seismic studies is providing a new understanding of how calving is manifest seismically. The continuous nature of remote seismic recording, combined with automated detection, proffer this as a technique for long-term 24/7 glacier monitoring. Measuring the ice loss from marine-terminating glaciers remains a key step in determining the flux of freshwater into the oceans. This freshwater is a critical control on sea level, ocean currents, and by extension, climate. Recent experiments in coastal Alaska (e.g. NSF award #0810313) demonstrate the complex but tractable seismic signature of calving (Figure 1). Estimating ice mass remains a challenge, but it is now possible to infer calving activity remotely from continuous seismic records near glaciers.

A calving event at Yahtse glacier, south-central Alaska. Three video frames at left show the detachment and fall of an iceberg from the terminus. A nearby seismic recording (at right) is filtered in several bands to illustrate the multiple overlapping processes that contribute to the signal.

However activity across a regional ice field cannot be extrapolated from a single glacier. Glaciers in close proximity can exhibit wildly different behavior, such as retreating via catastrophic ice loss while adjacent glaciers are advancing. To understand the outflow of an entire ice field, it is necessary to monitoring glaciers on a regional scale.

Earthscope

The broad regional coverage afforded by the Transportable Array (TA) would allow research to expand from a one-glacier-at-a-time technique, to comprehensive calving monitoring across an entire glacier province. The TA, coupled with existing stations, would provide a station density sufficient to track notable calving events at a rate of 10s to 100s per day in Alaska. This real time tracking could even facilitate time-sensitive efforts such as on-call satellite imagery, LIDAR or deployment of on-ice instrumentation, not unlike how the community advances earthquake and volcanic eruption studies through rapid response campaigns.