The Greenland ice sheet presently accounts for \( \sim 70\% \) of global ice sheet mass loss. Because this mass loss is associated with sea-level rise at a rate of 0.7 mm/year, the development of improved monitoring techniques to observe ongoing changes in ice sheet mass balance is of paramount concern. Spaceborne mass balance techniques are commonly used; however, they are inadequate for many purposes because of their low spatial and/or temporal resolution. We demonstrate that small variations in seismic wave speed in Earth’s crust, as measured with the correlation of seismic noise, may be used to infer seasonal ice sheet mass balance. Seasonal loading and unloading of glacial mass induces strain in the crust, and these strains then result in seismic velocity changes due to poroelastic processes. Our method provides a new and independent way of monitoring (in near real time) ice sheet mass balance, yielding new constraints on ice sheet evolution and its contribution to global sea-level changes. An increased number of seismic stations in the vicinity of ice sheets will enhance our ability to create detailed space-time records of ice mass variations.

Figure 1: GRACE mass variation curve (red), measured velocity variations (blue dots) with std. deviation (thin blue) with time. Poroelastically moded velocity variations (green) from the GRACE data.