



Seismic acoustic impedance, effective pressure, and basal drag

Robert Arthern, Alex Brisbourne, Andrew Smith, and Rosie Williams
British Antarctic Survey, Cambridge, United Kingdom (rart@bas.ac.uk)

Acoustic impedance is a measurable quantity that can be recovered using active seismic surveys. Its value depends on the speed of sound in the sediment and the sediment density. For granular sediments there are theories that relate the speed of sound to the effective pressure, the difference between ice overburden and subglacial water pressure. This provides a link between the seismic observable and a key control on basal sliding. For sediments that follow a Coulomb friction law, the higher the effective pressure the higher the shear stress supported by the sediments. In this presentation we investigate the links between acoustic impedance, effective pressure and basal drag that are predicted by theories of the speed of sound in granular materials. We use results for basal drag from an ice flow model inversion in Antarctica to predict how acoustic impedance would vary under the hypothesis that sliding is controlled by a Coulomb sliding law.