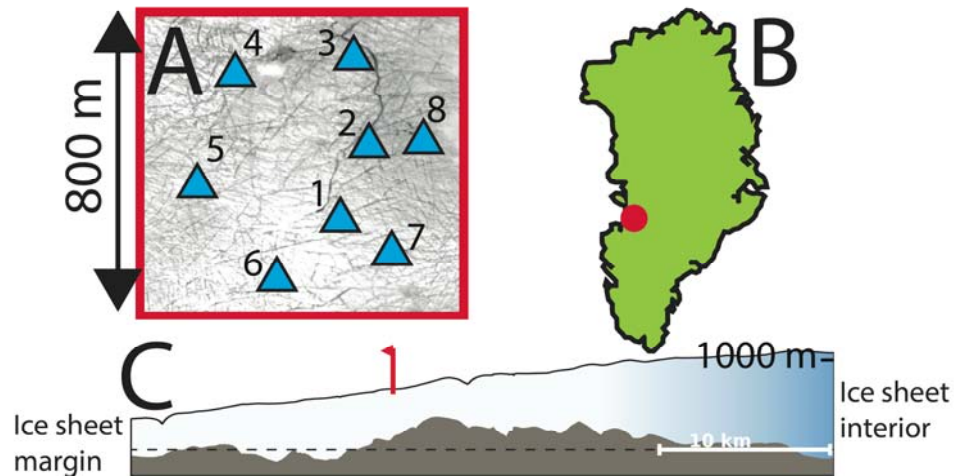STUDY SITE

Figure DR1: A: Seismic stations (blue triangles) used for receiver function analysis. The background shows the highly crevassed ice surface during the melt season (Worldview-2 satellite image provided by Polar Geospatial Center). B: Map of Greenland with seismic network location indicated by red dot. C: Flow line cross-section with seismic network location indicated by red flag. Dashed line represents sea level.

Table DR1: Seismometer coordinates.

Station ID	Latitude (°)	Longitude (°)	Height above sea level (m)
1	69.444740	-49.879224	673.5
2	69.447099	-49.876759	670.4
3	69.449859	-49.877981	679.1
4	69.449233	-49.887816	668.2
5	69.445943	-49.891868	679.1
6	69.443012	-49.884984	674.2
7	69.443618	-49.874942	666.3
8	69.447105	-49.871866	675.0

ERROR ANALSYS FOR P-RECEIVER FUNCTIONS (PRF's)

We are hesitant to draw concrete conclusions about sediment composition, given that synthetic tests have shown the Poisson's ratio presents large error ellipses with respect to sediment thickness and velocity (Figure 1; Chaput et al., 2013). Generally, sources for errors on seismic velocity models derived from PRF's are related to model parameter tradeoffs. A conservative error estimate can be obtained from the arithmetic sum of errors from the three following sources:

1) *Error from the sediment density/Poisson's ratio tradeoff*. For a synthetic model with 300 m of sediments, (Chaput et al., 2013) noted that reasonable models could be produced to fit the data within a roughly 75 m sediment thickness ellipse. This error scales with sediment thickness to 35 m in our case.

2) *Averaged bootstrapped error from (*Chaput et al., 2013): In the present case there is an insufficient number of events to bootstrap the PRF distribution. We therefore adopt a 20 m error as indicated by Antarctic PRFs over ice/sediment systems to estimate the 95% confidence range.

3) *Estimated error ellipses from the grid search*: an additional error is introduced by the size and shape of the residual surface in parameter space (Figure 2). From the error ellipse we assign an additional 30 m error with respect to an obvious minimum in misfit. Overall, we estimate the total error for a sediment thickness of ~160 m to be no larger than 85 m. The sources of error considered here disappear in the absence of sediments, i.e., there exist no models that fit the data for an absence of subglacial sediments.

REFERENCE

Chaput, J., Aster, R.C., Huerta, A., Sun, X., Lloyd, A., Wiens, D., Nyblade, A., Anandakrishnan, S., Winberry, J.P., and Wilson, T., 2013, The crustal thickness of West Antarctica: Journal of Geophysical Research. Solid Earth, v. 118, doi:10.1002/2013JB010642.