



Accuracy and precision of ice stream bed topography derived from ground-based radar surveys

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There is some confusion within the glaciological community as to the accuracy of the basal topography derived from radar measurements. A number of texts and papers state that basal topography cannot be determined to better than one quarter of the wavelength of the radar system. On the other hand King et al (Nature Geoscience, 2009) claimed that features of the bed topography beneath Rutford Ice Stream, Antarctica can be distinguished to +/- 3m using a 3 MHz radar system (which has a quarter wavelength of 14m in ice). These statements of accuracy are mutually exclusive.

I will show in this presentation that the measurement of ice thickness is a radar range determination to a single strongly-reflective target. This measurement has much higher accuracy than the resolution of two targets of similar reflection strength, which is governed by the quarter-wave criterion. The rise time of the source signal and the sensitivity and digitisation interval of the recording system are the controlling criteria on radar range accuracy.

A dataset from Pine Island Glacier, West Antarctica will be used to illustrate these points, as well as the repeatability or precision of radar range measurements, and the influence of gridding parameters and positioning accuracy on the final DEM product.