

Radar characteristics of an ice stream marginal crevasse zone: analysis of a high resolution, three-dimensional GPR dataset from the margin of Rutford Ice Stream, West Antarctica

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Narrow zones of intense crevassing characterise many ice stream margins where the stress regime exceeds some threshold value. Theories of formation and subsequent alteration of crevasses within the margin have generally been formulated based on plan views of the crevasse field and there are few observations of the three-dimensional shape of crevasses because the marginal zone is usually extremely difficult to access. Parts of the margin of Rutford Ice Stream, West Antarctica are well defined by bright reflectivity on RADARSAT images, indicating extensive crevassing, however visual satellite imagery of the same area shows few open crevasses, even though the flow speed differential is >210 m/a. These areas provide a rare opportunity to obtain dimensional data on crevasses within an ice stream margin.

Here we present closely-spaced grids of 200 MHz ice-penetrating radar profiles from a section of the Rutford margin where a two-person team on snowmobiles was able to traverse the area safely and obtain grids of 100 x 200 m size with 10 m line spacing. The data were put through a basic processing sequence that included migration and then imported to a 3D interpretation software package for analysis. We will compare two grids spaced 20 km apart along the margin and set the metrics of the crevasses in the context of Landsat and RADARSAT imagery of the marginal zone. A key finding from this survey is that on this active margin crevasses are not generally open to the surface. This raises a question about the use of the depth of apices of hyperbolae in un-migrated GPR data as a reliable indication of a time of ice stream flow shut-down.