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Ice thickness distribution of Flask Glacier, Antarctic Peninsula, as measured by airborne radio-echo sounding

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The collapse of the Larsen B ice shelf in 2002 highlighted the importance of the buttressing effect that ice shelves have on tributary glaciers. Since then, considerable efforts have been spent in modeling possible implications of such events. Although significant progress has been made, modeling capabilities are still limited, often due to the lack of basic information, such as the geometrical setting of the situation. In this contribution we present the results of a field campaign aiming at providing this kind of basic information.
Ice thickness measurements collected with both an airborne and a ground-based radar system are presented for Flask Glacier (65°47′S 062°25′W), one of the main tributaries flowing into Scar Inlet, the remaining part of the Larsen B ice shelf.

Measurements in the airborne campaign were acquired with the Polarimetric Airborne Survey Instrument (PASIN), an airborne radio-echo sounding system configured to operate with a transmit power of 4 kW around a central frequency of 150 MHz. A 0.1 μs pulse optimized for imaging the near-surface layering was interleaved with a 4 μs, 10 MHz chirp that was used to obtain bed-echoes.
For validation, locally confined ground-based measurements were performed with the Deep-Look-Radar-Echo-Sounder (DELORES). The system worked with 20 kW peak power and a central frequency of 3 MHz.

We use data collected as a part of the airborne survey and data collected using the ground based radar to present the first area-wide estimates of ice thickness for the Flask glacier. Issues related to data collection and data interpretation are discussed. We find that using airborne data along flow lines of valley glaciers leads to ambiguities in ice-thickness estimates that can be successfully overcome when combined with local ground-based surveys.