

Bedforms and melt beneath Pine Island Glacier, results from the 2011 ground radar survey

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A detailed ground radar survey of the bed of Pine Island Glacier was conducted in the 2010/11 field season at the downstream limit of safe surface travel. The instrument used was a 4 MHz impulse radar and the data were collected on a 18 x 25 km grid with 500 m line spacing. The bed has three distinct zones: an area of relatively smooth topography with low amplitude (2 to 10 m) flutings, many of which are continuous for 18 km downstream; an area of higher amplitude (5-40 m) bedforms, many of which have an elongate drumlinoid form; and two narrow zones of low relief and very high reflection amplitude. With reference to near-by seismic data, we interpret these three domains as stiff till with the ice sliding over the bed; deforming till with ice motion taken up by shear deformation within the sediment; and narrow zones with high basal melt water content which underlie areas where the internal reflecting layers (isochrones) within the ice column are strongly drawn down towards the bed. The radar grid sits downstream of the convergence of one of the principal tributaries with the main trunk of Pine Island Glacier and modelling suggests different conditions at the bed in the two feeder zones. The relationship between these upstream conditions and the type and distribution of bedforms will be critically examined.