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Measuring isostatic rebound in ice covered areas

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Measurements of isostatic rebound (the rise of land when the huge weight of an ice sheet is reduced) are essential to produce accurate estimates of current ice mass balance for Antarctica, as well as understanding mantle convection and plate tectonics. Typically geodetic GPSs has been used to measure isostatic rebound rates to better than 1mm/yr, however in Antarctica measurements are severely limited by the lack of bedrock on which to attach a GPS.

We intend to use the ice core drill hole on Berkner Island, Antarctica, which was drilled down 948.5m to bedrock in 2004/5 austral field season, to access the level of the bedrock. A geodetic GPS at the top of the hole will provide an accurate position so the problem becomes one of knowing the relative position of the bottom of the drill compared to the GPS antenna to an accuracy better than 1mm/yr. We present practical details of the problem and our intended method of performing the measurement.