



How deep do you need to drill through ice to measure the geothermal heat flux?

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The geothermal heat flux has a strong influence on ice flow and in particular on the age of basal ice. Currently it can only be really measured by drilling into the conductive thermal boundary layer; in Greenland, this is the bottom 20% of the ice-sheet, but in East Antarctica it essentially fills the whole thickness of the ice-sheet owing to the low accumulation rate, raising the issue of how deep one needs to drill and measure the temperature to determine the geothermal heat flux. Factors influencing this minimum depth are the depth of ice, the accumulation rate and the temperature. This paper addresses the question by modelling the effect of uncertainties and measurement errors to determine the accuracy to which geothermal heat flux can be estimated as a function of the depth of measurement. We show that in East Antarctica, drillings of 500m may be enough to determine the heat flux with sufficient accuracy for many practical applications.