



An evaluation tool for detecting potential sites of million year-old ice in Antarctica

Brice Van Liefferinge and Frank Pattyn

Université Libre de Bruxelles, Laboratoire de Glaciologie, Brussels, Belgium (bvlieffe@ulb.ac.be)

Finding suitable potential sites for an undisturbed record of million-year old ice in Antarctica requires slow-moving ice (preferably an ice divide) and basal conditions that are not disturbed by large topographic variations. Furthermore, ice should be thick and cold basal conditions should prevail, since basal melting would destroy the bottom layers. While boundary conditions such as ice thickness and accumulation rates are relatively well constrained, the major uncertainty in determining basal thermal conditions resides in the geothermal heat flow (GHF) underneath the ice sheet.

We developed two modelling tools to explore uncertainties in existing GHF data sets and their effect on basal temperatures of the Antarctic Ice Sheet. Both complementary methods lead to a better comprehension of basal temperature sensitivity and a characterization of potential ice coring sites within these uncertainties. The combination of both modeling approaches show that the most likely oldest ice sites are situated near the divide areas (close to existing deep drilling sites, but in areas of smaller ice thickness) and across the Gamburtsev Subglacial Mountains.

The developed (and freely available) MATLAB tool can be used to explore in more detail potential drilling sites for million year old ice based on both models, and give the user a sense of uncertainties in ice thickness and GHF.