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Towards inverse modeling of surface data on Rutford Ice Stream, West Antarctica

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Observations of surface velocities and surface geometries on Rutford Ice Stream, West Antarctica, are inverted to infer the shape of the underlying bed and the bed resistance to basal sliding. An area within this ice stream where a clear topographic expression of a basal undulation is visible has been selected for this purpose. Field measurements have been conducted by the British Antarctic Survey during the winters 2002/2003 and 2003/2004.

The inverse procedure follows a statistical formulation of the problem as that of determining p(b, c|s, u, w), the probability density for the parameter values being the bed topography b, and basal slipperiness c, conditional on measured values, i.e surface elevation and surface velocities s, u, w. This Bayesian inversion approach permits the inclusion of a priori information about basal properties into the inversion scheme. Inverse estimates of bed topography and basal slipperiness are incorporated into a non-linear forward finite element model.