



How long has the central-northern Greenland Ice Sheet been melting at the base?

Irina Rogozhina (1), Alexey G. Petrunin (1,2), Jesse V. Johnson (3), and Alan P. M. Vaughan (4)

(1) Helmholtz Centre Potsdam GFZ German Research Centre For Geosciences, 1.3, Potsdam, Germany (valmont@gfz-potsdam.de), (2) Schmidt Institute of Physics of the Earth, Moscow, Russia, (3) The University of Montana, Department of Computer Science, Missoula, USA, (4) Trinity College Dublin, Ireland

Ice-penetrating radar studies (Fahnestock et al., 2001) and the deep ice core project NGRIP (Anderson et al., 2004) have identified extensive areas of rapid basal melt under the central-northern Greenland Ice Sheet (GIS). Our new reconstruction of the lithosphere structure in Greenland reveal that strong anomalies in geothermal heat flux are responsible for much of the estimated ice loss through basal melt. We use our coupled lithosphere-GIS model to study the history of basal ice conditions since the Pliocene period and find that the anomalous heat flow has been maintaining basal ice melt throughout the history of Greenland glaciation. Persistence of basal melt water over the course of ~ 3.5 million years and periodic development of paleo ice streams originating at the anomaly have likely caused considerable erosion of the subglacial bedrock. The erosion is revealed by ice-penetrating radar measurements, and now exerts a geometric control on ice sheet streaming in the eroded region, and possibly the overall geometry of the GIS.

Anderson, K. K., et al. (2004), High-resolution record of Northern Hemisphere climate extending into the last interglacial period, *Nature*, 431(7005), 147–151

Fahnestock, M., W. Abdalati, I. Joughin, J. Brozena, and P. Gogineni (2001), High geothermal heat flow, basal melt, and the origin of rapid ice flow in central Greenland, *Science*, 294, 2338–2342