

Antarctica ice sheet dynamics derived from ERS-1 precise topography

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Abstract

For the first time, the high quality and coverage of the ERS-1 radar altimeter, help provide a very accurate surface topographic map covering 80% of the Antarctica ice sheet. It contributes significantly to glaciological studies such as ice sheet flow modeling. The topography allows estimation of the ice flow direction, the balance velocity and the basal shear stress that intervene in the rheological relations. Its use in ice sheet flow modeling helps both mapping local anomalies and estimating rheological parameters. Other precise parameters can be deduced from this topography map, such as surface curvature. Surface curvature points out ice flow line anomalies, which are propagated from coast to dome, leading to the visualization of the true flowlines. We then point out the bedrock effect or basal condition effect both on ice flow direction and on outline flow velocity. We show that a part of the ice sheet volume is controlled by the outline flow condition.

Keywords: altimeter, ice sheet dynamic