

Ice flow dynamics of the tributaries to ice stream D, West Antarctica - numerical modelling based on the observations from Byrd borehole

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Abstract

The West Antarctic ice streams originate as a network of moderately fast-flowing (up to about 100 m/a) tributaries. It is reasonable to assume that evolution of ice within the tributary system affects the transition from tributary to streaming flow, and thus, the behaviour of ice streams as well. An ice-sheet flow-line model is used to simulate two tributaries flowing toward the onset to ice stream D. The model considers the effect of ice fabric anisotropy on the flow of ice by modifying Glen's flow law via an enhancement factor. The enhancement factor is estimated using observations from the Byrd station borehole, which is close to one of the tributaries. Internal layers derived from the SPRI/TUD/NSF Radio-Echo Sounding surveys conducted in the interior of West Antarctica are used for model development and verification. The model is used to simulate ice flow regimes and depth-variation in crystal orientation fabrics near the ice divide through the two tributaries. Comparison between modelled isochrones and observed internal layers, dated by layer-tracing back to the Byrd ice core, is used to discuss the steadiness of the ice sheet's drainage system over time and relations to the current dH/dt observed by satellite altimetry.

Topic: 4

Oral presentation