INLAND ICE SHEET THINNING DUE TO HOLOCENE WARMTH

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Abstract. The Holocene warmth is now affecting the flow of the central West Antarctic ice sheet. It is supposed that the ice sheet reached approximate steady-state during the Wisconsinan. A perturbation analysis of ice-sheet temperatures indicates that deep ice has warmed by one or two degrees since the Wisconsinan. Warmer ice deforms more rapidly and the ice sheet should now be flowing 10 to 30% faster than during the Wisconsinan.

Earlier studies comparing ice outflow with the replenishment by new snow accumulation show that the velocities are about 20% faster than those needed to balance the accumulation. The warming effect is therefore a sufficient explanation for the imbalance and it is not necessary to suggest that there were also changes in accumulation-rate or in sea-level that affected this part of the ice sheet.

The increased ice outflow resulting from the warming, propagates down-glacier and causes marginal thickening and advance. In the case of the Laurentide and Scandinavian ice sheets, a major increase in net ablation and a decrease in total ice volume is expected, by this mechanism, to lag behind a climatic warming by many thousands of years.

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DISCUSSION

D. A. Yuen [written question]: Your analysis of the effect on the velocity of ice sheets due to sudden perturbation of surficial temperature does not include the feed-back of the $\mathbf{u}\cdot\nabla T$ term on the resultant energy equation. In a stability analysis, where dynamical effects are included, the effects of the temperature and velocity on one another are fully coupled, and must be solved in a fully self-consistent manner. How do you make *a posteriori* estimates of the perturbed velocity field from your approach?

I. M. Whillans: I am concerned here only with the first effects of the warming on ice flow. Calculations of later effects should include this feed-back.

FLOW OF ANTARCTIC ICE SHELVES BETWEEN LONG. 29° E. AND 44° W.

By Olav Orheim

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Abstract. This paper discusses the mass outflow and dynamics of a 3 000 km long front of the Antarctic ice sheet—the coastline from Prinsesse Ragnhild Kyst to the Filchner Ice Shelf. Ice shelves, mostly 50–100 km wide, account for more than 95% of this coastline. Large mass losses by calving generally occur at intervals of several decades at any particular location, and usually involve shelf areas of 10–1 000 km². The mass loss by calving during the