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CORRESPONDENCE

The Editor,

Journal of Glaciology

SIR,

On the grain-size dependence of secondary creep

In their recent paper Duval and Le Gac (1980) show that the permanent creep-rate of polycrystalline ice does not increase with grain-size. We wish to agree with their conclusion by presenting data we have collected at higher strain-rates ($5.5 \times 10^{-4}\ s^{-1}$), on laboratory-grown, randomly oriented, polycrystalline ice tested at a constant strain-rate in compression. Figure 1 shows the maximum yield stress reached as a function of grain-size, for the, albeit narrow, range of grain-sizes from 0.8 to 1.8 mm diameter. No significant effect of grain-size is seen. We are extending the results to smaller grain-sizes, but are having difficulty in obtaining small-grain ice which is also air free. We cannot go to much larger grain-sizes because our sample diameter is fixed at 20 mm and our results (Fig. 2) show that the sample diameter should be approximately 12 times the grain diameter for the maximum yield stress to be independent of grain-size. For this reason Duval and Le Gac should be cautious in interpreting their results from samples greater than 7 mm diameter when their sample size is 80 mm. The same comment applies to Baker's (1978) original work.

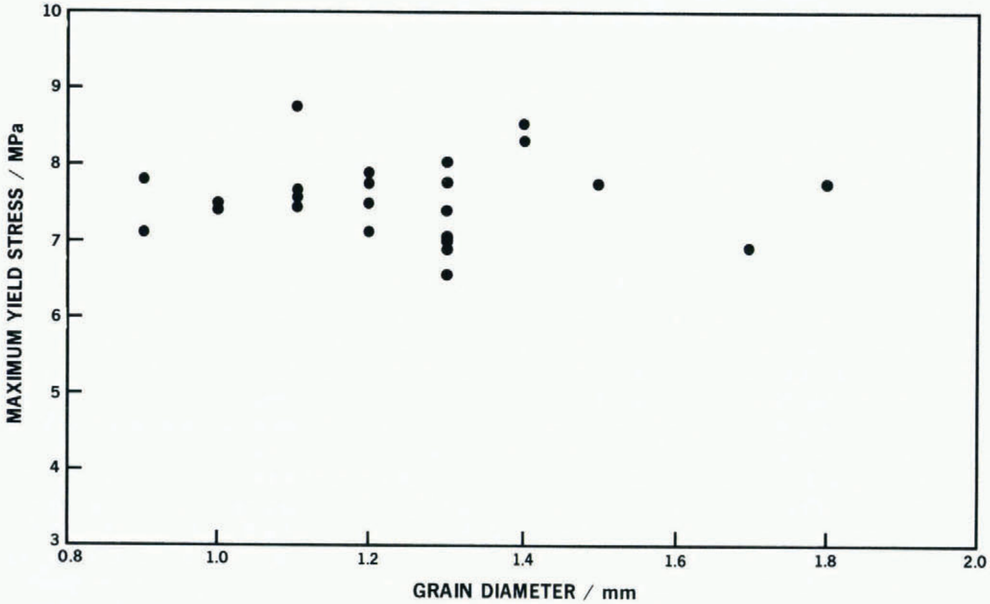

Fig. 1. The maximum yield stress plotted against grain-size, for laboratory-grown polycrystalline ice tested at $-10.5°C$ strain-rate $5.5 \times 10^{-4}\ s^{-1}$, sample diameter 20 mm, sample length 60 mm.

Fisheries and Environment Canada, National Hydrology Research Institute,
Inland Waters Directorate, Snow and Ice Division,
562 Booth Street,
Ottawa, Ontario K1A 0E7, Canada
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STEPHEN J. JONES
HEMMING A. M. CHEW

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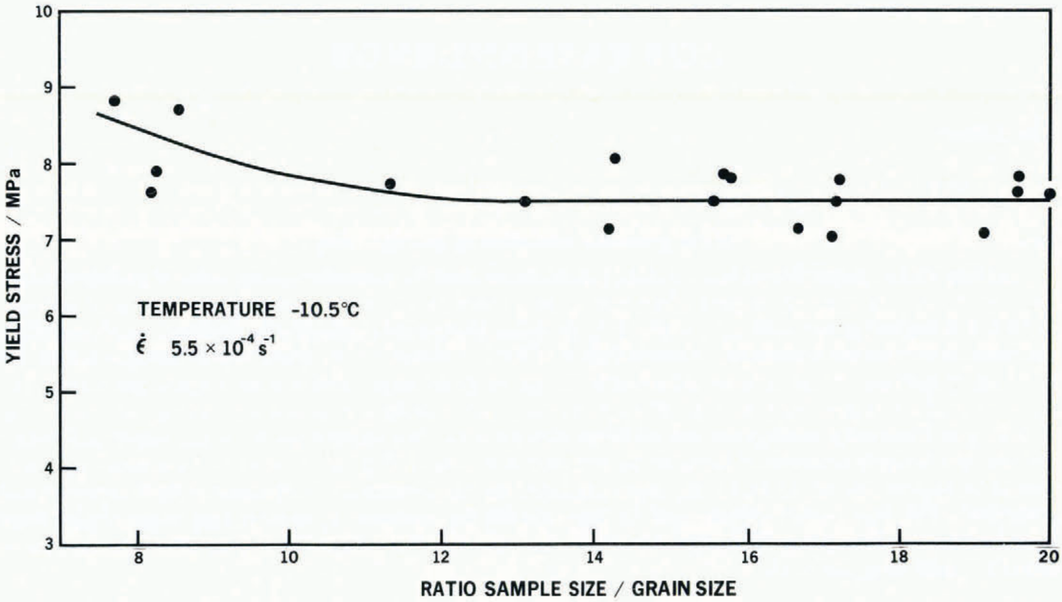

Fig. 2. The maximum yield stress plotted against the ratio of sample size to grain-size. The grain-size was kept constant at 1.0 mm and the sample diameter was varied. Below a ratio of 12 the yield stress depends on this ratio.

REFERENCES

Baker, R. W. 1978. The influence of ice-crystal size on creep. *Journal of Glaciology*, Vol. 21, No. 85, p. 485–500.

Duval, P., *and* Le Gac, H. 1980. Does the permanent creep-rate of polycrystalline ice increase with crystal size? *Journal of Glaciology*, Vol. 25, No. 91, p. 151–57.

SIR, *The weak underbelly of the West Antarctic ice sheet*

Possible collapse of the West Antarctic ice sheet by surges of Thwaites and Pine Island Glaciers into the Pine Island Bay polynya of the Amundsen Sea was a subject addressed in papers by Lingle and Clark (1979) and Thomas (1979), and in abstracts by Denton and others (1979) and Hughes (1979), that were published in Vol. 24, No. 90 of the *Journal of Glaciology*. This concept was first developed in 1975 by George H. Denton and me as part of our CLIMAP responsibilities to reconstruct the maximum Antarctic ice sheet and then to disintegrate the marine West Antarctic portion. Lingle and Clark (1979) have acknowledged us and CLIMAP in this regard, and we are grateful to them.

A brief history of the development of the concept that Pine Island Bay may be the weak underbelly of the West Antarctic ice sheet is in order, because the American Society for the Advancement of Science (AAAS) and the United States Department of Energy (DOE) sponsored a workshop at the University of Maine on 8–10 April 1980 to formulate a science plan that would "elucidate the research that might establish once and for all the likelihood and time frame of collapse of the grounded ice" in West Antarctica (David M. Burns, Director of the AAAS/DOE Climate Project, letter of 11 October 1979).

CLIMAP (Climate: Long-range Investigations, Mapping, and Prediction) conducted two experiments, reconstructing the maximum ice-age climate 18 000 years ago and the maximum interglaciation climate 125 000 years ago. George H. Denton was the Principal Investigator responsible for providing the areas, elevations, and volumes of ice sheets as input boundary conditions for these two CLIMAP experiments. This work was done at the University of Maine, where I was the Task Group Leader responsible for numerically reconstructing and disintegrating ice sheets having areal extents specified by Denton. Results of this work are presented in chapter 6 (Hughes and others, 1981) and chapter 7 (Stuiver and others, 1981) of *The last great ice sheets.*