

LETTERS TO THE EDITOR

Comment on "New Evidence from Beneath the Western North Atlantic for the Depth of Glacial Erosion in Greenland and North America" by E. P. Laine

As a glacial geologist, I was delighted to read Laine's contribution (1980) to our scanty knowledge of long-term rates of glacial erosion within the southwest sector of the Laurentide Ice Sheet. The estimates of the volume of deep-sea sediment appear reasonably well founded, but I am disappointed that Laine has "exhumed" a theory of deep erosion of the central portion of the Laurentide Ice Sheet (White, 1977) which, as far as I was concerned, Sugden (1976) and Gravenor (1975) had seriously questioned and laid to rest. Laine appears not to be aware of, or at least believes it of no significance that:

1. The central interior basin of the Laurentide Ice Sheet, Hudson Bay, is primarily underlain by Paleozoic rocks. Furthermore, Paleozoic limestones and other "soft" sediments lie on the floor of Hudson Strait. Thus, "deep" erosion, if it occurred, must have primarily resulted in the extensive erosion of a Paleozoic cover. This implies that the process of deep erosion should have contributed a large amount of detrital carbonates to the deep sea.

2. The work of Higgs (1978) on the provenance of Mesozoic and Cenozoic rocks from the Labrador and western Greenland continental margins indicates that the "unroofing" of the Precambrian shield occurred "since the Paleocene, exposing progressively deeper levels of the crust" (Higgs, 1978, p. 1859). Post-Paleocene erosion of high-grade supracrustal rocks is implied. Moreover, even during the Paleocene, there is only scanty evidence for the contribution from sedimentary source rocks. This implies to me that the Paleozoic cover was already well removed from the continental

margins and that the major erosional region was, in fact, outside the so-called arc of exhumation. This may have been concentrated along the fiords and sounds.

3. The flow lines of the Laurentide Ice Sheet (Laine, 1980, Fig. 4) are at variance with the consensus of field studies. There is no, and I repeat *no*, glacial geological evidence for radial overflow from Hudson Bay during the last glaciation (Shilts *et al.*, 1979; Shilts, 1980; Andrews and Miller, 1979; Hillaire-Marcel *et al.*, 1980). Instead, most Canadian glacial geologists view the Laurentide Ice Sheet as a complex of domes and saddles with the domes located over the land area.

4. If deep erosion characterizes the central region of an ice sheet, why does the area of southern Hudson Bay possess one of the longest multitill and nonglacial sediment records in northern Canada (Skinner, 1973; MacDonald 1971; Andrews *et al.*, 1980)?

In conclusion, I am conscious of the problems facing anyone in their attempts to equate the volume of sediment with rates and location of erosion. Thus, I strongly support the basic thrust of Laine's study, but I am totally unconvinced that these data can be used to say anything about "deep erosion," especially when we consider that the flow model employed is at variance with the known geological data (Shilts, 1980). It will be important to refine this initial study by: (1) working on the rates of erosion throughout the Quaternary, for example, was most of the erosion accomplished very early, possibly even during the first one or two glacial cycles (e.g., Andrews, 1979); and (2) expanding the work of Higgs (1978) to examine the provenance of the sedi-

ments. Laine's work is clearly important, and this discussion is not meant to detract in any way from its overall significance.

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