

LETTERS TO THE EDITOR

Letter to the Editor in Response to Article by Dorn *et al.*

In a recent article in *Quaternary Research*, R. I. Dorn *et al.* (1987) discuss dates for moraines at Pine Creek, Sierra Nevada, California. They report ^{14}C ages for desert varnish on till of the Tioga glaciation and “cation-ratio” ages for varnish on till of older glaciations mapped by Bateman (1965), on the basis of subjective relative-weathering estimates and geomorphic criteria, as Tahoe and early Tahoe or pre-Tahoe. Dorn assigns Tahoe at Pine Creek to marine $\delta^{18}\text{O}$ stage 6 and states that “these older ages for the Tahoe moraines of Pine Creek are consistent with the results of Gillespie *et al.* (1984), who found that the older (sic) glaciation of Sawmill Canyon . . . predates the intracanyon basalt flow ^{40}Ar – ^{39}Ar dated at 119,000 \pm 7,000 years B.P.” Perhaps our respective age estimates for the oldest, *pre-Tahoe* moraines are consistent, but this is not the claim of Dorn *et al.* (1987). Instead, Dorn clearly implies that the results at Sawmill Creek support a stage-6 Tahoe glaciation, which is not what Gillespie *et al.* (1984) concluded. In this letter I present my point of view.

I assigned moraines in Sawmill Canyon to four distinct glacial advances, based upon quantitative and other relative-dating (RD) measurements (Gillespie, 1982). The oldest I considered to be pre-Tahoe, not Tahoe as implied by Dorn. Its age was bracketed by ^{40}Ar – ^{39}Ar ages on interfingering lavas at 131,000 \pm 10,000 and 463,000 \pm 40,000 yr. Dorn’s claim, then, was that his 143,000- to 156,000-yr-old Tahoe glaciation at Pine Creek was consistent with our 130,000- to 463,000-yr-old pre-Tahoe glaciation at Sawmill Creek. This doesn’t make much sense, unless Dorn has discounted my RD data.

I found that the second oldest moraine at

Sawmill Creek satisfied Blackwelder’s relative-weathering criteria for the Tahoe glaciation (Blackwelder, 1931) and was clearly much more weathered than the Tioga moraines (~13,000–19,000 yr old ($\delta^{18}\text{O}$ stage 2), if they correlate with the ones dated by Dorn at Pine Creek). The Tahoe moraine overlies the lava dated at 119,000 \pm 7,000 yr B.P. It was deposited sometime during the interval including $\delta^{18}\text{O}$ stages 3–5, and probably during stage 4 (Gillespie, 1982, 1984). Thus the evidence at Sawmill Creek supports the view that there was a stage 4 Tahoe glaciation in the Sierra Nevada. Perhaps any correlative stage 4 deposits at Pine Creek were less extensive and masked by the later Tioga moraines (Gibbons *et al.*, 1984). In any case, at first glance our conclusions and Dorn’s are certainly not compatible. Below is one possible reason.

Blackwelder’s criteria defining Sierran glaciations are stratigraphic, not time-stratigraphic. In 1984 I suggested that perhaps the stratigraphic Tahoe unit was defined broadly enough to include till deposited during both marine $\delta^{18}\text{O}$ stages 4 and 6 (Gillespie, 1984). This would explain the apparent dilemma presented by Bateman’s glacial stage assignments, Dorn’s varnish ages, and my results, but is unsatisfying to those who would like a one-to-one correspondence between stratigraphic and time-stratigraphic nomenclature. Resolution of this problem must at least await publication of quantitative RD data for the moraines at Pine Creek, necessary to place those moraines more firmly in the context of Sierran glaciations. In the meantime, it would be interesting to see Dorn’s varnish-dating techniques applied to other valleys for which there is independent confirmation of at least some of his inferred ages.

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