

Letter to the Editor

Comment on “Late Quaternary stratigraphy and geochronology of the western Killpecker Dunes, Wyoming, USA,” by J.H. Mayer and S.A. Mahan, 2004. *Quaternary Research* 61, 72–84

This paper reports a chronology of the Killpecker Dunes in Wyoming, USA. It relies largely on a set of luminescence ages, all of which are almost certainly incorrect, and should not be used for reconstructing past climatic conditions for the region. My arguments are as follows.

Three luminescence ages are reported for each of six strata. In general, the three ages for a given sample do not agree; the worst disagreement is $15,710 \pm 960$ vs. 4910 ± 280 years for KRM-3 stratum 1. Clearly at least one is wrong and I am certain that both are wrong.

Luminescence dating procedures are complex and must be done with great care; that said, enough studies have been made in optical dating of quartz that one now has confidence that current techniques properly applied will yield correct ages. Yet, as the authors note, the ages of 4910 ± 280 and 6160 ± 310 years obtained for 90- to 125- μm quartz grains from stratum 1 are entirely inconsistent with the $>12,000$ yr age known from archaeological evidence. There is clearly something amiss with the techniques used for obtaining the quartz optical ages. It appears the authors recognized this but nevertheless accepted one of them; they should not have. All must be regarded as erroneous.

An optical age using IR excitation and a thermoluminescence (TL) age were obtained using 4- to 11- μm grains from each sample. These are generally consistent, and the authors have used this as a justification for accepting them, presumably using the argument that these are independent methods. Agreement can be used to conclude that the grains were exposed to sufficient sunlight prior to burial for the techniques to be applicable. One cannot use agreement to conclude the ages are correct, because there are potential errors common to both techniques. In both

cases it is likely that luminescence from feldspar grains dominated the measured luminescence. It has been well known for over two decades that feldspars can yield ages that are too young because of “anomalous fading” and that specific tests are necessary to see if the samples exhibit this phenomenon (Aitken, 1985). It has been known for over 3 years that anomalous fading is ubiquitous in potassium feldspars, and that for optical dating of Holocene sediments it can be measured and corrected for (Huntley and Lamothe, 2001). The authors do not mention any such tests, so one must assume the ages obtained to be lower limits. Evidence for the presence of fading can be found in the two ages for FIN-1, stratum 1, of 8045 ± 445 and 8455 ± 565 yr, both clearly wrong because this stratum underlies Cody Complex artifacts (10,200–9500 cal yr B.P.) at this site. There is no need to invoke intrusive contaminants as the authors did even though no sedimentary evidence for it was noted.

In summary, all the luminescence ages should be taken to be incorrect as a result of inappropriate laboratory procedures, and a chronology of past climate should not be deduced from them.

References

- Aitken, M.J., 1985. Thermoluminescence Dating. Academic Press, London.
Huntley, D.J., Lamothe, M., 2001. Ubiquity of anomalous fading in K-feldspars and the measurement and correction for it in optical dating. *Canadian Journal of Earth Sciences* 38, 1093–1106.

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