LETTER

Refuting the evidence for an earlier birth of the Taklimakan Desert

In a recent issue of PNAS, Zheng et al. (1) report a "Late Oligocene–Early Miocene age" of the Taklimakan Desert in northwest China. Their age was based on $^{40}Ar/^{39}Ar$ dating of biotites and U–Pb dating of zircons from layers within the Xiyu Formation, which they interpreted as "volcanic ash." This chronology effectively extends the formation of the Taklimakan Desert from ∼5 Ma, as recently reported from outcrop (2) and high-resolution borehole data (3), to 27 Ma (1).

After publication of this article, a field investigation was organized with its two leading authors (Hongbo Zheng and Xiaochun Wei) and 26 other geologists to more closely scrutinize the stratigraphy of the Xiyu Formation. Our new field and laboratory investigations do not support the existence of the volcanic ash layers in their section. These "volcanic ash" layers should instead be reinterpreted as heterolithologic sediment. Accordingly, the $^{40}Ar/^{39}Ar$ age of biotites and the U–Pb age of zircons actually represent the time of formation of detrital minerals rather than of isochronous air-fall material. Three points are evident, as follows.

Firstly, the three "volcanic ash" layers (I to III) were identified at the Kekeya section by Xiaochun Wei during our joint field expedition (Fig. 1*A*). Layer I is characterized by large-scale cross-bedding, and cross-bedding and parallel bedding are present in layers II and III. Laser particle size analysis indicates that the size distribution patterns of these layers are very similar to those of modern river sands, with layers I and III texturally resembling sandstones and the interbedded layer II resembling a sandy siltstone.

Secondly, in thin sections of layers I, II, and III, under the polarizing microscope, there are no chunky, bubble-wall, and/or vesicular glass shards that typically predominate in biotite- and quartz-bearing calc-alkaline (high silica) tephra of primary origin (Fig. 1*B*). Instead, the minerals present are heterogeneous in composition, variably weathered, and rounded, implying a detrital origin. To further constrain this, we conducted electron microprobe (EMP) imaging (Fig. 2) and analyses, which confirmed the absence of glass shards and/or pumice, but indicated the presence of angular and euhedral minerals (i.e., biotite, muscovite, quartz, feldspars) derived from sand-sized clay-aggregated particles (Fig. 2).

Finally, Zheng et al. (1) state that they updated the magnetostratigraphy of the Maztag section (figure S10 in ref. 1), using declination and inclination data from our earlier published work (4), but they selectively ignored mammalian fossil evidence (i.e., the occurrence of *Olonbulukia tsaidamensis*) from the lower portions of our section, which alternatively indicates a Late Miocene age of ∼8–9 Ma (4). Consequently, their interpreted basal age of 26 Ma is completely at odds with the mammalian fossil evidence.

In summary, from a combination of field and petrological data supported by mammalian fossil evidence, it is clear that Zheng et al. (1) have misidentified fluvial sediments for primary tephra, which they incorrectly used as a chronological basis for their age revision for the initial formation of the Taklimakan Desert.

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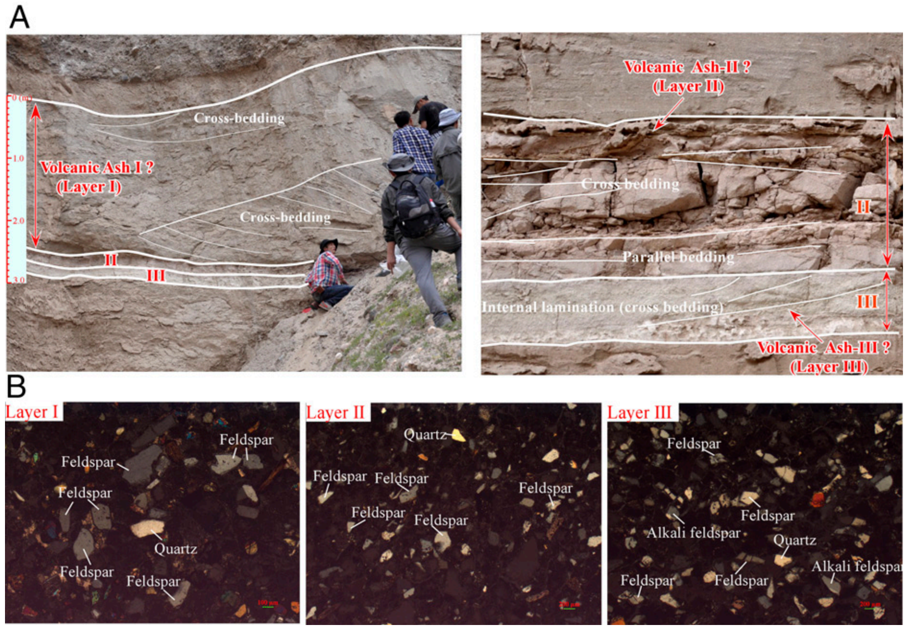

Fig. 1. (*A*) The three layers of "volcanic ash" in the Kekeya section, northwest China. (*B*) Thin sections under polarizing microscope did not indicate the occurrence of chunky, bubble-wall, or vesicular glass shards but variably weathered and rounded minerals implying detrital origin.

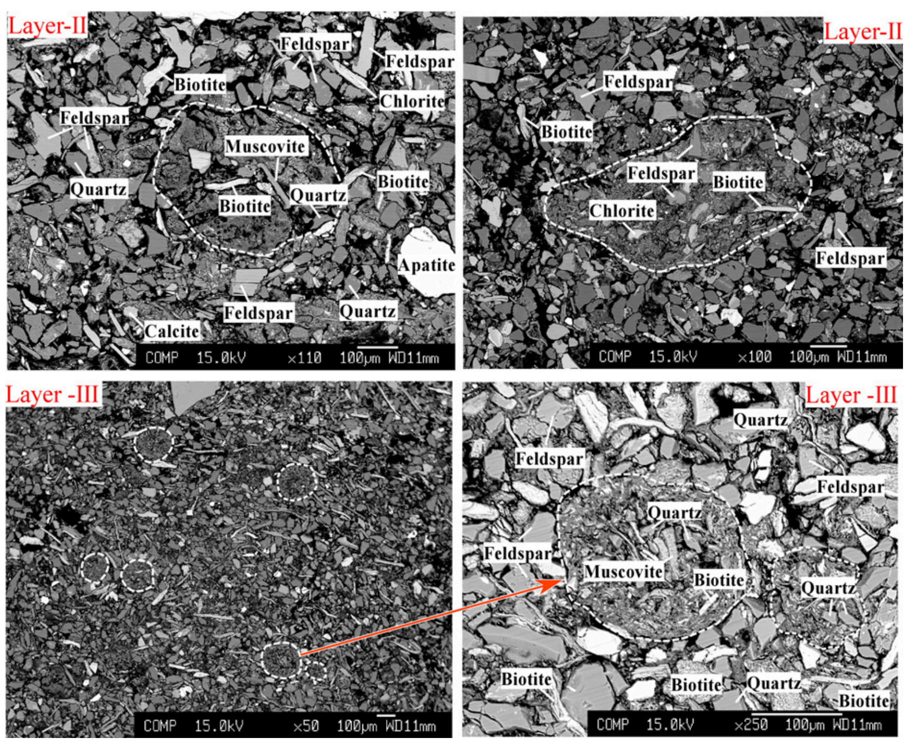

Fig. 2. EMP images and analysis of layers II and III confirm the absence of glass shards and the presence of angular and euhedral minerals (i.e., biotite, muscovite, chlorite, quartz, feldspars) derived from sand-sized clay-aggregated particles (dashed circles).