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For many years it still is debated whether all Australasian tektites were formed in one single impact event or by several impacts separated in place and/or time. Since no corresponding crater(s) have yet been detected, radiometric and isotopic analyses of tektites are practically the only available tools to potentially solve the problem. Previous isotopic [1] and some age [2,3] studies provided evidence for a single tektite forming event 700–800 ka ago, whereas other age studies [4,5] indicated two distinct events separated by ~150 ka. Here we report on the first systematic and comparative stepwise heating ^{40}Ar-^{39}Ar and fission track study of Australasian tektites.

We determined both types of ages on the very same eight tektites, four Australites and four Indochinites, from all over the strewnfield: Australites from Lake Argyle (Northern Territory), Charlotte Waters (central on the continent), Pine Creek (South Australia), and Hughes (Nullabor Plains); Indochinites from Thailand, Kovang Tchéon Wan, Sangiran (Java) and Santa Mesa (Philippines). The new data are presented in Fig. 1 (solid lines) as *Gaussian histograms* [6]. These histograms are constructed by summing the Gaussian normal distributions of all ages with the individual age values as centers and the errors (including monitor uncertainty) as the standard deviations. Thus, precise ages represent themselves as sharp peaks and data sets with larger errors yield flat or hilly histograms. All Gaussian histograms have been normalized to a maximum value equal to 1.0 to ease comparison. The ^{40}Ar-^{39}Ar ages of Australites and Indochinites (Fig. 1 a,b) are indistinguishable and have a mean age of 786 ± 12 ka (1σ). (Our previous report [5] of a ^{40}Ar-^{39}Ar isochrone age difference of ≈150 ka is not supported by the new and more systematic study). On the other hand, the respective fission track plateau age histograms (Fig. 1 c,d, solid lines) which also include data from [2, 4] and some unpublished ages are different. Within error limits the mean fission track ages of Australites and the ^{40}Ar-^{39}Ar ages of all Australasian tektites are the same while the Indochinite fission track ages appear to be ≈100 ka younger.

In Fig. 1 we also compare the new results with ages from previous studies [3, 7, 8] which we have recalculated using uniform constants. The number of included individual ages in each histogram is given in brackets. Previous K-Ar [7,8] and total fusion ^{40}Ar-^{39}Ar [3] ages scatter considerably around the maximum and new best value (the reason for that can only be speculated to have been difficulties with the atmospheric ^{40}Ar correction). Fig. 1 c,d also gives the histograms for uncorrected fission track ages including data from [9,10] (for the correction procedure applied in the present study cf. [11]). While Indochinites rarely yield uncorrected ages <600 ka, this is more common for Australites. In Fig. 1d we show the fission track age of an obsidian that was found together with tektites on the Philippines. Its age is close to that of Indochinites and demonstrates the presence of volcanic activity shortly after the fall of the tektites – at least on the Philippines. Since volcanism was not restricted to the Philippine Islands we suggest that volcanic activity – after tektite formation – caused the partial resetting of the fission track clock by thermal overprinting. Certainly the fission track clock is more prone to be reset by elevated temperatures than is the K-Ar clock. Consequently, the fission track ages <800 ka date volcanism rather than the formation of tektites. This scenario may also explain the scarcity of very low apparent Indochinite fission track ages if they were buried by the volcanic flows shortly after formation and thereby protected from subsequent disturbances.

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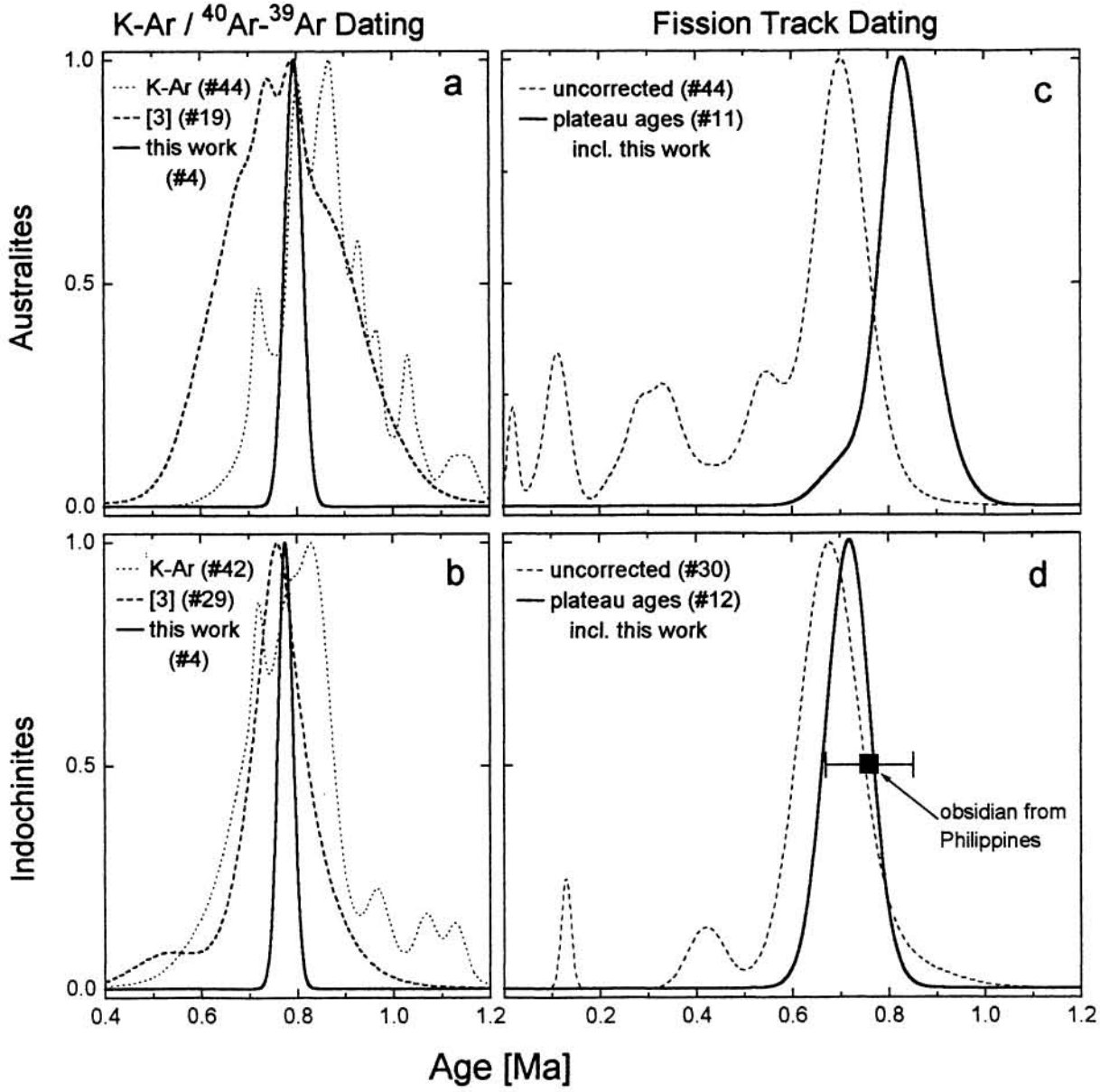
Figure 1: Gaussian histograms of ages of Australites and Indochinites. (a,b): K-Ar ages [7,8], total fusion ^{40}Ar-^{39}Ar ages [3] and stepped heating ^{40}Ar-^{39}Ar ages (this work); (c,d): uncorrected and plateau fission track ages [2, 9, 10, this work and unpublished data]. The numbers in brackets are the numbers of dated samples.



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