

Identification of Ejecta Deposit formed by Australasian Tektite Event based on Discovery of Shocked Quartz and *in situ* Tektite Fragments in North Eastern Thailand

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The Australasian Tektite Event (AATE), which occurred ca. 0.8 Ma, is the youngest record of a large impact event on the Earth. Although it is estimated that it occurred somewhere within eastern Indochina based on the distribution of tektites, the crater has never been located definitively. Distribution of proximal ejecta deposit will provide useful information to specify the location and magnitude of the impact because the thickness of an ejecta deposit varies with distance from the crater and magnitude of the impact. However, the proximal ejecta deposit of the AATE has never been identified on land in the Indochina Peninsula. Here, We identified the Quaternary depositional sequence at Huai Om in northeastern Thailand as the ejecta deposit based on the discovery and occurrence of shocked quartz with planar deformation features (PDFs) and in-situ occurrence of layered tektite fragments.

The Quaternary depositional sequence at Huai Om can be divided into three lithostratigraphic units 1–3, in ascending order. Unit 1 is composed of decimeter scale silt–sand layers containing rip-up clasts and showing cross-lamination. Unit 2 is a tektite-bearing gravel layer, and the thickness varies from 20 cm to 1 m. Unit 3 is a massive well-sorted sand layer, and the thickness is 3 m.

Shocked quartz grains with PDFs were found throughout units 1–3. PDFs were confirmed by measurement of the orientation of 62 lamellae sets in 49 grains on thin sections using a universal stage microscope and observations using a scanning electron microscope and transmission electron microscope. The abundance of shocked quartz measured on smear slides (percentage of quartz grains with PDFs to the total quartz grains counted) is 8–9 % throughout the units 1–3.

In addition to the presence of the shocked quartz, we found an assemblage of fragments of a layered tektite in the upper part of unit 2. At least 160 tektite fragments were concentrated in a small (~40 cm x 40 cm) area. The tektite fragments vary from 2 mm to 3.5 cm in size, showing very poorly sorting, and have angular shapes. Each of the fragments has a similar chemical composition, which was confirmed by EPMA analysis. These characteristics suggest that these tektite fragments were formed by fragmentation of one large (~30–40 cm sized) layered tektite. To investigate their occurrence in three-dimension, we took a block sample of this layer as including tektite fragments and conduct CT-scan analysis. The CT-scan images revealed that the tektite fragments are buried facing their fracture surfaces each other, and can fit together like a jigsaw puzzle. This occurrence indicates that the fragments were buried immediately after fragmentation and not transported after the burial. Thus, the tektite fragments were formed *in situ* when a large layered tektite landed on the ground after traveling a ballistic trajectory.

Based on the continuous presence of the shocked quartz throughout units 1 to 3 and the occurrence of *in situ* tektite fragments, we identify that units 1 to 3 at Huai Om is the proximal ejecta deposit formed by

the AATE. Based on lithological and sedimentological evidence, unit 1 is considered as deposited by a flow loaded with fine ejecta grains possibly induced by the lateral wind of vapor expansion, unit 2 is considered as representing ejecta curtain gravels, and unit 3 is considered as representing fallout ejecta.

The result of this study provides criteria to identify the proximal ejecta deposit in the surrounding area, which will be useful to trace the distribution and lateral changes of the ejecta deposit and specify the location, magnitude, and target rocks of the AATE.

Keywords: Australasian Tektite, Shocked quartz , Ejecta deposit