

The Distribution of the Ejecta Deposit derived from Australasian Tektite Event: Implication for the Location of the Impact

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Tektites are glass spherules formed by large extra-terrestrial impacts and so far reported from 4 strewn fields on the Earth (e.g., McCall, 2001). Australasian tektites—distributed widely from Southeast Asia to Antarctica—are considered to be formed by an impact event at ca. 0.79 Ma in Southeast Asia. This impact event is the youngest among large (diameter of a projectile larger than 1 km) impact events. Because of its young age, it is expected that evidence of the impact (impact crater and ejecta deposits) and the record of environmental perturbation by the impact are well preserved. Therefore, this impact event would serve as an important case study to understand the environmental effects of large impact events on the Earth.

Based on the wide distribution of the tektite—larger than 10% of the Earth's surface—the magnitude of the impact has been estimated as large enough to make 30–120 km sized impact crater (e.g., Prasad et al., 2007). The biggest mystery, however, is that no crater has been found and precise location and magnitude of the impact are not well understood.

The location of the impact has been estimated mainly based on the distribution of the tektites. The layered tektites, which are considered to be proximal to the source crater because of their large sizes (larger than 10 cm) and internal inhomogeneity, are distributed in the limited area in Thailand, Laos and Vietnam (Shnetzler, 1992). The number of microtektites per unit area in marine sediment cores decrease with the distance from Indochina peninsula (e.g., Prasad et al., 2007). Such distribution of tektites suggests that the location of the impact is somewhere in the eastern part of Indochina peninsula.

For more precisely constraining the location of the impact, the distribution of the ejecta deposit is important. The ejecta deposit, which is formed by deposition of materials ejected from the source crater, increases its thickness toward the location of the impact. It is also known that the abundance and size of shock-metamorphosed minerals in ejecta deposit increase towards the location of the impact (e.g., Morgan et al., 2006). The ejecta deposit of this impact event, however, has not been reported on the Indochina Peninsula.

In order to identify the ejecta deposit and clarify its distribution in the Indochina Peninsula, we have conducted field surveys in northeastern Thailand, central Vietnam, and southern Laos. We discovered shocked quartz grains—one of the most diagnostic evidence of impact—from the Quaternary sediment unconformably covering the basement rock, and identify the ejecta deposit at Huai Om section located near the border between northeastern Thailand and southern Laos. The ejecta deposit at Huai Om section can be divided into three units: silt-sand layers containing lip-up clasts of the basement rock (Unit 1, approximately 1 m in thickness), a tektite-bearing gravel layer (Unit 2, 20 cm–1 m in thickness), and a massive sand layer (Unit 3, approximately 3 m in thickness), in ascending order.

The tektite bearing gravel layer and the massive sand layer (corresponding to Units 2 and 3 at Huai Om

section) are distributed widely in the eastern part of Indochina Peninsula. Especially, the thickness of the tektite bearing gravel layer (Unit 2) increases toward the area around the southern part of the border between Thailand and Laos. We have measured abundance and size of shocked quartz grains at three sites in northeastern Thailand including Huai Om section. Although the size of shocked quartz grains is similar (approximately 200 μm) among these sites, its abundance varies between 5 and 10% and increases toward the area around the southern part of the border between Thailand and Laos. The distribution of the tektite-bearing gravel layer and abundance of shocked quartz grains indicate that the location of the impact is close to this area.

We are measuring the abundance and size of shocked quartz grains at additional sites in Thailand, Vietnam and Laos. In this presentation, we will report the distribution of the thickness of the ejecta deposit, abundance and size of shocked quartz in the eastern part of Indochina Peninsula to further constrain the location of the impact.

Keywords: Tektite, Shocked quartz, Ejecta, Australasian Tektite