LOCATION OF THE AUSTRALASIAN TEKTITE IMPACT EVENT BASED ON DISTRIBUTION OF THE EJECTA DEPOSITS IN THE EASTERN INDOCHINA. T. Tada[1], R. Tada[1,2], P. A. Carling[3], W. Songtham[4], P. Chansom[4], L. X. Thuyen[5], C. Q. Nguyen[6], T. Kogure[2], Y. Chang[2*], and E. Tajika[2], [1]Institute for Geo-Cosmology, Chiba Institute of Technology, 2-17-1, Tsudanuma, Narashino, Chiba 275-0016, Japan (tada.toshihiro@p.chibakoudai.jp), [2]Department of Earth and Planetary Science, the University of Tokyo, 7-3-1 Hongo, Bunkyo-Ku, Tokyo 113-0033, Japan, [3]Geography and Environmental Sciences, University of Southampton, Highfield, Southampton SO17 1BJ, UK, [5]Ho Chi Minh City University of Science, 227 Đ. Nguyễn Văn Cừ, Phường-4, Quận-5, Thành phố Hồ Chí Minh, Vietnam, [6]DRAGON - Mekong Institute, Can Tho University Campus II, 3/2 street, Xuan Khanh ward, Ninh Kieu district, Can Tho 900000, Vietnam, *Present affiliation: Google, Shibuya-City, Tokyo, Japan G.K.

Introduction: The Australasian tektite event (AATE; ca. 0.79 Ma) is the youngest large impact event on the Earth. Based on the wide distribution of the tektite extending from Southeast Asia to Antarctica, the magnitude of the impact has been estimated as large enough to create a 30–120 km-sized crater [e.g., 1]. Despite intensive search efforts, the source crater of the AATE has not been conclusively identified to date, although the location has been estimated as somewhere in eastern Indochina based on the distribution of the tektites [1–4]. Recently, the hypothesis was proposed that the crater was buried under younger basalt in Bolaven Plateau in southwestern Laos [5].

To constrain the impact location, the distribution of the ejecta deposit is useful since the thickness of an ejecta deposit generally increases toward the impact location. The ejecta deposit derived from the AATE was identified at Huai Om and HO06 sections in northeastern Thailand by [6, 7] based on the detailed occurrence of tektites and shocked quartz with planar deformation features (PDFs) in the Quaternary sedimentary sequence. The ejecta deposit is composed of three lithostratigraphic units: Units 1–3 in ascending order. Unit 2 is a tektite-bearing breccia layer occasionally called "laterite" because of intensive cementation by iron oxide/hydroxide, which is considered as the ejecta curtain deposit (see [6, 7] for the detailed description and interpretation of each unit).

In this study, we have conducted field surveys in a wide area of eastern Indochina to investigate the distribution of the ejecta deposit, especially focusing on the thickness distribution of the breccia layer (Unit 2).

Methods: Field surveys were conducted at 21 localities in eastern Indochina including northeastern Thailand, southern Vietnam, southern Laos, and northern Cambodia (Fig. 1). Because the outcrops were generally covered by vegetation, we cleaned the outcrops to make complete exposure from the basement rock to the top of the Quaternary deposit and make columnar sections at each locality. Sediment samples were taken from each lithostratigraphic unit.

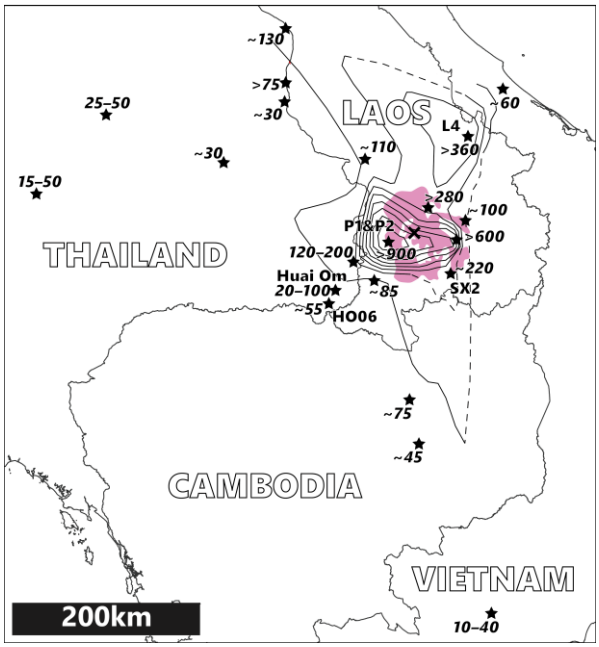

Figure 1. Map of the study area. The surveyed sites are indicated with black stars. The thickness of Unit 2 at each site is also shown in centimeters with contours. The estimated impact site is indicated with X. The distribution of the basalt in Bolaven Plateau is shown as the pink area.

Samples were indurated with resin, and cut surfaces were polished and thin sections were made for microscopic observation. The orientations of PDFs in quartz grains were measured using a four-axis universal stage at Institute for Geo-Cosmology of Chiba Institute of Technology, Japan, based on the method of [8–10].

Results: The Quaternary sedimentary sequence similar to that of the ejecta deposit of AATE reported in northeastern Thailand [6, 7] was observed in a wide area in eastern Indochina. The Quaternary sequence can be divided into Units 1–3 in ascending order. Unit 1 is silt–sand layer occasionally containing lip-up clasts of the underlying basement rock. Unit 2 is the tektite-bearing breccia layer with thickness varying

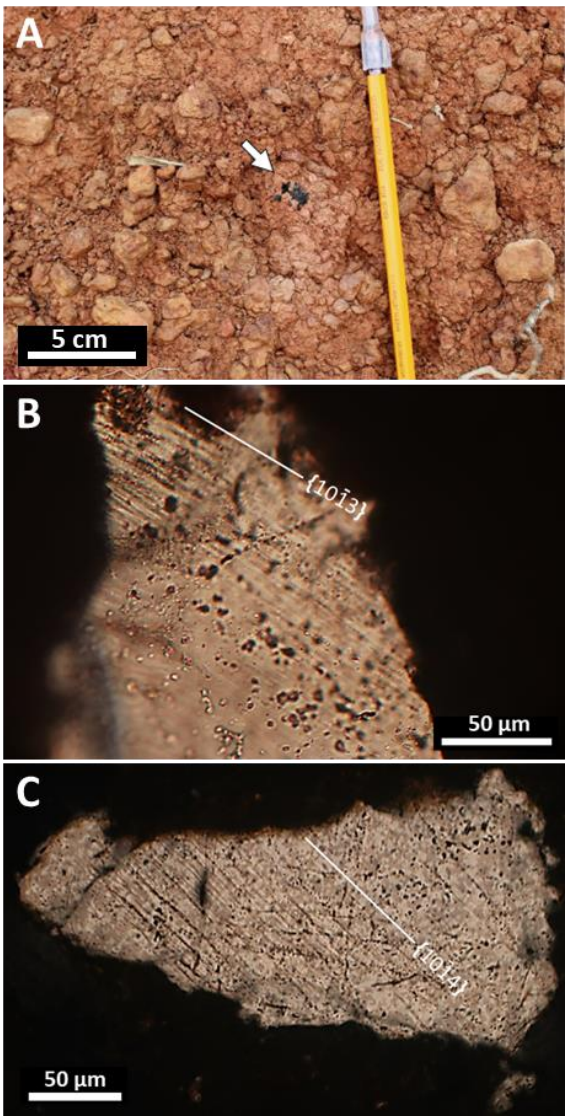

Figure 2. A) Photograph showing the occurrence of a tektite in the breccia layer (Unit 2) at L4 section in southeastern Laos. The tektite is indicated with the white arrow. B) and C) Photomicrographs of the shocked quartz with PDFs found from Unit 2 at P1 section (B) and SX2 section (C) in southwestern Laos.

from 20 cm to several meters and composed of quartzite fragments, sandstone and mudstone fragments, and weathered basalt fragments. Unit 3 is a massive sand layer. Especially Unit 2 and Unit 3 are laterally traceable throughout eastern Indochina. The lithostratigraphy and the distribution of each unit will be reported in detail at the presentation. Tektites are generally found from the upper to uppermost part of Unit 2. Shocked quartz grains with PDFs were found from the Quaternary sequence at multiple sites (Fig.2).

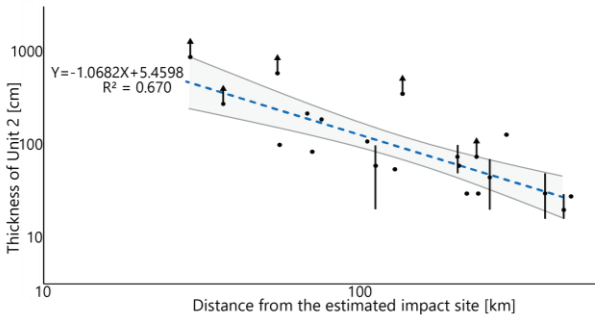

Figure 3. A) Graph of log thickness of Unit 2 versus log distance of each site from the estimated source area at 15.2°N latitude and 106.1°E longitude. The regression equation and its 95% confidence interval are shown. For sites where the original thickness of Unit 2 is unknown, the maximum thickness that can be observed at the outcrop is plotted with the upper arrow. For sites where the thickness of Unit 2 varies, the typical thickness observed at the outcrop is plotted with a range.

Discussion and Conclusions: The thickness of Unit 2 tends to increase toward southwestern Laos (Figs. 1, 3). At P1 and P2 sections located 2 km east of Pakse city, the breccia layer of at least 9 m thick was observed. The regression analysis of the distribution of the thickness of Unit 2, assuming that the log thickness is negatively correlated with log distance from a source area, indicates that the Bolaven Plateau area (15.2°N, 106.1°E) is the most probable impact site of the AATE (Figs. 1, 3). The presence of the weathered basalt and sandstone fragments in Unit 2 also indicates the Bolaven Plateau as a source site of the ejecta since Cretaceous sandstone and Quaternary basalt are widely distributed in this area [e.g., 2]. The result of this study is consistent with the hypothesis of [2].

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