THE AUSTRALASIAN TEKTITE STREWN FIELD (HIGHLY OBLIQUE) SOURCE IMPACT IS IN CHAMPASAK PROVINCE, LAOS.

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Introduction: The ~790,000 year-old Australasian tektite strewn field is the largest known on Earth extending across southeastern Asia and Australia to Antarctica (and adjacent ocean basins). The asymmetric strewn field has "butterfly wings" and a downrange lobe (and rays) extending southeastwards suggesting that it formed as a result of a highly oblique impact [1, 2]. Variations in tektite size, form, mineralogy, isotopes, and volatile and major element compositions indicate a source in central Indochina, but no expected large crater (≥30 km diameter) has been found [e.g. 3, 4]. A highly oblique impact (e.g., ~5°) also explains why no large crater has been found as impact energy is strongly partitioned into jetting rather than excavation, yielding a >10 times smaller volume crater [5].

Source Impact Location Constraints: The distribution of the most proximal ejecta type is the best clue to locating a source crater and the Muong Nong (MN) tektites are the most proximal [e.g., 3]. Schnetzler [3] proposed that the MN size distribution and elemental abundance gradients indicated that the source impact was located near the southern Laos-Thailand border area; Hildebrand [2] partly filled in MN collection gaps and the augmented elemental gradient data shows that the source crater occurs in southwestern Laos near the Cambodian and Thai borders.

The Champasak Craters: Two elliptical craters occur just north of the Laos-Cambodian border in the southwestern Annamite Mountains (~600 m relief) of Champasak province: Champasak A (~ 3 by 1.6 km; 14.5094° N; 105.9681° E) and B (~ 1.1 by 0.7 km; 14.4076° N; 105.9923° E). Both craters are breached to the east and particularly Champasak A has been somewhat enlarged by erosion. The two craters cut the regional structural lineaments and exhibit some of the steepest slopes in the area, indicating their relatively young age.

The impacted protolith. The craters formed within a Lower Middle Triassic rhyolitic to dacitic extrusive succession with minor clastic sediments up to 1 km thick [6]; fieldwork broadly confirms the succession mapping. The geographic MN elemental variations [3, 4] likely reflect rhyolitic to dacitic succession variation plus a quartoze sediment component for the northwestern sector of Champasak A. The clast-rich melt rock in Champasak A [2] forms a now-dissected melt sheet with thickness of >50 m remaining near its centre; southwards >100 m of melt remains; the melt rock contains rare clasts of clastic sediments indicating a quartoze sedimentary layer in the protolith. The mean elemental composition of the remaining melt sheet is plotted vs. average australite composition in Fig. 1; the agreement is generally good with deviations reflecting volatile loss, projectile contamination and local variation in protolith composition. For example, while the remaining melt sheet is relatively homogenous for most elements, Ca abundance variation is large N to S reflecting variations in the impacted protolith based upon adjacent wall rock.

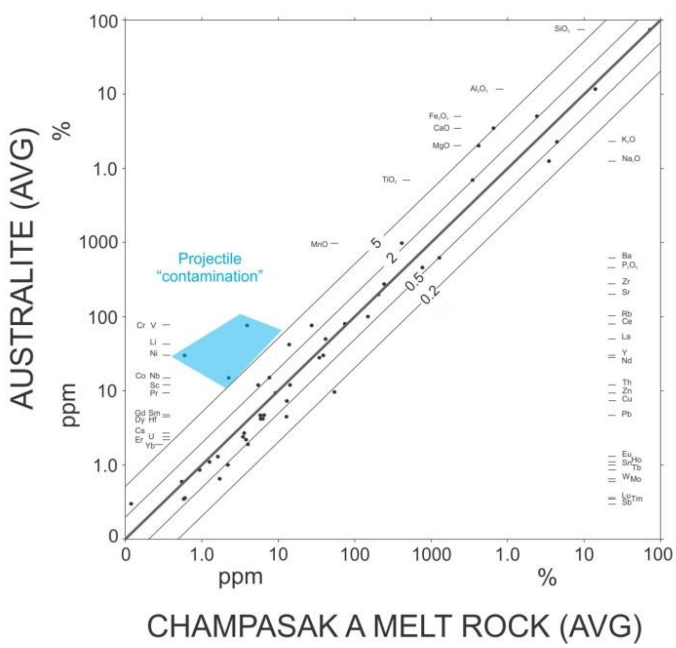

Figure 1: Comparison of average australite compostion to average Champasak A melt sheet composition for 46 major, minor and trace elements.

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