GEOGRAPHIC VARIATIONS IN PETROGRAPHY AND COMPOSITION IN AUSTRALASIAN MICROTEKTITES: IMPLICATIONS FOR THEIR FORMATION AND PARENT CRATER LOCATION.

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Mineral inclusions: We report the occurrence of microscopic inclusions of shocked quartz plus a Zr-phase and traces of Fe-oxide crystallites in Australasian microtektites recovered from deep-sea sediment cores within 2000 km of Indochina (see [1] for details). The shocked quartz and the Zr-phase are interpreted as relicts of the target. Furthermore, the petrographic heterogeneity of Australasian microtektites in terms of abundance of relict mineral inclusions, vesicles and schlieren decreases towards Indochina. This finding supports the current hypothesis that the source crater of the largest and youngest tektite strewn field on Earth is located in the Indochina region, as internal heterogeneity characterizes impact glass found in or near the source crater. The finding also indicates that the Australasian microtektites with the longest trajectories experienced the highest temperatures or were heated longer. Lastly, the definition of microtektites should include the possible occurrence of microscopic relict inclusions as an indication of proximity to the source crater.

Alkali loss: We studied the variations of the volatile major elements Na and K in Australasian microtektites with distance from the putative source crater location in Indochina (see [2] for details). The dataset includes 169 normal-type Australasian microtektites (101 from this study and 68 from the literature) from 24 deep-sea sediment cores up to 8000 km from Indochina, and 54 Transantarctic Mountain microtektites from northern Victoria Land, 11 000 km due southeast of Indochina. Normal-type (MgO < 5.5 wt% and SiO_2 = 60-78 wt%) Transantarctic Mountain microtektites and Australasian microtektites share a common volatilization trend with Na and K contents and range in alkali contents decreasing with distance from Indochina. The average total alkali ($Na_2O + K_2O$) concentrations at distance ranges of 1000 - 2000 km, 2000 - 4000 km, 4000 - 8000 km and >8000 km are 4.27 ± 0.67 wt% (n = 84), 3.20 ± 1.21 wt% (n = 50), 2.10 ± 0.25 wt% (n =35) and 1.25 ± 0.25 wt% (n = 54), respectively. The trend highlights a relationship between increasing loss of volatiles in microtektites with longer trajectories and higher temperature-time regimes which should be taken into account in microtektite formation modeling. The trend is consistent with a previous hypothesis that Transantarctic Mountain microtektites belong to the Australasian strewn field and that Indochina is the target region for the parent catastrophic impact. Possible and likely complementary volatilization mechanisms include the "bubble-stripping" model [3] and diffusive loss at high temperature during impact melting and hypervelocity flight.

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References: [1] Folco L. et al. 2010. *Geology* 38:211-214. [2] Folco L. et al. 2010. *Earth & Planetary Science Letters* 293:135-139. [3] Melosh H. J. and Artemieva N. 2004. Abstract #1723. 35th Lunar & Planetary Science Conference.