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Exploring the collisional origins for the formation of Australasian tektites

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Tektites are impact products from high-energy collisional events and are found in association with known strewn fields scattered around their origins of impact. Tektites and microtektites from the Australasian Strewn Field have been well-studied, characterized by a wide variety of compositions in major and trace elements, and are well-accepted to be composed of materials from the upper continental crust [1]. To explore the origins of such impact products through their compositional contributions from the impact source and impactor, we have analyzed the major and trace element compositions of a number of Australasian tektites using the EMPA and quadrupole ICP-MS. Notable observations include well-defined linear trends for REE vs Th compositions in log-log space, which extend to the Transantarctic and deep-sea microtektites measured through LA-ICP-MS from multiple studies [2, and references therein], assigning Australasian tektites and microtektites a unique fingerprint differentiating such objects from other igneous melts. These linear relations strongly suggest that Australasian tektites and microtektites are linked through Rayleigh evaporation of materials originating from the upper continental crust. A similar trend is observed for Ni-normalized Cr and Co concentrations for the Australasian tektites and microtektites, attributed to an impactor of chondritic origin [3] and possible mafic components [2]. Careful analysis of such trends suggests at least two different groupings. We explore whether such groupings may reflect the degree of evaporation and condensation involved, and the possibility of the involvement two separate impacts of different energy levels that may have originated from a bolide that fragmented during atmospheric entry. Identifying similar systematic geochemical trends has implications for identifying materials that have formed from impact events and understanding their collisional history.

[1] Koeberl et al., (2014) *Treatise on Geochemistry*, 73-118
[2] Folco et al., (2023) *GCA* 360, 231-240
[3] Folco et al., (2018) *GCA* 222, 550-568