The spatial density of in-situ Australasian tektites in Southern China

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Introduction: The source crater of the Australasian strewn of tektites and microtektites has not been found. Most studies agree that the source crater should be somewhere around 17ºN and 107ºE [1]. The distribution of various forms of tektites (i.e., splash-form, ablated splash-form and Muong Nong tektites), the spatial density of microtektites collected from deep ocean sedimentary cores, the possible trend of devolatilization observed in microtektites all suggest that the source crater should be located somewhere in the southeast Asia [cf. 2]. Among the multiple lines of evidence, the spatial density of microtektites is the most important one, as the density generally decreases with larger distances from the southeast Asia, although the data points are rather scattered [1]. However, a potential caveat of the method is that although dozens of cores have recovered microtektites from this strewn field, the combined area of the cores is less than 1 m^2 [3], while the entire strewn field covers >20% of the Earth surface [4]. Therefore, whether or not the observed density variations of microtektites represent the actual situation should be regarded as an open question. A fundamental reason supporting this argument is that the transportation process of microtektites is not resolved at all, since the trajectory is heavily intertwined with the impact-disturbed atmosphere [5].

Tektites are at least two-orders of magnitude larger than micro-tektites, so that the transportation of tektites should be less affected by the atmosphere and their trajectories are more akin to ballistic trajectory. An investigation of the spatial density of tektites should be informative to both the spatial distribution of microtektites and possible location of source crater. However, there has been no such study for tektites. This is because except for 5 locations that have discovered possible in-situ tektites (i.e., tektites that have not been mobilized after the initial deposition; [6]), so far, the collected tektites have uniformly been transported after deposition.

Stratigraphy of tektites in the southern China: The current northern boundary of the Australasian strewn field is located at Baise, Guangxi Province [7]. It is well known at the southern China, tektites typically occur right at the boundary between the two sections of the Beihai Formation, although the majority of tektites in southern China are also transported ones [8]. During the past three years, we have done a systematical field investigation over a 2º×2º areas in the Guangdong, Hainan, and Guangxi Provinces to study the stratigraphic positions of tektites. We found 25 outcrops that probably contain in-situ tektites. Three pieces of evidence support the scenario of in-situ occurrence: (1) the discovered tektites are uniformly located between the upper sandstone and lower conglomerate sections of the Beihai Formation, and this boundary has the same stratigraphic ages with the tektites (^{10}Be age is under investigation); (2) the discovered tektites are little eroded and they are larger than the grain size of the sandstone and conglomerate above and below their occurrences, so that they are unlikely to have been transported. Before ^{10}Be age for the boundary is successfully derived, we have to face at least one extreme possibility that may negate this scenario: the tektites might have been transported for short distances after deposition, e.g., under the effect of microtopography (10s-m scale).

Spatial density: During the field trip, we have measured the line density for these in-situ tektites, assuming that the spatial density of tektites at a given location is uniform so a line density can be representative of the general density. The measured profiles have gentle dips, and those with complicated attitudes are avoided considering that small-scale transportation might have inevitably occurred. A more strict method should wholly reveal the boundary and carefully collect the number of tektites within a given area. We notice the following spatial density: (1) at each given location, the line density of tektites can be varied by >10 folds, which is consistent with that of microtektites [1]; (2) the southernmost Hainan Province and the Lei Zhou peninsula do not have uniformly larger line densities of tektites than the areas to the north, which is inconsistent with that of the general spatial densities of microtektites reported by [2] and [3].

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