

Expanding the Belize Glass Field, in the Physical, Chemical and Geographic Spaces

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Natural occurrence of a tektite-like fully melted impact glass has been recognized in Belize, e.g. [1,2]; we therefore provisionally name this material belizite. Years of searching by field geologists (J.C. and D.M.) and local people have yielded >4000 belizites with masses in the <1 to 103 g range. They show pitted surfaces with clear splash-forms (mostly spheroidal but also various elongated forms including teardrop and dumbbell) although a number of samples are more angular. No layered sample has been found but schlierens are common.

Magnetic susceptibility appears very homogeneous (s.d. of 3% on 40 samples excluding two outliers) and purely paramagnetic, which is typical for tektites [3]. However, we found two outliers with significant magnetite content (up to 200 ppm), confirming findings of [4]. While a large majority of belizites shows a porosity <1%, a number of samples are in the 8% range and we just recovered a 17 g sample with 22% porosity, including foamy zones (near 50% vesicles). These physical heterogeneities may suggest an affinity with more proximal impact glasses. Cumulative distribution versus mass shows a fractal exponent near minus 3, similar to what we observed in ivorites and atacamaites.

Chemical homogeneity is another clue to define tektite, but the threshold toward what can be considered as heterogeneous is hard to quantify. Using SEM-EDX averages we observed between-samples relative variability of 2, 5, 9, 18, 24, 25 and 30 %, on SiO₂, Al₂O₃, K₂O, CaO, TiO₂, FeO and NaO, respectively. Such chemical variability is observed in established tektites. Paramagnetic susceptibility measurements confirm bulk total iron variability of about 27%. Within-sample variability seems similar (based on microprobe as well) apart from lechatelierite inclusions and SiO₂ rich schlierens. Lechatelierite counting leads to 1 ‰ abundance with size up to 1 mm.

The geographic distribution in Belize, NW part of the Cayo district, is now well defined and does not exceed 500 km². Belizites are found only on Miocene clays and overlying gravels, while the surrounding older limestone hills have not revealed any sample. Whether this reflects a geological conservation bias or the real strewnfield remains to be established. A much larger strewnfield has been proposed [1] based on the recovery of similar glass in Maya excavations from Guatemala (Tikal and Topoxte) as well as Mexico (Dzibilchaltun). However, a systematic search conducted for five days by PR in between Belize border and Tikal has been unsuccessful, despite concentrating on clay formations and outcropping conditions similar to the Cayo area. A touristic visit to Tikal and Topoxte confirmed their setting on limestone hilltops, a non-favorable situation to preserve belizites based on the Belize case. The alternative to natural occurrence of belizites within the Maya sites soils would be that the Mayas transported this material, through exchanges with the several Maya cities present in the Belize strewnfield (including El Pilar where a belizite has been excavated). However, this is at odds with archeological evidences that did not recognize processed belizite or samples placed in ceremonial deposits. At the moment the possibility and the motives for such a transport is not grounded and we thus remain with a likely much larger strewnfield, although with lower density than the Belize “hotspot”.

References [1] Povenmire H and Cornec J. (2015) LPSC abstract#1132 [2] King D.T et al. (2016) LPSC abstract#2910 [3] Rochette P. et al. (2015) EPSL 432, 381–390 [4] Hoffman V. et al. (2016) LPSC abstract#2482.