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TEKTITES: ORIGIN AS MELTS PRODUCED BY THE IMPACT OF SMALL PROJECTILES ONTO DRY TARGETS. John T. Wasson, University of California, Los Angeles, CA 90024 USA.

A number of curious features of tektites seem to be more easily understood if they are produced by showers of small (10-100 m) projectiles onto dry, porous target materials. Tektites are samples of glass with no crystallites and very rare relict grains. Their compositions are closely similar to mean continental crust, especially that of the continent upon which they rest. They are very dry, but their volatile contents are moderately high, generally in the range 0.2-1.0x those of continental crust. Some tektites are very large (the largest is 13 kg and a fragment) and show layering that seems best interpreted to have resulted from flow in a layer of melt on the Earth's suface.

The formation of tektites in general and layered tektites in particular seems to require a very special kind of cratering event. Evidence for the formation of pools of melt free of unmelted clasts has not been reported for the well-studied terrestrial craters such as Manicouagan or Ries. I suggest that large amounts of relict-free melt were produced only when a sizeable fraction of the cratered target consisted of dry, high-porosity materials such as aeolian sediments. Since dry, high-porosity target materials are always confined to the outer 100-200 m of the Earth, the fraction of melt produced melt is probably higher in small (radius 50-500 m) craters than in large (r>1 km) craters. Another reason to infer that the Southeast Asian tektites were produced in a multitude of small craters is the wide distribution of layered tektites. The field spans at least 1200 km, which would require ballistic ejection at velocities >2 km s^{-1} if all melt was generated in a single crater. It seems impossible to devise a scenario that would lead to the deposition of primary melt as a crystal-free pool at a distance of 600 km from the crater. Ballistic transport of large (>10 m) bodies would lead to crater formation and inmixing of unmelted target on impact. Drag and shear would prevent the transport of small masses through the atmosphere. Although accretionary events energetic enough to produce tektites occur on a frequency of Ma^{-1}, only 4 tektite fields are known from the past 40 Ma. This fits well with the picture that tektites require unusually weak (cometary?) projectiles that break up in heliocentric orbit far from the Earth and exceptional climatic (dry and windy) circumstances.