The Tamarack Pond Core as a Rosetta Stone for Impact Events: How Many Late Holocene Impact Ejecta Layers?

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Abstract

A core from Tamarack Pond in Black Rock forest has 11 prospective impact ejecta layers that contain Ni rich metal embedded in the surfaces of concoidally fractured grains or marine microfossils. Six out of the eleven layers contain impact glass that has a chemistry and morphology that is inconsistent with volcanic glass. Nine out of the eleven layers contain marine microfossils. Some of the marine microfossils are embedded within the surface of impact glasses. Still other marine microfossils are of species with a distal origin, on the order of 10,000 km away at a minimum. The following work is needed to fully confirm the impact origin of these 11 layers: 1) SEM imaging of the glasses to look for vesicles and entrained microfossils, 2) microprobe analyses and petrographic imaging of the glasses to ensure that their chemistry and petrography are diagnostic of an impact origin (and inconsistent with a volcanic origin), 3) SEM/EDS investigation of concoidally fractured grains in the layers to assess if they are encrusted with Ni rich metal, 4) consultation of micropaleontologists to determine the prospective microfossils' genus and species, 5) SEM imaging and microanalysis of marine microfossils to search for and confirm microscopic to ultramicroscopic "splashes" of Ni-rich metal and 6) obtaining additional C-14 dates on the core. To maximize our chances of obtaining a publishable result in a short time, this study will concentrate on the three layers with the most glass and the largest glass shards (Layers 8, 10 and 11). Layer 8 has a preliminary age that matches that of a tsunami layer in the Hudson and on Long Island. The Hudson layer contains impact ejecta. The glasses from layers 10 and 11 have distinctively different chemistries and as well as especially large sizes that will allow us to determine the effects of bioturbation on the distribution of impact ejecta. Extensive sieving and microscope work (optical, petrographic, and SEM) will be required to complete this study. The climate center grant will fund the analytical costs (AMS C-14 dating, SEM time, and polished thin section costs) for two students who will work this summer. Their salaries will be funded from another grant. The high school student (Katie Cagen) will use the results to compete for a Westinghouse scholarship in her senior year. The college student (Perri Gerard-Little) will use the results as the basis for her senior thesis. The glasses from Layer 8 and layer 11 have preliminary ages that match those of climate downturns at 208 B.C. and 1158 B.C. The potential scientific return of this work is very high, as these layers could serve as regional marker horizons in both marine and terrestrial cores.