Plop Plop Fizz Fizz: Identifying and Characterizing Microejecta From Oceanic Extraterrestrial Impacts Using Analytical Scanning Electron Microscopy

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Recent evidence gathered from multiple lines of investigation converges to postulate a higher than average incidence of catastrophic oceanic impacts in the Holocene that affected global climate and thereby the course of human history. Oceanic impacts further back in time are also being documented. One productive technological tool used in the process of these investigations is the combination of scanning electron microscopy (SEM) and energy-dispersive X-ray microanalysis (EDS), with which we define and characterize impact-related (ultra)microscopic particles. In support of our Holocene and related impact investigations, this presentation of SEM images and EDS data illustrates the application of these technologies in the examination of microscopic and ultramicroscopic fragments, grains, microtektites, and other spherules associated with two oceanic extraterrestrial impact events. Secondary electron micrographs record the microejecta's shapes, sizes, structures, and textures. Our EDS data identify the elemental or compound/mineral compositions of heterogeneous specimens as well as of individual spots and areas in nonhomogeneous host particles as "mapped" by backscatter imaging. The source craters covered here include twin ca.1500 ybp craters in the Gulf of Carpentaria (Australia) as well as one in the Ross Sea (Antarctica) dated to the late Pliocene. Important results from the Gulf of Carpentaria include magnetite impact spherules, impact glass, and minerals with odd, potentially indicative, fractures. From the Ross Sea, we show melted KCl fragments and possible melted ilmenite grains, "onion- skin"-type layered tektites composed of pure SiO2, pseudotachylite-like veined rock fragments, a glass with possible shatter cone structures, and other microejecta particles whose structural and chemical natures we interpret as diagnostic of these impact events.

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