Chesapeake Bay Crater: Source for upper Eocene ejecta, New Jersey continental margin

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Additional evidence for a 90-km impact structure in Chesapeake Bay was provided by the Ocean Drilling Program (ODP) during an expedition to the New Jersey continental slope. The impact event, that occurred during the late Eocene, 35.5 million years ago, blasted material into the atmosphere. The impact debris consisting of tektites, which are glasses produced by the melting and quenching of terrestrial rocks during hypervelocity impact on the Earth, and shock metamorphosed minerals settled across Texas, Georgia, the Caribbean Sea, Gulf of Mexico, and Barbados forming the North American Strewn Field. Impact ejecta of upper Eocene age were first discovered offshore New Jersey at Deep Sea Drilling (DSDP) Site 612 in a single layer 8 cm thick. We report additional upper Eocene ejecta composed of tektites and shock metamorphosed minerals recovered from drill cores at ODP Sites 904 and 903 on the New Jersey continental slope at 1123 m and 450 m of water depth, respectively.

The mineralogy, major oxide composition of the ejecta materials and the biostratigraphic age of the enclosing sediment permit to correlate the New Jersey margin ejecta to the Exmore boulder bed, which has been identified as impact debris derived from the Chesapeake Bay impact event. The Chesapeake Bay Crater, located only 300 km away from the New Jersey margin, has been shown to be the source for the North American Field, and now demonstrated as the origin of the New Jersey slope ejecta.

The sediment associated with the ejecta at Site 904 provides new important information about the dynamics of impact events. The 35-cm-thick ejecta-bearing layer can be subdivided into three subunits that indicate a sequence of events initiated first by sediment failure, second by arrival of the gravel size fragments, followed by deposition of abundant sand-size ejecta by gravity settling, and terminated with a 12-cm-thick sedimentary deposit containing rare silt-sized tektites and evidence of waning currents. These events are interpreted by linking sediment deposition to seismic ground motion and subsequent tsunami waves triggered by both the Chesapeake Bay impact and slope failures.