(U-TH)/HE DATING OF SHOCKED ZIRCONS FROM CHESAPEAKE BAY DISTAL IMPACT EJECTA AT ODP SITE 1073

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The 40-km diameter central crater of the Chesapeake Bay impact structure is thought to be the source for the North American tektite (NAT) strewn field, found preserved both onshore and offshore (Deutsch and Koeberl 2006). The age of the Chesapeake Bay impact structure is inferred indirectly from K/Ar, fission track, U-Pb and 40Ar/39Ar dates of NA tektites, yielding ages ranging from 32.5 ± 2.0 to 35.9 ± 4.8 Ma (Fernandes et al. 2019).

To augment previous geochronological attempts to date the Chesapeake Bay event, we used the (U‐Th)/He method to date 21 individual zircons in a sediment from ODP 1073, located ~390 km NE of the crater. In addition, 8 zircon fragments (not dated) were examined by optical and electron imaging in combination with energy dispersive X-ray microanalyses to characterize shock levels in the sample material and to help interpret our dating results.

The zircons from the drill core show evidence of shock metamorphism, including planar deformation features, granular texture and decomposition to baddeleyite and silica. The shocked zircon grains likely represent distal ejecta from the Chesapeake Bay impact structure due to the excavation/ejection process, whereas the unshocked zircon crystals may be derived from unshocked Chesapeake Bay target rocks, different sources unrelated to the impact, or may represent contamination by drilling mud (Andrews et al. 2016).

(U-Th)/He dates for zircons from this sediment range from 33.49 ± 0.94 to 305.1 ± 8.6 Ma (all 2σ errors). Six of the 21 dates are younger than 70 Ma, and the 3 youngest dates range from 36.7 ± 1.0 Ma to 33.49 ± 0.94 Ma. The 2 youngest zircon crystals are optically distinctive (opaque/milky white and translucent/partly cloudy). However, the third-youngest zircon is clear/euhedral, similar in appearance to older dated zircons that preserve no evidence of shock metamorphism, therefore, this analysis was excluded. The 2 youngest zircons yield an inverse-variance weighted mean (U-Th)/He age of 33.99 ± 0.71 Ma (n = 2; MSWD = 2.6), interpreted as the shock-induced zircon (U-Th)/He resetting age of the Chesapeake Bay impact event. Our results provide evidence that it is possible to obtain impact crater formation ages via (U-Th)/He dating of carefully characterized distal ejecta samples due to the fast He diffusion properties in zircon.