Rim Deformation as Evidence for an Oblique Meteorite Impact at the Flynn Creek Crater, Tennessee

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It has been shown statistically that the probability of a vertical extraterrestrial impact is negligible, but it is far more probable to have an impact occur at 45˚ (Gault and Wedekind, 1978). Bolide trajectory and angle of impact are major controls of impact cratering morphology. Specifically the ejecta distribution directly reflects the angle and trajectory of impact; elongation of the crater in plan view can result from low impact angles; and central peaks appear to be dominated by reverse faults thrusting with the trajectory (Gault and Wedekind, 1978, Schultz and Anderson, 1996, Scherler, et al., 2006, and Kenkman and Poelchau, 2009). The Flynn Creek impact structure was created about 382 million years ago during the Late Devonian, in a shallow marine setting (Roddy, 1968 and Scheiber and Over, 2005). All traces of ejecta external to the crater have been eroded, eliminating one indicator of trajectory (Roddy, 1968 and Scheiber and Over, 2005). The crater shape in plan view exhibits elongation along the slightly southwest to northeast axis, while the central uplift is dominated by reverse faults thrusting to the east (Roddy, 1979). The subsequent burial of this crater allowed for effective preservation of the crater; however it also denies access to some parts necessary to determine impactor trajectory. The development of caves and surfical erosion of the crater rim provide access to the structural deformation associated with what could be an oblique impact. By using the caves and some surface exposures, it may be possible to determine if the Flynn Creek structure was indeed produced by the effects of an oblique impact, and also to determine the trajectory of the impactor.