

PALEOMAGNETIC ANALYSIS OF THE FLYNN CREEK AND WELLS CREEK IMPACT STRUCTURES, NORTH CENTRAL TENNESSEE, USA. N. J. Rohleder¹ and S. A. Dulin¹, ¹University of Oklahoma 100 E. Boyd St. Suite 710 Norman, OK 73019. n@ou.edu, sdulin@ou.edu.

The timing of impact of many structures is only able to be determined by stratigraphic constraints, yielding many known impact structures with wide age-ranges. Paleomagnetic sampling is one way to further constrain the timing of impacts, particularly in the absence of other methods. Two structures in central Tennessee, Flynn Creek and Wells Creek, were sampled for paleomagnetic analysis to potentially refine the stratigraphically determined ages of the impact structures and to yield insight into paleomagnetic process associated with impact deformation. Using paleomagnetic techniques the age range for the Wells Creek impact age can be further constrained: while the Flynn Creek age range can be verified and these data can be used as a proof of concept.

The Flynn Creek impact structure is located near Gainsborough, Tennessee, and is made up of Ordovician and Devonian limestones and dolomites. The structure is 3.8km in diameter; the age of the impact has been determined stratigraphically. The Chattanooga Shale (Upper Devonian) is undeformed—indicating that the impact event happened before its deposition while the Flynn Creek Breccia (Lower Devonian) was brecciated due to the impact. The age of the structure is well-constrained to 360 +/- 20 Ma. The rim of the structure is completely eroded, likely due so its formation within a shallow epicontinental seas.

The Wells Creek impact structure, located in Cumberland City, Tennessee, is an eroded impact structure that is 12 km in diameter. The structure is made up of Ordovician, Silurian, Devonian, and Mississippian Limestones—all of which are deformed due impact. Shatter cones as well as brecciation have been discovered in the center of the impact. The impact is currently age constrained solely by stratigraphic evidence—the deformed units are overlain by Cretaceous Tuscaloosa Shale. This places the impact event around 200 my +/- 100 million years.

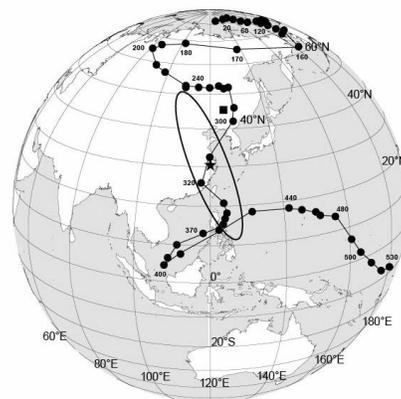
Nine sites were sampled (8-10 specimens per site) from the central uplift of the Flynn Creek impact to determine the presence of a paleomagnetic signature (fig 1). A preliminary study of 9 specimens from four sites taken from the Flynn Creek Breccia, located in the center of the structure, were demagnetized using alternating-field demagnetization from 10mT-120mT in 10mT increments. A preliminary stable magnetic direction was found with a dec=157.5, inc=31.8, k=8.45, a95=18.8. The virtual pole derived from these

data is 32.4 N, 120 E (Dp: 11.9, Dm:21.1). The pole lies on the apparent polar wander path at 310 Ma; the error from this preliminary pole overlies the Late Devonian (fig 2). The error is very large due to the small number of preliminary samples. These data support the stratigraphic age constraint for this impact event (360 +/- 20mya).

Further analysis of the remaining Flynn Creek sampling locations is ongoing, as well as sites within the Wells Creek structure and undeformed rocks outside of the structure. This will help determine the spatial extent of the ancient magnetization. The preliminary magnetic results of the Flynn Creek impact show that a magnetization was acquired during or shortly after impact. If the Wells Creek also holds a magnetization, the age of the impact may be further constrained than the wide stratigraphic range.



(Fig. 1 Flynn Creek Breccia—center of impact structure)



(Fig. 2 Preliminary pole with error showing overlap of Late Devonian)