PLANAR DEFORMATION FEATURES IN QUARTZ GRAINS FROM A DEEPLY BURIED, CANDIDATE IMPACT STRUCTURE, CENTRAL NEW YORK. D. T. King, Jr.[1], L. W. Peturny[1] and D. Leiphart[2], [1]Geosciences, 2050 Memorial Coliseum, Auburn University, Auburn, Alabama 36849 USA [kingdat@auburn.edu], [2]Chesapeake Energy Corporation, Oklahoma City, Oklahoma 73118 USA.

Introduction: A previous geophysical study defined a deeply buried buried, ~ 3.5-km diameter circular structure in the Finger Lakes area of central New York [1, 2]. This feature has been suggested as a candidate impact structure (Bear Swamp) [1, 2]. This annular structural feature is located at an average depth of ~ 1.2 km and in seismic section appears to have a central peak and an apparent crater moat [1, 2]. Previous bore-hole data and samples indicated a structure-filling sequence consisting of lithic arenite and carbonate breccia overlain by finely laminated, presumed post-impact sedimentary unit. The apparent target strata were part of the Queenston Formation, an Upper Ordovician clastic wedge deposit consisting mainly of lower coastal plain sediments. Erosional truncation of the apparent crater rim and abrupt termination of the laminated, presumed post-impact filling unit indicate that the candidate impact structure is approximately coeval with the inter-regional basal Silurian transgression [1-3]. According to previous work, the age of this local post-Tippecanoe transgression is at or near the global Ordovician-Silurian boundary [1-3].

Petrography: Even though previous geophysical and bore-hole evidence supported this candidate structure as being of impact origin, evidence such as measurable PDFs in quartz was not reported until recently [3]. For this study, thin sections were made from a short drill-core segment extracted from a well that penetrated the apparent crater moat adjacent to the structure's apparent central uplift. Thin sections consist mainly of what we interpret as impact breccia matrix, which is a lithic arenite consisting of quartz, feldspars, mica, and lithic fragments (e.g., clastics, carbonates, and chert). Quartz grains bearing PDFs are rare in the thin sections examined, occurring at a rate of about 1-4 per slide. The PDFs are both decorated and fresh and there are 1-5 sets per grain (Figs. 2-4). Quartz with PDFs typically displays also one or more PFs, more than one internal crystalline domain, at least some undulose extinction, and a slight grey-brown discoloration in non-polarized light. PDFs have wide-ranging polar angles, based on 10 grains and 25 planes analyzed so far. The most common polar angle so far observed relates to the plane {2131} [3] (Fig. 5). Our PDF measurements coincide with shock-characteristic planes and polar angles in quartz from within other well-established impact structures.

Acknowlegements: We thank Chesapeake Energy, Oklahoma City, for samples and background information.

References: [1] Leiphart D. (2010) *AGU Abstracts* #P53C-1526. [2] Leiphart D. (2012) *The Leading Edge*, August, 892-897. [3] King Jr. D. T., et al. (2017) *GSA Abstracts*, #304809.

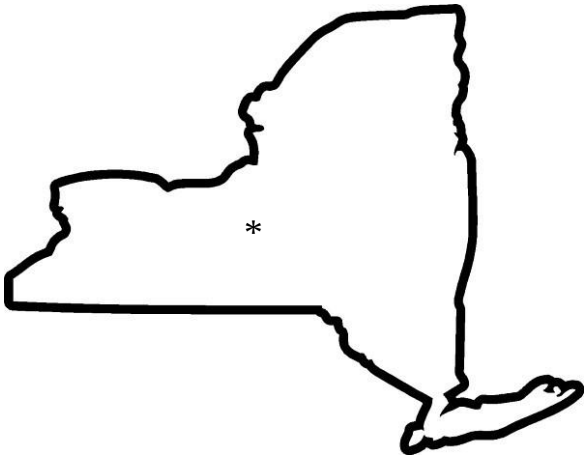

Figure 1. Approximate location (*) of the proposed Bear Swamp structure in central New York.

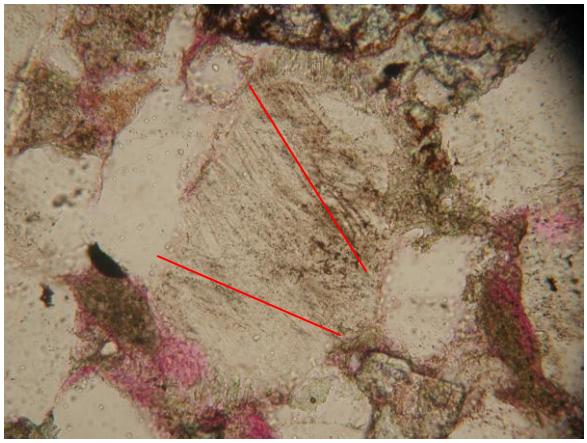

Figure 2. Quartz grain with two sets of decorated PDFs. Upper line indicates {1012}; lower line indicates {2131}. Slide 4835.16; grain W1.

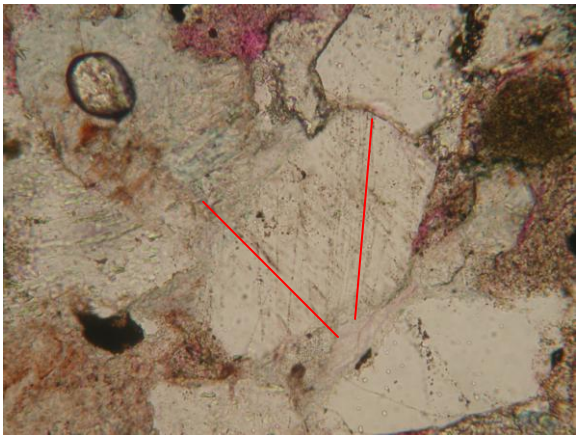

Figure 3. Quartz grain with two sets of PDFs. Upper line indicates {2131}; lower line indicates {1013}. Slide 4835.16; grain S1.

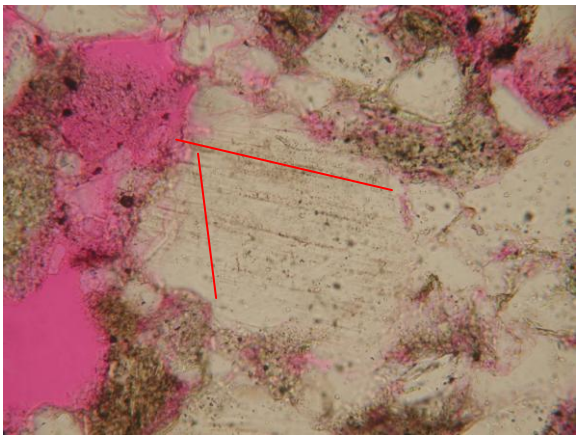

Figure 4. Quartz grain with two set of PDFs. Upper line inidicates {1014}; lower line marks a plane that could not be indexed but appears to be at a polar angle of 56.8 degrees. Slide 4845.70; grain W2.

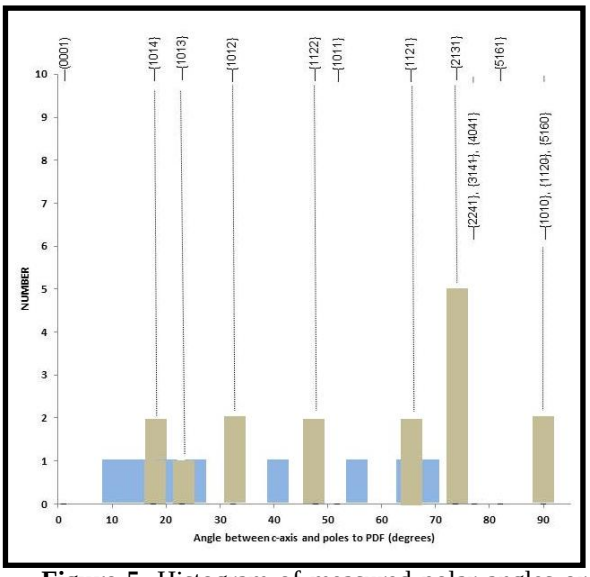

Figure 5. Histogram of measured polar angles organized according to their crystallographic indices. Based on 10 grains and 25 planes total. Grey data are indexed planes; blue were not indexable. Data were collected from thin sections and input by the authors into WIP, an on-line PDF indexing program by L. Ferrière and A. Losiak.