RECONSTRUCTION OF THE WESTERN RIM OF THE WETUMPKA IMPACT STRUCTURE: CLUES TO THE EXCAVATION PROCESS IN A FOLIATED METASEDIMENTARY TARGET. P. Tabares Rodenas [1], D.T. King, Jr. [1], J. Ormö [2], L.W. Petruny[1], and L.J. Marzen[1] [1]Dept. of Geology and Geography, Auburn University, Auburn, AL 36849, USA [pzt0005@auburn.edu]; [2] Centro de Astrobiología, INTA, 28850 Torrejón de Ardoz, Madrid, Spain [ormoj@cab.inta-csic.es].

Introduction: The Wetumpka impact structure (near the town of Wetumpka, Alabama) has a semi-circular crystalline rim that is ~ 5 km in diameter [1, 2]. This well-exposed, marine-target impact structure developed in a near-shore setting with a few tens of meters of seawater and about 120 m of poorly consolidated, water-saturated sediments covering a crystalline basement (mainly weathered metasedimentary schists). Our previous studies have described a semi-circular, crystalline rim, an interior structure-filling unit, and an exterior disturbed area developed within the sedimentary target sequence outside the southwestern part of the central, basement crater. Based on field and drill-core observations, we recognize the following specific structural and lithological impact-related terrains: partially preserved overturned crystalline rim flap; slumped interior megablock terrain; central polymict breccia (originating as near-field ejecta); interior marine chalk deposits and reworked glauconitic sands (formed by resurge and post-impact deposition); and a collapsed southern part of the rim with overturned flap (mainly developed within the sedimentary target rocks).

Material and methods: This study is aimed at attaining a better understanding of the behavior of foliated crystalline rocks during the cratering process, specifically what are the mechanisms that relate to the deformation and emplacement of the crystalline crater rim. For that reason a series of detailed measurements of strike and dip of foliation and fracture planes were made on the best-exposed (western) part of the crater rim in order to create an inventory of fracture and schistosity plane orientations. For all the details of this inventory, the reader is referred to the Auburn University Electronic Thesis Database [3]. This inventory of structural orientations was merged with new topographic data obtained by using a new LiDAR data set (made available by the County Revenue Commissoner's Office in Wetumpka) [4]. Further, we used structural orientations obtained in a drill core (AU Scientific Core Hole #09-01, as described by [3]) from the western rim of Wetumpka. Lastly, a set of electrical resistivity measurements from a western rim area was used to model the structural fabric of an area near the core hole [3].

Results: The structural measurements reveal a consistent orientation of a reconstructed fold axis (striking N37°) on the western rim [3]. This fold is inferred as the hinge of the overturned flap, thus shedding some light on the impact-induced overturning process of rim flap development in this sector of the impact structure's rim.

Figure 1 shows a digital geological map of Wetumpka, the location of structural orientation measurements and their trends, and the location of the geological cross-section produced in this study. Figure 2 shows the geological cross-section A-A' in Figure 1.

Conclusions: The geological cross-section (Fig. 2) shows the simplest interpretation of structural deformation of the western rim area. Foliated metamorphic basement rocks are lifted up and overturned in this western area. This shows the involvement of crystalline basement in western rim formation during crater excavation. The cross-section also shows the asymmetry of Wetumpka impact structure with regard to basement involvement in rim formation. The western rim cross-section is quite different from the eastern side. It is hoped that future investigations may show more specifically how this asymmetry is related to impact angle and/or pre-existing target bedrock structure.

References: [1] King Jr. D.T. et al. (2002) EPSL 202, 541-549. [2] King Jr. D.T. (2006) MAPS 41, 1625-1631. [3] Tabares Rodenas, P. (2012) Auburn University Master's Thesis [http://etd.auburn.edu/etd]. [4] Tabares Rodenas P. et al. (2012) LPSC XLIII Abstract #2522.

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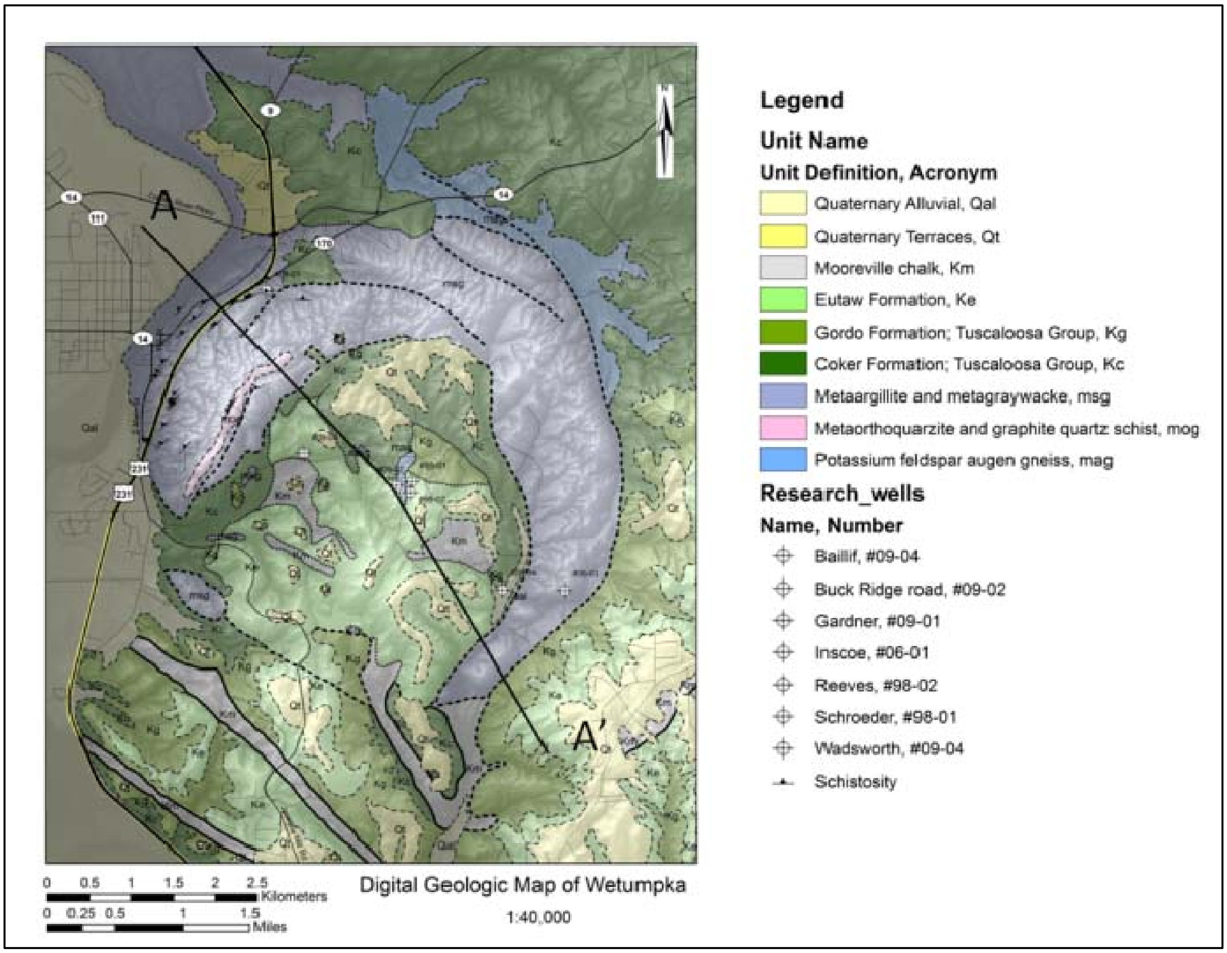

Figure 1. Digital geological map of Wetumpka impact structure, Alabama.

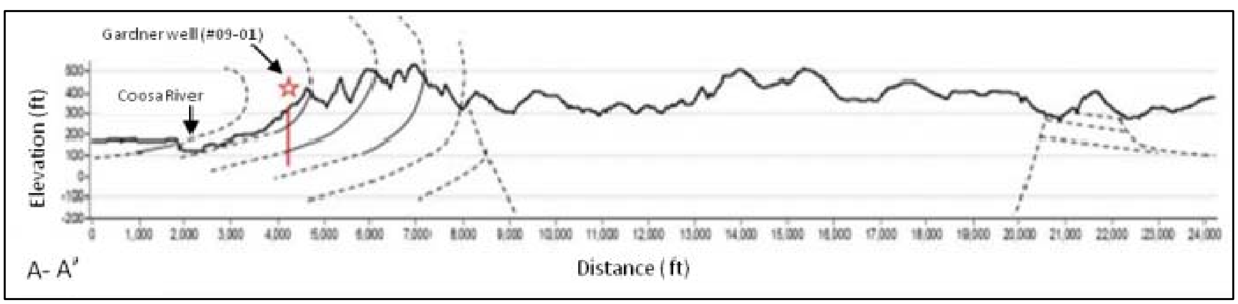

Figure 2. Inferred cross-section of Wetumpka impact structure, Alabama.