

**SHALLOW SUBSURFACE STRATIGRAPHY OF WETUMPKA IMPACT STRUCTURE, ALABAMA (USA).** D. T. King, Jr.<sup>1</sup>, J. Ormö<sup>2</sup>, L. W. Petruny<sup>1</sup>, R. S. Harris<sup>3</sup>, R. C. Johnson<sup>1</sup>, J. K. Markin<sup>1</sup>, T. L. Neathery<sup>4</sup>, and P. Tabares Rodenas<sup>1</sup>, <sup>1</sup>Geology Office, Auburn University, Auburn, Alabama 36849 [kingdat@auburn.edu], <sup>2</sup>Centro de Astrobiología, INTA, 28850 Torrejón de Ardoz, Madrid, Spain [ormoj@cab.inta-csic.es], <sup>3</sup>Geosciences, Georgia State University, Atlanta, Georgia 30302, <sup>4</sup>Neathery and Associates, Veterans' Parkway, Tuscaloosa, Alabama 35404.

**Introduction:** The Wetumpka impact structure (Fig. 1) is a Late Cretaceous marine target impact feature located in central Alabama (~ 32 deg 31' N; ~ 86 deg 10' W) [1, 2, 3]. The total structural diameter is ~ 7.6 km, but the inner crystalline rim has a diameter of ~ 5 km. Wetumpka's submarine target formations included (in reverse age order): a few m of lower Mooreville Chalk, the clastic paralic Eutaw Formation, the clastic fluvial Tuscaloosa Formation, and basal weathered crystalline Piedmont metamorphic rocks. Wetumpka's geochronological age (based on (U-Th)/He dating method) is  $84.4 \pm 1.4$  Ma, which is near the Santonian-Campanian boundary [4].

Wetumpka impact structure consists of three surficial terrains (Fig. 2), including crystalline rim, interior (intracrater sediments and broken formations), and exterior (structurally disturbed target formations).

**Well drilling:** Between 1998 and 2009, a total of eight shallow wells were drilled within the Wetumpka impact structure for scientific purposes. Five of the wells are less than 100 m in depth; three are 200 m or more. Seven of the wells were cored and one provided cuttings. The wells (in order for drilling) are as follows (abbreviations are used in Figs. 1 and 2): Schroeder (S); Reeves (R); Eason (E; cuttings only); Inscoe (I); Gardner (G); Buck Ridge Road (BR); Ballif (B); and Wadsworth (W). Figure 2 shows the wells in a serial correlation wherein the wells are positioned as if they were projected onto a northwest-southeast plane (approximated by line C-D on Fig. 2).

**Subsurface stratigraphy:** In the shallow subsurface, core drilling has revealed several facies, including crystalline blocks in sand matrix, impactite sands with sedimentary megablocks, slumped sedimentary megablocks (of target formations – Eutaw and Tuscaloosa), polymict impact breccia, glauconitic chalk (resurge facies), and crystalline blocks. Of these facies, impactite sands, polymict impact breccias, and glauconitic chalk contain shocked grains [5, 6].

The variety of shallow subsurface facies within Wetumpka impact structure is perhaps to be expected considering the target stratigraphy and the marine target nature of the structure's origin. It should be noted that the wells drilled so far penetrate only the upper 15 to 20 percent of the potential crater-filling sequence (see cross-sections in [3]).

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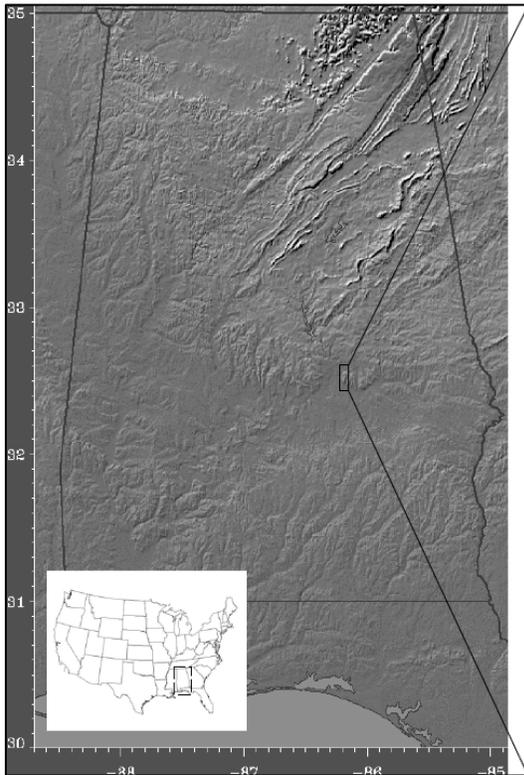
**References:** [1] King Jr. D. T. et al. (2002) *EPSL* 202, 541-549. [2] King Jr. D. T. et al. (2003) *Cratering in marine environments and on ice*, Springer-Verlag, Berlin, 97-113. [3] King Jr. D. T. (2006) *MAPS* 41, 1625-1631. [4] Wartho J.-A. et al. (2011) *LPS* 42 – this volume. [5] King Jr. D. T. et al. (2010) *LPS* 41 abst. 1424. [6] Johnson R. C. (2007) *Auburn U. Master's thesis*. [7] King Jr. D. T. et al. (2007) *LPS* 38, abstract #2178. [8] King Jr. D. T. and Ormö J. (2011) *GSA Spec. Paper* (in press).

**Additional Information:** *Figure 1.* Left side: state of Alabama satellite image; right side: digital elevation model of Wetumpka impact structure area, Elmore County, Alabama, with surficial terrains and key points indicated. For cross-section A-B, see reference [3]. Well locations are marked with same abbreviations as in text at right.

Additional outcrops of interest also indicated: CVS – outcrop behind local pharmacy on US highway 231; CM – chalk meadow; C – the “Cliffs” outcrops; H – outcrops on Harrogate Springs Road; JHR – Jasmine Hill Road outcrops; JHE – Jasmine Hill Estates outcrops; BK – the breccia knolls; and HM – Harwell Mill Creek outcrops. Terrains: *crystalline rim* = mainly intact megablocks of schistose-gneissic bedrock with reoriented foliation that mainly dips away from the center of the structure; *interior* = large megablocks of sedimentary target formations (Eutaw and Tuscaloosa) with mixed provenance sands of mainly sedimentary origin and resurge deposits of glauconitic chalk (interior unit also contains centrally located deposits of resurge proximal ejecta, a polymict breccias); and *exterior* = structurally disturbed target formations, including Mooreville Chalk, Eutaw Formation, and Tuscaloosa Group, which are largely intact yet highly faulted and tilted in some places (interpreted as a sort of decollement feature by [3]).

*Figure 2.* Compiled from several sources including: wells S and R [2, 6]; wells E and I [7], wells G, BR, B, and W [5, 8]. All wells were cored, except well E, which has cuttings only.

**Fig. 1.** Location maps (see explanation under additional information on previous page).



**Fig. 2. BELOW** - Correlation among all Wetumpka wells (northwest on left).

