

COMPARISON OF MARINE-CRATER STRATIGRAPHY: CHESAPEAKE BAY AND WETUMPKA. D. T. King, Jr.¹, L. W. Petruny², R. S. Harris³, J. Glidewell¹, and R. C. Johnson¹ ¹Geology Office, Auburn University, Auburn, AL 36849 USA [kingdat@auburn.edu], ²Astra-Terra Research, Auburn, AL 36831-3323 USA [lpetruny@att.net], ³Dept. Geology, University of Georgia, Athens, GA 30602 [robert_harris@brown.edu].

Introduction: Chesapeake Bay crater, Virginia, is a late Eocene impact structure, which is completely buried beneath the Atlantic Coastal Plain. Chesapeake Bay consists of an inner crater (~ 38 km in diameter) and an outer, annular trough, which gives the structure a diameter of ~ 85 km. Wetumpka impact structure, Alabama, is a Late Cretaceous impact feature, which is moderately eroded and largely exposed near the Gulf Coastal Plain-Piedmont boundary. Wetumpka has an inner crater, which is ~ 5 km in diameter and, on the south and southwest, a ~ 7-km wide surrounding disturbed terrain, which is much like a segment of an annular trough. The shape of Chesapeake Bay crater has been described as an ‘inverted sombrero,’ and comparably Wetumpka has been called an ‘inverted baseball cap.’ Both are marine impacts of the continental shelf and the shelf stratigraphy in both instances consisted of a section of unconsolidated clastics underlain by crystalline basement rocks. Post-impact sediments and ejecta are present at Chesapeake Bay, but not at Wetumpka.

Drilling at Chesapeake Bay: Recent drilling at Chesapeake Bay in the inner crater (the Eyreville core), as discussed by [1], revealed a stratigraphy of 444 m of post-impact sediments, which was underlain (in order of penetration) by 652 m of “sediment clast breccia and sediment mega-blocks”[1], 275 m of “granite megablock(s)”[1], 22 m of “sediment with lithic blocks”[1], ~157 m of “suevitic and lithic impact breccia”[1], and “schist and pegmatite, minor impact breccia veins”[1]. This recent drilling ended in the schist and pegmatite unit at a depth of ~ 1,766.3 m.

Drilling at Wetumpka: Drilling during 1998 in the center of Wetumpka’s 5-km diameter “inner crater” revealed an upper layer (~ 100 m) of sediment clast breccia and mega-blocks, which was underlain by an upper layer of suevitic and lithic impact breccia (~ 50 m) and a lower breccia layer of varied lithology ranging from sediment clast breccia to crystalline clast breccia (~ 50 m) [2, 3]. The ~ 200 m drill holes ended in the lower breccia layer.

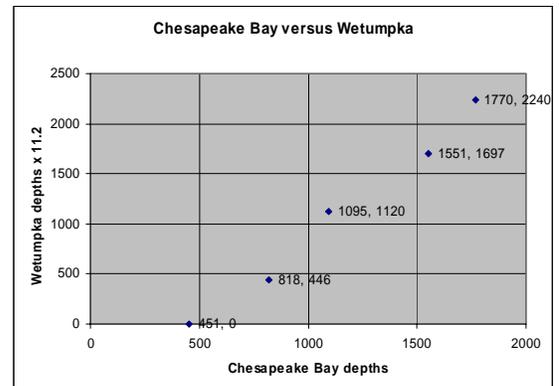
Comparison of drilling results: Because post-impact sediments are likely absent at Wetumpka, the comparison starts at the sediment clast breccia and sediment mega-blocks interval, which is present as the thickest unit in both structures despite the fact that Wetumpka’s unit is moderately eroded. Units

below the sediment clast breccia and sediment mega-blocks interval are similar in both wells. Schist megablocks compare to granitic blocks in terms of origin.

Drilling penetrated to a point within the fill of the inner central crater in both instances. At Chesapeake Bay, this point was a little over one-half way through the inner basin fill, and at Wetumpka this point was a little under one-half way [3] (Fig. 2).

Comparison of stratigraphy: Chesapeake Bay crater and Wetumpka impact structure have similar inner crater filling stratigraphies, and when proportionately scaled (Fig.1; Wetumpka depths X 1.2), look very similar, especially regarding the relative size of the inner crater and the annular trough zone. If a hole could be drilled to a depth of ~ 1 km at Wetumpka, this would reveal a deeper stratigraphy and basement rock relationships a depths comparable to ~ 5-6 km at Chesapeake Bay.

References: [1] Gohn G. S. et al. (2006) *EOS*, 87, 349, 355. [2] King Jr. D. T. et al. (2002) *EPSL*, 202, 541-549. [3] Johnson R. C. (2007) *MS thesis, Auburn Univ.* [4] Poag C. W. (2004) *Springer Impact*



Series.

Figure 1. Apparent linear relationship between depths to key levels in the Chesapeake Bay and Wetumpka impact structures in cross-plot. Note that Wetumpka depths have been multiplied by a factor of 11.2 to account for the scale difference between the two structures. As each point, the numbers are Chesapeake Bay (Eyreville) depth (left), and Wetumpka depth (right). From upper right, the key points plotted are base of cores, top of basement megablocks, top of crystalline megablocks, top of sedimentary slump blocks, and top of impactoclastic sands.

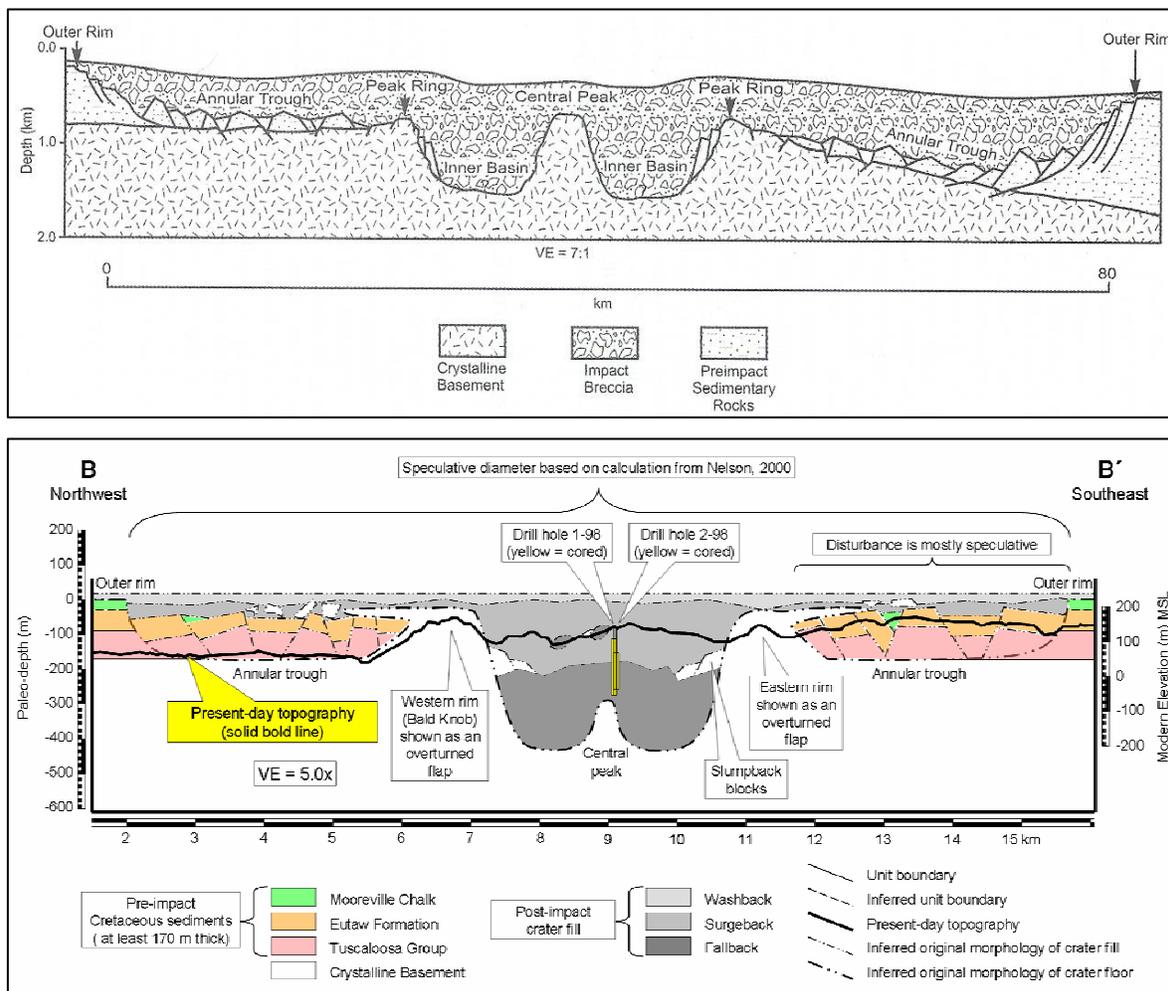


Figure 2. Comparative geologic cross sections of the Chesapeake Bay and Wetumpka impact structures proportionately scaled so that they appear the same size. Cross section at top from [4] and at bottom from [3].