COMPARISON OF TWO MARINE IMPACTS: CHESAPEAKE BAY AND WETUMPKA. R. C. Johnson[1], J. Glidewell[1], L. W. Petruny[2], D. T. King, Jr.[1] [1]Dept. Geology, Auburn University, Auburn, AL 36849 USA [johnsrc@auburn.edu; glideje@auburn.edu; kingdat@auburn.edu], [2]Astra-Terra Research, Auburn, AL 36831-3323 USA [lpetruny@att.net].

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 sombereo,' 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, 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 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 (Fig. 1). 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. 1).

Comparison of petrography: At present, we are engaged in a petrographic comparison of lithic composition and levels of shock in the two structures. Preliminary core descriptions were completed and key impact-related petrographic features were noted previously by [1] but an embargo still exists on specific results. Our petrographic analysis will likely employ methods similar to [5]. This research may also help to meet other goals outlined by the sponsoring agencies of the recent drilling (ICDP and USGS), including the study and classification of impact breccias, the determination of how they may have formed, and the documentation of levels and gradients of shock deformation of constituent grains [6]. Petrographic study of Chesapeake Bay core samples from the recent drilling will lead to an understanding of the petrology and shock-metamorphic features of impactite facies characteristic of the Chesapeake Bay crater, which can be compared to Wetumpka impact structure where such data already exist [2, 3]. Ultimately, this work may help to develop a better understanding of marine impact processes in general.

Implications: Chesapeake Bay crater and Wetumpka impact structure have similar inner crater filling stratigraphies, and when proportionately scaled, 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*. [5] Ferriere L. et al. (2007) *MAPS 42*. [6] Edwards L. E. et al. (2004) *USGS OFR 1016*.

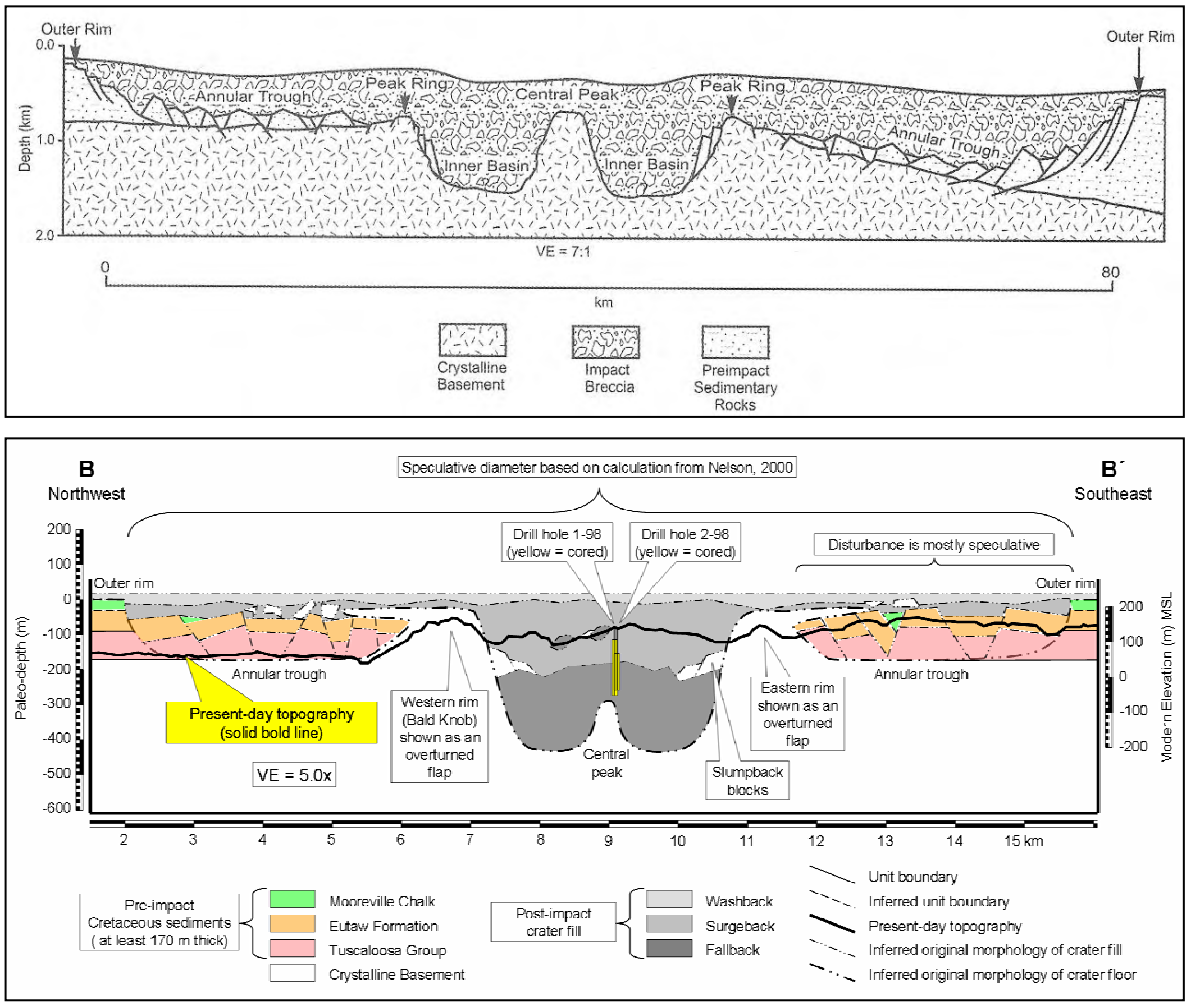

Figure 1. Comparative geologic cross sections of the Chesapeake Bay and Wetumpka impact structures proportionately scaled so that they appear the same size. Cross section at top from [4] and at bottom from [3].