

**COSMIC IMPACT IN THE COASTAL PLAIN OF MISSISSIPPI? THE RIDDLE THE OF THE KILMICHAEL STRUCTURE.** D. T. King, Jr.<sup>1</sup> and L. W. Petruny<sup>2</sup>, <sup>1</sup>Dept. Geology, Auburn University, Auburn, AL 36849-5305 USA, <sup>2</sup>Astra-Terra Research, Auburn, AL 36831-3323 USA.

**Introduction:** The Kilmichael structure is a nearly circular, structurally disturbed feature possessing a diameter of approximately 9 km. The structure is located at approximately 33°30'N by 89°33'W, which is near the town of Kilmichael, Montgomery County, Mississippi [1,2]. There is virtually no topographic expression of the Kilmichael structure, but it is not buried, therefore local outcrops provide insights into its near surface features.

**Stratigraphy:** Target stratigraphy included the Eocene section (Lisbon, Tallahatta, and Meridian Sands and Wilcox Group), Paleocene section (Midway Group), and Upper Cretaceous section (Prairie Bluff Chalk, Ripley Formation, and Demopolis Chalk). Stratigraphy encountered in well drilling at the structure's center is quite different. Interpreting from the log of Kilmichael core #2 [3], there is an upper impact-related unit composed of resedimented Wilcox Group sandy sediments (0-18 m), which is underlain by 60 m of resedimented gravels and gravelly sands (18-78 m depth). This gravel unit is then underlain by 44 m of resedimented sands (78-122 m; derived mainly from the Midway Group?). The lowermost unit, a clay and chalk clast monomict impact breccia, is the lowest unit penetrated by the core (122-143 m).

**Points favoring cosmic impact origin:** Kilmichael consists of a central (uplift?) region approximately 2 km in diameter and a down-faulted ring area surrounding the central region (= annular graben?). There is structural uplift in the central region of nearly 450 m and structural lowering of approximately 180 m in the down-faulted ring [1,2]. There is an outer zone of highly faulted structural slabs and monoliths that is in turn surrounded by a discontinuous outer graben area [1,2]. A seismic reflection profile transecting Kilmichael shows a subsurface structure that mimics the concentric structural areas just noted [2]. There is a 3 mGal positive gravity anomaly over the central uplift and a slight negative anomaly over the down-faulted ring [2], which is a pattern consistent with a complex impact structure [4]. Favorable comparison of structures and geophysical properties between Kilmichael and Upheaval Dome, Utah, have been made for 70 years [5,6]. As at Upheaval Dome and some wet-target impact craters, no definitive shocked minerals have been recovered [2].

At outcrop scale, numerous reverse and thrust faults occur which show top-toward-the-center vergence as deduced from drag. In addition, numerous highly deformed blocks of clastic sediment occur within the outer margin of the outer graben area (= crater rim?). These blocks, 3 to 10 m across, are likely fall-back ejecta of the proximal crater rim terrain, which form a mappable megabreccia zone about the crater.

**Age of structure:** Structure-filling sediments show affinities, both petrographic and micropaleontologic [3], for provenance from within the Eocene and Upper Cretaceous section in the target area. The age of the youngest deformed unit in the structure is Letetian-Bartonian (~ 40 to 45 m.y.) [1], and thus this age is also suggested for Kilmichael structure.

**References:** [1] Robertson P. B. and Butler M. D. (1982) *J. Geol.*, 90, 589-601. [2] Koeberl C. K. et al. (2000) *LPSC XXXI*, abstr. 1602. [3] Miss. Office Geology (1996) *Core log*. [4] Grieve R. A. F. and Pilkington M. (1996) *AGSO J. Austral. Geol. Geophys.*, 16, 399-420 [5] Bucher W. H. (1936) *Rept. XVI Intl. Geol. Cong. (1933)*, 2, 1055-1084. [6] Priddy R. R. (1943) *Miss. State Geol. Surv. Bull.*, 51, 115p.