DISTAL EJECTA PARTICLES IN MARINE RESURGE DEPOSITS (MOOREVILLE CHALK), WETUMPKA IMPACT STRUCTURE, ALABAMA. L. W. Petruny[1] and D. T. King, Jr.[1], [1]Geosciences, 2050 Memorial Coliseum, Auburn University, Auburn, AL 36849 USA [kingdat@auburn.edu].

Introduction: The Upper Cretaceous Mooreville Chalk is a stratigraphic unit in the inner coastal plain of Alabama,which crops out along a wide belt several 10s of km south of Wetumpka impact structure. Enigmatic inlier outcrops of this chalk near Wetumpka were documented during the 1890s [1]. During the 1970s, geological mapping of Wetumpka by Tony Neathery and others [2] showed that chalk occurred in several places within and near Wetumpka impact structure. The Mooreville Chalk is not found in any Wetumpka impact breccia [3], and it is unlikely that any of this chalk was actually deposited at the Wetumpka target area. Drilling of a 26 m section of chalk within Wetumpka impact structure showed a succession of graded beds, which were interpreted as evidence of resurge deposition of displaced shelfal chalk [4, 5]. Partially melted dinoflagellates were recovered from this chalk [6]. Based on this evidence, the chalk found within and near Wetumpka impact structure is interpreted to be strictly resurge in origin, having flowed into the target area as marine waters returned to the area [5]. In this paper, we looked for evidence of impact-related grains in the chalk as potential confirming evidence of the resurge interpretation and to see what fine-grained impact materials may have been dispered during the impact event.

Methods: During field work spanning several years, chalk samples were collected from nearly all the outcrops of chalk within and near Wetumpka impact structure. These were disaggregated and washed through a set of sieve screens, allowing us to capture representative samples of the various silt and sand grains in the chalk. Grains in the 1000 to 62.5 micron size range were imbued with epoxy, and these epoxy-bound samples were made into standard petrographic thin sections for petrographic analysis.

Results: Overall the captured sediment was composed mainly of quartz (angular silt to sub-angular and sub-rounded coarse sand). Other components were mica, feldspars, foraminifera, carbonate grains, glauconite, and several types of rare impact-affected grains. Of these impact-affected grains (Figs. 2-5), the most notable were quartz grains with PFs, PDFs, and toasting (mainly coarse sand), glassy objects, spheroidal aggregates, altered carbonate grains, carbonate accretionary lapilli, and quartz grains imbued with iron-oxide along fine fractures. Glauconite, which is very rare in the Mooreville Chalk [7], is common in some outcrops of the resurge chalk at Wetumpka.

Interpretations: The presence of impact-related grains in the chalk at Wetumpka is interpreted to be the result of mixing of these distal ejecta components with resurging marine waters that were heavily laden with shelfal chalky sediment. This chalky sediment was entrained by water currents, perhaps aided by secondary impacts on the sea floor, in the deeper shelfal area south of the the shallow-water target zone. Locally abundance glauconite in the resurge chalk is thought to be from erosion of glauconite-rich zones below the Mooreville Chalk, specifically within the upper Eutaw Formation.

Implications: Particles identified in this study support the interpretation that the Wetumpka chalk is not secular Mooreville, but rather a resurge unit. Future research would be to locate similar grains in distal ejecta deposits many crater radii from Wetumpka, probably within the lower beds of the Mooreville Chalk [8]. In marine impacts like Wetumpka, distal ejecta particles of the sort noted here also may be useful separating resurge versus secular depositional units.

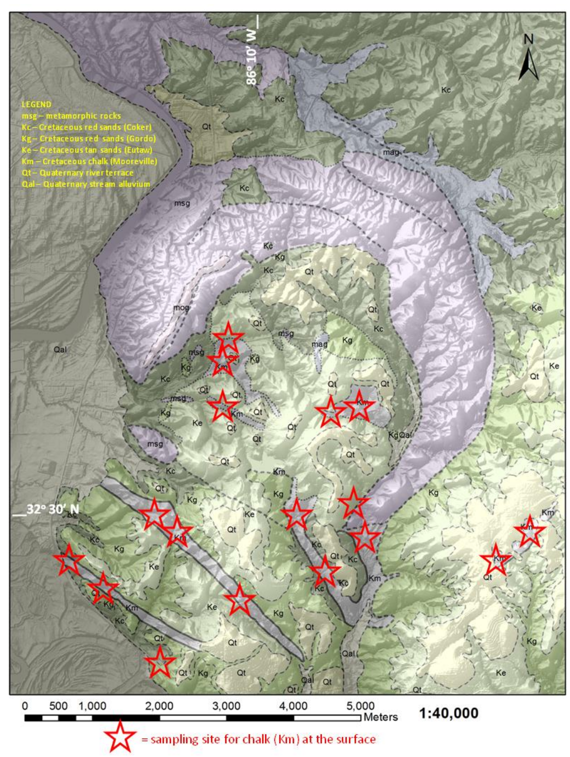

Figure 1. Location map for resurge chalk samples. LiDAR geological map by P. Tabares Rodenas. Geologic contacts were taken from the map figure in [2].

References: [1] Smith E.A. (1894) *Geol. Survey Ala. Spec. Rept. 6*. [2] Neathery T. L. et al. (1976) *Geol. Soc. Amer. Bull. 87*, 567-573. [3] King Jr. D. T. et al. (2002) *Earth Planet. Sci. Lett. 202*, 541-549. [4] Markin J. K. and King Jr. D. T. (2012) *GCAGS Trans. 62*, 65-272. [5] King Jr. D. T. and J. Ormö (2012) *Geol. Soc. Amer. Spec. Paper 483*, 287-300. [6] King Jr. D. T. and Petruny L. W. (2009) *LPS XL* #2381. [7] King Jr. D. T. (1987) *SE Geol*. 27, 141-154. [8] King Jr. D. T. and Petruny L. W. (2010) *GCAGS Trans. 60*, 369-377.

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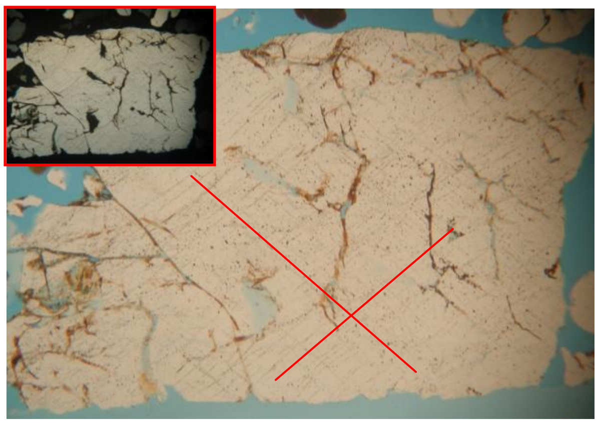

Figure 2. Coarse quartz grain with two sets of PDFs (marked). Inset: cross-polarized view.

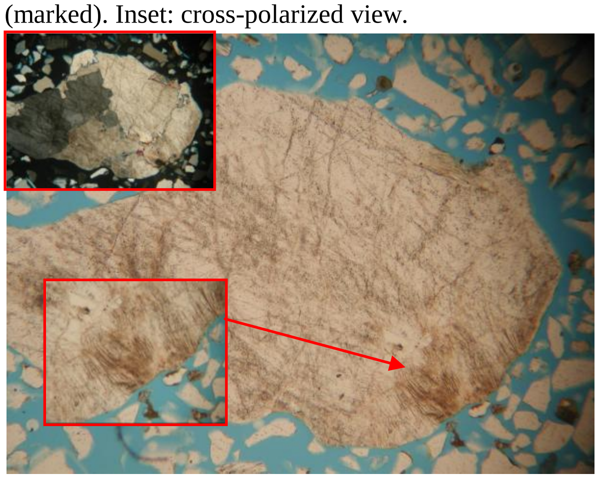

Figure 3. Coarse quartz grain with decorated, curviplanar PDFs. Upper inset: cross-polarzied view. Lower inset: close up of deformed PDFs at margin.

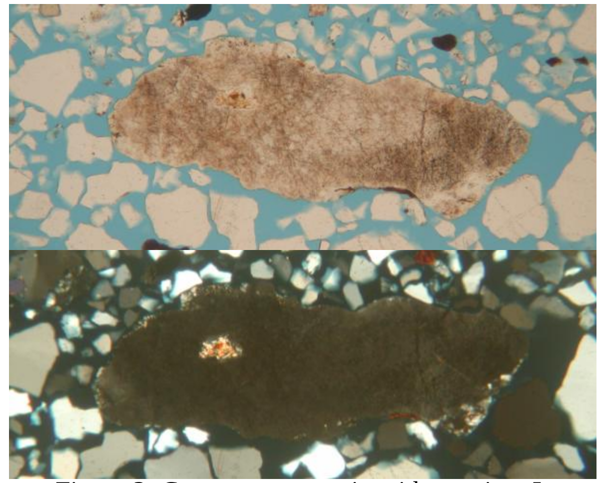

Figure 3. Coarse quartz grain with toasting. Lower: cross-polarized view of same grain at near total extinction, which persists regardless of stage orientation.

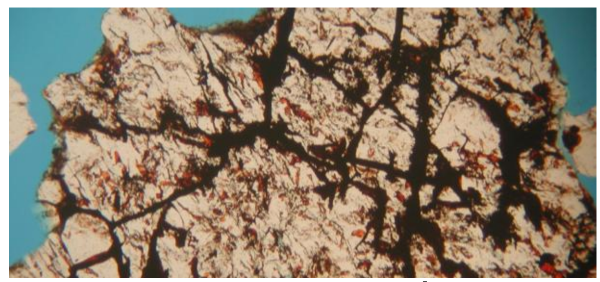

Figure 4. Coarse quartz grain with pervasive iron-oxide imbued along fractures (plane light).

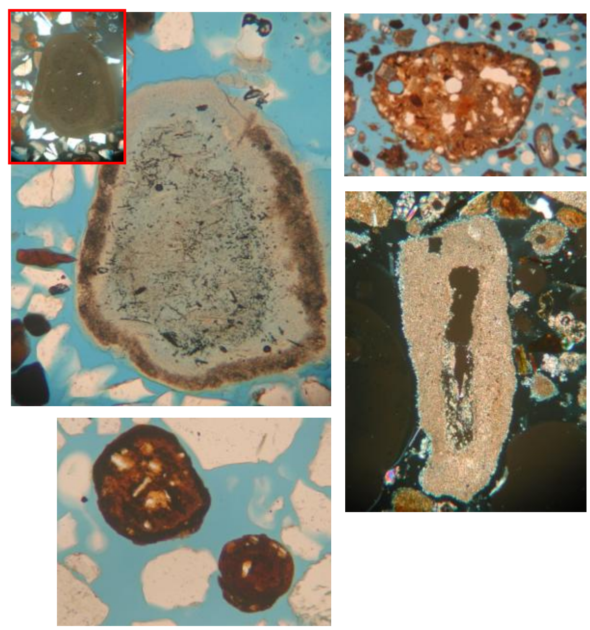

Figure 5. Clockwise: Fine-sand glass particle (inset, cross polarized); aggregate impact spheroid with darkened rim; carbonate lapillus (cross-polarized); and two nearly opaque spheroidal aggregates. All named particles are medium sand size.