**IMPACT-AFFECTED QUARTZ CLASTS IN THE PROXIMAL EJECTA DEPOSIT, WETUMPKA IMPACT STRUCTURE, ALABAMA.** D. T. King, Jr.¹ and L. W. Petruny¹, ²Geosciences, Auburn University, Auburn, Alabama 36849 USA [kingdat@auburn.edu].

**Introduction:** Wetumpka impact structure is a marine-target impact feature in the inner coastal plain of Alabama [1, 2, 3] (Fig. 1). This impact structure, which is located in Elmore County, Alabama, is elongated so that it is about 5 km in west to east diameter and 7.5 km from north to south. Wetumpka’s target stratigraphy includes pre-Cretaceous metamorphic basement rocks (Piedmont schists), and overlying fluvial clastics of the Upper Cretaceous Tuscaloosa Group and the Eutaw Formation’s shoreline sands. The age of Wetumpka is 84.4 m. y. +/- 1.4 m.ny. [4]. During Wetumpka’s modification stage, a substantial amount of soft target sediment slumped and flowed back into the crater bowl, including ultimately an upper unit of proximal impact ejecta, which contains some large metamorphic target rock boulders, a significant quantity of comminuted target schist and gneiss, and a minor component of shocked quartz sand grains, pebbles, cobbles, and small boulders [5].

Wetumpka’ boulder breccia: The slump-emplaced, proximal ejecta deposit (i.e., boulder-bearing polymict breccia; Fig. 2) presently occupies an area of a few thousand square meters on the crater floor at Wetumpka. Quartz clasts that are the subject of this report range from pebbles to small boulders and occur within the sandy clay matrix of this ejecta deposit. Many of these quartz clasts are impact-affected, and these quartz clasts likely derive from three possible sources in the target: (1) quartz augen and other quartz masses within the basement Piedmont schists; (2) a coarse residuum layer atop these schists where quartz augen and other quartz masses were concentrated on an unconformity surface prior to deposition of directly overlying Upper Cretaceous target sediments (Tuscaloosa Group); and (3) fluvial pebbles from within the Tuscaloosa Group. Generally, clasts from source number (1) above are angular; source (2) are subangular; and source (3) are subrounded to rounded.

Boulder breccia’s impact-affected quartz clasts: All impact-affected quartz clasts bear notable petrographic evidence of shock, including PFs, incipient PDFs, FFs, and/or toasting and discoloration. Megascopic evidence of impact effects include (1) lower (‘pumice-like’) density; (2) various auto-breccia textures; (3) remarkable contorted clast shapes; (4) 60/120-degree cleavage in large quartz crystals; and/or (5) clasts with polymict textual zonation (i.e., an outer rim zone that appears white and an inner core zone that appears glassy or resinous and is a very light grey, faint blue, or (rarely) very pale lavender).

**Petrography of impact-affected quartz clasts:** Impact-affected quartz clasts show different styles of microscopic shock deformation. Where present, the most common PDFs are ω and π, but there are sets of planes corresponding to higher angles between a pole to plane and the c-axis of the host quartz crystal. Each impact-affected clast type has its own petrographic characteristics as follows. The “pumice-like,” lower density clasts exhibit toasting and discoloration, plus numerous sets of PDFs. Various auto-breccia clasts display PFs with FFs and some rare PDFs. Contorted clasts shapes show parallel PFs with attendant ladder-like perpendicular fractures. Quartz masses with megascopic cleavage have mainly PFs. And, clasts with polymict textural zonation exhibit mainly FFs in the interior zone with glassy luster and PF networks in the outer rim zone (5).

Figures 3-6 show selected examples of megascopic and microscopic views of some of the impact-affected quartz clast types noted above.

**Discussion:** Impact-affected quartz pebbles, cobbles, and boulders that contain PFs, FFs, PDFs, and/or other impact effects have been reported from a few other impact structures [e.g., 6, 7, 8], but in comparison the range of such impact-related features in quartz clasts at Wetumpka appears to be unusual. At present, it is unclear why Wetumpka’s quartz clasts are affected in such different ways, but this may have to do with position in the target sequence, which is a topic of ongoing investigation.

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Figure 1. Late Cretaceous paleogeography of North America and the location of Alabama and of the Wetumpka impact crater (red dot).

Figure 2. Outcrop of Wetumpka boulder breccia showing red sandy matrix with pebbles and cobbles of target schist, gneiss, and quartz clasts embedded within.

Figure 3. Example of the appearance of the “pumice-like” quartz clast from Wetumpka.

Figure 4. Example of microscopic impact deformation of a “pumice-like” quartz clast. Includes discoloration, toasting, PFs, and PDFs.

Figure 5. Example of the appearance of an auto-breccia quartz clast from Wetumpka.

Figure 6. Examples of microscopic impact deformation (mainly FFs) of auto-breccia quartz clasts.