REGIONAL STRATIGRAPHIC CORRELATION OF NORTH AMERICAN TEKTITES. E. F. Albin, Department of Space Sciences, Fernbank Science Center, 156 Heaton Park Drive (NE), Atlanta, Georgia 30307, ed.albin@fernbank.edu.

Introduction: The North American tektite strewn field was likely created by the impact event that formed the ~ 35 Ma Chesapeake Bay crater [e.g., 1]. Tektites were deposited over a vast area including Georgia, Texas, Cuba, the Caribbean Sea, Gulf of Mexico, Barbados, the western Atlantic Ocean off of the New Jersey coast, and possibly Martha's Vineyard. Today, these tektites occur within or near (if redistributed by erosion) upper Eocene deposits. In this investigation, tektite stratigraphic occurrence is considered in a regional context and an effort is made to correlate the parent horizon between the sub-strewn fields.

Occurrence of Georgia Tektites: The first part of this study is concerned with the location of the georgiaite stratigraphic horizon in sediments of the east-central Georgia Coastal Plain. Three upper Eocene formations (Dry Branch, Tivola Limestone, and Clinchfield) occur adjacent to the georgiaite distribution area and are candidates to harbor the tektite parent stratum. Since the tektites were strewn across a coastal environment at the beginning of a relative highstand in sea level, the assumption is that preservation was favorable due to eventual burial by sediments. Huddlestun and others [2] described the Clinchfield, Tivola Limestone, and Dry Branch Formations as a classic marine transgressive sequence.

There are three types of data that can be used to constrain the stratigraphic position of the georgiaites: a) the sedimentary units from which the tektites are now collected; b) the potassium-argon dates determined for upper Eocene glaucony; and c) the biostratigraphic occurrence of North American microtektites, an associated iridium anomaly, and the Chesapeake Bay crater. Each category of data can be expressed in terms of an inequality that indicates whether the georgiaites must be below or above a given stratigraphic horizon. From each type of data and the generated inequalities, it should be possible to define a horizon in which the tektites must occur.

Although known georgiaites are considered to have been reworked from an older source deposit [e.g., 3], their occurrence provides valuable information that can be used to constrain the position of the parent stratum. To date, approximately 1200 tektites have been recovered from Coastal Plain sediments [4]. These georgiaites are found in 17 counties across east-central Georgia. Virtually all tektites have been collected from the Altamaha Formation. This Miocene deposit is the most extensive surficial deposit in the Georgia Coastal Plain group of sediments, and there is good correlation between the aerial distribution of the Altamaha Formation and the distribution pattern for the tektites. In addition to these georgiaites, a tektite find on the Oligocene Tobacco Road Sand, in Twiggs County, was reported by Povenmire [5]. Since all georgiaites found thus far occur on either the Altamaha Formation or the Tobacco Road Sand Formation, and given that the georgiaites can be reworked from below these deposits, the Tobacco Road Sand Formation must represent the uppermost possible horizon for the tektites.

The potassium-argon dates determined for Georgia glauconies can also be used to set additional constraints on the stratigraphic location of georgiaites [6]. Although the glaucony ages are probably too young due to the loss of some radiogenic argon, these dates can be interpreted as a minimum age of deposition for the upper Eocene deposits. For instance, the Tivola Limestone Formation must be at least 33.9 Ma with the Dry Branch Formation being deposited slightly later as it has a minimum age of deposition of at least 33.6 Ma. Based on the potassium-argon glaucony age determined for the uppermost section of the Clinchfield Formation, the deposit has a minimum age of 35.7 Ma. Thus, the Clinchfield Formation appears to have been emplaced before the tektite forming event as the georgiaites have a mean potassium-argon age of 35.2 Ma [6]. In light of the potassium-argon dates of the georgiaites and upper Eocene glauconies, and given that the glaucony dates must represent the minimum possible age of the formations, the georgiaites must occur above the Clinchfield Formation.

Microtektites and the Chesapeake Bay Crater: The biostratigraphic position of North American deep sea microtektites, a related iridium anomaly, and the Chesapeake Bay crater can be used to further constrain the location of the tektite layer in upper Eocene deposits. According to Wei [7], the North American microtektites at the DSDP Site 612 are constrained by the last occurrence of the planktonic foraminifera *Reticulofenestra reticulata* and the first occurrence of the calcareous nannofossil *Istholithus recurvus.* Montanari et al. [8] reported iridium anomalies of late Eocene age, from sedimentary sequences in Italy and Antarctica, that are thought to be related to the North American tektite cratering event. They interpret these

iridium anomalies to span the lower part of the planktonic foraminiferal P16 Zone and the calcareous nannofossil NP 19-20 Zone. At the Massingnano site in Italy, the iridium anomaly is marked by the last occurrence of the planktonic foraminifera *Globigerinatheka semiinvoluta* and the first occurrence of *Globorotalia cerroazulensis.* It is also marked by the first occurrence of calcareous nannofossils *I. recurvus*. Other important biostratigraphic evidence can be drawn from the Chesapeake Bay crater itself. Poag and Aubry [9] summarized the biostratigraphy of the Chickahominy Formation -- the upper Eocene deposit that directly overlies the crater and the DSDP Site 612 microtektite layer in the western Atlantic. The middle portion of the Chickahominy Formation resides in the P16 Zone as characterized by the occurrence of the foraminiferal marker *Cribrohantkenina inflata*. Although *G. semiinvoluta* has not been identified in the Chickahominy Formation, the calcareous nannofossils *Discoaster saipanensis* and *I. recurvus*, from the NP 19-20 Zone, are found in the Chickahominy Formation. According to Poag and Aubry [9], the underlying Exmore breccia unit also contains a matrix that belongs to the lower NP 19-20 calcareous nannofossil zone on the basis of the occurrence of *I. recurvus* and *Discoaster barbadiensis*. In summary, North American tektite forming event occurs within the planktonic foraminiferal P16 Zone at the *G. semiinvoluta* - *G. cerroazulensis* transition. The stratigraphic position of the microtektites is also marked within the calcareous nannofossil NP 19-20 Zone after the first occurrence of *I. recurvus*.

Regional Correlation of N. A. Tektites: Since the above biostratigraphic markers have been recognized in the deposits of east-central Georgia, it should be possible to draw some important conclusions about the stratigraphic position of the georgiaites. The upper Eocene Dry Branch, Tivola Limestone, and Clinchfield Formations contain microfossil assemblages characteristic of the P16 planktonic foraminieral zone [10] and the NP 19-20 calcareous nannofossil zone [11]. Huddlestun and Hetrick [10] assigned the Tivola Limestone Formation and the lowermost section of the Dry Branch Formation to the planktonic foraminiferal *G. semiinvoluta* zone. However, they placed the majority of the Dry Branch Formation into the *G. cerroazulensis* planktonic foraminiferal zone. Schmidt and Wise [12] and Horwath [11] delineated the biostratigraphic range of the Dry Branch Formation (Twiggs Clay Member) by the first occurrence of *I. recurvus* and the last occurrence of *D. barbadiensis* calcareous nannofossils. Thus, the biostratigraphic evidence suggests that the georgiaite horizon must occur above the Tivola Limestone but near the base of the Dry Branch Formation.

To summarize the above arguments: a) tektite finds on the Miocene Altamaha and Oligocene Tobacco Road Formations define the upper limit of tektite occurrence; b) the potassium-argon dates for upper Eocene glaucony indicate that the tektite horizon lies above the Clinchfield Formation; and c) the biostratigraphic evidence rules out the Tivola Limestone Formation as a possible source and places the georgiaite parent stratum in the basal section of the Dry Branch Formation. This placement is in agreement with the regional biostratigraphic correlation of upper Eocene deposits, which include the North American tektite horizon, across the Atlantic and Gulf Coastal Plains -- from the Chesapeake Bay crater to the bediasite occurrence in south-central Texas. For instance, Ward [13] correlates the Chickahominy Formation, the upper Eocene deposit that rest immediately above the Chesapeake Bay crater and the DSDP Site 612 microtektites [14], with the Dry Branch Formation in east-central Georgia. King [15] described a bediasite find within the upper Eocene Wellborn Formation in Grimes County, Texas. This deposit has been traced eastward and correlates with the Yazoo Clay Formation in Louisiana, Mississippi, Alabama, and the Dry Branch Formation in Georgia [16]. It is entirely possible that North American tektites may eventually be recovered from upper Eocene deposits between Georgia and Texas.

References: [1] Koeberl C. et al. (1996) *Science, 271*, 1263-1266. [2] Huddlestun P. F. et al. (1974) *Guidebook 12, Southeast. Sec., GSA*, 35p. [3] King, E. A. (1964) *Geochim. Cosmochim. Acta., 28*, 915-919. [4] Povenmire, H. R. (1995) *Lunar Planet. Sci., 26*, 1131-1132. [5] Povenmire H. R. (1985) *Meteoritics, 20*, 795-799. [6] Albin E. F. (1997) *Ph.D. Dissertation, Univ. GA*, 302p. [7] Wei W. (1995) *Paleogeo. Paleoclim. Paleoecol., 114*, 101-110. [8] Montanari et al. (1993) *Palaios, 8*, 420-437. [9] Poag C. W. and Aubry M. (1995) *Palaios, 10*, 16-43. [10] Huddlestun P. F. and Hetrick, J. H. (1986) *Ga. Geol. Surv. Bull., 95*, 79p. [11] Horwath R. W. (1990) *Master's Thesis, Univ. GA*, 127p. [12] Schmidt W. and Wise S. W. (1979) *Ga. Geol. Surv. Infor. Circ., 53*, 97-113. [13] Ward L. W. (1989) *28th Internat. Geol. Cong., Field Trip Guidebook T172*, 63-100. [14] Poag C. W. (1996) *Meteor. Planet. Sci., 31*, 218-226. [15] King E. A. (1968) *Geol. Soc. Amer. Prog. (1968 Ann. Meet.)*, 160-161. [16] Spain D. R. and Siesser W. G. (1986) *Southeast. Geol., 26*, 251-262.