

EVIDENCE FOR AN EARLY MEZOZOIC IMPACT IN SOUTHEASTERN NORTH AMERICA.

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Introduction: J. M. German [1] describes a suite of narrow (<0.5 m) lamprophyric dikes in east-central Georgia. The dikes typically parallel the strike of Early Jurassic CAMP (Central Atlantic Magmatic Providence) diabase intrusions in the area. Structural relationships loosely suggest that the lamprophyres are nearly contemporaneous with CAMP magmatism. German and Harris [2] propose that they are somewhat older (Late Permian to Late Triassic) based on reported radiometric ages of similar swarms in adjacent areas of NW Africa, but accurate dates are needed. Some of the lamprophyric rocks contain xenocrysts exhibiting features usually considered characteristic of shock metamorphism during hypervelocity impacts. This raises the possibility that these rocks record an impact event in Southeastern North America during the early Mesozoic.

Petrology: The lamprophyre suite contains a variety of lithologies (spessartites, kersantites, camptonites) often appearing to occupy the same fissure. The kersantites regularly weather to small rounded and elongate nodules, whereas the others are blocky. This rock consistently is composed of quartz, microcline, and andesine/labradorite xenocrysts in a black, aphanitic groundmass of plagioclase and kaersutite. A rectilinear network of skeletal titanomagnetite pervades the mesostasis, occasionally extending into and across ghost-like plagioclase grains suggesting the hosts were completely molten just before quench.

Feldspar xenocrysts exhibit checkerboard patterns (Fig. 1), the result of crystallographically controlled melting, attributed to shock in melt sheets and dikes at a number of impact structures. The injection of mesostasis along melt channels is most similar to feldspars described by Whitehead et al. [3] from Popigai. Some quartz grains exhibit rhombohedral planar fractures, filled by secondary barite. The grains may contain planar fluid inclusion trails some of which are short and at acute angles to PFs. Some quartz shows the characteristic "fish-scales" of *ballen*. Together these features suggest that the emplacement of at least one lamprophyric melt involved shock capable of producing effects usually attributed to ~3-7 GPa.

Implications: Although the possibility that eruptions from deep mantle sources might produce such conditions must be considered, it is an intriguing hypothesis that the dikes could represent injection from an impact near the Bahama Nexxus, as originally proposed by R. S. Dietz [4]. However, the eruption of endogenic magmas along weaknesses produced by a precursor impact (similar to lunar maria) seems more probable than impact genesis of CAMP basalts.

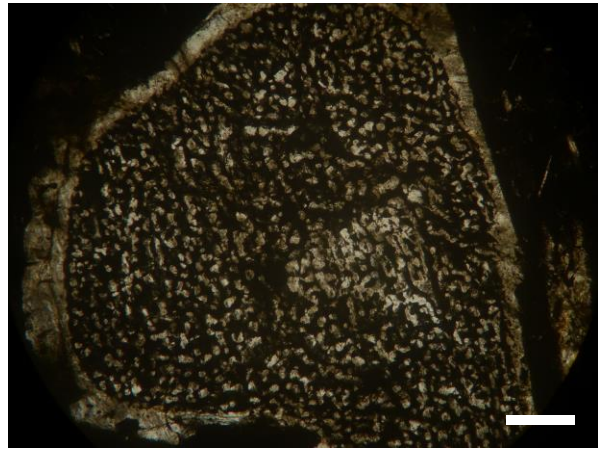


Figure 1. Cross-polarized light photomicrograph of a plagioclase grain exhibiting the checkerboard texture indicative of crystallographically controlled melting. Scale bar = 200 μm .

References: [1] German J. M. (1993) *GA Geol. Survey Bull.*, 125, 59 pp. [2] German J. M. and Harris R. S. (2012) *GA Geol. Soc.*, 31. [3] Whitehead J. et al. (2002) *MAPS*, 37, 623-647. [4] Dietz R. S. (1986) *Meteoritics*, 31, 355-356.

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