AN ALTERNATIVE ORIGIN FOR COESITE FROM THE RICHAT STRUCTURE, MAURITANIA. S. Master[1] and J. Karfunkel[2], [1]Impact Cratering Research Group, Dept. Geology, Univ. Witwatersrand, Wits 2050, Johannesburg, South Africa (sharadmaster@hotmail.com), [2]Universidade Federale de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil (jokarfun@igc.ufmg.br).

The Richat structure is a 38-km diameter circular concentric domal feature in the Adrar region of Mauritania, (western Sahara Desert) [1-4]. Although the early workers regarded it as of endogenic origin [1-5], others have considered it as a possible impact structure [6-8]. In 1969, the Richat structure was investigated in the field by Dietz [9], who found no evidence of shock metamorphism, and concluded that the structure was definitely not of impact origin. Richat has since then been regarded as a discredited impact structure, probably of endogenic origin [10-12].

Aside from the remarkable circularity of the concentric ridges of quartzite, which have a relief of up to 100 m, and the presence of some chert and quartzite breccias, the strongest evidence put forward by proponents of the impact origin of the Richat structure was the discovery of the high-pressure silica polymorph coesite in some of the quartzite breccias [6]. This was taken to indicate high shock pressures (>2 GPa), related to the formation of the structure by impact processes. Dietz et al. (1969) [9] rejected a shock wave origin for the coesite, citing the complete absence of even minor grain fracturing in the quartzite breccias. They suggested instead that local intergrain stress concentrations may have exceeded 2 GPa pressures in certain tectonic environments; or that pressures <2 GPa may produce coesite under conditions of high stress and strain-rates [9, 13].

In the Diamantina region of Minas Gerais, Brazil, shattered quartzite outcrops have been found which contain coesite. The origin of these shattered outcrops has been attributed to the effects of lightning strikes [14]. Microfractures in these quartzites are saturated with water during the rainy season. When struck by lightning, the water temperature in these confined systems rises to over 1500°C, resulting in an explosive expansion, which can blow rocks apart, and produce estimated pressures >3.5 GPa, indicated by the presence of coesite (identified by RMP analyses). Thus we propose an alternative origin for the coesite from Richat, which would be consistent with the lack of shock metamorphic features in the structure. We suggest that the coesite-bearing quartzite breccias of the Richat structure were produced by lightning strikes, during a wetter pluvial period [15] in the history of the Sahara Desert, attested to by the presence of Paleolithic sites in the Mauritanian Adrar [16]. The presence of coesite in the Richat structure [6] would then no longer be enigmatic, and the endogenic origin of the structure is supported.

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