A SEARCH FOR DETRITAL SHOCKED ZIRCONS ERODED FROM THE SANTA FE IMPACT STRUCTURE, NEW MEXICO, USA. C. M. Lugo Centeno, A.J. Cavosie, H.A. Radovan. Univ. Puerto Rico.

Introduction: The documentation of shatter cones and shocked quartz were recently used to confirm the newly identifed, highly teconized, Santa Fe impact structure near Santa Fe, New Mexico, USA [1]. To provide more information about the distribution of shocked minerals and the intensity of shock metamorphism, a search was conducted for detrital shocked zircons in the general vicinity of the shatter cone outcrops. Recent studies in South Africa (Vredefort Dome), and Ontario Canada (Sudbury) have demonstrated that detrital shock zircons can survive post-impact metamorphism, uplift, erosion, and distal sedimentary transport [2,3,4,5]. Preliminary results from this search are equivocal; detrital zircons with microstructures resembling both planar fractures and granular texture were identified, however the expressions of these features on the surfaces of grains identified thus far are insufficient to definitively confirm an impact origin. Our search for more convincing detrital shocked zircons from the Santa Fe impact structure is ongoing.

Santa Fe impact structure: The age of the impact structure is poorly known, and broadly constrained to have occurred in the interval from 1.7 Ga to the Mississippian [1]. The structure is deeply eroded and highly deformed, with an estimated original size of 6-13 km [1].

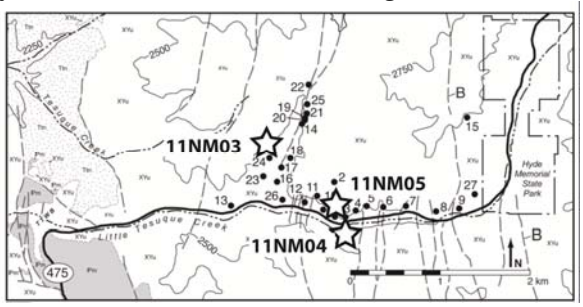

Figure 1. Map of the location of Santa Fe impact structure, after [1]. White stars are locations where sediment samples were collected. Black dots shows the location of the shatter cones outcrops identified previously [1].

Sediment samples: Three sediment samples were collected near the Santa Fe impact structure (Fig. 1). Sample 11NM03 was collected in the major north-south drainage on Hwy 475 and is ~ 1 kg of colluvium/alluvium. Sample 11NM04 was collected in Little Tesuque Creek, which flows west towards Santa Fe, and is ~1kg sediment sample of alluvium. Sample 11NM05 was collected at the base of shatter cone outcrops, and is a ~1 kg sample of colluvium.

SEM results: Backscattered electron imaging (BSE) was used to search for shock features. The zircons are euhedral to subhedral. A total of 128 detrital zircon grains were examined, and 2% (2 grains) exhibit possible shock features (Fig. 2). One grain contains fractures that are sub-parallel to each other and visible on multiple faces, but are not strictly planar. These fractures, if impact related, might result from low-shock pressure deformation (<20 GPa). A grain with a granular textured pyramid was found (Fig. 2b), but the cause of the granularization remains uncertain.

Discussion: The microstructures found are suggestive, but can not yet be confirmed as impact in origin. Before these grains can be confirmed as detrital shocked zircons, further studies are needed.

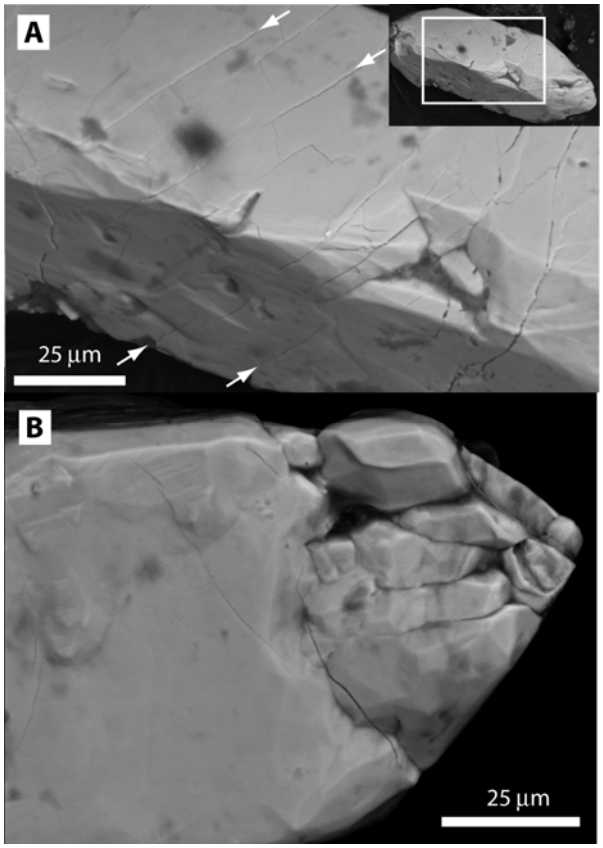

Figure 2. (A) BSE image of possible planar fracture microstructures in grain 11NM03-87. (B) BSE image of detrital zircon with a granular textured pyramid, sample 11NM04-08.

References: [1] Fackelman et al. (2008) EPSL. [2] Cavosie et al. (2010) GSA Bulletin. [3] Erickson et al. (2010) GCA. [4] Erickson et al. (2012) LPSC. [5] Thomson et al. (2012) LPSC.