ORA BANDA: EVIDENCE FOR A NEWLY DISCOVERED IMPACT STRUCTURE IN WESTERN AUSTRALIA. R. R. Quintero[1], A. J. Cavosie[1], J. Meyers[2], and C. Workman-Davies[3], [1]Space Science and Technology Centre, School of Earth and Planetary Science, Curtin University, Perth, Australia. [2]Resource Potentials, Perth, WA, Australia. [3]Evolution Mining, Kalgoorlie, WA, Australia. Corresponding author: r.quinteromendez@postgrad.curtin.edu.au

Introduction: The Ora Banda structure is a circular geophysical anomaly located in the eastern goldfields of Western Australia (30° 17' S, 120° 58' E), ~80 km north of the town Kalgoorlie. The structure is approximately 5 km in diameter and was first recognized by gravity surveying of the area during gold exploration. Ora Banda was recently announced in the media as an impact structure based on the finding of shatter cones, which provide diagnostic evidence of hypervelocity impact [1]. Shatter cones were found at the surface near the center of the structure (**Fig. 1**), as well as in drill core from the Ora Banda site (**Fig. 2**). Core samples from diamond hole EVDD0054, drilled to a total depth of 180.5m, were acquired in collaboration with industry partners. Here we present photographic evidence of shatter cones, breccias, and initial micro-analytical work conducted on polymict breccia from drill core samples.

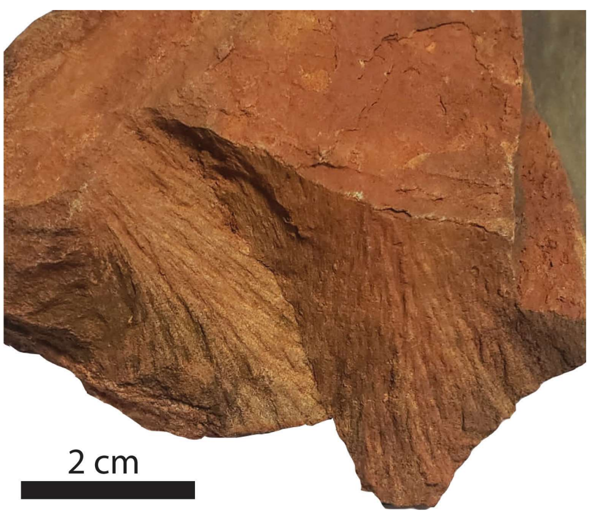

Figure 1. Shatter cones in altered rock (metabasalt) from surface outcrop, near the center of the structure.

Samples and Methods: Five samples of polymict breccia from drill core, spanning a ~30 m interval, were surveyed (**Fig. 3**). The breccias have gray, green, and brown matrices that are predominantly clast-rich (lithic breccia), and vary from matrix- to clast-supported. Breccia clast lithologies range from igneous (both plutonic and volcanic), to sedimentary. Dark objects/clasts in one interval may be melt, but this has not yet been confirmed. Scanning electron microscopy was performed in the John de Laeter Centre at Curtin University. Detailed backscattered electron (BSE) images of individual grains and zones of interest were collected. Energy dispersive spectroscopy (EDS) spectra were acquired to identify the composition of targets of interest.

Figure 2. Shatter cone in Ora Banda core sample.

Planar Microstructures in quartz: Nine quartz grains with planar microstructures were identified within a siltstone clast in breccia sample 20OB06 using BSE imaging (**Fig. 4**). Quartz grains with planar microstructures are generally small, ranging in size from 5-25 µm. Most quartz grains display one set of planar microstructures, although some grains contain planar microstructures in multiple orientations (**Fig. 4**).

The planar microstructures we identified in quartz grains in a clast from Ora Banda polymict breccia have not yet been indexed by universal stage, but they appear similar to planar deformation features known to form in quartz under shock compression [2]. At this stage we view such grains as tentative, rather than confirmed, evidence for the presence of shocked quartz in Ora Banda polymict breccia.

Diagnostic evidence of impact found at the Ora Banda site is currently limited to shatter cones in both surface exposures and those encountered in drill core. Planar microstructures in quartz have thus far only been identified in BSE images, and therefore at this stage do not yet constitute confirmed diagnostic evidence for the presence of shocked quartz. Work in progress includes petrographic analysis of thin sections and universal stage analysis, a crucial step in confirming if the observed features in quartz provide additional diagnostic evidence of impact processes [3,4].

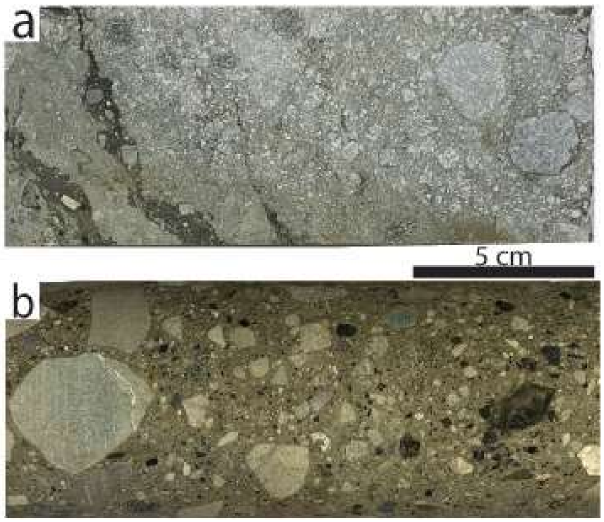

Figure 3. Polymict breccia from the Ora Banda structure. (a) core sample 20OB05. (b) core sample 20OB06. Core images are in horizontal orientation.

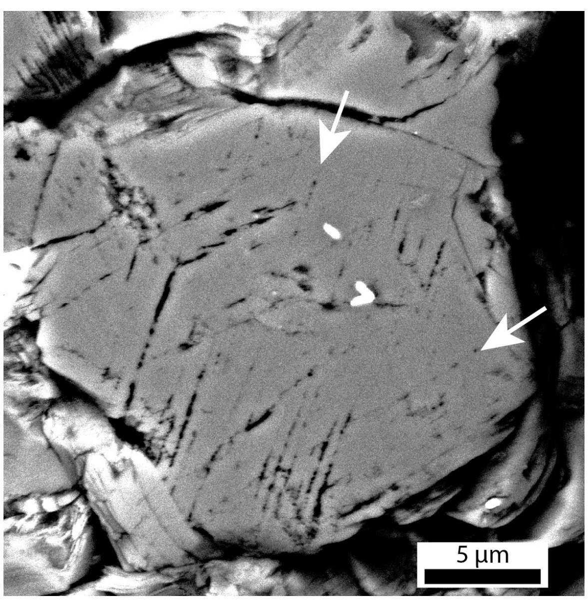

Figure 4. BSE image of quartz grain in a sedimentary clast from breccia sample 20OB06. Planar microstructures in multiple orientations are indicated by arrows.

Conclusion: We propose that the presence of shatter cones provides compelling evidence for a hypervelocity impact origin for the Ora Banda structure. In addition to ongoing work to confirm the presence of shocked quartz, we are currently working on many other aspects of Ora Banda rocks, including documenting the presence of other shocked minerals, determining if melt is present in the breccia, determination of impact age, and other investigations. Additional field work is also planned.

These results represent the first description of shock effects at the Ora Banda structure. At this stage of our investigation, many aspects of the Ora Banda structure remain unknown, including its age. If/when the impact origin for Ora Banda is accepted, it would increase the number of confirmed impact structures in Western Australia from 14 to 15, and the number of confirmed impact structures in Australia from 31 to 32 [5].

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