A NESTED OR COMPOSITE SHATTER CONE STRUCTURE IN THE SOUTH RANGE OF SUDBURY. D. M. Hurwitz[1], M. Zanetti[2], M. P. Lucas[3], D. Anders[4], G. Kramer[1], O. Thomson[5], D. A. Kring[1], G. R. Osinski[4]. [1]LPI, Center for Lunar Science and Exploration, Houston, TX; [2]Dept. Earth and Planetary Sciences, Washington Univ., MO; [3]Dept. of Earth and Planetary Sciences, Univ. of Tennessee, TN; [4]Centre for Planetary Science and Exploration, Univ. Western Ontario; [5]Univ. Puerto Rico Mayagüez

Introduction: The 1.85 Ga Sudbury impact structure, Ontario, Canada, ranks among the largest impact structures on Earth with an apparent diameter of ~200 km [1]. Sudbury is known for its well-developed shatter cones [2], features that indicate deformation by impact-induced shock waves [e.g., 3]. Early mapping efforts indicate that shatter cones developed in a belt up to ~18 km wide around the basin [4-6], generally confined to brecciated target rocks that bound the central Sudbury Igneous Complex. During a recent effort to update these distribution maps [7], we identified a possible composite cone containing smaller nested shatter cones in an outcrop located in the southeast quadrant of Sudbury (coordinates 46.5309°N, 80.8421°W). Similar composite cones have also been identified in association with the Vredefort structure [e.g., 8,9].

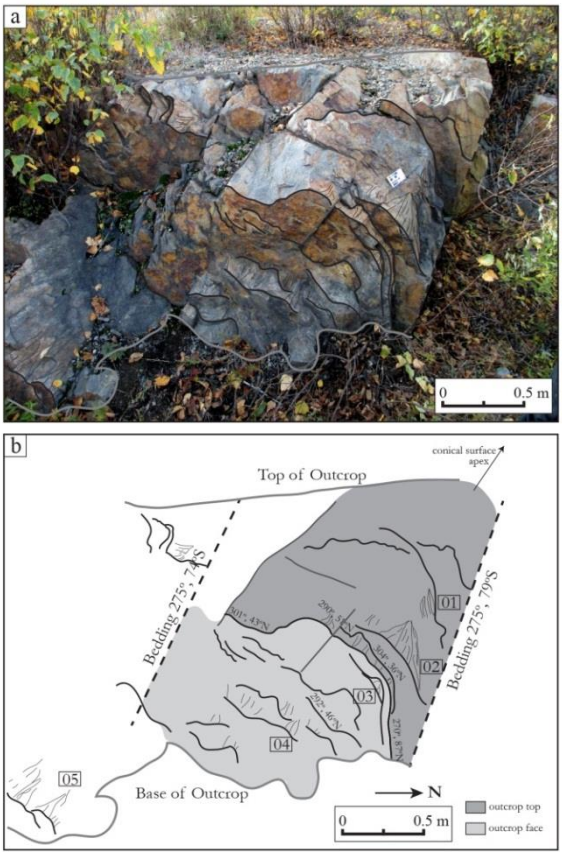

Figure 1: (a) Nested shatter cones in this outcrop are interpreted to represent a composite cone. (b) Sketch of the outcrop shown in (a), showing locations of secondary (parasitic) shatter cones (thin black lines).

Figure 2: Parasitic shatter cones on the side of the outcrop (feature 01, Fig. 1b). Lineations converge at an apex, a characteristic trait of shatter cones.

Observations: The survey area is within the South Range of the Sudbury impact structure, northeast of the city of Sudbury. Outcrops in this area contain target metasediments and quartzites. In one location (Fig. 1), there are a series of stacked, curvilinear foliations, some of which contain clusters of lineations (Fig. 1b). In five of these identified clusters, the lineations approach convergence, a texture that is consistent with well-developed shatter cones (e.g., Fig. 2). We measured trends and plunges for clustered lineations to identify trends in shatter cone orientation.

Interpretations: Observations suggest that this outcrop is a swarm of shatter cones oriented around a central cone-shaped core. We therefore interpret this layered sequence of embedded shatter cones as a single large, ≥1.5 m wide composite cone. Trends of parasitic shatter cone axes appear to be correlated with that of the larger composite cone, with small cone axes pointing up and towards the apex of the composite cone. The composite cone is consistent with formation from a shock wave radiating from a point source that was locally modified to produce a diffraction-like pattern of nested cones.

References: [1] Grieve et al. (2010), *MaPS*, *45*, 759; [2] Dietz and Butler (1964), *Nature*, *204*, 280; [3] Gash, (1971), *Nature Phys. Sci.*, *230*, 32; [4] Bray, et al. (1966), *J. Geology*, *74*, 243; [5] Dietz, (1972), *Geol. Assoc. Canada, Spec. Paper 10*, 29; [6] French (1972), *Geol. Assoc. Canada, Spec. Paper 10*, 19; [7] Osinski et al. (2013) *Large Meteorit. Impact*, *5*, this meeting; [8] Albat and Mayer (1989), *Tectonophys.*, *162*, 265; [9] Wieland et al. (2006) *MaPS*, *41*, 1737.