FIELD AND LABORATORY STUDIES ON SHATTER CONES IN THE VREDEFORT DOME, SOUTH AFRICA, AND THEIR GENESIS. F. Wieland[1] and W.U. Reimold[2], [1]wielanf@scinece.pg.wits.ac.za; [2]reimoldw@geosciences.wits.ac.za; [1,2]Impact Cratering Research Group, School of Geosciences, University of the Witwatersrand, Private Bag 3, P.O. Wits 2050, Johannesburg, South Africa.

The orientation of shatter cones has played an important role in the debate about the formation of this impact-related deformation phenomenon. New orientation data derived from samples collected from sites throughout the collar of the Vredefort Dome and *in situ* measurerments of striations on shatter cone surfaces have been obtained. The orientation of shatter cone apeces in the Vredefort Dome was described in detail by Manton [1] as consistently outward or downward (with respect to the center of the dome). Considering, that the collar strata have been dramatically rotated, restoration of the bedding to their position prior to the impact would change the orientation of apeces to an upward and inward direction, respectively, i.e. towards the crater center. Although this study confirms, that the most prominent oriention of shatter cone apeces is indeed normal to the strike to the bedding (and therefore parallel to the dip direction of the bedding plane), two other trends have been observed. One set is parallel to the strike of the bedding (and normal to the dip direction of the bedding plane), not changing the apex orientation when rotating the bedding back to the presumed pre-impact position, and a third trend at angles to the strike of the bedding and the bedding surface between 30 and 60°. Note that shatter cone apeces may point in opposite direction (i.e. up and down) within each set of orientation. Observation on striation geometries confirm their radial to subparallel character, as discussed by Nicolayson and Reimold [2]. Sagy et al. [3] defined striations to form distinctive ridges with a certain angle between their flanks or margins. They suggested a relationship between increasing angles and the distance of the sample locationn from the crater center. We wish to demonstrate that contrary to Sagy et al.'s thinking, these ridge-like structures are formed not by a single striation, but by a whole bunch of striations, lending themselves a "small shatter cone-like" appearance. *In situ* measurements on striations, following the concept of Sagy et al. [3], and from samples from the collar of the Vredefort Dome do not confirm their relationship between angle and distance from crater center. The average width of these angles varies from cone to cone, not providing consistent results for a single cone specimen, and certainly not for a number of samples from a given location (angles measured on the same sample may vary between 15 and 47°.

Conclusion: The orientation of shatter cones is more diverse than described in previous studies. A rotation of the strata back to their pre-impact position does not satisfy the variety of shatter cone orientation. On the premise that the cone apeces should always point into the direction of the energy (shock wave) source, our observations imply a scattering or reflection of the shock wave on discontinuities. These could include inhomogeneities in the rock (such as textural or structural heterogeneities), change in lithological character [e.g. degree of recrystallization], and mineral content. The hypothesis of a relationship between the width of angles of striation ridges with distance of the sample location from the center of the impact structure is not supported by this study.

References: [1] Manton, W.I. (1965), N. Y. Acad. Sci. Ann. 123, 1017-1049; [2] Nicolayon and Reimold, W.U. (1999), J. Geophys. Res. 104, 4911-4030; [3] Sagy, A. et al. (2002), Nature 418, 310-313.