**STRUCTURAL EVOLUTION OF THE CENTRAL UPLIFT OF THE VREDEFORT IMPACT STRUCTURE, SOUTH AFRICA**

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A structural investigation of the collar rocks of the 80-km-wide Vredefort dome provides evidence of the geometries and chronology of impact-related deformation features in the deep levels of the central uplift of the giant, 2.02 Ga, Vredefort impact structure. The dome exposes a 40-km-wide core of crystalline basement gneisses and a 15-20 km wide collar of predominantly siliciclastic supracrustal strata. Recent petrographic work by Gibson et al. [1] has established that the rocks experienced strongly variable shock pressures across the dome, from ~2 GPa in the outer parts to >30 GPa in the centre. Outcrops across the dome are marked by an intense fracture network with cm to metre spacing, which contains pods and veins of pseudotachylite, and which ranges from planar to curviplanar in the collar rocks, to anastomosing in the crystalline core rocks. The pseudotachylites are attributed to shock ± friction melting along the fractures, triggered by local heterogeneities in the impact shock wave.

Segments of shatter cones are present throughout the collar rocks up to at least 65 km from the crater center. Contrary to previous studies, the orientation of shatter cone apices does not point consistently towards the crater center after backrotation of the bedding, and up to three different orientations have been observed in individual outcrops. Formation of the central uplift involved strong inward and upward displacements. The collar strata were uplifted by at least 15 km and were rotated to subvertical orientations. This rotation extends into the crystalline core, but the inner ~15 km radius shows no evidence of substantial rotation, suggesting a plug-like geometry for the central uplift. On a smaller scale, the dome is polygonal rather than circular. Individual segments are up to several km long and display relative rotations of ~30- 45°. They are separated by radial oblique-slip faults with estimated slips of several hundreds of metres up to a few km, which are flanked by km-scale drag folds with intense jointing. These features reflect tangential shortening during the initial formation of the central uplift. The preponderance of sinistral offsets along the major faults may reflect asymmetric stress distribution during central uplift formation caused by inclined target strata. This is supported by the NW-SE asymmetry of dips of the strata in the dome.

Multiple joint sets are intensely developed on a cm- to dm-scale in all rock types. Most of these appear to be extensional and are attributed to radial and tangential collapse of the central uplift. They may contain pseudotachylite, but may also cut across thin pseudotachylite veins, suggesting that the latter crystallized before jointing was complete.

In summary, the Vredefort dome displays a chronological sequence of structures formed during the shock compression phase of impact, the initial phase of central uplift formation, and the final collapse of the central uplift. Whilst the large-scale features are consistent with tangential shortening associated with the initial formation of the central uplift, most of the small-scale joints appear to be related to radial extension, which most likely occurred during the collapse of the central uplift.

**References:** [1] R. Gibson et al. (2001), Lunar Planet Sci. XXXII, Lunar and Planet. Inst., Houston, CD-Rom, # 1012, 2pp.; [2] Lana, C. et al. (2002), submitted to Meteoritics and Planet. Sci.