STRUCTURAL CRATER RIM ANALYSIS AT METEOR CRATER.

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Introduction: Meteor Crater, located in Arizona, USA, shows obvious morphological deviations from a circular crater shape. Its square shape has been interpreted to be a consequence of a regional joint system that runs diagonally to the square [1,2]. The crater rim was re-examined to determine if there are further deviations from circularity and any preferential directions in the orientation of bedding that might reveal the direction of impact. In particular, detailed measurements of strike-dip were collected around the entire crater rim as a function of GPS data.

Results: Analysis of the strike and dip of bedding in the rim shows that the data reflect the general morphology of the crater rim. Stereo plots reveal differences between the (roughly) N-S-trending segments, which display a greater amount of axial rotation, and the E-W-trending segments. This implies an axis of bilateral symmetry with a NNW-SSE orientation, which might be an indicator for a direction of impact.

We also applied a new method of analysis that displays geographic data in an azimuthal reference scheme relative to the crater center. The strike of rock layers in the rim is then examined for deviations from a concentric or circular orientation with regards to the crater center. The majority of deviations in our dataset coincide with the rough square shape of the rim, in particular at the western and eastern flank. The most proximal part of the ejecta, defining the overturned flap of the crater rim, was also measured and shows more chaotic behavior that has less relation to crater rim morphology, which is in part due to the sparse distribution of appropriate outcrops.

Geographic coordinates and altitude were measured of the boundary between the Kaibab and Moenkopi formations, exposed in the top portion of the rim, in order to create a three-dimensional model. This originally subhorizontal surface has been uplifted and overturned to varying degrees during the impact. Strongest uplift occurred in the four corners of the crater, especially in the SE, where even the lower Coconino Formation is well exposed over a 300m-long segment. It is possible that the horizontal momentum of an obliquely striking impactor could exhibit preferential force downrange and extrude a larger block of the crater wall relative to the rest of the crater. An impactor traveling to the SE would contradict Shoemaker, who suggests the impactor was moving to the NNW [3], but no consensus has been reached on this matter so far.

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References: [1] Shoemaker E. M. 1960. *Structure of the Earth's Crust and Deformation of Rocks.* Rept. 18, p. 418-434. [2] Roddy D. J. 1978. *Proc. Lunar Planet. Sci. Conf. 9th* p. 3891-3930. [3] Roddy D. J. & Shoemaker E. M. 1995. *Meteoritics* 30, 567.