

**MONOMICT IMPACT BRECCIA FROM DHALA
STRUCTURE, ARCHEAN BUNDELKHAND CRATON,
CENTRAL INDIA: MACRO- AND MESOSCOPIC
IMPACT-INDUCED DEFORMATION.**

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Introduction: The Dhala impact structure centered at 25°17'59.7" N / 78°8'3.1" E, with an estimated diameter of ~15 km is located in the westernmost part of the Bundelkhand craton, Shivpuri District, Madhya Pradesh State, India [1]. The presence of unequivocal and diagnostic shock metamorphic features, extensive macro-deformation, and a large impact melt breccia dyke has already been reported [2]. The Dhala structure has a well defined central uplift surrounded by largely eroded multiple breccia rings. The breccia rings are separated by crater-fill sediments and suevite deposits. Monomict impact breccia outcrops occur as elliptical bodies with maximum elevation of 360 m. The present study reports the data from the field study of monomict granitoid breccia outcrops and IRS-1D (PAN+LISS-III) hybrid geocoded analogue data.

Results: A total of 98 presently exposed breccia outcrops occur around the central uplift with highly variable characteristics. The clasts are very angular, vary in size and show varied orientation. The average aspect ratios of clasts from one outcrop to another vary. Brittle structures (like joints and faults) and melt (±breccia) veins of varied length and width are observed. About 657 joint data and 55 fault trends have been collected from the breccia rings of Dhala structure. The faults show sinistral as well as dextral offset. The study of satellite data reveals the presence of a strong regional E-W fabric on both the northern ("Raksa Shear Zone"; [3]) and the southern ("Bundelkhand Tectonic Zone"; [4]) sides of the crater structure. Radial and concentric fractures are observed in and around the central uplift up to a distance of about 10 km from the center. The central uplift has undergone faulting. The regional E-W trending mylonitic fabric (steeply dipping due N) shows a gentle swerving to the ESE around the Dhala structure. Giant quartz veins with nearly NE-SW trend and relatively lighter appearance in the satellite data are the most conspicuous linear structures with positive relief in the environs of the crater. Mafic intrusives can be identified as linear outcrops with darker appearance and with a NW-SE trend. Quartz veins as well as mafic dykes show offset and fracturing at the outcrop scale, in the vicinity of the Dhala structure. The brittle structures in areas covered by alluvium are basically identified by abruptly (90°) changing stream trends.

Discussion: The distribution and density of brittle structures observed in breccia outcrops are variable. Apparent melt veins at the mm to cm scale in the monomict breccia are oriented parallel to important fracture directions. Joint analysis shows a radial pattern with slight complication due to pre-existing fabric elements (giant quartz veins, mafic dykes and the "Bundelkhand Tectonic Zone"). The presence of brittle structures in giant quartz veins and mafic intrusives and swerving of the mylonitic foliation in diorite suggest that the impact event post-dates these respective events.

References [1] Pati, J.K. (2005), *MAPS 40* (S): A121. [2] Pati, J.K. et al. (2006), 1st International Conference on Impact Cratering in the Solar System, ESTEC, Noordwijk, The Netherlands. [3] Senthippan, M. (1981) *Geological Surv. India Spec. Pub. No. 3*:73-76. [4] Pati, J.K. (1999), *Geol. Surv. India Rec.*131: 95-96