ASTEROID IMPACT VARIATIONS OF NRM AND REM OF TARGET BASALTS OF LONAR CRATER, INDIA.

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Introduction: Around 50 ka old Lonar crater (dia ~1.8 km), India, is completely excavated in ~65 Ma Deccan Traps by an oblique impact of a chondritic asteroid that stuck the pre-impact target from the east at an angle of 30-45^{o} [1, 2 and references therein]. We report here some rock magnetic experimental results on the possible relationships between variations of natural remanent magnetization (NRM) and REM [=NRM/saturation isothermal remanent magnetization (SIRM)] of the target basalts with the direction of impact.

Experimental procedures: Oriented drill cores collected from around the Lonar crater rim and adjoining areas were cut into two to three specimens of 2.2 cm height in the laboratory. The NRM and SIRM imparted at 1 T by a Molspin pulse magnetizer, were measured using a Molspin and JR-6 spinner magnetometers.

Results: The unshocked target basalts (n=44) at ≥2 km E of crater rim have mean NRM of ~3.87 Am^{-1} [standard deviation (sd): 1.24 Am^{-1}]. The shocked targets [2] between ~1-2 km uprange of crater to the west (n=207) show a general increase in average NRM to ~11.24 Am^{-1} (sd: 9.58 Am^{-1}). The targets from N, NW, W, and SW sectors of crater rim (n=203) and an eastern sector (n=27) show average NRM of ~5.62 Am^{-1} (sd: 2.22 Am^{-1}) and ~3.89 Am^{-1} (sd: 1.28 Am^{-1}), respectively. The targets from SE (n=51) and S (n=34) sectors show a wide variation of NRM with an average of ~18.2 Am^{-1} (sd: 14.3 Am^{-1}). A few samples in the N, SE and S sectors, however, show very high NRM (~100-350 Am^{-1}). The REM of unshocked target basalts (n=7) are <0.79% with an average of ~0.42%. The basalts from around the crater rim (n=45) except the western rim sector (n=12) have REM mostly <1.5% with an average of ~0.40%, and only 22% of shocked basalts show higher REM with an average of ~3.67%. Further it is found that samples with still higher REM occur only on the western rim sector and to the west adjacent to the crater in the uprange. The samples from this area (n=39) have 36% data of REM between 1.97 and 12.65% with an average of ~5.10%; the rest of the samples, however, have REM <1.5% with an average of ~0.49%.

Discussions: The NRM of shocked basalts is in general increases due to impact. Although the NRM does not show much change over the unshocked target either in the downrange (no increment) or uprange (~one and half time increment) on the east-west plane of impact, a significant increase (~5 times) is seen oblique to the plane and direction of impact. The shocked targets at ~1.5 to 2 km west of the crater rim in uprange also show a significant increase (~3 times) in NRM. Most of very strongly shocked target basalts (~71%) from around the crater rim and adjacent to the west of the rim have an average REM of ~0.44%, which is very similar to unshocked targets; the rest of the sample set, mostly from the western sector of the crater rim and to the west adjacent to the crater in uprange show an average REM of ~5.10% with values up to ~12 times higher over the unshocked targets.

References: [1] Fredriksson et al. 1973. *Science* 180:862-864. [2] Misra et al. 2010. *Geological Society of America Bulletin* 122:563-574. [3] Sengupta et al. 1997. *Revista de Fisica Aplicada e Instrumentacao* 12:1-7.