COSMIC RAY EFFECTS IN DEVRI-KHERA (L6) AND LOHAWAT (HOW): TWO METEORITES THAT FELL IN CLOSE PROXIMITY, IN SPACE AND TIME.

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Introduction: On October 30, 1994, at 21:00 hrs (IST), Devri-Khera (L6) meteorite fell in Rajasthan (76°37'30" E; 24°16'30" N), India [1]. Six fragments totaling 1140 g have been collected, within 4 km distance. Same day at 23:45 hrs (IST) Lohawat (How) meteorite fell in Rajasthan (72°37'36" E; 26°57'56" N), about 100 km away from Devri-Khera [2]. This is a first recorded instance that two different classes of meteorites fell within close proximity in space and time. We have investigated Lohawat for cosmic ray exposure records [2, 3]. Here we report cosmic ray exposure records of Devri-Khera and compare this pair of meteorites to learn about any common or special features, in their interplanetary sojourn.

Cosmogenic radionuclides have been measured by non-destructive γ-ray spectrometry, with a hyper-pure germanium detector, located in a 20 cm thick lead housing described earlier [4]. Cosmogenic stable isotopes of noble gases have been measured by standard mass spectrometric procedures [2].

Devri-Khera: Only ^{26}Al activity (59.4±2.4 dpm/kg) could be clearly seen in the gamma counting, as most cosmogenic radionuclides decayed during the past 16 years since fall. The recovered radius of Devri-Khera is ~6.7 cm, and for a ~90% atmospheric mass ablation, the pre-atmospheric radius should be ~14.5 cm and the ^{26}Al activity is consistent with a simple exposure for a 15 cm radius L chondrite [5]. Cosmogenic ^{3}He and ^{21}Ne gave exposure ages of 30.8 Ma and 34.2 Ma respectively, consistent with each other, within the experimental uncertainities of ±15%. Kr isotope data do not show any neutron effects due to Br (n, γ) reaction. This suggests that Devri-Khera meteoroid experienced cosmic ray exposure as a small object (r ~15 cm) throughout, since break up from its parent asteroid.

Lohawat: Lohawat is a howardite exhibiting light and dark lithologies. ^{26}Al activity (72 dpm/kg) and the ratio (^{22}Na/^{26}Al) ~1 indicate simple exposure and that Lohawat has not suffered any fragmentation in the interplanetary space, during the past 2 Ma. Partial loss of cosmogenic ^{3}He and ^{21}Ne, but a high exposure age of 110 Ma, based on cosmogenic ^{38}Ar are indicated, from the analysis of a light lithology sample [2]. Track data, together with cosmogenic stable and radionuclides suggest a simple exposure with a preatmospheric radius of 27 cm. Subsequently, we have analysed two dark lithology samples of Lohawat. They do not show any signatures of solar gases (typically found in howardites) but cosmogenic ^{38}Ar is low by a factor of 3 as compared to the light lithology.

Discussion: Both Devri-Khera and Lohawat have long exposure ages, Lohawat being the highest among howardites. Except that Lohawat has partially lost cosmogenic He, Ne, there does not seem to be any special similarity/feature about the cosmic ray exposure between these two meteorites. Their fall at close proximity of time and space seems to be just a chance coincidence.

References: [1] Ghosh S. et al. (2001) *MAPS* **36**, A241-A245; [2] Sisodia M.S. et al. (2001) *MAPS* **36**, 1457-1466; [3] Mahajan R.R. et al. (2000) *MAPS* **35**, A101; [4] Bhandari N. et al. (2008) *MAPS* **43**, 761-770; [5] Leya I. and Masarik J. (2009) *MAPS* **44**, 1061-1086;