

COSMIC RAYS IN THE SOLAR NEIGHBORHOOD.

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Galactic cosmic rays (GCR) provide information on their discrete sources in the "local" region of the galaxy, the solar neighborhood. Their huge energies are thought (e.g. [1]) to derive from supernovae (SNe) in the galaxy, and only a fraction of the SN energy is needed for GCR acceleration. There is a considerable amount of evidence that this acceleration is by the shock waves of SN explosions as they travel through the interstellar gas in the SN-active star-forming regions (OB associations) associated with the galactic spiral arms. Whenever our Solar System was located in or near such star-formation regions, as we have been for the last ~20 Ma (e.g. [2]), an increased GCR flux has to be expected.

Iron meteorites have long been known to represent detectors of GCR radiation [3]. High precision ³⁶Cl-³⁶Ar, ¹⁰Be-²¹Ne, ²⁶Al-²¹Ne CRE ages were reported [4] which disagree in a systematic way with ages obtained from ⁴⁰K-⁴¹K isotopic data (⁴⁰K, $t_{1/2} = 1.26$ Ga). The lower average production rates over the time interval of calibration (150 to 700 Ma) are lower by 28% and suggest an 38% increase in the recent cosmic-ray flux. A larger (>50%) increase is suggested relative to the average flux over the last 1 Ga, an average over several rotations of the galaxy. Preliminary calculations suggest that this flux increase is consistent with that expected for current GCR propagation models from SN acceleration in local star-forming regions.

In order to constrain the more recent flux changes, several investigations are studying nuclides with 10^5 to 10^7 a half-lives, ⁸¹Kr, ³⁶Cl, ¹⁰Be, ⁵³Mn and ¹²⁹I, as well as their stable products. ¹²⁹I ($t_{1/2} = 16$ Ma) concentrations and its decay product ¹²⁹Xe were studied in troilites of the strongly shielded Cape York iron and techniques are required to resolve isotopic shifts in ¹²⁹Xe and ¹³¹Xe due to neutron capture in ¹²⁸Te and ¹³⁰Te from ¹²⁹Xe excesses due to extinct ¹²⁹I. The first reliable CRE age for the Cape York iron is a ¹²⁹I-¹²⁹Xe age of 93 Ma.

References: [1] Axford, W.I. (1981) Proceedings 17th International Cosmic-Ray Conference (Paris) 12, 155; [2] De Zeeuw, P.T. et al. (1999) *Astrophysical Journal* 117, 354-399; [3] Voshage H. (1962) *Z. Nat-forsch.* 17a, 422-432; [4] Lavielle B. et al. (1999) *Earth & Planetary Science Letters* 170, 93-104.