

LONG-TERM COSMIC RAY INTENSITY VS. SOLAR PROXIES: A SIMPLE LINEAR RELATION DOES NOT WORK

K. Mursula (1), I.G. Usoskin (2), G.A. Kovaltsov (3)

(1) Department of Physical Sciences, POB 3000, FIN-90014 University of Oulu, Finland, (2) Sodankyla Geophysical Observatory, POB 3000, FIN-90014 University of Oulu, Finland

It was recently suggested (Lockwood et al., 2000; 2001) that the cosmic ray intensity in the neutron monitor energy range is linearly related to coronal source flux, and can be reconstructed for 130 years using the estimated long term coronal flux. Moreover, by reversing this relation, they reconstructed the coronal flux on the 500-year scale using the cosmogenic ^{10}Be data as an index of cosmic ray intensity. Here we show that a linear regression is oversimplified and leads to unphysical results on long time scales. In particular, the reconstructed cosmic ray intensity has a steep trend which is four times larger than the allowed upper bound. The reconstructed cosmic ray intensity exceeds the local interstellar cosmic ray flux around 1900. We argue that the unphysical results using a linear assumption are due to the oversimplified approach which does not account for complexity and significant nonlinearity of cosmic ray modulation in the heliosphere. We show also that there is no homogeneous linear relation between coronal source flux and cosmic rays.