

COSMIC RAY INTENSITY VS. SOLAR INDICES: IS THERE A SIMPLE LINEAR RELATION?

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It was recently suggested by Lockwood [2000,2001] that cosmic ray (CR) flux in the neutron monitor (NM) energy range is linearly related to such surrogate solar indices as solar coronal source flux and/or cosmogenic isotope ^{10}Be abundance, and can be reconstructed in the past. Here we show that this approach is oversimplified. We reanalyse the reconstructed CR flux comparing it with the observed (Climax) NM flux during the last four solar cycles. While the details of CR time profile are reasonably reproduced by the Lockwood's regression model, the overall trend is 6 times larger than the actual one leading to the unphysical results. E.g., the reconstructed CR intensity minimum in early 1900s [Lockwood 2000] is higher than the highest recent CR maxima in 1965. Applying the NM yield function to the local interstellar (unmodulated) flux of GCR we show that the unmodulated Climax NM count rate would be only about 16% higher than the actual count rate in 1977. On the other hand, the Climax NM count rate reconstructed by Lockwood is 20% higher around 1900 than in 1977, thus exceeding the unmodulated CR flux. We argue that these unphysical results are due to the oversimplified approach which does not account for complexity and significant nonlinearity of CR modulation in the heliosphere.