

THE MAIN CHARACTERISTICS OF THE SOLAR ENERGETIC PARTICLE EVENTS RELEVANT TO SOLAR ACTIVITY

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The results are presented of analyzing the solar energetic particle (SEP) event number and proton fluence as dependent on solar activity.

The analysis allows for the random character of SEP event occurrences, for the threshold effect in determining the small events, for the coincidence (overlap) effects of event determination during high solar activity period, and for the statistical and methodological errors in experimental data.

It is shown, that the main experimental SEP event data (SEP event number, occurrence frequency, and proton fluences) can be completely explained by two mean SEP event regularities, namely, the mean SEP event occurrence frequency is proportional to sunspot number [1], while the SEP distribution function normalized to the unified solar activity is independent of (invariant to) solar activity [2].

The problem of large SEP events is discussed. The large event occurrences are shown to be fully determined by the SEP distribution function and the statistical regularities effective at low probabilities. The analysis concludes that none of the experimental data can prohibit the occurrences of large SEP events even during the period of the low solar activity (a hint to such a possibility is the occurrence of the SEP event on 20-21 February 1994 during the period of monthly mean sunspot number $W=34$).

References

[1] Nymmik R.A., "Relationships among Solar Activity, SEP Occurrence Frequency, and Solar Energetic Particle Event Distribution Function", in proceedings of *the 25th ICRC*, 1999a, v. 6, pp. 280-283.

[2] Nymmik R.A., "Solar Energetic Particle Event Distribution Function as Inferred from Spaceborne Measurements and Lunar Rock Isotopic Data, in proceedings of *the 25th ICRC* 1999b, V. 6, pp. 268-271