Statistical properties of the long time proton fluency in the near Earth space and estimation of possible effects on radiation safety

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We use 11-year database of proton fluency observations with GOES-7,8,9,11 in three energetic channels (E>1 Mev, E>10 Mev, E>100 Mev) for estimation of statistical properties of observed radiation impacts.

We show that proton fluency statistics includes 2 different populations of events: in the first group amplitudes of fluency event in the different energetic channels does not depend one from another, for the second group amplitudes of fluency events in different energetic channels are hard correlated one with another with high confidence level. This difference reflects existing of 2 different sources of fluency events with different nature.

Comparison between relative input in fluency, accumulated during long time, from different kinds of events (rare high amplitude events (caused by extremely strong solar flares) and permanent background of low amplitude bursts, shows the dominant role of rare high amplitude events in accumulated fluency. We analyze statistics of fluency events and show that frequency - amplitude dependence has with high accuracy power like form (with exponent a=-0.2) and high amplitude events are dominating in long-time input to integral fluency.

We tested dependence of frequency-amplitude spectrum on phase of solar activity and show that in minimum of solar activity this spectrum change drastically (a=-0.6) with lower amplitude events domination. We use this data for estimation of probability for events with level of space proton radiation dangerous for satellite's based technology and astronaut's health.