

ROGUE SEP EVENTS: OBSERVATIONAL ASPECTS

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About once a solar cycle, a SEP event occurs whose fluence dominates that for the entire cycle. We refer to such events as "rogue" events, in analogy to rogue ocean waves having unusually large amplitudes. Well-known examples of rogue SEP events occurred on 14 July 1959, 4 August 1972, and 19 October 1989. In this paper we review the solar (multiple CMEs) and interplanetary (converging shocks) circumstances that give rise to these rare but geophysically important events.