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Two Acceleration Mechanisms for Ground Level Enhancements

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Abstract content

The previous paper showed that particles in the 20 January 2005 GLE were probably accelerated in two distinct regions. X- and gamma-ray observations of the RHESSI spacecraft identify these regions as a loop-like, bipolar structure in the lower corona which accelerates the particles on a short, ephemeral time scale to several GeV in energy, and the shock around the CME emanating from the parent flare, that later accelerates particles over larger spatial and time scales, but to lower energies. It is noted that the anisotropic distributions of the radiation in two such ephemeral GLE that occurred in 1960 and 1978 were very similar. Using these three events as guidance, it is shown that initial ephemeral enhancements have been observed previously in at least nine, and possibly in eleven GLE associated with solar flares west of 28° W on the solar disk, leading us to propose that the event of 20 January 2005 should be regarded as the defining example of the GLE, namely that there are two separate acceleration episodes in the typical GLE: (a) acceleration directly associated with the flare itself in the lower corona, and (b) acceleration by a supercritical shock driven by the associated CME, at about 2.5 solar radii.

If this papers is presented for a collaboration, please specify the collaboration

Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olivo, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 1 (SH), pages 269-272

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