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Travel delays of impulsive SEPs due to turbulent lengthening of the solar wind magnetic field lines

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Abstract content

The assumption that the first arriving particles in impulsive solar energetic particle (SEP) events travel scatter-free along regular Parker-spiral magnetic field lines from injection at the Sun to detection at 1 AU has led to the conclusion that impulsive SEPs are often injected well after a type III radio burst is observed at the Sun. If all the turbulent scales are taken into account in the description of the solar wind magnetic fields, however, one realizes that the length of the field lines, and therefore the path lengths of the SEPs, are much increased by the turbulence. Close to 1 AU, the length of a turbulent field segment is increased on average by close to 50%, with even longer field lines in some slow SW streams. In impulsive SEP events, noticeable travel delays of the first arriving particles should result from this turbulent lengthening of the field lines, with significant variations of these travel delays from one event to another. We argue that the delay of the particles occurs during their travel to 1 AU, mostly close to 1 AU, not at their injection at the Sun.

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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 147-150

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