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Globally Non-Simultaneous Forbush Decrease Events

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Abstract content

It is generally believed that Forbush Decrease (FD) events happen simultaneously over the globe of the Earth. However, there have been reports on non-simultaneous FD events. We investigate the properties of non-simultaneous FD events in order to determine what solar wind conditions lead to global simultaneity of FD events.

We examined the hourly data of the Oulu Neutron Monitor (NM) station from 1998 to 2006. We have selected FD events that have greater than 3.5 % intensity reductions. Global simultaneity was determined by comparing the time profiles of these FD events with those recorded by other NM stations at Inuvik and Magadan. These three NM stations are located at approximately the same high latitude, but fairly evenly spaced in longitudes.

Most FD event onsets are observed simultaneously by each NM station in universal time (UT) regardless of the location of the station, whereas some other FD events are not simultaneously detected, but at similar local times (LT). The stronger FD events tend to be simultaneous events, but the weaker FD events non-simultaneous. The latter occurs only if the main phase of the FD is superposed in phase with the declining phase of diurnal variation, which has the maximum around noon and the minimum around midnight. The simultaneous FD events might occur when the high speed strong magnetic barrier (IP shock sheath and MC) overtakes the Earth, whereas the non-simultaneous FD events might occur only when the slow moving weak magnetic barrier passes by on the dusk side of the Earth. The global simultaneity of FD events depends on speed and IMF strength of solar wind overtaking Earth's magnetosphere and its propagation direction. This model of FD simultaneity can be tested by the STEREO mission.

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Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olive, 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 343-346

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