

The global simultaneity of Forbush Decreases

Su Yeon Oh, Yu Yi, and Yong Ha Kim

Dept. of Astronomy and Space Science, Chungnam National University

Forbush Decrease (FD) is supposed to happen simultaneously over the globe of the earth. There have been several reports on the non-simultaneous FD events. We studied the properties of non-simultaneous FD events and the solar wind conditions causing such FD events in detail in order to figure out what solar wind conditions determine global simultaneity of FD events and understand physics of underlying mechanism driving the FD events. We examined the hourly data of the Oulu Neutron Monitor (NM) station from 1998 to 2002. We selected 49 FD events that show more than 3.5 % intensity reduction. Global simultaneity was determined by comparing the time profiles of these FD events with those recorded by other NM stations at Inuvik and Magadan located in almost the same high latitude but in separated longitudes. The solar wind parameters driving FD event main phase were verified. Most of FD events are recorded simultaneously by each NM station in universal time regardless of the location of the station, whereas the other FD events are recorded not at simultaneous universal time but at the similar local time. The average of the GCR intensity decrease is about -6.4 % for the simultaneous FD events, and about -4.7 % for the non-simultaneous FD events. Regardless of the simultaneity, 39 out of 49 FD events are associated with the interplanetary shock sheath regions. The simultaneous FD events are caused by the higher speed and stronger IMF solar wind interacting with the GCR particles in longer duration than the non-simultaneous FD events. For the non-simultaneous FD events, the GCR intensity maximum appears at day time of the NM station and the minimum at night time. The weaker FD events may be seen as the non-simultaneous FD events, only if superposed in phase with the diurnal variation of 1~2 % change.