

STATISTICAL EVIDENCE OF THE REALITY OF GLOBALLY NON-SIMULTANEOUS FORBUSH DECREASE EVENTS

SU YEON OH 1, Yu Yi 2, Yong Kyun Kim 3, John Bieber 4

1. Department of Astronomy and Space Science, Chungnam National University,
Bartol Research Institute, Department of Physics and Astronomy, University of Delaware
e-mail: osy1999@cnu.ac.kr
2. Department of Astronomy and Space Science, Chungnam National University,
e-mail: euyiyu@cnu.ac.kr
3. Department of Nuclear Engineering, Hanyang University, e-mail: ykkim4@hanyang.ac.kr
4. Bartol Research Institute, Department of Physics and Astronomy, University of Delaware
e-mail: jwbieber@bartol.udel.edu

One of such abrupt GCR intensity change is Forbush Decrease (FD) event, which is named after the first observer of the phenomenon, Forbush (1938). The FD event is known as a globally simultaneous phenomenon. However, there have been several reports on non-simultaneous FD events in universal time. Oh et al. [2008] investigated the characteristics of those globally non-simultaneous FD events observed from 1998 to 2002. The main phase onset time distribution in local time of the non-simultaneous FD events was different from one of the simultaneous FD event. Based on that statistics, they suggested that the global simultaneity of FD events depends on the solar wind physical parameters and propagation direction in three-dimensional heliosphere around the Earth. Thus, it is necessary to have a statistical test using more data of FD events. The FD event data are extended period from 1971 to 2006 and the intensity threshold of FD event is lowered ($> 3.0\%$) in selecting FD events. The number of total FD events in statistics is 218 using Oulu, Inuvik, and Magadan Neutron Monitor (NM) station data archives. In addition, the probability of the same distribution of those two different classes of FD events is calculated in each NM station's view rather than one NM station's. All three NM stations confirm that the probability of different distribution of FD main phase onset times of globally simultaneous and non-simultaneous is higher than 99 %. This statistical study may support the hypothesis that the simultaneous FD events might occur when stronger magnetic barriers pass by the Earth through the central part of the magnetic barriers and in contrast the non-simultaneous FD events may occur only if the less strong magnetic barriers pass the Earth on the dusk side of the magnetosphere. This hypothesis can be tested by the real observation of STEREO mission.

Forbush Decrease, Cosmic Ray, Magnetic Cloud

Su Yeon Oh, Department of Astronomy and Space Science, Chungnam National University