

Extreme space weather events between 2003 and 2005

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It is important in the space weather to study extreme space weather events because the extreme events have a large chance to make troubles on satellite systems, power grids, and so on.

Recently big space storms have occurred in October and November 2003, November 2004, and January 2005 though it is approaching at a minimum period at the solar activity cycle that changes at 11 cycles of year.

In the event in October and November 2003, the proton event of the fifth size after 1969 occurred on October 29. Its peak flux of the proton of 10MeV or more was 29,500pfu. A large geomagnetic storm with Dst index -401 nT occurred on October 30. This geomagnetic storm was the sixth size after 1957.

The observation the GOES satellite in the United States started on November 4 in 1975 and the flare of X28/3B since then was generated. The event in October and November 2003 was very big in various points as noted above.

A geomagnetic storm with Dst index -472 nT occurred on November 20, 2003. This geomagnetic storm was associated with solar active region that caused the above-mentioned event. The size of geomagnetic storm was the second after 1957. However, other related events were not such large.

In the event in November 2004, a very strong geomagnetic storm with Dst index -383nT occurred. The size of this geomagnetic storm was the tenth after 1975. The speed of the solar wind disturbance associated with this storm was approximately 700km/s. However, very strong southwards interplanetary magnetic field (IMF) continued for a long time. As a result, the low latitude aurora was observed in Japan on November 8. However, the peak flux of the proton of 10 MV or more.

The event in January 2005 was characterized by solar energetic particle event with large flux and hard spectrum. The peak flux of the proton of 100MeV or more, 652pfu was observed associated with the X7.1/2B flare on January 20. This peak flux was high level since the event in October 1989. The strongest GLE (ground level event) in solar cycle 23 was also observed. However, the minimum value of Dst index during the geomagnetic storm was -125nT.

The characteristics of each space storms can be clarified like this by the comparison of past extreme space weather events.