Effect of halo Coronal Mass Ejections on cosmic ray intensity during ascending phase of Solar Cycle 23

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Abstract

We have selected 55 halo coronal mass ejections (CME) events for the period of 1986 to 2000. Out of 55 CME's 13 are found to be associated with Sudden Storm Commencement (SSC'S). It has been investigated that the only those CME's which are associated with SSCs are found to be effective in producing short — term decrease in cosmic rays.

1. Introduction

Coronal mass ejections carry large amount of plasma and magnetic fields into the heliosphere. CME's have considerable importance towards our understanding of the heliospheric disturbances, because of the evolved amount of mass and energy injected into the interplanetary medium. Earlier studies also indicated the influence of CME's on cosmic rays and geomagnetic field of earth (Shrivastava 2001a,b; Shrivastava and Singh 2002; Shrivastava et al 2003), In this work, cosmic ray response to the well identified halo CME's have been studied during the period of ascending phase of solar cycle 23.

2. Method

Events of halo coronal mass ejections have been identified from the Internet Web site:http://lasco-nrl.nzvvy,mil. Daily values of cosmic ray oulu station has been used in chree analysis of super epch methed.

3. Results

We have identified 55 halo CME events to show their influence on cosmic ray intensity for the period of 1986 to 2000. The halo CMEs then those CMEs which are more likely to impact the earth then those which are shot out at right angles to the earth sun line, Those CME's which shows their association with Forbush decreases are excluded from analysis. We have adopted the chree analysis to determine the average behavior of cosmic ray intensity. The result of chree analysis for days -2 to 8 have been plotted in Fig.1 as percent deviation of oulu

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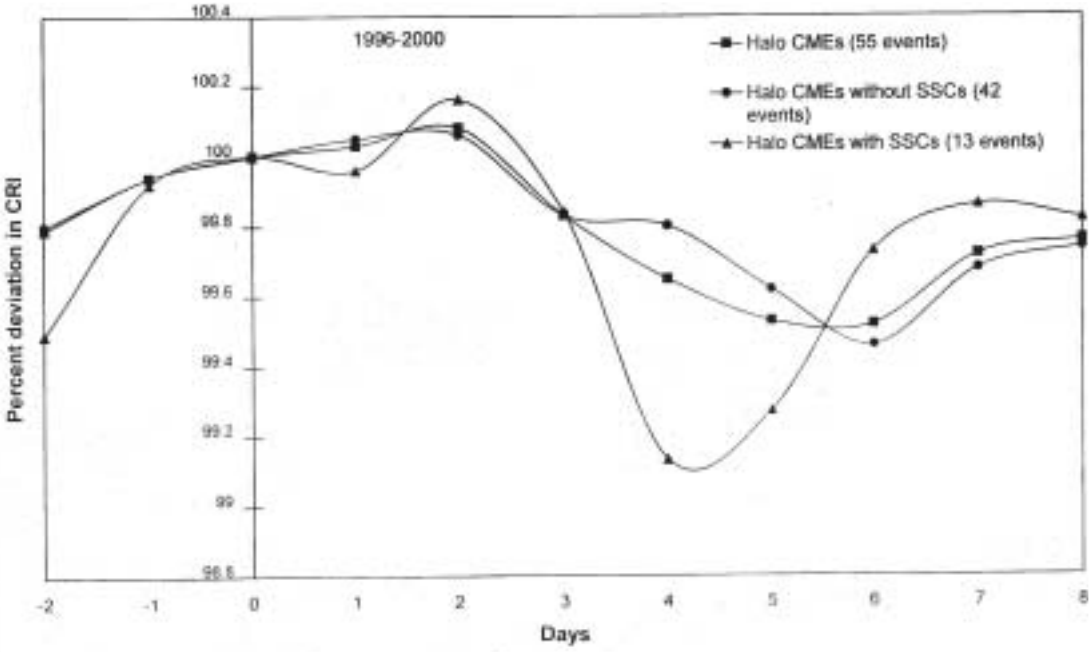

Fig. 1. Shows the average picture of cosmic ray intensity under the influence of Halo CMEs. Influence of Halo CMEs without SSCs and with SSCs are also depicted by different symbols.

cosmic ray data. It is to be pointed out that for each event the cosmic ray intensity first averaged for e;sven day -2 day to 8 days with zero epoch day and this average is used to calculate percent deviation for each day. Zero day is taken as onset of CMEs. CMEs are also separated into two categories (1) SSC associated (II)without SSC associated. It can be seen that halo CMEs in association with SSCs produce larger decrease in cosmic ray intensity.

4. Discussion

The observations obtained fupm this study indicates that the transient variations in cosmic ray intensity is effectively produced by coronal mass ejection's, It can be said that CMEs are one of the interplanetary factor, which produce depression in cosmic ray energetic particles in interplanetary space/ CMEs are the primary cause of geomagnetic disturbances with variety of cosmic ray modulation. (Biber and Evanson). According to their theories, which CME moves on to the field line connecting to the sun and earth. It quickly alters the special gradient and/ on spectrum of cosmic rays on that field line. The process on convection and diffusion which govern the quite time anisotropy then adopt themselves to the near boundary conditions imposed by the Coronal mass efections.

5. Conclusions

1. CMEs are found to be responsible in cosmic ray modulation.
2. Halo CMEs in association with SSCs produce larger decrease in cosmic ray intensity.

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