

# Geomagnetic disturbances and coronal rays

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**Abstract.** The cause of 92 geomagnetic disturbances in the period of 1997 - 2003 was analyzed. There were used data from LASCO C3 instrument from SOHO satellite, SOHO LASCO CME Catalog, and the daily average indices Ap. In this contribution we proposed to search sources of the geomagnetic storms taking into account the old idea by Newkirk and Bohlin (1965). According to this idea a solar coronal streamer can cause geomagnetic disturbance when it crosses the Earth's space.

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## 1. Introduction

The question of geomagnetic storms cause is of about 100 years old. But we still do not know the exact answer. The majority of solar scientists suppose, that the cause of geomagnetic disturbances is in solar flares, in coronal holes, which we can observe in X-ray, and in coronal mass ejections (CMEs).

But none of these hypotheses can forecast the geomagnetic disturbances with sufficient certainty.

In this contribution we propose to search sources of the geomagnetic storms taking into account the old idea by Newkirk and Bohlin (1965). According to this idea a solar coronal streamer can cause geomagnetic disturbance when it crosses the Earth's space.

## 2. The choice of events and the method of investigation

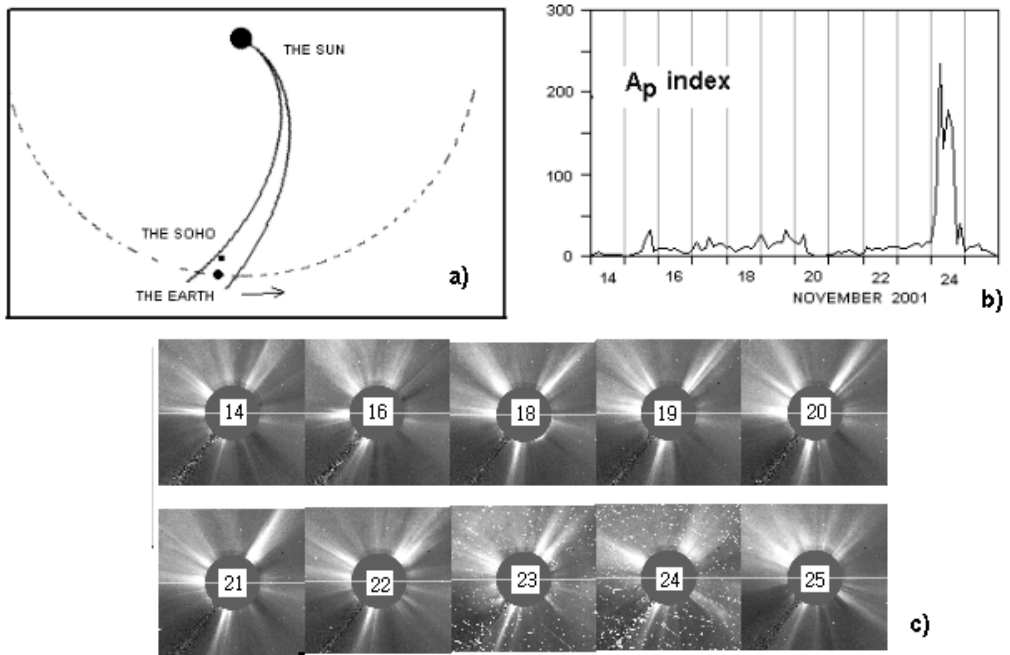
We have chosen the days, in which the Ap index was higher than 30 for our contribution. There were 92 such events in years 1997 - 2003. During the investigation we decided to change the criterion. We have studied only such events, when the difference in daily indices was higher than 50. Moreover, the time interval was shortened only to years 1999 - 2001. There were 22 such events: 1999 Feb 18; 1999 Jul 30; 1999 Oct 22; 2000 Feb 12; 2000 Apr 6 - 7; 2000 May 24; 2000 Jun 8; 2000 Jul 14 - 15; 2000 Aug 12; 2000 Sep 17 - 18; 2000 Sep 30; 2000 Oct 4 - 5; 2000 Nov 6; 2000 Nov 29; 2001 Mar 20; 2001 Mar 31; 2001 Apr 8; 2001 Apr 11, 2001 Oct 3; 2001 Oct 22; 2001 Nov 6 and 2001 Nov 24.

For each event we have to draw the position of the ecliptic plane into the pictures from LASCO C3 and we examined to find in this plane the coronal streamer of about 5 - 9 days before the geomagnetic storm. The courses of daily Ap index were drawn as well.

We can observe coronal streamers in the ecliptic plane very infrequently, but in our 22 events we can suppose that 1/3 of all big geomagnetic storms is caused by coronal streamers which transit near the Earth. We introduce in Fig.1. one event as an example.

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**Figure 1.** The example for described hypothesis: a) The scenario of the geomagnetic disturbance introduced by Newkirk and Bohlin (1965); b) The course of the  $A_p$  index; c) A series of the LASCOS C3 pictures in which we can see the coronal streamer on the east limb in the ecliptical plane already from Nov 14.

The CME catalog is generated and maintained by NASA and The Catholic University of America in cooperation with the Naval Research Laboratory. SOHO is a project of international cooperation between ESA and NASA.

## References

Newkirk, G.Jr. & Bohlin, J.D. 1965 *Annales d'Astrophysique* **22**, 234.