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SHORT COMMUNICATIONS

Comment[1] on "Geoeffectiveness of Halo Coronal Mass Ejections" by N. Gopalswamy, S. Yashiro, and S. Akiyama (J. Geophys. Res. 2007, 112, doi:10.1029/2006JA012149)

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Studying the geoeffectiveness (the ability to generate geomagnetic storms) of the solar phenomena, coronal mass ejections (CME) in particular, is a topical problem both for understanding the physical mechanisms of disturbance transfer from the Sun to the Earth and for the problem of forecasting magnetospheric disturbances on the basis of solar observations. However, the CME geoeffectiveness estimates available at the moment differ from each other rather strongly. This is due to a lot of methodological problems, including the fact that the quantities obtained by various methods are often treated as identical parameters [1–3]. One of such problems is the question of the direction of motion of so-called halo CMEs, i.e., such CMEs, in which the glow around the eclipsing coronagraph disk is observed. In this case the eclipsing coronagraph disk cuts out a part of the field of view, and there is no information about the medium between the Sun and an observer. So, the necessity arises to attract additional information, in particular, that obtained by other astronomical instruments and in the other range of electromagnetic radiation of the Sun.

Gopalswamy et al. [4] have studied the halo-CME geoeffectiveness on the basis of solar observations during 1996–2005 and found that the geoeffectiveness of 229 CMEs of "frontside halo" type was 71%. Earlier, for observations of 305 CMEs of "frontside halo" type it was found that their geoeffectiveness equaled 40% [5.]. On the other hand, the joint analysis of solar and interplanetary measurements has shown that, most probably, the geoeffectiveness of CMEs of "frontside halo" type equals about 50% [2, 3]. However, *Gopalswamy et al.* [4] have not discussed possible reasons of this difference and restricted themselves to general words, namely: "The reason for the conflicting results (geoeffectiveness of CMEs ranging from 35% to more than 80%) may be attributed to the different definition of halo CME and geoeffectiveness". By this reason, we present here our point of view about the high geoeffectiveness obtained by *Gopalswamy et al.* [4].

Various statistics of CMEs of "frontside halo" type (305 events during 1997–2003 [5] and 229 events during 1996–2005 [4]) indicates that *Gopalswamy et al.* [4] have used more rigorous criterion for selecting the events. They wrote: "The solar source of a halo CME is usually given as the heliographic coordinates of any associated eruption region obtained in one or more of the following ways: (1) using H-alpha flare location if available from the Solar Geophysical Data, (2) running EIT movies (i.e., the sequence of images of the ultraviolet EIT instrument—author's comment) with superposed LASCO images to identify any associated disk activity, such as EUV dimming, and (3) identification the centroid of the post eruption arcades in X-ray and EUV images when available". And then they state: "For backside (of a disk—author's comment) halos we do not see any disk activity". This approach contains some obvious logical mistake. All known links of CME with various manifestations of disk activity are statistical (probabilistic) rather than physical ones, because physical links between these phenomena are not unequivocally established till now. The used technique does not allow one to distinguish between the "frontside CME without disk activity" and the "backside CME". Thus, the absence of the observational facts of disk activity is not a sufficient condition that the events, which can be called the "frontside CME without disk activity", could be excluded from the list of "frontside CMEs" and

[1] The present note was prepared for the Journal of Geophysical Research (see Preprint http://arxiv.org/abs/0801.2709), where the paper by *Gopalswamy et al.*, [2007] was published. However, two of three reviewers concentrated their efforts mainly at inadmittance of publishing and discussing this problem rather than at discussing obvious methodological problems of the modern experimental physics. So, we express our gratitude to the "Cosmic Research" journal for the possibility of publishing our comment, as well as for the opportunity of wide and open discussion of the problems touched in it.

included into the list of "backside CMEs". This was confirmed by numerous cases of observation of so-called "interplanetary CME" (ICME) in the interplanetary space near the Earth (some of them even with magnetic storms) and so-called "problem storms", for which one did not manage to find any activity on the frontside of the Sun [6–10]. In particular, *Zhang et al.* [10] wrote in the Introduction: "a number of ICMEs, including those causing strong magnetic storms, were found not to be associated with any CMEs identifiable frontside halo CMEs [Zhang et al., 2003; Schwenn et al., 2005]". They have studied the sources of 88 strong magnetic storms ($Dst < -100$ nT) in the period of 1996–2005 and found out that "nine events cleary showed ICME signatures in the solar wind observations. However, we were not able to find any conventional frontside CME candidates in the plausible search window, i.e., we fail to indentify any eruptive feature on the solar surfase (e.g., filament eruption, dimming, loop arcade, or long-duration flare), in spite of the availability of disk obervations from EIT, SXT, or SXI. Similar "problem events" have been reported earlier [Webb et al., 1998; Zhang et al., 2003]". It would be strange, if the selection techniques used by *Gopalswamy et al.*, [4] and *Zhang et al.* [5], have principally differed between each other, because the same data were analyzed in these papers, and the major part of co-authors took part in both papers.

Thus, we can draw the following conclusions:

1. The method of selection used by *Gopalswamy et al.* [4] is incorrect, since it identifies a part of halo-CMEs on the visible side ("frontside halo CMEs without disk activity") as the "backside CMEs".

2. The list of halo CMEs on the visible side, used by *Gopalswamy et al.* [4], is incorrect (incomplete), since it does not include all halo CMEs on the visible side during the analyzed time interval.

3. The estimations of geoeffectiveness of halo CMEs on the visible side, made by *Gopalswamy et al.* [4], are incorrect (overestimated), since they were obtained only for "frontside halo CMEs with disk activity".

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