IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

THE EFFECT OF SOLAR AND INTER PLANETARY DISTURBANCE ON SPACE WHEATHER

Moushmi Jaisawal, M.L. Chouhan, Ravi Katare
Department of Physics, Govt. Science College Jabalpur M.P. India

ABSTRACT:

The interplanetary medium environment near Earth is dominated by disturbances originating directly from the solar and interplanetary medium, such as solar flares, X-ray flares, coronal holes, CMEs, and the interplanetary magnetic field. Coronal mass ejections (CMEs) have a large influence on space weather and can affect the Earth in a variety of ways. Furthermore, the influence of solar phenomena and associated interplanetary disturbances offers a once-in-a-lifetime opportunity to comprehend the relationship between solar, interplanetary, and geomagnetic activity. The investigation of solar, interplanetary, and geomagnetic parameters enables the identification of disturbances and their impact on space weather interaction in the interplanetary magnetic field.

Keywords: Space Weather, Solar Physics CMEs, Solar Flares, Solar Energetic particles, Geomagnetic Field.

INTRODUCTION – Every happening on earth is dictated by SUN. One can imagine how much the sun influence the earth. Almost every event of planet earth is dictated by the sun. Space Weather was coined not long ago to describe the dynamic condition in the earth's outer space environment in the same way that "Weather and Climate" refer to condition in earth's lower atmosphere Space weather includes any and all conditions and events on the SUN, in the solar wind in near earth space and in our upper atmosphere that can effect space borne and ground based technological systems and through these human life. The sun regularly bothes earth and the rest of our solar system of energy in the forms of the light and electrically charged particles and magnetic fields. Therefore the study of SUN and disturbance on it has significances. Unfortunately reliable date of SUN can only be received after later 19th century.

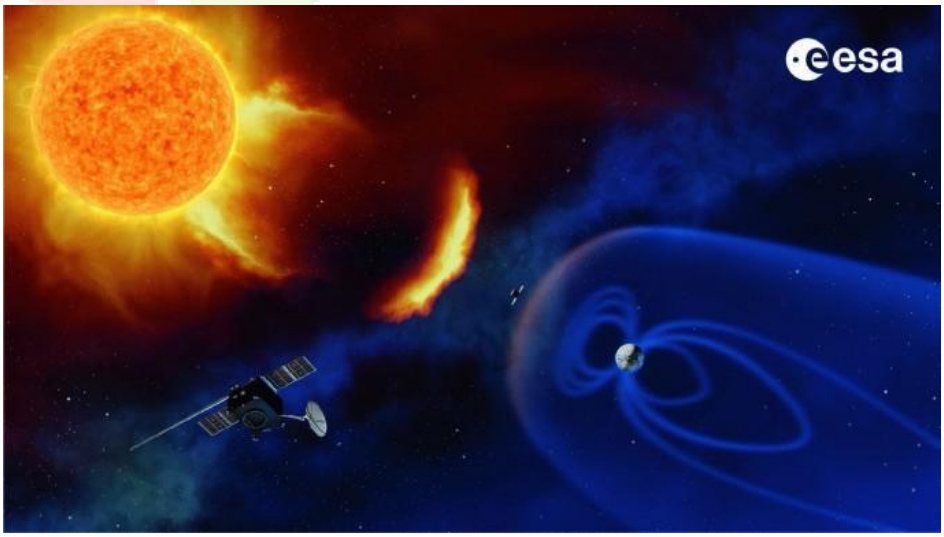
1. Co-relation-to study the effect of solar disturbances on the earth.
2. Cross co-relation-Delay time?

The various disturbances, data would be co-related with the geophysical data on the co-relation coefficient would be obtained. The Interplanetary magnetic field (IMF) is a part of the sun's magnetic field that is carried into inter planetary space by the solar wind. The IMF originates in region on the sun where the magnetic field is "Open" that is, where the field lines emerging from one region do not return to a conjugate region, but extends virtually indefinitely into space.

THIS ARTICLE FOCUSES ON THE FOLLOWING SPACE PHENOMENON

1. CMEs
2. Solar Wind
3. Solar Flares
4. Interplanetary
5. Solar Energetic Particles
6. Geo Magnetic Storms

As an active star, our Sun experiences cyclic variations that are related to more or less frequently occurring activity phenomena observed at the solar surface. High energetic activity phenomena, caused by changes in the Sun's magnetic field, travel through our solar system and interact with the atmospheres of the planets. These interactions are well documented on Earth and are known to cause geomagnetic disturbances with consequences for modern society. Space Weather refers to the Sun's influence on our solar system. As a result, solar activity must be continuously monitored from space and on the ground in order to assess times of increased influence. International space agencies established programmes such as ESA Space Situational Awareness (SSA) and NASA Living With a Star (LWS) (cf. Fig. 1) to increase Space Weather awareness and, as a result, support and fund fundamental research and development of Space Weather forecasting tools on a long-term basis.



A number of processes, such as active region and magnetic field evolution, energy build-up and release, and global structuring of inner heliospheric space, must be understood in order to properly describe these phenomena from a solar perspective. Space weather is a topic of widespread interest, and it supports an active and prosperous interdisciplinary research community. As a result, it encourages information and knowledge exchange between international research groups on solar-, heliospheric-, and geo-space (Sun-to-impact disciplines) in order to improve scientific knowledge for improving existing and developing new Space Weather forecasting models.

LITERATURE REVIEW

Strong Interaction of CMEs with earth environment causes serious space weather effect through the coupled magnetosphere system. A Geomagnetic storm is a global disturbance of the earth's Magnetic field (Akasofu, 1963) and usually occurs in response to abnormal conditions in IMF and solar wind.
et.al. (2012) Kahler (192) pointed out if the CME is associated with flare then the CME originates in the explosive phase of the flare. Gosling (1993) showed that solar flares play no fundamental role in causing geomagneti disturbances. Flares and CMEs are part of the same magnetic eruption process (Harrison 1995) Schreiber 1998; Zhang et al. 2001; Singh et al. 2012: Singh et al 2013). Characteristics of flares associated with CMEs has been discussed in the literature (Aggrawal et al. 2008; Pandey and Deboy 2009, Balveer 2011; Singh and Mishra 2015).

A variety of geomagnetic storm and several sources of their origin have been suggested by many authors (Tsurutani et at 1988).

The phenomenon of the geomagnetic storm and its manifestation has been discussed in the literature (Chapman 1936, Murayama 1982, Oh & Yu 2004; Jatin Rathod et al, 2008 and Kane 2014; Singh & Mishra 2015. He wish and Bravo (1986) found that geomagnetic storms are more associated with coronal holes than the solar flares

Singh & Mishra (2015). He wish & Barvo (1986) found that geomagnetic storms are more associated with coronal holes than the solar flares.

The impact of an Interplanetary irregularity causing a sudden change in the geomagnetic components are called sudden commencements (smith et all, 1986). It is accepted that the impact of the interplanetary irregularity on the magnetopause causes hydromagnetic waves which travel through the magnetosphere towards the earth as also into the tail and their isotropic mode give the SSC. The importance of geomagnetic storms is basically two fold. One refers to their academic aspect and the other involves principal aspects that in some cases can represent a particular concern for mankind.

The ring current development can be monitored with the Dst index (Gonzels et al. 1994, Bakare 2010, Kane 2014). Some of the most dramatic space weather effects occur in association with eruption of material from the solar atmosphere into interplanetary space. These eruptions are, known as coronal mass ejections, (CMES).

Standard criteria are generally used for the identification of ICMEs, complemented by several other features (chi et al, 2016, Kilpua et.al. 2017 Zurbucher & Richardson, 2006). However the circumtance that not all ICMEs even exhibit no features present in all ICMEs hinders a standardized identification method & fuels the need for time consuming visual expert labeling.

The study by Nguyen et.al. (2019) was however one of the first to address this topic and one is growing number of studies on the application of machine learning in the space sciences.

(Reiss et.al. 2021) forecasting global geomegnetic activity (Topliff et.al. 2020) or the timing of the solar wind propagation delay between the Lagrangian point L1 and Earth.

(Baumann & Mc Closkey 2021) are just a few examples of how machine learning is being applied in the area of space weather.

The Automatic detection of ICEMs is only one specific instance of the widely known challenge of detecting events in time series.

(Li & Guan, 2021) or human activity recognition (Young et.al. 2015). Even the solar wind in situ data itself features many more phenomena beyond ICMEs, for instance co rotating interaction regions (CIRs)

Improvements compared to an existing method. A comparable study was published during the finalization of this manuscript by Chan et.al. (2022).

METHODOLOGY

The data pertaining to various disturbances are co-related with the geomagnetic data, IMF's and their co-relation coefficient would be determined. To estimate the delays cross co-relation method would be used in IMFs, cosmic ray intensity We will examine the parameters of the variable of their some of the solar activities. We analyzed the data in the technical forms and for that we will use the data from **SOHO LASCO, NASA, MASLO, NEUTRNO** and different websites.

RESULT AND DISCUSSION:

The CME in Figure 2 has all of the substructures observed by the Large Angle and Spectrometric Coronagraph (LASCO) on board the Solar and Heliospheric Observatory (SOHO) mission: shock sheath, bright front, void, and core. The bright front in Figure 2a is thought to represent the outline of a magnetic flux rope, which has been identified as the void region. The kink (marked S in Figure 2b) in the nearby streamer indicates the presence of a shock. The shock sheath can be seen as a diffuse structure surrounding the CME flux rope in the difference (event minus pre-event) image in Figure 2c.

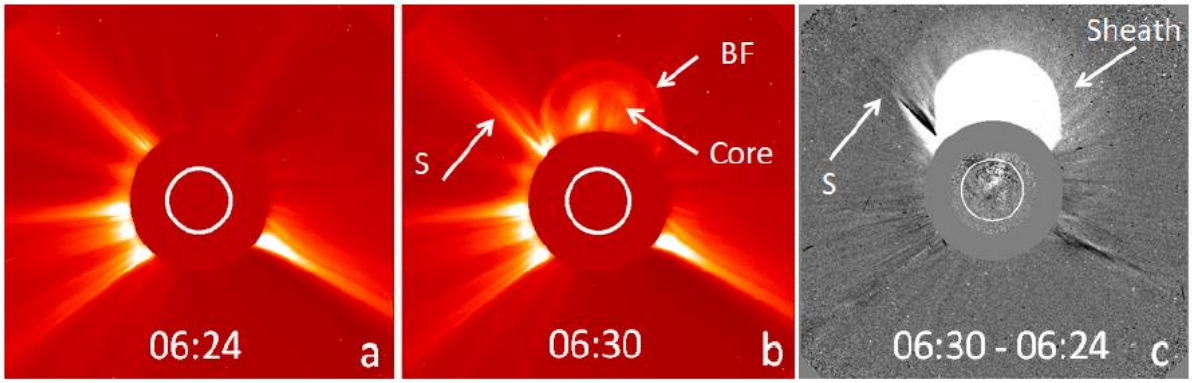


Figure 2: The basic morphology of the 15 January 2005 CME as seen by SOHO/LASCO/C2.

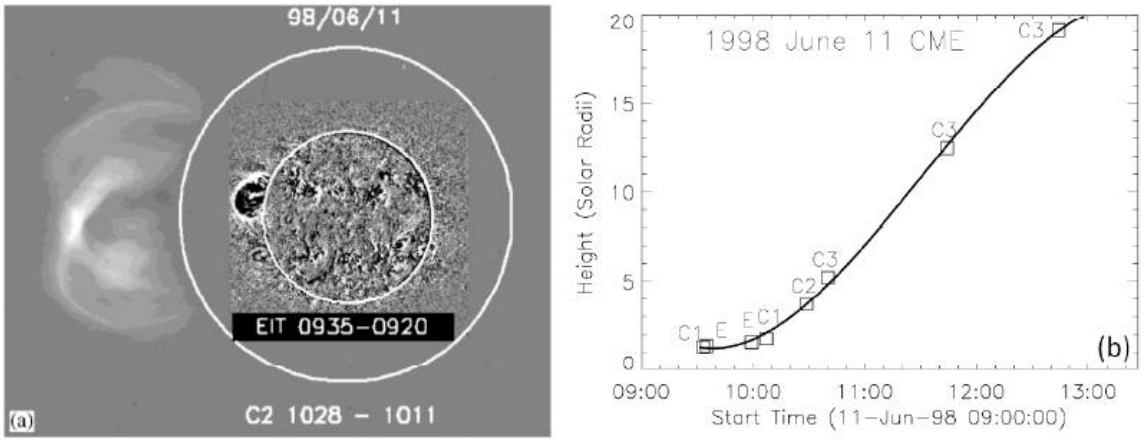


Diagram 3. (a) The 11 June 1998 CME at two different times: 09:35 UT in the SOHO/EIT FOV and 10:28 UT in the LASCO/C2 FIV. The CME could also be seen in the LASCO/C1 FOV (not shown). The solar disc and the LASCO/C2 occulting disc are represented by the inner and outer white circles, respectively. (b) A combined SOHO/LASCO (C1, C2, C3) and EIT (E) CME height-time plot.

There are only a few cases in which a moderate to severe deceleration process occurs before a CME arrives at 1AU, which may result in no discernible effect on the geomagnetic field and its indices. The statistical results presented here are consistent with previous findings that most CMEs with initial speeds greater than ambient solar wind are decelerated.

Figure 4 depicts the variation of interplanetary parameters and geomagnetic parameters from 11 to 17 April 2006.

Conclusion:

In this work, a relationship between interplanetary features and geomagnetic field will be established on the basis of new mechanism, which are reported in recent literature. Interplanetary and solar causes of geomagnetic storms will be investigated on the basis of recent data and existing proposed study with new interplanetary features. It will help us in advancing our knowledge about geomagnetic disturbances in different interplanetary condition. It is expected that the total average interplanetary magnetic field has a good co-relation with the large geomagnetic storms.

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24. For example, the SCOSTEP effort that resulted in excellent publications via CAWSES http://www.terrapub.co.jp/onlineproceedings/ste/CAWSES2007/index.html, the VarSITI programs (e.g., ISEST Zhang et al. 2018, see http://www.varsiti.org) or the international Space Weather Action Teams, iSWAT, where interdisciplinary groups gather together under https://www.iswat-cospar.org.

DATA SOURCES (Relevant Websites)

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