RELATIONSHIP BETWEEN SOLAR WIND PARAMETERS AND GEOMAGNETIC ACTIVITY INDICES

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UNIVERSITI TEKNOLOGI MARA

AZRIN NUR FARHANA BT ABDULLAH DIN @ AZMAN

B.ENG (HONS) ELECTRONIC (COMMUNICATION)
FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM, SELANGOR

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ABSTRACT

This study examined the relationship of solar wind parameters due to geomagnetic activity indices during disturbed period (Coronal Holes events & Coronal Mass Ejection events) and quiet period. In this analysis, for solar wind parameters, we are focusing on Interplanetary Magnetic Field Magnitude (B), Interplanetary Magnetic Field Temperature (T), Proton Density (N), Solar Wind Speed (Vsw) and Solar Wind Input Energy (ε) while for the geomagnetic indices, polar cap index (PC), auroral electrojet index (AE), disturbance storm time index (Dst) and planetary K-index (Kp) were investigated. The solar wind parameters and geomagnetic indices data are retrieved from OMNIWeb Data Explorer maintained by Goddard Space Flight Center, NASA. The variability of horizontal component of the geomagnetic field at three different latitudes stations extracted from Magnetic Data Acquisition System/Circum-pan Pacific Magnetometer Network (MAGDAS/CPMN) were investigated in order to study the correlation of geomagnetic pulsations with solar wind parameters. Data are supplied by International Center for Space Weather Science and Education, ICSWSE, Kyushu University, Japan. Due to availability of data, the event within 2009 and 2010 period were chosen. From the analysis, both Coronal Holes and Coronal Mass Ejection events show significant relationship with geomagnetic indices and pulsations. Both solar wind events influence the geomagnetic pulsations according to the geomagnetic stations. Details of the analysis will be discussed throughout this paper.

Keywords— Coronal holes, Coronal mass ejection, Geomagnetic indices, Solar wind parameters, Geomagnetic pulsations

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Space weather is driven by solar activity which is comprises a wide variety of phenomena such as solar flares, geomagnetic storms and solar energetic particles. Solar flares occurred when there is a sudden increase in electromagnetic radiation. It is an explosion on the Sun's surface caused by the release of magnetic energy in the solar atmosphere. Geomagnetic storms are caused by bulk flows of magnetized plasma from sudden eruptions known as Coronal Mass Ejections (CME) and from solar wind interactions known as Coronal Holes (CH). The solar energetic particles are generated by CMEs and flares that accelerate particles to relativistic speeds.

The interaction between sun's magnetic field lines and energetic ions emits from the sun formed the solar wind. It is a stream of charged particles or a plasma released from the upper atmosphere of the sun. It mostly consist of electrons and protons. The source of the solar wind is the sun's hot corona. Due to the high kinetic energy and high temperature of the corona, these particles can escape the sun's gravity. The stream of particles varies in density, temperature, and speed over time.

As the geomagnetic activity is dependence on the solar wind, a suitable function of the solar wind parameters describing input to the magnetosphere is used to characterize the geomagnetic activity. Dependence of geomagnetic activity on various solar wind