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INVESTIGATION ON THE SIGNIFICANT SOLAR TERRESTRIAL PARAMETERS AFFECTING IONOSPHERIC SQ CURRENT SYSTEM

Abstract

The purpose of this study is to extend previous research concerning the behavior of Ionospheric Solar Quiet (Sq) in 2008 and 2012 during minimum and maximum phases of solar cycle 24 respectively. This study investigates the parameter of space weather physic that affects the external Sq current by using a statistical correlation coefficient method. The two years data in 2008 and 2012 and monthly averages of solar wind parameter and geomagnetic activity indices were extracted from Space Physics Data Facility (SPDF) OMNIWeb interface to present the correlation with an external sources of Sq current. On the same timescale, the correlation between the solar wind parameter and geomagnetic activity indices with the Sq current is not stemmed only from a single parameter that considered as controlling parameter of Sq variation. Absolutely, the Sun – Magnetosphere – Atmosphere – Lithosphere coupling illuminates a strong explanation on how the interconnected link process between solar wind parameter, geomagnetic activity indices, and Sq current. This study found generally the interplanetary magnetic field, B is corresponding well in 2012 for a few months but in 2008 the K-Planetary index (Kp) shows a good correspond but it does not show a similarity for the whole year. Noticed, the Kp index is the horizontal component data of Earth magnetic field that used to indicate a global geomagnetic storm. The interplanetary magnetic field and K-Planetary index data are based on the magnetic field where B as vector quantity indicates the total strength of the interplanetary magnetic field while the Kp index is measured at the Earth on fixed stations around the world. However, other parameters (solar wind speed, solar wind dynamic pressure, solar wind input energy, proton density, IMF Bz and Disturbance storm time index) are also discussed in detail in this study. It should be emphasized that the Sq current is controlled by several space weather component rather than a single parameter. The driven mechanism of Sq currents which are ionospheric wind-dynamo and ionospheric conductivity at E region in correspond with underground conductivity extracted from localized geomagnetic observations are also being discussed as substantiating analysis. As conclusion, the physic of space weather parameter is changed accordingly due to the process flow of solar-terrestrial coupling that may trigger the ionospheric Sq current system. Finally, remaining issues are highlighted to provide possible directions for future work.