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Space weather effects on the generation of the equatorial scintillation during geomagnetic storms

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The solar wind and geomagnetic storms cause a wide spectrum of irregularities and processes which are generated from the polar ionosphere to the equatorial ionosphere. However, the space weather effects the on the equatorial ionospheric phenomena are not studied completely and the physical nature of many penetration mechanisms from the Polar Regions to the equatorial ionosphere has not been completely understood. In this study the solar wind and the equatorial ionosphere parameters, Kp, Dst, AE, and AL indices characterized contribution of different magnetospheric and ionospheric currents to the H-component of geomagnetic field are examined to test the space weather effect on the generation of ionospheric irregularities producing VLF scintillations. We demonstrate relationships between the equatorial ionospheric scintillation and the IMF Bz, Dst, Kp, AE, AL. It is shown that all these indices and the Bz of the IMF are suitable for investigations of scintillation activity at the equatorial ionosphere. Although that the Dst index is convenient and available one to study geomagnetic conditions during the ionospheric disturbances, the examples show that difficulties emerge when we consider relation of the magnetospheric ring current to the equatorial ionosphere height variations and scintillation activity. The reason is that the Dst index not includes the auroral sources. Kp activity take better advantage to depict of scintillation activity because it as planetary index carries more information about auroral electrojets. We show that the auroral indices AE, AL and Kp do better than Dst index for the prediction of the ionospheric scintillation at the equator. It is found that the factor, which presents during magnetic storms to fully inhibit scintillation, is the positive Bz-component of the IMF. It is shown that during the positive Bz IMF F layer cannot raise altitude where scintillations are formed. The space weather effect on the auroral ionosphere and models are presented to explain the relationship between the equatorial ionospheric parameters as h'F and foF2, and the equatorial ge-

omagnetic variations with the polar ionosphere currents and the solar wind. Taking into account the time delay between the solar wind and the ionosphere phenomena, the relationship between the solar wind and the ionosphere parameters can be used for predicting of scintillation activity.