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Possible relationship between Solar Wind Input Energy and Seismicity

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Solar wind is one of the most prominent features in interplanetary magnetic field (IMF) and acts as a medium for most of solar perturbations to penetrate into the earth ionosphere. The connection of solar wind and magnetosphere to the ionosphere has been introduced since early year 1960 by considering the solar wind energy transfer or input energy as a function of solar wind parameters. This energy can cause several space weather events such as aurora, geomagnetic storm and ionospheric disturbances. In this paper, we investigate possible influence of solar wind input energy on earthquake events. Our previous statistical analysis on relationship between solar and seismic activities (Jusoh and Yumoto, 2011, Jusoh et al., 2012) has shown high tendency of earthquakes during lower phase solar cycles. However a clear coupling mechanism was not established yet. To connect the solar impact on seismicity, we investigate the penetration of solar wind energy to lower ionosphere and lithosphere during high solar wind events. In our analysis, the underground polarization ratios for Pc3-5 were analyzed with the occurrence of local earthquake events at certain time periods. This analysis focuses at Onagawa area, which is one of major seismic regions in Japan.

Solar wind parameters were obtained from the Goddard Space Flight Center, NASA via the OMNIWeb Data Explorer and the Space Physics Data Facility. Earthquake events were extracted from the Advanced National Seismic System (ANSS) database. The localized Pc3-Pc5 magnetic pulsations for polarization ratio data were extracted from Magnetic Data Acquisition System (MAGDAS)/Circum Pan Magnetic Network (CPMN) located at Onagawa station, Japan (N38.43, E141.47). This magnetometer array has been established by International Center for Space Weather Science and Education, Kyushu University, Japan.

From the results, we observed significant correlations between solar wind input energy and underground polarization ratio at difference earthquake magnitudes and epicenter depths. The details of the analysis will be discussed in the presentation.

Keywords: High Speed Solar Wind, Solar Wind Input Energy, Geomagnetic Pulsation, Underground Polarization ratio, Earthquake