SFE∗s observed at Dip-equator CPMN stations: Characteristics and possible mechanisms

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'Solar flare effect'(SFE) is a well-studied phenomena known as geomagnetic disturbances accompanied with solar flares. Radiation from solar flares are believed to cause enhancements of ionospheric conductivities without any change in the pattern of ionospheric electric fields. Many scientists have demonstrated that disturbance vectors of SFEs are similar in the direction of the pre-flare Sq vectors[e.g. McNish, 1937; Nagata, 1952]. Therefore, SFEs observed at equatorial stations typically show a positive (negative) variations in SFE(H) during normal (counter) electrojet conditions[e.g. Rastogi et al, 1999].

We studied SFEs observed at the stations of the Circum-pan Pacific Magnetometer Network (CPMN) [Yumoto et al., 2001] and found two unusual events. In these two events, SFEs(H) observed at the dip equator showed negative variations(or anti-Sq variations) around local noon. We named these disturbances observed at dip equator as SFE∗s to distinguish them from the ordinary SFEs. It is difficult to explain SFE∗with the Sq dynamo fields only. This let us assume another current system which superposed on the Sq current system of the event day.

In the present paper, the method of principal component analysis has been applied to CPMN magnetometer data for SFE∗events to distinguish between Sq current system and superposed-current system. The results show that the superposed-current system has strong-westward currents in the equatorial region while no evidence of predominant current is noted in the middle-high latitude regions. We will discuss possible explanations for the westward currents.