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Variation of Sq focus latitudes for the active sun year 2001

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Variations of Sq focus latitudes for the northern and southern hemispheres have been broadly investigated by utilizing magnetic observation networks. The relation of the Sq focus latitude and the equatorial electrojet strength has also been discussed because the electrojet results from the Sq current in the equatorial day side of the ionosphere. The day-to-day variation of the Sq focus latitude has been evaluated during the quiet days or weak disturbance days. In order to evaluate the seasonal variation of the Sq focus, the contribution of the magnetic disturbance must be as little as possible through the year. For example, Stening et al. [2007] used the data corrected for the magnetic disturbance by subtracting the Dst index for the quiet sun year 1997. The similar method using the Dst index had been applied in a study of the Japan Meteorological Agency (JMA) for the active sun year 1958 and for the quiet sun year 1964; The results, however, might have been entangled with the errors. In the previous work, we examined the characteristics of the variability in the Sq focus latitudes on data from the JMA observatories for 17 active sun years, using a wavelet analysis which retrieves the Sq variation approximately. In this study, we examine the relation between the northern and southern Sq foci during the active sun year 2001 on data from both the JMA and the INTERMAGNET: MMB, KAK, KNY, CBI, GUA, KDU, CTA, ASP, and CNB.

Our results are as follows:

1. We found the approximate-synchronization in the poleward and equatorward movements of the northern and southern Sq foci during spring and during autumn.
2. We found the out-of-phase synchronization in the poleward and equatorward movements of the Sq foci during February and during December. This result overlaps that of Stening et al. [2007].
3. We found various poleward and equatorward shifts in the Sq focus latitudes, showing a poleward shift of the northern focus in February and an equatorward shift of the southern focus in November (Stening et al., 2007).
4. The strength of the equatorial electrojet was obtained representatively from data at the Huancayo observatory. On the occasional cases that the Sq focus moves equatorward, the strength of the electrojet increases. These agree with the previous works. The poleward and equatorward shifts of the Sq foci might be correlated with the enhancements of the electrojet strength during spring and during autumn.
5. The periodicity of about 10 days (or about 30 days) in the variation of Sq focus latitudes can be directly attributed to that of the Sq variation retrieved by the wavelet analysis.

Keywords: Sq current system, Sq focus latitude, seasonal variation, equatorial electrojet, wavelet analysis