

Atmospheric Electric Field variation at Syowa Station Associated with Auroral Activity

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The variation of atmospheric electric field (AEF) associated with auroral activity was examined using the data observed at Syowa Station during 2015 to 2017. We derived the reference values of AEF from the fair-weather AEF data at Syowa under the inactive auroral conditions, and compared the difference between observed and reference values of the AEF with Cosmic noise absorption (CNA), geomagnetic field, and Auroral Electrojet Index (AE-index). The results showed that the AE-index which is an indicator of the global current had a higher correlation with AEF variations than CNA and geomagnetic field, which represent local variations near the stations.

When the AE-index was increased, the AEF also increased in the dawn MLT sector, while it decreased in the dusk-to-midnight sector. Furthermore, the diurnal variation of AEF values when the AE-index exceeded 600 nT had a maximum in the morning and a minimum in the afternoon. This was quite different from the usual diurnal variation of AEF (Carnegie curve).

The relationship between the AEF values, AE-index and MLT suggested that the variation of the AEF was caused by the ionospheric potential variations (positive in the dawn MLT sector and negative in the dusk-to-midnight sector) occurred with the substorms.