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MLT/GMLAT dependence of magnetic field variations contributing to the AE index and possibility of AE index improvement

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The AE index is calculated from the geomagnetic field data obtained at 12 observations which are located in geomagnetic latitude (GMLAT) of 61.7 deg. - 70.0 deg. and it has been used to study the magnetic activity in the auroral zone. In recent years, 4 AE stations in Russia, however, often have troubles in observation and data transfer. This leads us to calculate the AE index from data of 9-11 stations. Fortunately, there are two other Russian observatories (Norilsk and Amderma) located at a little lower latitude (GMLAT=59.4 deg. and 61.5 deg., respectively) and use of these data may improve the AE index in the future. In this study, we examine MLT/GMLAT dependence of geomagnetic field variations contributing to the AE index by using the data from 12 AE stations, Norilsk, and Amderma. It is found that both AL and AU indices have two ranges of MLT (AL: around 0400 MLT, around 1040 MLT and AU: around 0510 MLT, around 1840 MLT) contributing to the index during quiet periods and one MLT range (AL: around 0240 MLT and AU: around 1730 MLT) during disturbed periods. Besides, Norilsk and Amderma show the similar level of magnetic field disturbances as that of the present AE stations. Thus, we can conclude that geomagnetic observatories in such low latitude (around 60 deg. GMLAT) can detect the magnetic field disturbances caused by ionospheric current located at higher latitude.

Keywords: the AE index