Universal time variations of the auroral electrojet indices

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Using the hourly-mean AE indices for the past 20 years, amounting to a total of 175,296 hours, we examine how the longitudinal station gaps of the present AE network affect the ability to monitor accurately the auroral electrojets. The latitudinal shift of the auroral electrojet location with magnetic activity also affects the reliability of the AE indices. These combined effects would result in pronounced universal time(UT) variations of the AE indices. By counting the number of occurrences recorded during the given ranges of activity, say every 100 nT and 200 nT for the AU and AL indices, respectively for each hour of universal time, the UT variations of the two indices are examined separately. The result demonstrates clearly that they are strongly dependent upon UT. Furthermore, it is noted that the equatorward expansion of the auroral electrojets is more responsible for the UT variation than are the longitudinal station gaps. For the range of the magnetic activity levels examined in this study, i.e, 0 ~ 500 nT and 0 ~-1000 nT for the AU and AL indices, the centers of the eastward and westward electrojets seem to be located within the latitudinal ranges 71° ~ 65° and 68° ~ 62° , respectively. The seasonal change of ionospheric conductance also contributes to the UT variation, particularly that of the AL index. While maintaining a similar variation pattern, the amplitude of the variation increases during winter and decreases during summer. It indicates that the UT variation of the AL index is more serious during winter than summer. With more AE stations being located within the former range than the latter, it is easily understood why the AL index is more strongly dependent upon UT than is the AU index. Considering such a latitudinal distribution, it is highly probable that the present AL indices often underestimate distributed conditions during specific universal time intervals, particularly 0200 ~ 0800UT.