Similarity and difference in the temporal behavior of the *Dst, AE,* and *ASY* indices

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Statistical processing of the data over 100,000 hours observation period revealed certain relations in the *Dst* and *AE* index behavior. The value of each index for the current hour appeared to depend mostly on the two factors: dawn-to-dusk electric field E_y = -VB_s in the solar wind, B_s being the southward IMF component, and the value of this index for the previous hour. Thus, the temporal behavior can be described by the equations

$$\frac{dDst}{dt} = -2.9(E_y - 0.51) - \frac{Dst + 15}{13.6}, \qquad \frac{dAE}{dt} = 67(E_y - 0.53) - \frac{AE - 220}{2.6}$$

where t is in hours, E_y in mV/m. This equation yields 13.6/2.6 hour delay of the *Dst*/*AE* response to a change in the southward IMF. According to the equations, a prolonged period of the southward IMF is accompanied by steady (invariable) behavior of both *AE* and *Dst* indices. A statistical relation of the B_zIMF to two successive values of the indices (*Dst* or *AE*) has been also obtained. The corresponding empirical formulas allow to restore with a good accuracy the B_zIMF component for the intervals when this component was not measured.

The behavior of the *H* and *D* components of the low-latitude *ASY* index was examined for several magnetic storms from 1-minute data. The following equations were obtained for the storm of 18-21 October, 1998:

$$\frac{dASYH}{dt} = 3.8(E_y - 1.6) - \frac{ASYH - 29}{2.2}, \qquad \frac{dASYD}{dt} = 5.2(E_y - 1.6) - \frac{ASYD - 41}{2.0}$$

Similarity in the characteristic times of the *AE* and *ASY* indices allows to conclude that the origin of the geomagnetic variation associated with the *ASY* index is the auroral electrojets.