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Ring current and auroral electrojets in connection with interplanetary medium parameters during magnetic storm

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Abstract. The relationship between the auroral electrojet indices (*AE*) and the ring current magnetic field (*DR*) was investigated by observations obtained during the magnetic storm on 1-3 April 1973. During the storm main phase the *DR* development is accompanied by a shift of the auroral electrojets toward the equator. As a result, the standard *AE* indices calculated on the basis of data from auroral observatories was substantially lower than the real values (*AE*'). To determine *AE*' during the course of a storm main phase data from subauroral magnetic observatories should be used. It is shown that the intensity of the indices (*AE*') which take into account the shift of the electrojets is increased substantially relative to the standard indices during the storm main phase. *AE*' values are closely correlated with geoeffective solar wind parameters. A high correlation was obtained between *AE*' and the energy flux into the ring current during the storm main phase. Analysis of magnetic field variations during intervals with intense southward IMF components demonstrates a decrease of the saturation effect of auroral electrojet currents if subauroral stations magnetic field variations are taken into account. This applies both to case studies and statistical data. The dynamics of the electrojets in connection with the development of the ring current and of magnetospheric substorms can be described by the presence (absence) of saturation for minimum (maximum) *AE* index values during a 1-h interval. The ring current magnetic field asymmetry (*ASY*) was calculated as the difference between the maximum and minimum field values along a parallel of latitude at low latitudes. The *ASY* value is closely correlated with geoeffective solar wind parameters and simultaneously is a more sensitive indicator of IMF B_z variations than the symmetric ring current. *ASY* increases (decreases) faster during the main phase (the recovery phase) than *DR*. The magnetic field decay at low latitudes in the recovery phase occurs faster in the afternoon sector than at dusk.

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