

SAR-arc characteristics in the region of ring current dissipation and during polarization jet development

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Electron temperature variations measured by AUREOLE 3, DE 2, COSMOS 900 and INTERCOSMOS 24 in the F – region of the ionosphere during different phases of magnetospheric disturbances are analyzed and classified. (1) Intense electron heating up to 6000 K and higher inside the latitudinal band of 5 – 8 degrees is connected to ring current energy dissipation and is observed during recovery phase of large magnetic storms. This electron heating causes the formation of classical SAR-arcs. (2) In other structures of 2 – 3 degrees latitude width electron temperature is enhanced up to 3000 – 3500 K. Formation of these structures is associated with initiation of substorm activity and can coincide with a start of storm main phase. In these structures the frictional heating of plasma due to strong electric field is operated. (3) The effect of electron heating in excess of 6000 K when the solar wind shock impacts on the magnetosphere of the Earth was experimentally revealed using the AUREOLE 3 measurements in subauroral ionosphere. The solar wind energy transfer from the magnetopause to the inner magnetosphere could be provided by kinetic Alfvénic waves. For the first time this possibility of energy dissipation in the terrestrial magnetosphere was considered theoretically by Hasegava and Mima (J. Geophys. Res., 83, 1117, 1978).