

ISOLATED SUBSTORM EXPANSION PHASE ONSET AND THE MECHANISM OF AURORAL BRIGHTENING

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The checking of “inside-out” and “outside-in” models of the isolated substorm expansion phase onset continues to be one of the main problems of the physics of magnetospheric substorm. In spite of comprehensive multi satellite observations, such problem requires careful analysis of ground based observations. Results of magnetic and television ground based observations with resolution 25 frames per second are analyzed. The case with first brightening arc just near zenith of the Lovosero observatory is studied. The special methods of image filtering are used. Results of the study support the existence of delay time between the first auroral arc brightening and start of the large magnetic fluctuations in the Pi1-Pi2 frequency range. The formation of bright “hot spot” ~15 s ahead of the classical brightening of the whole arc was observed. The luminosity disturbances poleward of the arc during ~1 min before the arc brightening were not found. It is shown that the observed features of the first auroral arc brightening can point out on the development of some kind of the quasi-electrostatic instability at the moment of brightening. Theory describing the observed features of isolated substorm expansion phase onset and first auroral arc brightening is developed.

substorm, television ground based observations, first auroral arc brightening

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