



The signatures of kinetic ballooning instability during substorms

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We use the observations of THEMIS spacecraft, THEMIS Ground-Based Observatories and FORMOSAT-2/ISUAL satellite to investigate the behavior of wave-like brightness structure on the substorm auroral arcs associated with disturbances in the ionosphere and in the near-Earth plasma sheet. The results indicate that the exponential growth of the westward electrojet current is correlated with the exponential growth of the arc intensity which may support the theory of Cowling channel effect. We also find that the azimuthal mode number values of the wave-like substorm arcs are found to decrease with increasing geomagnetic latitude of the substorm auroral arc location. It is suggest that the azimuthal mode number is likely related to the ion gyroradius and azimuthal wave number. We also show that the azimuthal mode number of the substorm onset arc wave-like structure is similar to that of the disturbances in the plasma sheet. We discuss the role of the kinetic ballooning instability as a plausible candidate for substorm mechanism in understanding qualitatively the analysis results of these simultaneous observations of the ionospheric and magnetospheric substorm phenomena.