

Relative timing of substorm-associated magnetic reconnection in the magnetotail and formation of auroral onset arc

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We have studied the relative timing of magnetic reconnection in the near-Earth magnetotail and formation of auroral onset arc, based on substorm events observed by the THEMIS spacecraft and ground-based all-sky imagers. The THEMIS all-sky imagers can observe auroras over a wide area with temporal and spacial resolutions higher than spacecraft-borne cameras. This enables us to investigate the timing of auroral development in more detail than before. A few min after the appearance and intensification of an auroral onset arc, it begins to form wave-like structure. Then auroral poleward expansion begins another few min later. Based on observations of plasmoids in the near-Earth magnetotail, we clearly show that magnetic reconnection is initiated at $X \sim -20$ Re at least 1-3 min before the appearance of the auroral onset arc. This result suggests that magnetic reconnection plays some role in the formation of auroral onset arc.

Keywords: substorm, auroral onset arc, magnetotail, magnetic reconnection, plasmoid, GEMSIS