Longitudinal propagation of thin auroral arcs

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Substorm onset is initiated along an east-west aligned thin arc. The formation and dynamics of these thin arcs are important for understanding substorms. However, the arcs can be complicated and their associated process in the magnetosphere is still unclear. Our previous Rice Convection Model simulation has showed that when it is traveling through the middle plasma sheet, a flux tube bubble is elongated along the Sun-Earth direction, causing an auroral streamer; while when it arrives at the magnetic transition region and expands azimuthally, it will give rise to an east-west thin arc . In order to verify our prediction, we analyzed a number of events using THEMIS All-Sky-Imager data,.We find that the longitudinal propagation speed of the leading edge of the arcs is between 0.5 and 3.5 km/s, which is consistent with our simulation results.