

## Pi pulsations in the near-earth magnetotail at substorm onset

SAKURAI, Tohru<sup>1\*</sup> ; KADOKURA, Akira<sup>2</sup> ; TANAKA, Yoshimasa<sup>2</sup> ; SATO, Natsuo<sup>2</sup>

<sup>1</sup>Tokai University, <sup>2</sup>National Institute of Polar Research

The THEMIS satellite observations showed that Pi 1 and Pi 2 period range oscillations of the magnetic and electric fields play an important role at a substorm onset in the near-Earth magnetotail. They associated energetic particle accelerations toward the inner magnetosphere. The energetic particle accelerations were observed with very similar oscillation signatures to the Pi 1 and Pi 2 period range oscillations observed in the magnetic and electric fields.. This observation suggests that the Pi 1 and Pi 2 period range oscillations might play an important role for contribution to the auroral particle accelerations at substorm onset in the near-Earth magnetotail . The examination has been done on a substorm event observed on 28 February, 2009 at a THEMIS GBO station, Kuujuaq (KUJ) (Mag. Lat.=66.89 N, Mag. Lon.=13.23 E, Mag. Midnight =4.15 UT, L-value = 6.4 ) in the west coast at the high latitude of the North America Continent. This substorm event was simultaneously observed in the near-Earth magnetotail by the three THEMIS satellites, THEMIS-A, -E, and -D located in the midnight region at ~8 Re, ~8 Re and ~11 Re, respectively. The data examined in this study are the magnetic field, all-sky images (ASI) and keograms (ASK) obtained at KUJ and the satellite observations of the magnetic field, electric field, and the electron and ion energy spectra in the ESA pair, and peer data. The results show very interesting facts of the Pi 1 and Pi 2 period range oscillations in the magnetic field and auroral activities observed on the ground and their conjunctions of the magnetic, electric fields, and the associated accelerated particles in the near-Earth magnetotail. The implication of this work provides the importance of the Pi 1 and Pi 2 period range oscillations for controlling the substorm onset plasma processes in the near-Earth magnetotail.

**Keywords:** Magnetospheric Physics, Substorm, Pi pulsations