Global-COE Frontier Seminar

Pre-onset time sequence of auroral substorm onset: THEMIS all-sky imager and spacecraft observations

Speaker : Dr. Yukitoshi Nishimura
Affiliation : Nagoya University
Date & Time : 14:40 - 16:10 Jan 05, 2010 on Tuesday
Place : RIGAKU SOHGOH TOH Bldg. 2F #203 Lecture Room
Contact : Prof. Takayuki Ono
TEL: EXT#6514 / E-mail: ono@stpp.gp.tohoku.ac.jp

Abstract:

A critical, long-standing problem in substorm research is identification of the sequence of events leading to substorm auroral onset. Based on event and statistical analyses of THEMIS all-sky imager and spacecraft data, we show that there is a distinct and repeatable sequence of events leading to onset, which is initiated by a poleward boundary intensification (PBI) and followed by a north-south arc moving equatorward towards the onset latitude. The results indicate that onset is preceded by enhanced earthward plasma flows associated with enhanced reconnection near the pre-existing open-closed field line boundary. The flows carry new plasma from the open field line region to the plasma sheet. The auroral observations indicate that Earthward-transport of the new plasma leads to a near-Earth instability and auroral breakup ~5.5 min after PBI formation. Our observations also indicate the importance of region 2 magnetosphere-ionosphere electrodynamic coupling, which may play an important role in the motion of pre-onset auroral forms and determining the local times of onsets.