219th Regular Open Seminar（2017 Jun 21）

Title：Magnetic reconnection in space: Numerical simulations and spacecraft observations

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Abstract：

Phenomena like solar flares and auroras are consequences of magnetic reconnection in space. These "magnetic reconnection" events abruptly release the magnetic energy, as they change the topology of the magnetic field lines. Owning to its fundamental importance, the physics of magnetic reconnection has long been studied since 1950's.

In particular, in near-Earth space, reconnection takes place in tenuous plasmas. They are so tenuous that the charged particles (ions and electrons) rarely collide with each other. The particles move in very complex ways due to the electric and magnetic fields. On the other hand, as the particles move, they carry the electric current which in turn changes the electromagnetic field. The entire reconnection system becomes highly complex and is very difficult to predict.

In this talk, I will overview our recent attempts to understand basic physics of magnetic reconnection in space. After general introduction, I will outline our recent results by means of computer simulations, called particle-in-cell (PIC) simulations. Next, I will demonstrate our "in-situ" observation of a near-Earth reconnection event with Japanese Geotail spacecraft. Finally, I will introduce NASA's Magnetospheric Multiscale (MMS) mission, which is going to measure reconnection sites in the night-side space of the Earth *this* summer.

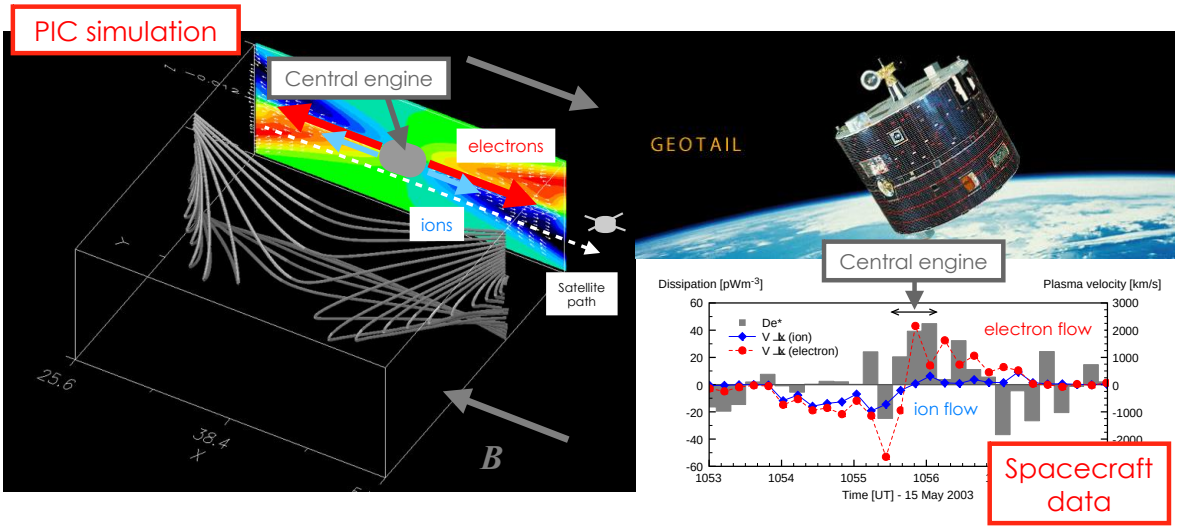

Fig. 1 Left) Particle-in-cell (PIC) simulation results: Topology of magnetic field lines. Right) Japanese Geotail spacecraft and in-situ plasma data.