ABSTRACTS (MASTER THESIS)

Simulation study on the growth of whistler mode chorus wave in the magnetosphere in disturbed conditions

**(Graduate School of Engineering,
Laboratory of Computer Simulation for Humanospheric Sciences,
RISH, Kyoto University)**

Takuya Ikeda

The radiation belt in the Earth's magnetosphere is composed of energetic electrons and protons. In order to understand risks for satellite launch, we need to understand the processes that govern the variation of the radiation belt. It is suggested that non-adiabatic acceleration of electrons interacting with electromagnetic waves called whistler mode chorus waves is effective for an abrupt increase in the radiation belt electrons. By coupling global MHD simulation and advection simulation (CIMI model), we calculated the growth rate of whistler mode waves and investigated spatiotemporal regions where the whistler mode waves can be excited. In the MHD simulation, the solar wind was changed under two kinds of conditions and the responses of the magnetosphere was reproduced. The results were used for advection simulation to reproduce the evolution of the phase space density of electrons in the magnetosphere. In Case 1, the dynamic pressure of the solar wind was multiplied by 6, and the z component of the interplanetary magnetic field (IMF) was changed from north to south. In Case 2, we changed the z component of the IMF from north to south without changing solar wind dynamic pressure. In Case 1, the interplanetary (IP) shock propagates anti-sunward. Just after the arrival of IP shock at the magnetosphere, the linear growth rate increased in the dayside magnetosphere, but there was no significant increase in the nonlinear growth rate. Substorm occurred in Case 1 and Case 2. In Case 2, the linear growth rate increased in the dawn-midnight region about 40 minutes after the substorm onset, and the nonlinear growth rate also increased in the same region. The nonlinear growth rate is much larger than the linear growth rate and it was found that nonlinear growth is extremely effective due to the excitation of whistler mode chorus waves. In Case 1, about 40 minutes after the substorm onset, the linear and nonlinear growth rate increased in the dawn-midnight region, too. The growth rate was larger and the increased area was wider that those in Case 2. This indicates that an increase in solar wind velocity has a great influence on the growth rate of the whistler mode waves. This is consistent with the idea that the radiation belt electrons are largely enhanced under the high speed solar wind.