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ACTIVITY REPORT

Section 1. Propagation of Atmospherics and VLF, ELF Radio Noise

A three-dimensional time-dependent magnetohydrodynamic (MHD) simulation was used to model the interaction between the solar wind and the plasmas produced from cometary gases. The model which includes cometary mass loading reproduced several features observed by the recent missions to comet Halley. A weak bow shock was formed in front of the comet and the magnetic field enhanced by a factor of 3.7 across the bow shock continued to increase up to the contact surface. A cold dense plasma sheet formed in the tail and this thin plasma sheet was oriented normal to the IMF direction. MHD fluctuations were enhanced in the neighborhood of the weak bow shock due to the plasma production process.

Secondly, a three-dimensional MHD model of the interaction between the solar wind and the earth's magnetosphere has been used to study the effects of dipole tilt on the structure and dynamics of the magnetotail. The location of the tail neutral sheet shifts in the north-south direction when we vary the dipole tilt. The magnetic neutral sheet is above the gyrocentric solar magnetosphere equator for positive tilt (summer for northern hemisphere) while below it for negative tilt. The neutral sheet forms an arc across the tail in the y-z plane for non-zero tilt and is similar to that deduced from observations by Fairfield. The position of the neutral sheet results from the requirement that the earthward magnetic flux equals the tailward flux.

The dependence of the magnetospheric configuration and polar cap structure on the north-south component of the interplanetary magnetic field (IMF) has been studied by using a new high-resolution MHD model. The characteristic features of the earth's magnetosphere, such as bow shock, magnetosheath, magnetopause, magnetotail, and plasma sheet, have been modeled for five different IMF conditions. For imposed southward IMF, magnetic neutral lines are formed in the subsolar and midnight tail regions on the equator. The magnetic field lines are dipolar near the earth and very concave in the magnetotail. The plasma convection is antisunward near the noon-midnight meridian and the plasma sheet becomes extremely thin. For no IMF, the dayside magnetic reconnection stops. For imposed northward IMF, the plasma sheet thickens in a small region near the noon-midnight meridian and extends into the tail lobes. The plasma sheet extension becomes less pronounced for incoming northward IMF. For both cases the convection near the noon-midnight meridian is sunward, and field aligned currents of the region 1 type appear on both sides of the plasma sheet extension. Moreover, we continue to study the dayside magnetic reconnection and the magnetotail dynamics from the three-dimensional global MHD simulation.

Ogino attended the Spring AGU Meeting at Baltimore, U.S.A. in May, 1987, the IUGG/IAGA XIX General Assembly at Vancouver, Canada in August and the XXII General Assembly of the International Union of Radio Science at Tel Aviv, Israel in August and September. He also attended the Chapman Conference on "Plasma Waves and Instabilities in Magnetospheres and at Comets" at Sendai/Mt. Zao in October.

Prof. K. Kakinuma had temporally taken over the responsibility of this section from April up to June, 1987. T. Oguti, who belongs to the Geophysics Research Laboratory, Faculty of Science, University of Tokyo, has joined as the section leader from July. Oguti attended at the IUGG/IAGA XIX General Assembly in Vancouver, Canada, in August, and also took part in the Ground-Spacecraft Auroral Dynamics Workshop as one of conveners in Saskatoon, Canada, in August. He had been invited by the Science Academy of USSR to visit Polar Science and Technology Council to discuss about the future collaboration in the joint research of dayside polar cusp phenomena and give lectures as well in University of Oslo, University of Tromsø and University of Bergen, Norway from October through December.

Data analysis of aurora, ULF-VLF waves and magnetic field variations obtained from the "Global Aurora Dynamics Campaign, 1985-1986" is in progress. Initial results show that; 1) characteristic magnetic field perturbations occur at a synchronous satellite when auroral protrusions develop in the area conjugate with the synchronous satellite, 2) local auroral expansions, accompanied by strong east-west drifts, in the dayside cusp region are concurrent with magnetic impulsive variations and Pi bursts, 3) long-period auroral pulsations, consisting of various kind movements of internal structures, could contribute to produce concurrent ground magnetic pulsations through the changes in both conductivities and electric fields, 4) "an event" of magnetic IPDP pulsations consists of many wave packets which come from various locations in the magnetosphere, 5) the equatorial magnetic pulsations are understood in terms of compressional HM waves with a small(<<1) azimuthal wave number.

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-Takasi Oguti-

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