Mapping of Electric Field Measured by Geotail into EXOS-D (Akebono) Position (3)

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We have compared the electric field observed by EXOS-D at 7000 km height with the simultaneous -VxB field observed by GEOTAIL at about 45 Re distance, and studied the physics of electric-field transmission from the magnetotail toward the ionosphere. To interpret the result we constructed a model of a simple circuit connecting the magnetotail with the ionosphere through the magnetic field line. This circuit includes a inductor and a resistance corresponding the ionosphere. The electric field in the magnetotail is filtered by a low-pass filter having characteristic time which is proportional to the inductance, and inverse-proportional to the resistivity. We filtered GEOTAIL data using this model and found that the output agrees well with EXOS-D data.

It is well known that the plasma bulk motion in the magnetosphere is controlled by the interplanetary magnetic field (IMF) and solar wind moment. It is one of strong evidences to suggest that electric field in the solar wind penetrates into magnetosphere and stimulates plasma motion.

We have compared the electric field observed by EXOS-D (Akebono) at several thousands km height with the simultaneous -VxB field observed by GEOTAIL at about 45 Re distance, and studied the physics of electric-field transmission from the magnetotail toward the ionosphere. The difference of electric field between two altitudes is considered to be due to the change of magnetospheric configuration which causes inductive electric field. In previous presentations, we have shown that the temporal change in the electric field at ionospheric altitude lags behind that in the electric field at GEOTAIL position. We found that the both agree well to each other when we compared the former with the latter one hour before the conjunction.

We constructed a model of a simple circuit connecting the magnetotail with the ionosphere through the magnetic field line. This circuit includes a inductor and a resistance corresponding the ionosphere. The inductance is defined by the area size inside the circuit, and the resistance is defined by the conductivity of the ionosphere. The electric field in the magnetotail is filtered by a low-pass filter having characteristic time which is proportional to the inductance, and inverse-proportional to the resistivity. We filtered GEOTAIL data using this model and found that the output agrees well with EXOS-D data.