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Statistical analysis of the large-amplitude Alfven waves observed in the magnetotail by Geotail

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Alfven waves have been found to propagate toward the earth in the nightside magnetosphere. They are considered to be associated with the auroral activity at the ionospheric altitudes. We have investigated the electric and magnetic field variations measured by Geotail in the mid-tail region, 10-30 Re, for 4 years, from 1997 to 2000. We found large-amplitude electric field fluctuations, which have peaks exceeding 10 mV/m, and the corresponding magnetic field fluctuations having the components in the direction perpendicular to the ambient magnetic field. These fluctuations were identified as Alfven waves from the comparison of the local Alfven speed with the coefficient derived from the linear fitting analysis between the electric and magnetic field variations. These large-amplitude Alfven waves propagate in the direction coinciding with the plasma flow, which is often earthward in the distances of 10-30 Re. They often appear at the plasma sheet boundary and are accompanied by ion beam. We will report the investigation about the correspondence with the plasma properties. Furthermore, we will discuss the energy inflow to the plasma sheet and ionosphere based on the statistical analysis of the energy flux carried by the Alfven waves and its spacial distribution.