

## Statistical analyses of electrostatic solitary waves observed in the electron foreshock region: Geotail observations

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Since electrostatic solitary waves were observed by the Geotail spacecraft in the earth's magnetotail region, the electrostatic solitary waves have been observed by some spacecraft also in regions other than the magnetotail region. The electrostatic solitary waves were also observed in the Earth's electron foreshock region by the Geotail spacecraft. However, the generation mechanism of the electrostatic solitary waves in the upstream region of the bow shock is not clear. In the electron foreshock region, since there are correlation with electron beams and observations of the electrostatic solitary waves, a plausible candidate of the generation mechanism is that the electrostatic solitary wave is excited by the electron beam accelerated in the bow shock transition. Since the electrostatic solitary waves propagate toward the upstream from the bow shock and are generated by the electron beams from the bow shock, it is expected that the excitations of the electrostatic solitary waves are strongly influenced by the condition of the bow shock. In order to make clear the influence of the bow shock condition that on the generation of the electrostatic solitary waves, we perform statistical analyses of the electrostatic solitary waves observed in the upstream region of the bow shock takes account of the distribution of the electrostatic solitary waves, characteristics of potential structures with parameters of the bow shock, propagation of the potential structures, and the relation between potential structure and electrons. In the present study, we discuss the generation mechanism of the electrostatic solitary waves observed in the electron foreshock region with respect to the electron velocity distribution using wave observations and statistical analyses.