

# Electrostatic solitary wave observed in the upstream region of the bow shock by Geotail

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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 upstream region of the bow shock by the Geotail spacecraft and the Wind spacecraft. However, the generation mechanism of the electrostatic solitary waves in the upstream region of the bow shock is not clear.

Since electric field intensities of the electrostatic solitary waves observed in the electron and ion foreshock regions are widely different, it is expected that generation mechanisms of the electrostatic solitary waves are different. 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 observations of the electrostatic solitary waves correlate with ion beams reflected by the bow shock in the ion foreshock region, it is expected that electrostatic solitary waves are generated by the Buneman instability.

Since the electrostatic solitary waves observed in both regions propagate toward the upstream from the bow shock and are generated by the electron or ion 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 and ions.

We found negative correlations with excitation of electron plasma waves and the observation of the electrostatic solitary waves in some events that observed in the electron foreshock region. Since these waves are excited by the electron beams, we discuss about the effect of the electron beams on the waves.