Boundary Layer Waves in Space Plasmas

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Generally, the boundary layers are formed whenever plasmas with different characteristics interact with each other. Therefore, boundary layers are frequently encountered in space and astrophysical plasmas. For example, interaction of solar wind plasma with the planets and comets produces magnetopause and cometopause boundary layers, respectively. Boundary layers occurring in space plasmas can support a wide spectrum of plasma waves in the range of frequencies above the proton plasma frequency, fpi, and smaller than or of the order of the electron plasma frequency, fpe. Such broadband electrostatic noise (BEN) has been observed in the magentospheres of Earth, Jupiter and Saturn, in the solar wind and Lunar wake. The high time resolution waveform capture data shows that BEN is composed of electrostatic solitary waves (ESWs), the Fourier transform of which results in the broadband nature of the noise. The electrostatic solitary structures are found in the electric field parallel to the background magnetic field, and are usually bipolar or tripolar. The electrostatic solitary structures have been interpreted in terms of phase space holes or solitary waves/double layers. In this talk, current understanding of the nonlinear fluid models for ion-and electron-acoustic solitons and double layers in multi-component plasmas will be reviewed. The relationship between the predictions of theoretical models and space observations of ESWs will be discussed for a few specific cases. It will be shown that models based on ion- and electron-acoustic solitons/double layers provide a plausible interpretation for the ESWs observed in space plasmas.