Characteristics of quasi field-aligned and very oblique whistler-mode emissions observed on THEMIS and RBSP

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Whistler-mode emissions, observed outside the plasmasphere, play an important role in both loss and acceleration of outer radiation belt electrons. Previous studies on the wave normal angle distribution of whistler-mode emissions in the equatorial magnetosphere have shown that there are two peaks: a major peak in the quasi field-aligned direction and a secondary peak at very oblique wave normal angles, close to the resonance cone. However, our understanding of the conditions under which whistler-mode waves are generated in these two directions is limited. We investigate polarization properties of the whistler-mode wave vector outside the plasmapause in the near-equatorial magnetosphere using high-resolution waveform data from multiple THEMIS spacecraft from the past several years. We examine various potential parameters, that may affect the dominant wave normal direction, such as hot electron temperature, the ratio of plasma pressure to magnetic pressure, the ratio of hot electron density to total electron density, hot electron anisotropy and etc., and their relation to the observed wave polarization. The newly available wave burst data and particle data on RBSP will also be used to investigate the characteristics of quasi field-aligned and very oblique whistler-mode waves and their associated plasma properties near the wave generation region. Our preliminary results show that the ratio of plasma pressure to magnetic pressure and the ratio of hot electron density to total electron density exhibit distinctive distribution for the two groups of whistler-mode waves (quasi field-aligned and very oblique). Furthermore, linear growth rates of whistler-mode waves for various wave normal angles, calculated based on the observed plasma parameters, will be used to investigate these observed wave polarization properties. Our results provide important information on the whistler-mode wave normal distribution and associated plasma conditions, which in turn play a significant role in the evolution of radiation belt electrons.