



Statistical study on magnetotail lobe waves with period 40 – 600 s observed by Cluster

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Ultra low frequency (ULF) waves play an important role in energy transport and dissipation in the magnetosphere. In this paper, 263 waves with period 40 – 150 s and 161 waves with period 150 – 600 s in the Earth's magnetotail lobe have been studied by using Cluster data from years 2001 to 2009. Our findings are as follows: (1) 90% of the wave amplitudes with period 40 – 150 s are below ~ 0.25 nT for transverse components, and ~ 0.16 nT for compressional component; The amplitudes of longer period waves are somewhat larger; For waves with period 150 – 600 s, 90% of the wave amplitudes are below ~ 0.36 nT and ~ 0.39 nT for transverse and compressional components, respectively. (2) Waves within 40 – 150 s prefer to occur in the lobe region close to the plasma sheet, while waves within 150 – 600 s can be observed throughout the lobe region; (3) The amplitudes of lobe waves and AE index are weakly correlated; However, we find that amplitudes tend to be larger when the AE index is larger; (4) Amplitudes also tend to be larger when the solar wind velocity, the solar wind dynamic pressure or its variations (Δ PSW) is larger; The correlation coefficient between amplitudes of waves within 150 – 600 s and Δ PSW is up to ~ 0.58 . We suggest that both dynamic pressure in the plasma sheet boundary layer or plasma sheet (inner source) and solar wind conditions (outer source) can contribute to the generation of lobe ULF waves; Waves within 40 – 150 s are effected more by inner source; Δ PSW is more associated with compressional waves within 150 – 600 s than that within 40 – 150 s.