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The quasi-periodical VLF/ELF emissions detected onboard the DEMETER spacecraft: statistical and theoretical analysis

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We present a statistical study of the quasi-periodic (QP) ELF/VLF emissions measured by the DEMETER spacecraft. Events with modulation period larger than 10 s and frequency bandwidth more than 200 Hz were visually selected among the six year of measurements. Selected QP-emissions events occur mostly at frequencies from about 750 Hz to 2 kHz, but they may be observed at frequencies as low as 500 Hz and as high as 8 kHz. The statistical analysis clearly shows that QP events with larger modulation periods have lower frequency drift and smaller wave amplitude. Intense QP events have higher frequency drifts and larger values of the frequency bandwiths.

Numerical simulation of the QP emissions based on the theoretical model of the flow cyclotron maser is performed. Calculations were made for wide range of plasma parameters (i.e. cold plasma density, L-shell, energetic electron flux and etc.) The numerical results are in good agreement with the observed relationship between different parameters of the QP emissions. The comparison between theoretical results and observations allow us to estimate the typical properties of the source of the QP emissions observed by the DEMETER satellite.