

Spectral structure of plasmaspheric cavity resonance estimated by compressional magnetic pulsations as observed by the Swarm satellites

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The plasmasphere is a cavity resonator for magnetosonic waves because the wave speed is very high on both inner and outer sides of the plasmasphere, i.e., at the ionosphere and the plasmapause, respectively. However, it is not yet very clear observationally what types of resonance oscillation (modes) exist and which mode dominates. A short period and large amplitude compressional Pc3 magnetic pulsation was observed by the Swarm satellites at a passage of the Lamb wave generated by the 2022 Tonga submarine volcanic eruption. The Pc3 wave shows a peculiar power spectral structure which has many sharp peaks. Similar Pc3 events observed in other period also show very similar spectral structure, and hence, it could be an inherent spectral structure of the plasmaspheric cavity resonance. Based on the above speculation, similar events, i.e., large amplitude and short period Pc3 waves, were searched through the Swarm VMF dataset from December 2013 to April 2022 and analyzed statistically. The results indicate a common spectral structure which has more than 5 clear spectral peaks with frequency interval about 0.004-0.005 Hz.

Keywords: plasmasphere, cavity resonance, compressional geomagnetic pulsation, Pc3 magnetic pulsation, spectral structure