



## **Equatorial noise emissions with quasiperiodic modulation: Investigating the source region**

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Equatorial noise emissions are electromagnetic waves observed routinely in the equatorial region of the inner magnetosphere at frequencies below the lower hybrid frequency. Although they were typically considered to be continuous in time, some of them exhibit a clear quasiperiodic modulation of the wave intensity, being effectively composed of individual quasiperiodic elements. The emissions are generated by unstable ring-like proton distribution functions, resulting in their fine harmonic structure which corresponds to the proton cyclotron frequency in the source region. Employing a reasonable magnetic field model, the evaluation of the observed harmonic structure can be thus used to determine the source radial distance. Moreover, the events for which the spacecraft passes directly through the source region can be distinguished by the fine harmonic structure following the locally evaluated proton cyclotron frequency. We use the data measured by the Cluster and Van Allen Probes spacecraft to identify such time intervals, and we use the in-situ measured magnetic field and plasma parameters to calculate the wave growth. This allows us to reveal a possible origin of the quasiperiodic modulation of the wave intensity, and to discuss differences between time-continuous equatorial noise and equatorial noise with a quasiperiodic modulation.