FUNNEL-SHAPED EMISSIONS OBSERVED BY CASSINI CLOSE TO THE SATURN'S B RING

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Abstract

We analyze funnel-shaped emissions detected by the plasma wave instrument on board the Cassini spacecraft during its pass over the Saturn's rings on July 1, 2004. These emissions were observed at radial distances from 1.3 to 1.9 Saturn radii and at frequencies between 2 and 12 kHz. Their frequency first decreases as a function of the radial distance and, after reaching a minimum near the synchronous rotation point in the B ring, the frequency steeply increases. We interpret these emissions as whistler-mode waves propagating close to the resonance cone. Similar emissions known as auroral hiss are frequently observed in the terrestrial high-latitude magnetosphere.

We developed an automated detection procedure for lower and upper frequency cutoffs observed in the Cassini data. Using these data, we perform a ray tracing study to show how the waves propagate from their source region close to the ring plane. This study also allows us to estimate the optimized position of the source region of the observed waves which gives the best agreement with the data. We also estimate influence of different density models on the results. Using an analogy with the terrestrial auroral hiss emissions, our observations could be explained by means of whistler-mode waves generated by field-aligned electron beams. These beams could be a part of current systems which possibly emerge as a result of interaction of the Saturn's B ring and its rigidly corotating magnetosphere.

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