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Striated AKR Emission: A Remote Tracer of Ion Solitary Structures

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We describe the statistical properties of narrowband drifting auroral kilometric radiation ('striated' AKR) based on observations from the Cluster wideband receiver during 2002-2005. We suggest that the observed characteristics, including frequency drift rate and direction, narrow bandwidth, observed intensity, and beaming angular sizes are all consistent with triggering by upward travelling ion solitary structures ('ion holes'). We calculate the expected perturbation of a horseshoe electron distribution function by an ion hole by integrating the resonance condition for a cyclotron maser instability (CMI) using the perturbed velocity distribution. We find that the CMI growth rate can be strongly enhanced as the horseshoe velocity distribution contracts inside the passing ion hole, resulting in a power gain increase greater than 100 dB. The gain curve is sharply peaked just above the R-mode cut-off frequency, with an effective bandwidth $\sim$50 Hz, consistent with the observed bandwidth of striated AKR emission. Ion holes, as observed *in situ* in the acceleration region, are detected primarily in the upward current region, move upward, and have speeds consistent with the observed slopes of SAKR bursts. Hence, we suggest that SAKR bursts are a remote sensor of ion holes and can be used to determine the frequency of occurrence, locations in the acceleration region, and temporal characteristic of these structures.