

Low Frequency Waves in Magnetospheric Plasmas as the Source of High Frequency Turbulence

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Wave-particle and wave-wave interactions are crucial elements of magnetosphere and ionosphere plasma dynamics. The interactions redistribute energy between different plasma populations and connect physical processes occurring on different spatial and temporal scales. Lower-hybrid waves (LHWs) may play a particularly interesting role in plasma dynamics, because they can couple to both ions and electrons. The excitation of LHWs has often been invoked to explain interactions between differing space plasma species, but remains one of the unresolved questions of multi-ion plasmas in the magnetosphere. We demonstrate that large-amplitude Alfvén waves, in particular those associated with lower frequency (LF) turbulence, may generate LHWs in the auroral zone and ring current and that in some cases this serves as the Alfvén wave saturation mechanism. We believe that this scenario can also play a vital role for particle populations in other regions, particularly in places under investigation by NASA THEMIS and RBSP missions.

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