The role of cold oxygen ions in EMIC wave

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Abstract: Electromagnetic ion cyclotron (EMIC) waves play a crucial role in Earth's magnetosphere dynamics by mediating particle precipitation and facilitating energy redistribution. The presence of cold oxygen ions (O^+), originating from the ionosphere, has a profound impact on the generation, growth, propagation, and saturation of EMIC waves. Recent advances using both hybrid simulations and linear theory have revealed that increasing concentrations of cold O^+ ions can significantly modify EMIC wave behavior altering growth rates, confining wave propagation, and suppressing wave amplitudes. These findings highlight the essential role of cold heavy ions in regulating EMIC wave properties and shaping the overall energy transfer processes within the magnetosphere.