

PEM026-P05

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Effect of ion composition on vortex structures in drift wave turbulence

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In the ionosphere, Io torus, and fusion plasmas, gradients of density, pressure, and temperature ubiquitously exist, which excite drift wave turbulence. The Hasegawa-Mima equation is known as a basic equation, which describes the dynamics of such drift wave turbulence. In a recent experimental study, a streamer, which is a bunching of drift-wave turbulence, have been observed. In addition, these streamer structures were revealed to be equivalent with soliton solutions (vortex structures) in nonlinear equations, which is a subset of the Hasegawa-Mima equation. However, the effect of multiple ion species and ion-electron temperature ratio is unclear, since a single species of cold ions is assumed in the ordinary Hasegawa-Mima equation.

In the present study, we first derive the extended Hasegawa-Mima equation, in which diamagnetic drifts of multiple ion species are included. Then, we derive a KdV equation from the obtained Hasegawa-Mima equation and evaluate the dependence of soliton solution on ion-electron temperature ratio and ion composition.

Keywords: drift wave, vortex structures, ion composition