Nonlinear ion cyclotron and ion acoustic structures in an electron-ion auroral plasma with an Oxygen ion beam including charge separation

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Observations from the FAST satellite indicate that the parallel and perpendicular electric field structures exhibit a spiky appearance. In this study, we use a plasma system consisting of warm ions, warm electrons and a warm oxygen beam including the charge separation effect and show that the coupled nonlinear ion cyclotron and ion acoustic waves could explain these observations. Depending on parameter selections, we find a range of numerical solutions from sinusoidal to sawtooth to highly spiky waveforms in the parallel electric field. The results are compared with the satellite observations.