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Nonlinear evolution of the ion-ion streaming instability in single- and multi-ion species plasmas[1] THOMAS CHAPMAN, RICHARD BERGER, ANDRIS DIMITS, DEBOJYOTI GHOSH, ILON JOSEPH, Lawrence Livermore Natl Lab, BENJAMIN WINJUM, University of California Los Angeles, JEFFREY BANKS, Rensselaer Polytechnic Institute, STEPHAN BRUNNER, Ecole Polytechnique Federale de Lausanne — When two streams of ions flow through one another, the relative flows may drive the growth of large-amplitude ion acoustic waves via the ion-ion streaming instability (IISI). We study the linear and nonlinear evolution of the IISI using a 2D+2V high-order continuum method novel to this problem. The electrostatic energy generated by the IISI is converted into ring-like velocity distributions of ions that are both heated and slowed. Due to variation in the ion trapping conditions for species of differing charge-to-mass ratio, we find that the plasma streaming velocity may be altered radically by the IISI. Here, this process causes the collisionless stopping of a lighter ion species by a heavier ion species. When the two streams each contain a mixture of species, the differing ion trapping conditions cause a velocity separation of the ion species. We observe that the heavier ion species emerges from the interaction significantly hotter than the lighter ion species, and can even be heated to a temperature significantly above that of the electrons.

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