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Convective Instabilities and Enhanced Electron Scattering Inherent to Presheaths[1] S.D. BAALRUD, C.C. HEGNA, J.D. CALLEN, University of Wisconsin-Madison — The stability of a presheath in weakly-collisional unmagnetized plasma with cold ions relative to electrons is analyzed. Ions are treated with the fluid equations and electrons as a collisionless (Vlasov) plasma in our derivation of inherent instabilities that grow due to the presheath electric field and corresponding ion flow. Our model suggests ion acoustic-type instabilities that depend on the local ion fluid speed throughout the presheath for modes with wavelengths typically shorter than the local Debye length. These convective instabilities propagate along the electric field with a growth rate depending upon the non adiabatic electron response. These instabilities produce a long range collective response for discrete particles. A Lenard-Balescu type collision operator is derived that accounts for the convective instabilities and leads to enhanced electron scattering relative to conventional Coulomb scattering and, therefore, modifies the electron distribution function. The presence of convective instabilities may provide an explanation for Langmuir's paradox whereby enhanced electron scattering may lead to populating the otherwise truncated part of the electron distribution function near a plasma boundary.

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S.D. Baalrud
University of Wisconsin-Madison

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