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The Farley-Buneman Instability in the Solar Chromosphere[1]
CHAD A. MADSEN, YAKOV S. DIMANT, MEERS M. OPPENHEIM, Center for Space Physics, Boston University, JUAN M. FONTENLA, Laboratory for Atmospheric and Space Physics, University of Colorado at Boulder — Strong currents drive the Farley-Buneman Instability (FBI) in the E-region ionosphere creating turbulence and heating. The solar chromosphere is a similar weakly ionized region with strong local Pedersen currents, and the FBI may play a role in sustaining the thin layer of enhanced temperature observed there. The plasma of the solar chromosphere requires a new theory of the FBI accounting for the presence of multiple ion species, higher temperatures and collisions between ionized metals and neutral hydrogen. This paper discusses the assumptions underlying the derivation of the multi-species FBI dispersion relation. It presents the predicted critical electron drift velocity needed to trigger the instability. Finally, this work argues that observed chromospheric neutral flow speeds are sufficiently large to trigger the multi-species FBI.

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