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Magnetohydrodynamic Fluid Stability in the Presence of Streaming Cosmic Rays¹ ERIC GREENFIELD, J.R. JOKIPII, JOE GIACALONE —

We examine the effects of streaming cosmic rays upstream of a strong, parallel collisionless shock. We include explicitly the inertia of the cosmic rays in our analysis, which was neglected in previous work. For parameters relevant to the acceleration of cosmic rays at a supernova blast wave, we find *no* MHD fluid instability that would lead to the amplification of the magnetic field above that given by the compression at the shock. We show how to recover, from our own analysis, the cosmic-ray-driven MHD fluid instability found by previous authors. We conclude that including the inertia of the cosmic rays keeps the system stable. More over, the cosmic ray current leads to an additional Hall-like term in the magnetic evolution equation. The implications of this paper for acceleration of galactic cosmic rays at supernova remnants are briefly discussed.

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