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Magnetohydrodynamic Instabilities of Astrophysical Jets

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We present the main findings of recent studies using high-resolution magnetohydrodynamic (MHD) simulations of compressible shear flow layers. First, we show how initially weak magnetic fields ultimately control the non linear dynamics of Kelvin-Helmholtz instabilities in two dimensional single layers and jets. In particular, small-scale magnetic reconnection events are able to partially disrupt the Kelvin-Helmholtz vortices at different stages of the evolution, even in the presence of a strong large-scale coalescence. Second, we show that co-spatial shear flows and twisted magnetic fields are susceptible to different types of MHD instabilities in a three dimensional cylindrical jet, thus leading to a stabilizing mutual interaction. The consequences of these results could help to understand the remarkable stability of observed astrophysical jets.

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