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Investigating AGN Jet Recollimation Shocks: Findings from 2D and 3D RMHD Simulations

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Understanding the structure of active galactic nucleus (AGN) jets is still an open question. Relativistic magnetohydrodynamical (RMHD) simulations help study these jets' dynamics and emission. Recent research focuses on instabilities downstream of recollimation shocks, using 3D simulations to show their complex dynamics and effects on jet structures. Turbulence in these regions can accelerate particles to high energies, which may explain extreme behaviors in high-energy peaked blazars. However, intense magnetic fields can suppress these instabilities, which are still being studied. This work looks at different instabilities downstream of recollimation shocks in AGN jets and how they impact particle acceleration and emission in various jet regions. We use high-resolution 2D and 3D simulations to set the stage for detailed RMHD simulations with the PLUTO code. Our results aim to enhance understanding of the spectral energy distribution, intensity, and polarization of non-thermal emissions, providing new insights into AGN jet dynamics.

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