S25c Poynting-flux-dominated Jets in Decreasing Density Atmospheres

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We present 3-dimensional MHD simulations of Poynting-flux-dominated (PFD) jets that are generated by the "Sweeping-Magnetic-Twist Mechanism" of jet production (Uchida & Shibata 1985). Our study focuses on the stability of the non-linear torsional Alfvén wave train (TAWT) and the development of current-driven helical instability, which may be responsible for the "wiggled" structure seen in AGN jets. Our previous numerical results (Nakamura, Uchida, & Hirose 2001) had revealed that PFD jets would be subject to the kink mode ($m = 1$) helical instability when the jet experiences a decreasing Alfvén velocity distribution caused by an *increasing* ambient density.

In the present study we investigate the behavior of jets in a variety of more realistic galactic atmospheric conditions, including decreasing density, pressure, and temperature gradients. We find that PFD jets can develop helical-kink distortions even when the jet experiences decreasing ambient conditions *and* the flow is strongly magnetically dominated. Nevertheless, some of our jets are apparently stable for the duration of the simulation, and we shall discuss possible criteria for MHD jet stability.