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PROPAGATION AND STABILITY OF RELATIVISTIC JETS

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Particle acceleration in relativistic jets to very high energies occurs at the expense of the dissipation of magnetic or kinetic energy. Therefore, understanding the processes that can trigger this dissipation is key to the characterization of the energy budgets and particle acceleration mechanisms at action in active galaxies. Instabilities and entrainment are two obvious candidates to trigger dissipation. On the one hand, supersonic, relativistic flows threaded by helical fields, as expected from the standard formation models of jets in supermassive black-holes, are unstable to a series of magnetohydrodynamical instabilities, such as the Kelvin-Helmholtz, current-driven, or possibly the pressure-driven instabilities. Furthermore, in the case of expanding jets, the Rayleigh-Taylor and centrifugal instabilities may also develop. With all these destabilizing processes at action, a natural question is how can some jets keep their collimated structure along hundreds of kiloparsecs. On the other hand, the interaction of the jet with stars and clouds of gas that cross the flow in their orbits around the galactic centers provides another scenario in which kinetic energy can be efficiently converted into internal energy and particles can be accelerated to non-thermal energies. In this talk, I will review the conditions under which these processes occur and their role both in jet evolution and propagation and energy dissipation.

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