Magnetic reconnection in AGN disks and jets

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Turbulent fast magnetic reconnection can be an important mechanism for accelerating particles to relativistic velocities and produce very-high-energy (gamma-ray and neutrino) emission in the magnetized regions of galactic and extragalactic black hole sources. In this talk, we discuss this process in the framework of accretion disks and relativistic jets of Active Galactic Nuclei (AGNs). We summarize recent results of our group on multidimensional numerical general-relativistic magnetohydrodynamical (GRMHD) and special relativistic MHD (SRMHD) simulations, including radiative transfer calculations and the injection of test particles, in order to understand this acceleration process and the resulting non-thermal emission both in the relativistic jets and accretion flows of these sources. Fast turbulent reconnection is naturally driven in these systems by MHD instabilities like the magnetorotational, Parker-Rayleigh-Taylor, and current-driven kink instabilities. We will also present the resulting magnetic reconnection rates, the power spectrum of the accelerated particles, and the non-thermal gamma-ray and neutrino emissions we obtain for these systems.