Sixteenth Marcel Grossmann Meeting

Contribution ID: **207** Type: **Invited talk in the parallel session**

Black hole flares: Accretion-driven accumulation and reconnection-driven ejection of magnetic flux

Monday, 5 July 2021 19:10 (20 minutes)

Magnetic reconnection in current sheets is conjectured to power bright TeV flares from the black hole in the center of the M87 Galaxy. It is unclear how, where, and when current sheets form in black-hole accretion flows. We show extreme resolution 3D general-relativistic magnetohydrodynamics and 2D general-relativistic particle-in-cell simulations to model reconnection and plasmoid formation in black hole magnetospheres. Plasmoids can form in thin current sheets In the inner 15 Schwarzschild radii from the event horizon, after which they can merge, grow to macroscopic hot spots of the order of a few Schwarzschild radii and escape the gravitational pull of the black hole. Large plasmoids are energized to relativistic temperatures via magnetic reconnection near the event horizon and they significantly heat the jet, contributing to its limb-brightening. We find that only hot plasmoids forming in magnetically dominated plasmas can potentially explain the energetics of flares. The flare period is determined by the reconnection rate, which we find to be consistent with studies of reconnection in isolated Harris-type current sheets.

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