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Repeating Transients from Centers of Galaxies as Extreme Mass Ratio Binaries

Wednesday, 10 July 2024 12:30 (30 minutes)

Extreme Mass Ratio binaries are systems containing a massive black hole (>10,000 Msolar) and a closely orbiting smaller object (0.1-1000 Msolar). If the companion is also a compact object they can produce gravitational waves potentially detectable with the space-based detectors that will start operating in the next decade. The identification of electromagnetic counterparts of such gravitational wave emitters will transform our understanding of supermassive black hole growth, probe dark energy, and put fundamental constraints on gravity. I will present an overview of the various flavors of repeating transients in galactic centers that we have identified using multi-wavelength studies of several classes of astrophysical transients including stellar tidal distribution events, outbursts from active galactic nuclei (AGN), quasi-periodic eruptions, and quasi-periodic outflows, as seen for the first time by our group. I will also present state-of-the-art general relativistic hydrodynamic simulations of objects embedded in accretion disks around supermassive black holes as a potential model to unify various flavors of repeating transients. I will argue that in some cases these repeating transients could be double compact object binaries with direct implications for multi-messenger astronomy. I will end by highlighting the prospects they hold for the coming decade.

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