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The Distribution of Inclinations of TDEs by Kerr Black Holes[1]
MICHAEL KESDEN, University of Texas at Dallas, THOMAS DEMASTRI, Michigan State University — A tidal disruption event (TDE) occurs when a star wanders close enough to a supermassive black hole (SBH) for its tidal fields to overwhelm the star's self gravity. Some of the resulting stellar debris can be accreted by the SBH to power a bright electromagnetic flare. The orbital angular momentum of the tidally disrupted star will generally be inclined with respect to the SBH spin which may have several observational consequences for the resulting TDE including delayed circularization and accretion of the tidal debris, (2) quasi-periodic oscillations of emission for the accretion disk, and (3) varying energy available to power luminous emission. We calculate, as a function of SBH mass and spin, the distribution of TDE inclinations which results from a complicated interplay between spin-dependent tidal forces, the spin-dependent threshold for direct capture by the event horizon, and two-body stellar relaxation. We find that the inclination distribution is biased towards prograde inclinations in the full loss-cone limit at low SBH masses, flips towards a retrograde bias at intermediate SBH masses where the stronger tidal forces on retrograde orbits dominate, and then returns to a strong prograde bias at higher masses where all retrograde orbits lead to direct capture.

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Michael Kesden
University of Texas at Dallas

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