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Black Holes in L-Galaxies (L-Galaxies-BH): application to tidal disruption events

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There have been many studies to explain the observed Tidal Disruption Events (TDE) rates, although we started identifying such events only in the last decade. Some predict that the rates are unexpectedly high and others conclude the observed TDE rates are what we would expect when combining the BH mass function and our understanding of the mechanism triggering a TDE. Our study offers as the first comprehensive view of tidal disruption events with semi-analytic models of galaxy evolution, allowing for further understanding of the TDE host galaxies properties, examination of the cosmological evolution of the rates and contribution to mass-growth of black holes at early times, as well as their co-evolution with either bulges or nuclear star clusters. In this first-of-its-kind approach, by solving for a broad range of the parameter space the 1D Fokker-Planck equation for a population of stars in a spherical potential, we produce time-dependent realistic rates, that are then assigned to a semi-analytic model specialised to model black holes (L-Galaxies-BH) which populate the volume of 100 cubic Mpc of the Millennium II Cosmological simulation. We investigate dichromatic stellar mass functions, with main-sequence stars (0.38 solar mass) and a population of stellar BH. These rates offer as a viable additional growth channel of the seed black holes, beyond traditional gas accretion, both at steep bulge profiles and at Nuclear Star Clusters. With the calculated instant TDE rate for every black hole (unique mass and spin), we have to make some reasonable assumptions to translate to detectable rates in optical and X-rays, based on recent developments of the physics underlying the TDE phenomenon (spin-dependent horizon suppression, physics of circularization, radiative efficiencies and bolometric corrections depending on type of TDE, stream precession, relativistic jets). The transformation it's a challenging computation itself, and I am going to focus a great part of my talk to this topic.

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Session Classification: Student talks