The light curves of Tidal Disruption Events: dependence on stellar interior structure

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In the past decades, new types of extremely luminous transients were revealed by astronomical surveys. One of them is the so-called tidal disruption event (TDE). When a star approaches a supermassive black hole (BH) within a critical distance (the tidal radius), tidal forces tear the star apart. When the stellar debris falls back onto the BH, the release of the potential energy generates a luminous flare and an observable light variation [1].
According to the generally used Newtonian model [2], the internal structure of the star strongly influences the mass accretion rate of the fallback material, which determines the luminosity. We focus on two stellar objects: a zero age main sequence star and a white dwarf. Density profiles of these objects are calculated by the Lane-Emden polytropic model [3], Chandrasekhar's theory [4] and the 1D stellar evolution code MESA [5]. Since the observable radiation can provide information about the TDE candidates, our goal is to investigate the spectral energy distributions and the time dependence of the total luminosities. To take into account the real physical configuration of these events, we can study the disc and the wind contribution separately as relevant sources of the radiation [6].
Considering different internal stellar structures, we perform a detailed comparison of TDEs. Our purpose is to determine the type of tidally disrupted star from the quasi-bolometric light curves.

References

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