Optimizing Tidal Disruption Event Detection: A Photometric Analysis of Host Galaxies

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Supermassive black holes lie at the centers of most large galaxies and play a crucial role in shaping galactic structure and dynamics. Despite being effectively invisible, they are studied indirectly through phenomena such as tidal disruption events (TDEs), which provide critical insight into black hole behavior. TDEs occur when a star is torn apart by the immense gravitational forces of a black hole, forming an accretion disk and producing transient electromagnetic radiation. Radio-emitting TDEs are especially challenging to observe, as they require extended monitoring to detect delayed emissions. This study investigates the photometric properties of galaxies hosting these events, with the goal of improving detection methods. We compared a sample of galaxies hosting radio TDEs to a control group of 500 redshift-matched non-host galaxies. UGRIZ and WISE magnitudes were analyzed using non-parametric tests to identify potential correlations. Host galaxies exhibited significantly lower g-r values (~0.335 mag) than non-hosts, indicating a correlation between TDE occurrence and higher active stellar-forming populations. Additionally, the lack of significant difference in W1-W2 magnitudes between host and control samples suggests that dust content is not a distinguishing factor in identifying radio TDE hosts, as previously proposed. We conclude that the overrepresentation of TDEs in dust-poor galaxies results from observational incompleteness due to obscuration. Ultimately, this research emphasizes the importance of long-term, multi-wavelength monitoring, as well as targeted observation methods based on photometric indices, to improve TDE detection and enhance our understanding of black holes and their role in galaxy processes.

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