

A repeating partial TDE candidate in an narrow-line seyfert 1 galaxy

Thanks to modern time-domain surveys, the process of identifying a tidal disruption event (TDE) gradually develops in the quiescent galaxy and several repeating partial TDEs have been studied. Meanwhile, the TDE in AGN is theoretically predicted to exhibit different observable features from the identified TDEs in quiescent galaxies. To date, a dozen of TDE in AGN candidates and the ambiguous nuclear transients (ANTs) have been well-studied, but it is still challenging to identify the population of TDE in AGN. We report the discovery of a repeating partial TDE candidate in a super-Eddington AGN, AT2021aeuk, which exhibits two similar flares separate with 3 years in a radio-loud narrow-line Seyfert 1 galaxies. After the onset of the second flare, we conducted multi-wavelength and spectral observations, revealing multiple features similar to the TDE in quiescent galaxies, and an extraordinary X-ray evolution which has never occurred in AGN but is similar to the other TDE candidates in AGN, potentially as a distinguishing feature for TDE in AGN. In contrast with the other TDE in AGN candidates and the ANTs, AT2021aeuk is unlikely from the AGN flares as: 1) the accretion rate is already super-Eddington before the outburst, resulting in the small variability from a nearly saturated accretion disk; 2) the light curve of two flares are similar and both are comparable to the TDEs in quiescent galaxies. We also found the relations in the light curve properties of the quiescent TDEs still hold for the TDE in AGN candidates and ANTs. Finally, we put a simple scenario for the potential emission mechanism for the TDE in AGN, which can account for the features observed in AT2021aeuk.

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