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A candidate miliparsec super-massive black hole binary, discovered while disrupting a gas cloud

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We report the discovery of a transient source in the ZTF public alert stream, whose location coincides with the nucleus of a $z < 0.1$ Seyfert galaxy. After the initial alert, the source has increased its brightness by up to half a magnitude five times, roughly every hundred days. While the periodic behaviour suggests a super-massive black hole binary, archival data shows that before the alert the source had a roughly constant, lower luminosity. A tidal disruption event, even one in a binary, does not fit the observations either, as the peak luminosities do not follow the usual decay. We therefore propose that the source behaviour can be due to the tidal disruption of a gas cloud by a SMBH binary. This process was modelled numerically by Goicovic, Cuadra et al (2016), who found that the binary accretes the gas in several successive peaks (two per orbit), with the relative peak intensities depending on the orbital configuration. Given a previous estimate of $\sim 3 \times 10^7 M_\odot$ for the SMBH masses, we can calculate that the putative binary has a separation of ~ 1 mpc and would merge in $\sim 10^4$ years, making it an interesting target to study the hierarchical assembly of SMBHs in the local Universe.

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