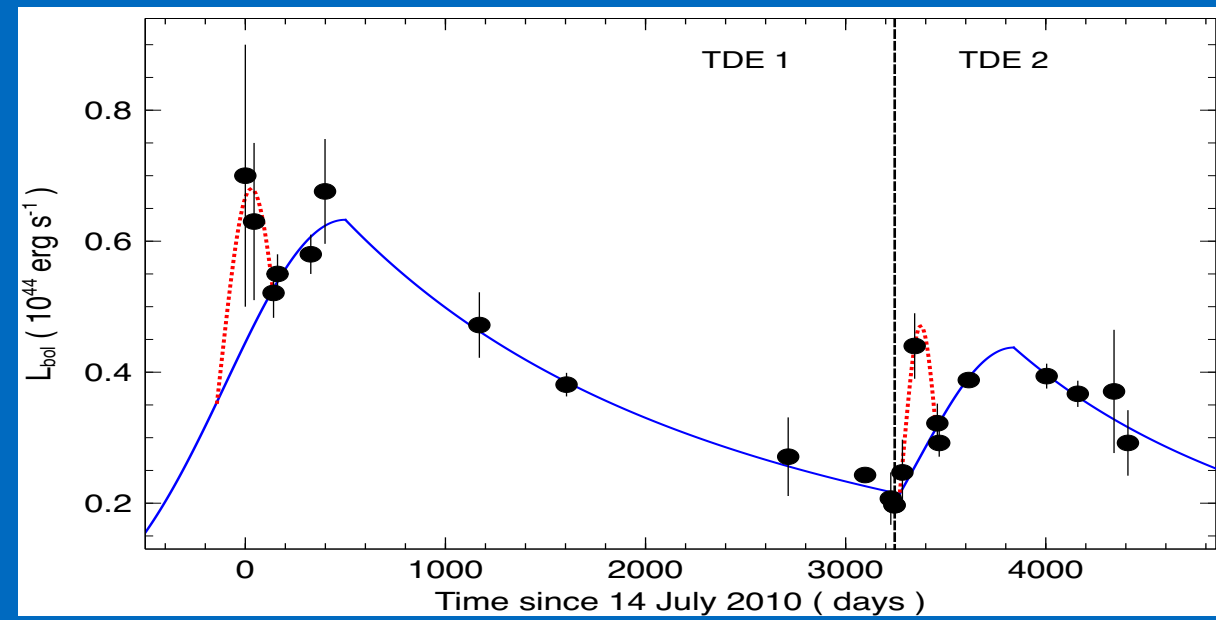
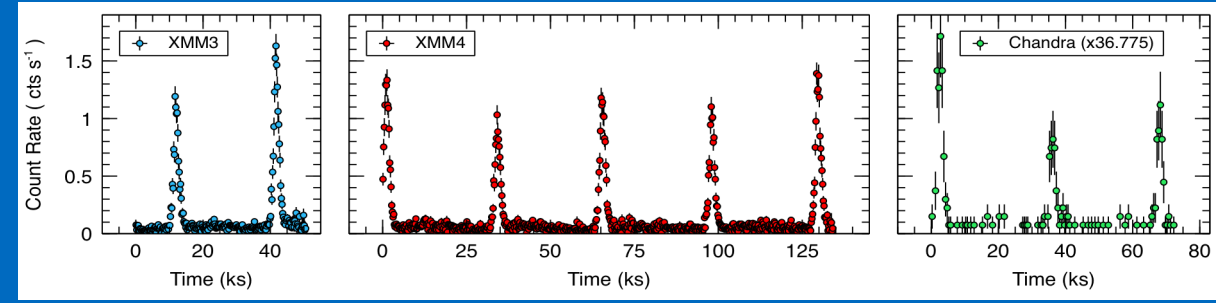


# Repeating Tidal disruptions and quasi-periodic eruptions in the nucleus of the galaxy GSN 069



Upper: Typical X-ray light curves of GSN 069 with QPEs  
Lower: Long-term luminosity evolution of GSN 069 with two TDE candidates identified

X-ray Quasi-Periodic Eruptions (QPEs) were first observed in the nucleus of the low-mass galaxy GSN 069 [Miniutti et al 2019, Nature, 573, 381]. QPEs are high-amplitude, soft X-ray bursts associated with the central super-massive black hole. In GSN 069, they typically recur every  $\sim 9$  h, last  $\sim 1$  h, and produce an increase of the X-ray count rate by up to two orders of magnitude (see Upper Panel on the left). Following their discovery in GSN 069, QPEs have now been securely detected from the nuclei of other 7 low-mass galaxies.

The new work, still led by CAB, reports a thorough analysis of GSN 069 since its first X-ray detection in 2010, highlighting the properties of the observed QPEs in detail, the discovery of an associated quasi-periodic oscillation (QPO) of the quiescent level emission, as well as the study of the overall X-ray long-term evolution that is shown to be consistent with two repeating tidal disruption events (TDEs) nine years apart (Lower Panel on the left).

This study provides a comprehensive summary of observational results that will inform theoretical and numerical studies on the origin of QPEs, and strengthens the connection between QPEs and TDEs.