



EXCELENCIA
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X-ray Quasi-Periodic Eruptions



from the galactic nucleus of RX J1301.9+2747

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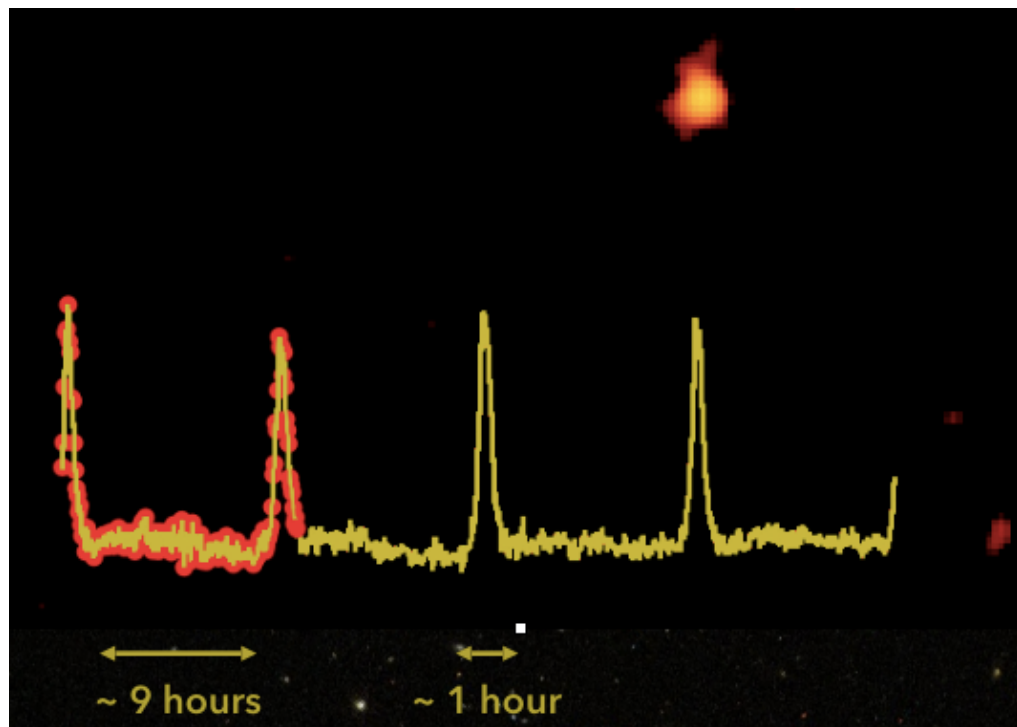
Following the recent discovery of X-ray quasi-periodic eruptions (QPEs) coming from the nucleus of the galaxy GSN 069 (*Miniutti et al. 2019, Nature 573, 381*), we detected three strong QPEs in a second active galaxy: RX J1301.9+2747. The detection of QPEs from a second galactic nucleus after GSN 069 rules out contamination by a Galactic source in both cases, such that QPEs ought to be considered a novel extragalactic phenomenon associated with accreting supermassive black holes.

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X-ray Quasi-Periodic Eruptions

First discovered in the nucleus of the galaxy GSN 069 (*Miniutti et al. 2019, Nature 573, 381*), QPEs are rapid and recurrent increases of the X-ray count-rate by more than one order of magnitude with respect to a stable quiescent level.



X-ray QPEs are associated to fast spectral transitions between a cold (50 eV) and a warm (120 eV) phase in the accretion flow around the “small-mass” (about 400,000 solar masses) supermassive black hole in the center of the galaxy GSN 069.



<https://www.csic.es/es/actualidad-del-csic/descubierto-un-agujero-negro-que-se-comporta-como-un-metronomo-de-rayos-x>



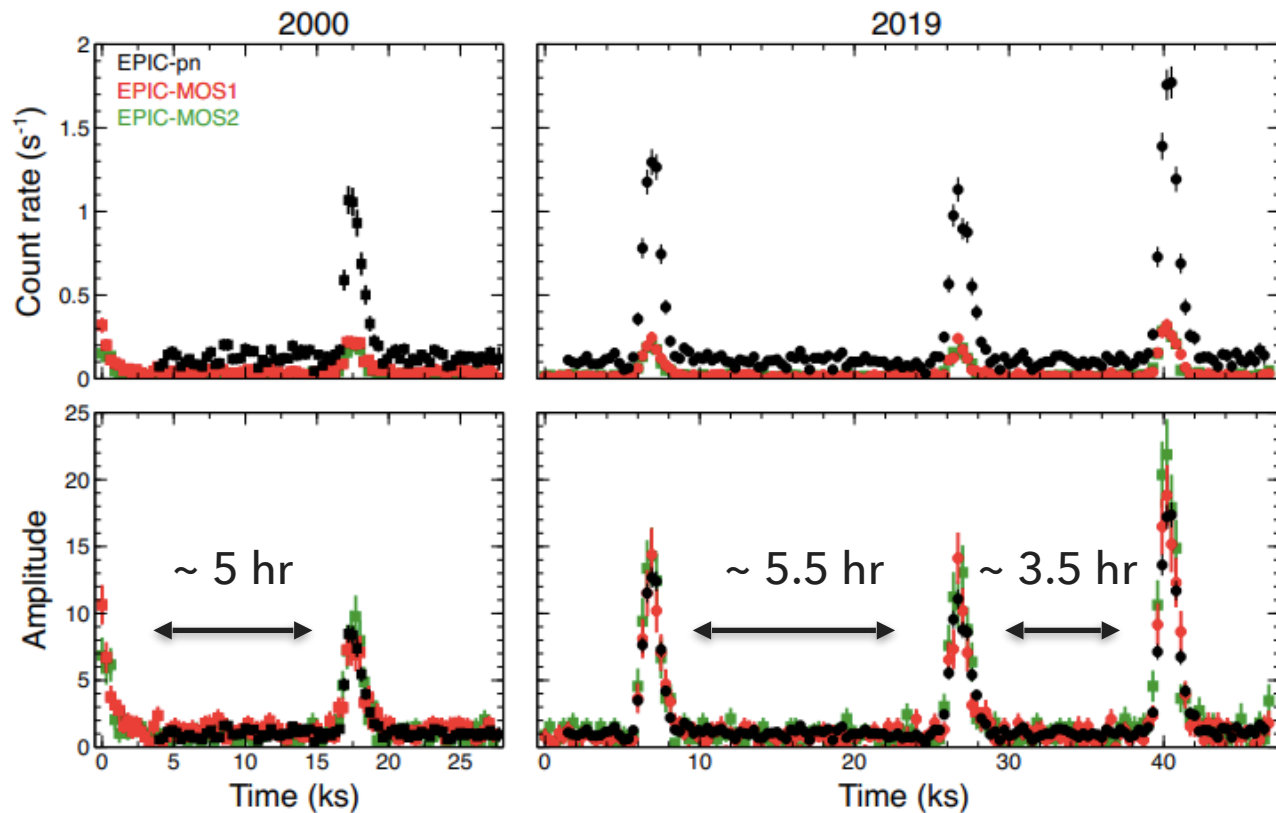
https://www.esa.int/Science_Exploration/Space_Science/Unexpected_periodic_flares_may_shed_light_on_black_hole_accretion



https://chandra.harvard.edu/press/19_releases/press_091119.html

QPEs in RX J1301.9+2747

Already observed by XMM-Newton in 2000 (Sun, Shu & Wang 2013, ApJ 768, 167; Shu et al. 2017, ApJ 837, 3), RX J1301.9+2747 shares many observational characteristics with GSN 069: a low-mass ($\sim 10^6$ solar masses) black hole, very weak or absent broad optical emission lines, a super-soft X-ray spectrum, a relatively high Eddington ratio.



A new XMM-Newton observation performed in May 2019 revealed the presence of three strong X-ray QPEs in the light curve of RX J1301.9+2747.

While the general temporal and spectral properties of the QPEs in RX J1301.9+2747 and GSN 069 are very similar, there are also evident differences: the QPEs in RX J1301.9+2747 are much shorter and repeat more rapidly, although their recurrence pattern is not clear.

Longer X-ray observations, expected for July 2020, should better clarify the temporal pattern of the QPEs in RX J1301.9+2747 and allow a detailed comparison with GSN 069 to be performed.

X-ray QPEs: Impact and prospects



QPEs have already attracted the interest of the scientific community, stimulating the elaboration of new theoretical scenarios to interpret the QPEs of GSN 069 (King 2020, MNRAS 493, 120).

QPEs have the potential to provide long-sought physical explanations for enigmatic phenomena happening close to supermassive black holes, such as changing-look events and the formation of the soft X-ray excess.

Which is the actual pattern of recurrence of the QPEs in RX J1301.9+2747? What is driving the differences between the QPEs of RX J1301.9+2747 and GSN 069? Which is the physical mechanism responsible for QPEs?

<https://chandra.harvard.edu/photo/2020/gsn069/>

Stay tuned!