The Galactic Center: Feeding and Feedback in a Normal Galactic Nucleus
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A new very faint X-ray transient in the Galactic center

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Abstract. A new X-ray transient, XMMU J174505.3−291445, has been detected within the 2012 *XMM-Newton* scan of the Galactic center. The short 4.7 ks flare, the highly absorbed X-ray spectrum and the relatively low luminosity of the event suggest the association of the source with either the class of very faint X-ray transients or that of supergiant fast X-ray transients. Further analysis, together with the identification of the possible infrared counterpart will help to unveil the true nature of XMMU J174505.3−291445.

Keywords. stars: flare, X-rays: binaries, accretion, Galaxy: center

1. X-ray timing and spectral properties of XMMU J174505.3−291445

Within the *XMM-Newton* scan of the Galactic center, a new X-ray transient, XMMU J174505.3−291445, has been detected at about 16′ from Sgr A* (R. A. (J2000) = 17:45:05.3, Dec. = −29:14:46; 0.8″ uncertainty at 90% confidence level), during a flare taking place on 2012 August 31. The source lies within the 2σ error circle of 2XMMi J174505.1−291445, a still unidentified object detected on 2006 February 27 and reported in the Third *XMM-Newton* Serendipitous Source Catalog by Watson *et al.* (2009).

The 2012 flare of XMMU J174505.3−291445 lasted about 4.7 ks, with an average flux of $F(0.2-12\,\mathrm{keV}) = 1.2\times10^{-11}\,\mathrm{erg\,cm^{-2}\,s^{-1}}$, corresponding to a luminosity of L$\sim 10^{35}\,\mathrm{erg\,s^{-1}}$ when assuming a distance of 8 kpc (Figure 1, left panel). About 6 hours after the flare, the luminosity had decreased to L$\sim 2\times10^{33}\,\mathrm{erg\,s^{-1}}$, and the source was not detected in any of the other 2012 scan observations. During the 2006 observation, 2XMMi J174505.1−291445 was detected at an intermediate activity level of L$\sim 8\times10^{33}\,\mathrm{erg\,s^{-1}}$. The combined EPIC MOS+PN spectra obtained during the 2012 flare can be equally well fitted by a power-law model with photon index $\Gamma = 2.1\pm0.2$ (Figure 1, right panel) or by a black body with temperature $kT = 1.8\pm0.1$ keV, in both cases absorbed by $N_{\mathrm{H}} \sim 20-30\times10^{22}\,\mathrm{cm^{-2}}$ (all quoted errors correspond to the 90% confidence level). The quiescence spectrum is best fitted by a black body with $kT = 1.1 \pm 0.5$ keV, absorbed by $N_{\mathrm{H}} = 20^{+23}_{-12}\times10^{22}\,\mathrm{cm^{-2}}$. No spectral evolution is observed during the outburst.

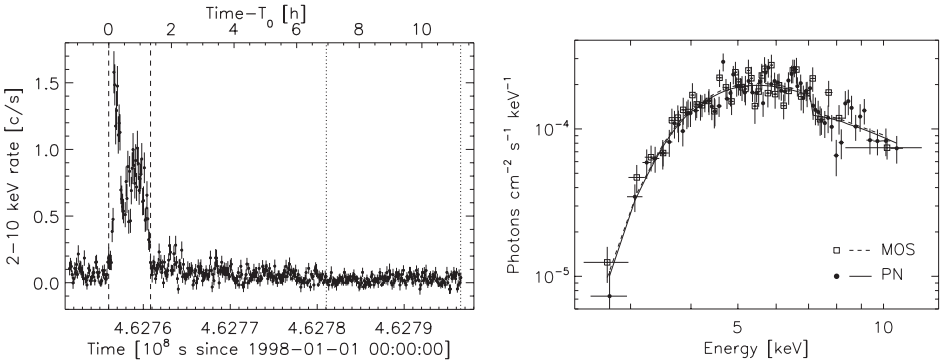

Figure 1. Left: 2–10 keV light curve of XMMU J174505.3−291445 measured by *XMM-Newton* EPIC/PN on 2012 August 31. The dashed lines mark the flare of the source, while the dotted lines define the quiescence period. **Right:** EPIC/PN (circles) and EPIC/MOS (squares) spectra during the flare, fitted with an absorbed power-law with $N_{\rm H} = (27 \pm 2) \times 10^{22}$ cm^{-2} and $\Gamma = 2.1 \pm 0.2$ (continuous and dashed lines for PN and MOS, respectively).

2. A new very faint X-ray transient?

The timing and spectral properties of XMMU J174505.3−291445 indicate that it is a distant Galactic source, consistent with a localization within the Galactic center. In particular, the highly absorbed X-ray spectrum excludes the identification with a foreground flaring star. Normal outbursts from bright X-ray binaries generally reach higher luminosities ($L_X \sim 10^{37-39}$ erg s^{-1}; Chen *et al.* 1997) and last longer, with the exception of supergiant fast X-ray transient sources, characterized by flares with a duration of a few hours. However, during outbursts these sources normally reach higher luminosities ($L_X \sim 10^{36-37}$ erg s^{-1}) and present harder spectra than observed for XMMU J174505.3−291445. On the other hand, the luminosity range of the new transient and its flaring spectrum fit the characteristics of very faint X-ray transients (VFXT), i.e. Galactic X-ray transients with moderate peak X-ray luminosities of $L_X \sim 10^{34-36}$ erg s^{-1} and with quiescent luminosities at, or below, $L_X \sim 10^{33}$ erg s^{-1} (Degenaar & Wijnands 2009). The origin of such a peculiar activity is still debated, and could be produced by a compact object accreting at a very low rate from the wind of a main sequence companion or in a low-mass X-ray binary with a tight orbit or an unusual donor star (King & Wijnands 2006, Degenaar *et al.* 2012). Infrared follow-up observations with the GROND instrument at the MPI/ESO 2.2m telescope on La Silla and with the 6.5m Magellan telescope in Las Campanas have been carried out and their analysis is ongoing (Soldi *et al.* in preparation). The identification of the infrared counterpart will be fundamental to determine the nature of XMMU J174505.3−291445.

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