A new Very Faint X-ray Transient in the Galactic centre

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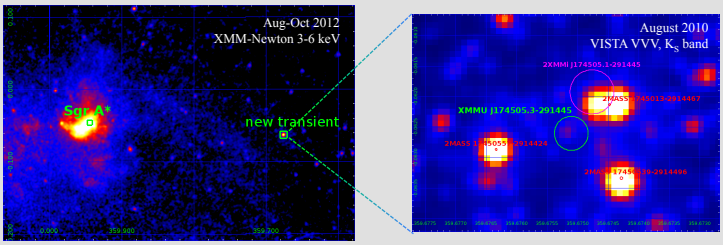
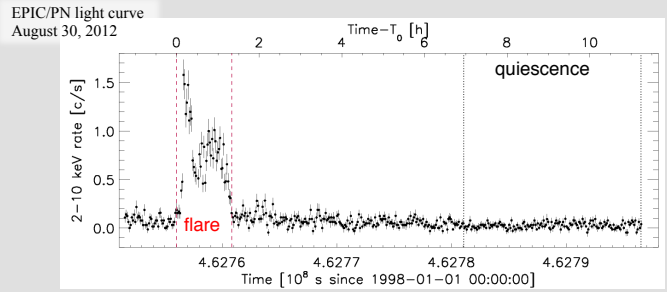
A new X-ray transient



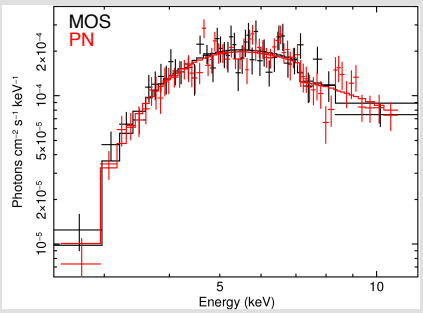
A new X-ray transient has been detected during the 2012 XMM-Newton scan of the Galactic centre, at about 16 arcmin from Sgr A*. XMMU J174505.3-291445 was detected during a flare taking place on August 31, 2012 at the position RA = 266.2720 deg, dec = -29.2461 deg (1 arcsec uncertainty). This is marginally consistent with the position of 2XMMi J174505.1-291445, a still unidentified source reported in the Third XMM-Newton Serendipitous Source Catalog by Watson et al. (2009) and detected on February 27, 2006. Possible IR counterparts are under study.

Timing properties



The source flare lasted about 4.7 ks, with an average flux of F_{flare} (0.2-12 keV) = 1.2×10^{-11} erg/cm^2/s, corresponding to a luminosity of L_{flare}= 10^{35} erg/s when assuming a distance of 8 kpc. About 6 hours after the flare, the luminosity had decreased down to $L_{quiescence}$ (0.2-12 keV) = 2×10^{33} erg/s. During the 2006 observation, 2XMMi J174505.1-291445 was detected at an intermediate activity level of L_{2006} (0.2-12 keV) = 8×10^{33} erg/s.

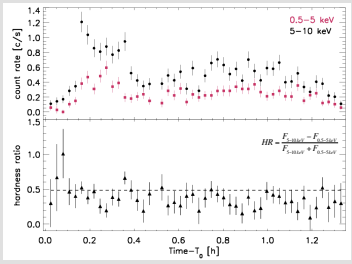
Spectral properties



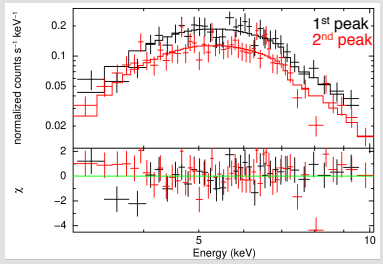
The combined EPIC spectra during the flare can be equally well fitted by a power law model with photon index $\Gamma = 2.1 \pm 0.2$ (model in the figure) or by a black body with temperature kT = 1.8 ± 0.1 keV, in both cases absorbed by $N_H \sim 20\text{-}30\times10^{22}$ cm^{-2}. The spectrum in quiescence is best fitted by a black body with kT = 1.1 ± 0.5 keV, absorbed by $N_H = 20^{+23}_{-12}\times10^{22}\,cm^{-2}$.

Spectral evolution

EPIC/PN flare light curve and hardness ratio



EPIC/PN flare spectra



No significant evolution of the hardness ratio is observed during the outburst. When comparing the PN spectra extracted during the first and second peak of the flare, the latter is found only slightly softer, either due to a softening of the continuum ($\Delta\Gamma$ = 0.5) or to a decrease of the absorption ($\Delta N_H = 6 \times 10^{22}$ cm^{-2}). The residuals in the bottom panel of the right figure are computed with respect to an absorbed power law model with the same parameters for the two spectra (Γ = 2.2 ± 0.3, $N_H = (29 \pm 4) \times 10^{22}$ cm^{-2}.)

A new Very Faint X-ray Transient ?

The timing and spectral properties of XMMU J174505.3-291445 indicate a Galactic origin of the source. In particular, the highly absorbed X-ray spectrum excludes the identification with a foreground flaring star. Normal outbursts from bright high-mass and low-mass X-ray binaries reach normally higher luminosities ($L_X \sim 10^{37\text{-}39}$ erg/s; Chen et al. 1997). In order to pinpoint the IR counterpart, follow-up observations by the GROND instrument at the MPI/ESO 2.2m telescope on La Silla and by the 6.5m Magellan telescope in Las Campanas have been carried out and their analysis is ongoing.

All the properties of XMMU J174505.3-291445 point towards the association of this object with the class of Very Faint X-ray Transients (VFXT), i.e. Galactic X-ray transients with moderate X-ray luminosities of $L_X \sim 10^{34\text{-}36}$ erg/s at the peak and with quiescent luminosities at, or below, $L_X \sim 10^{33}$ erg/s (Wijnands et al. 2006). 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).

Since only a dozen of objects are known to be VFXT, a new member of this class could provide important additional insights for the understanding of these sources (Soldi et al. in preparation).

References

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Acknowledgments

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