Hunting for state transitions in AMXPs

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Tenerife-La Laguna, 2015 June 25
Introduction

First transitional AMXP: IGR J18245-2452
Papitto et al. 2013

- An irradiated star
- An accretion disc (?)
- Other components (jets?)

Multi-wavelength campaigns during quiescence as best tools to disentangle all the possible components.

Two cases: XTE J1814-338 and PSR J1023+0038

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Hynes et al. 2010
The AMXP XTE J1814-338

29 images with the VLT-FORS2
When: 2009 Sep 10
Filters: BVR

The optical counterpart is well detected in all filters.
Clear sinusoidal variability modulated at the 4.3 h orbital period.

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Typical light curves of an irradiated companion star.

Baglio et al. 2013

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MCMC procedure (Breton et al. 2012) -> free parameters:
- Orbital inclination
- Extinction
- Day side temperature
- Disc flux in BVR- bands ...

All results are consistent with 2004 data (D’Avanzo et al. 2009).

\[ L_{irr} \sim 10^{34} \text{ erg/s} \quad L_X \sim 10^{32} \text{ erg/s} \]

Indirect evidence of a MSP

An accretion disc is necessary in order to fit the light curves.

\[ T_{day} = 5500 \text{ K} , \quad T_{night} = 3300 \text{ K} \]
\[ M_{\text{comp}} = 0.23 \pm 0.06 \text{ Msun} \]
Monitoring from outburst (2003) to quiescence:

Baglio et al. 2013

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Monitoring from outburst (2003) to quiescence:

Outburst in 2003: Krauss et al.
2005: infrared excess

Further component: JET

R-I constant in 2003-2004

XTE J1814 is fainter and bluer in 2009: the jet is absent.

Baglio et al. 2013

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REM observations:
g, r, i optical filters
J, H, K (NIR)

LT observations:
g, i optical filters

Light curves consistent with strong irradiation from the compact object.

No flickering or flaring activity is observed in the optical (unlike in the X-rays).

Swift XRT, UVOT:
2013 Oct 18 - 2014 May 2

Modulation at the 4.75 h orbital period.
Companion star black body + shock emission powered by the NS spin down luminosity

The UV point is not interpolated.

Addition of the accretion disk contribution

Minimal contribution of the disk in the X-rays

see also Takata et al. 2014, Li et al. 2014
Conclusions

Multi-wavelength campaigns aimed at disentangle the different components contributing to the overall emission of transitional millisecond pulsars and AMXPs.

**XTE J1814-338**: irradiated companion star + accretion disc + jet
The disc evolved during the monitoring

**PSR J1023+0038**: strongly irradiated companion star + accretion disc contributing in the optical and UV (but not in the X-rays).
Polarimetry: a new tool?

Campaign aimed at building a complete sample of bright LMXBs observed with polarimetric techniques.

Observations took place in Feb-Apr 2015 at the NTT (La Silla) with EFOSC2 and SOFI.

Optical and NIR observations of:

LMC X-2
4U 0614+091
2S 0921-630
PSR J1023+0038
SAX J1808.4-3658
XSS J12270-4859

PRELIMINARY RESULT: PSR J1023+0038 is polarized at 3 sigma c.l. in the optical.

\[ P_V = 0.86 \pm 0.28 \% \]
\[ P_R = 1.07 \pm 0.35 \% \]

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THANK YOU!