Hunting for state transitions in AMXPs

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Tenerife-La Laguna, 2015 June 25

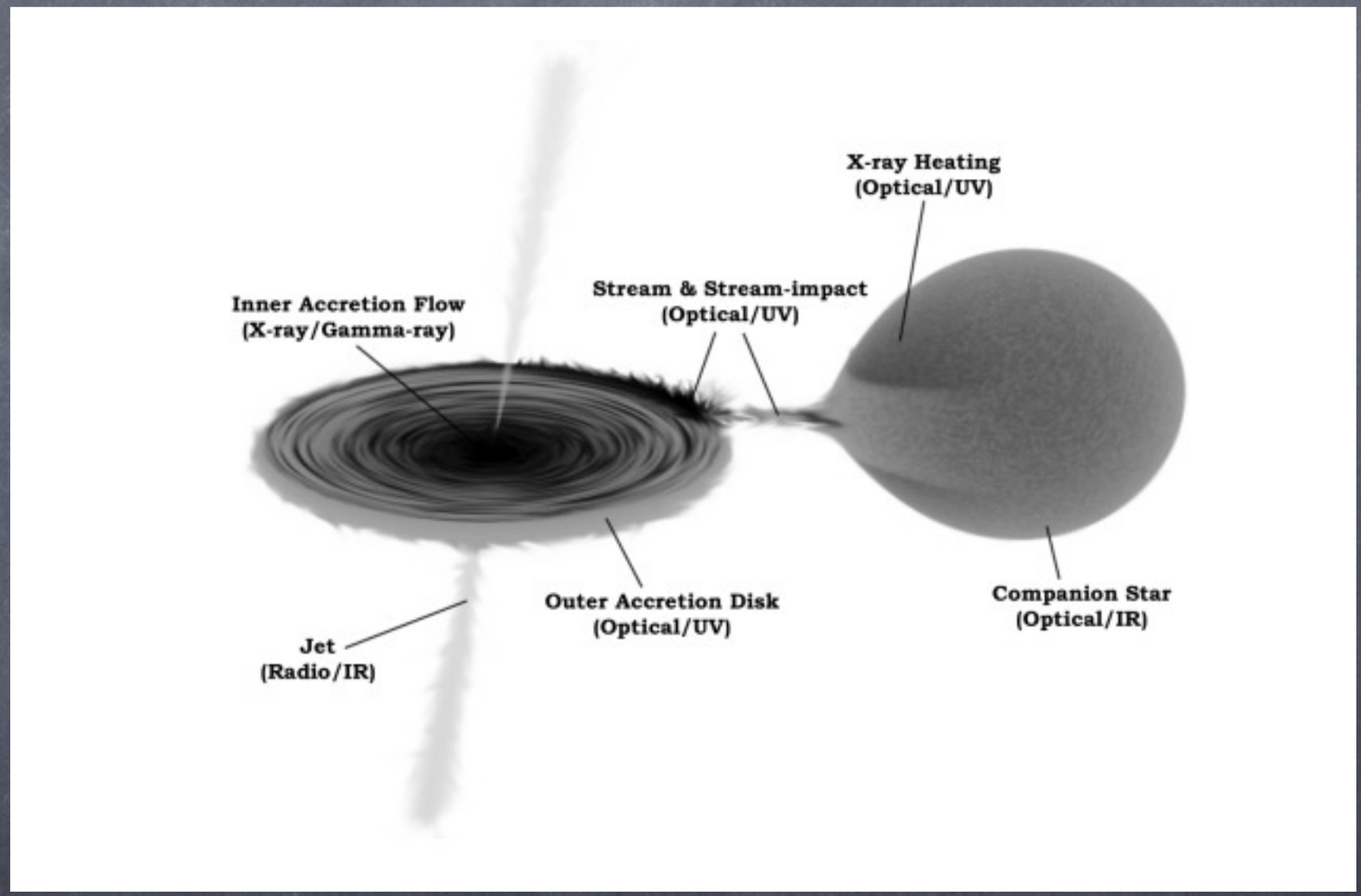
Introduction

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.



Hynes et al. 2010

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

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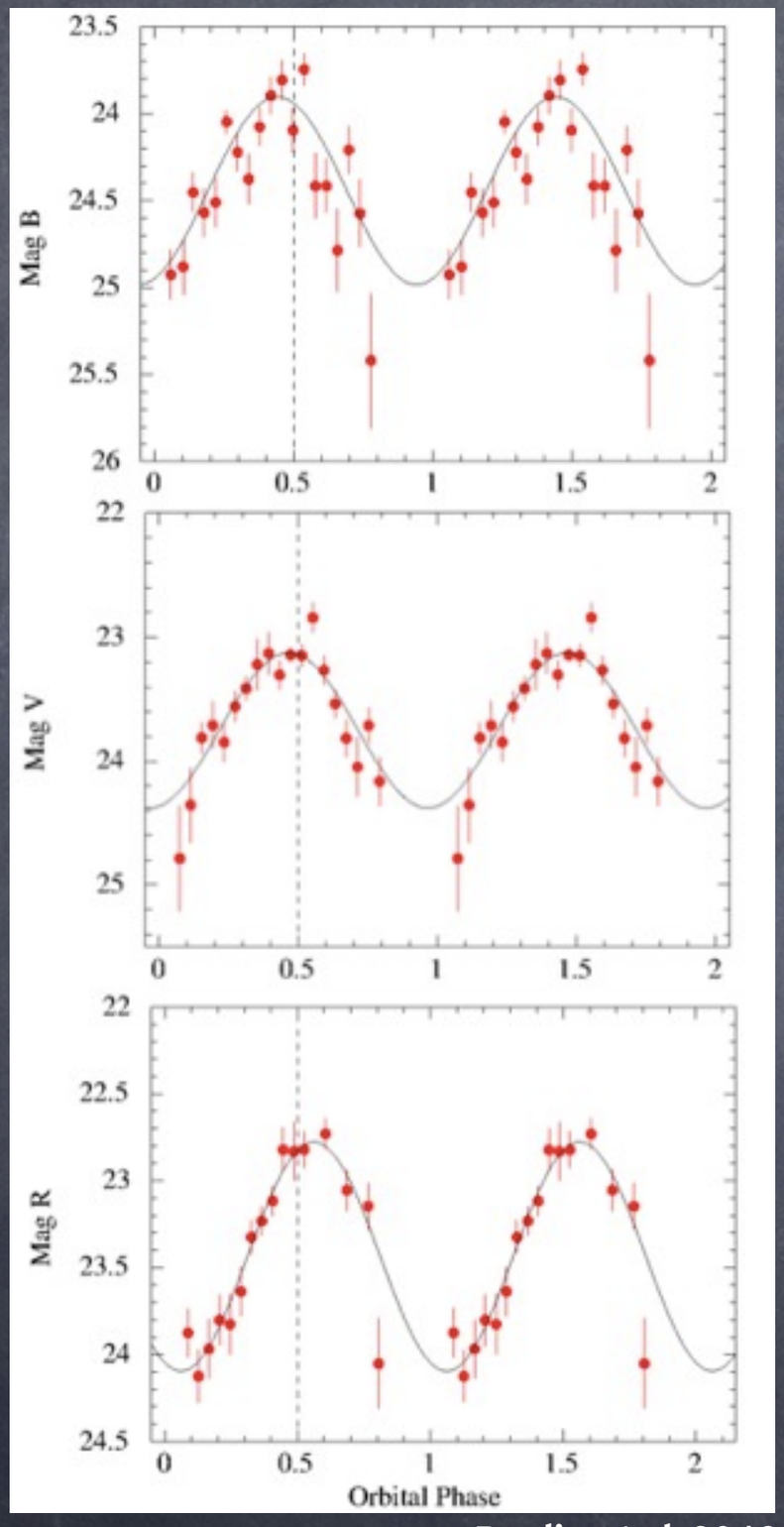
The AMXP XTE J1814-338

B

V

R



Baglio et al. 2013

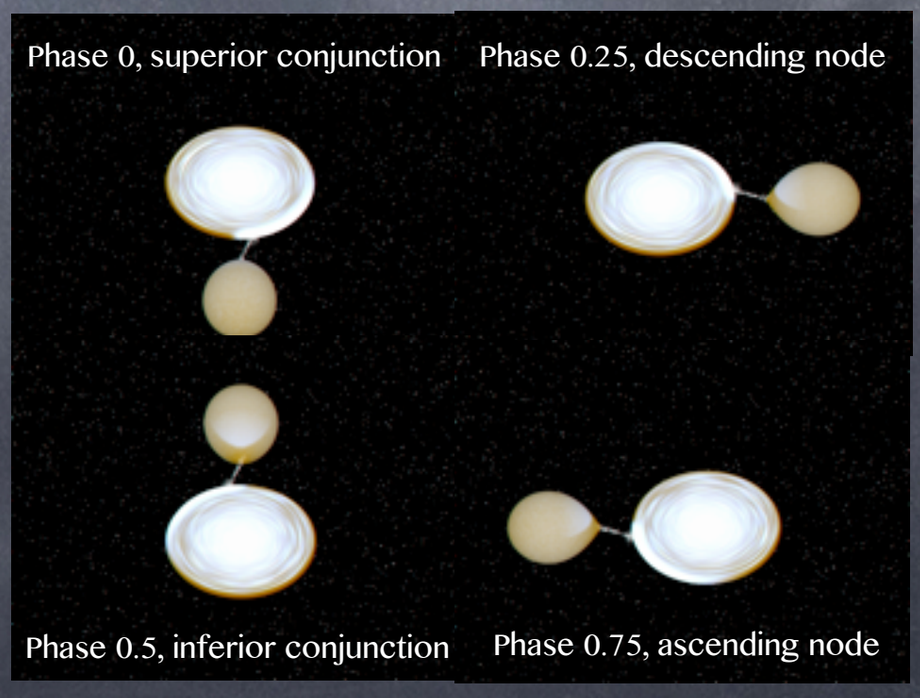
29 images with the VLT-FORS2

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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The AMXP XTE J1814-338

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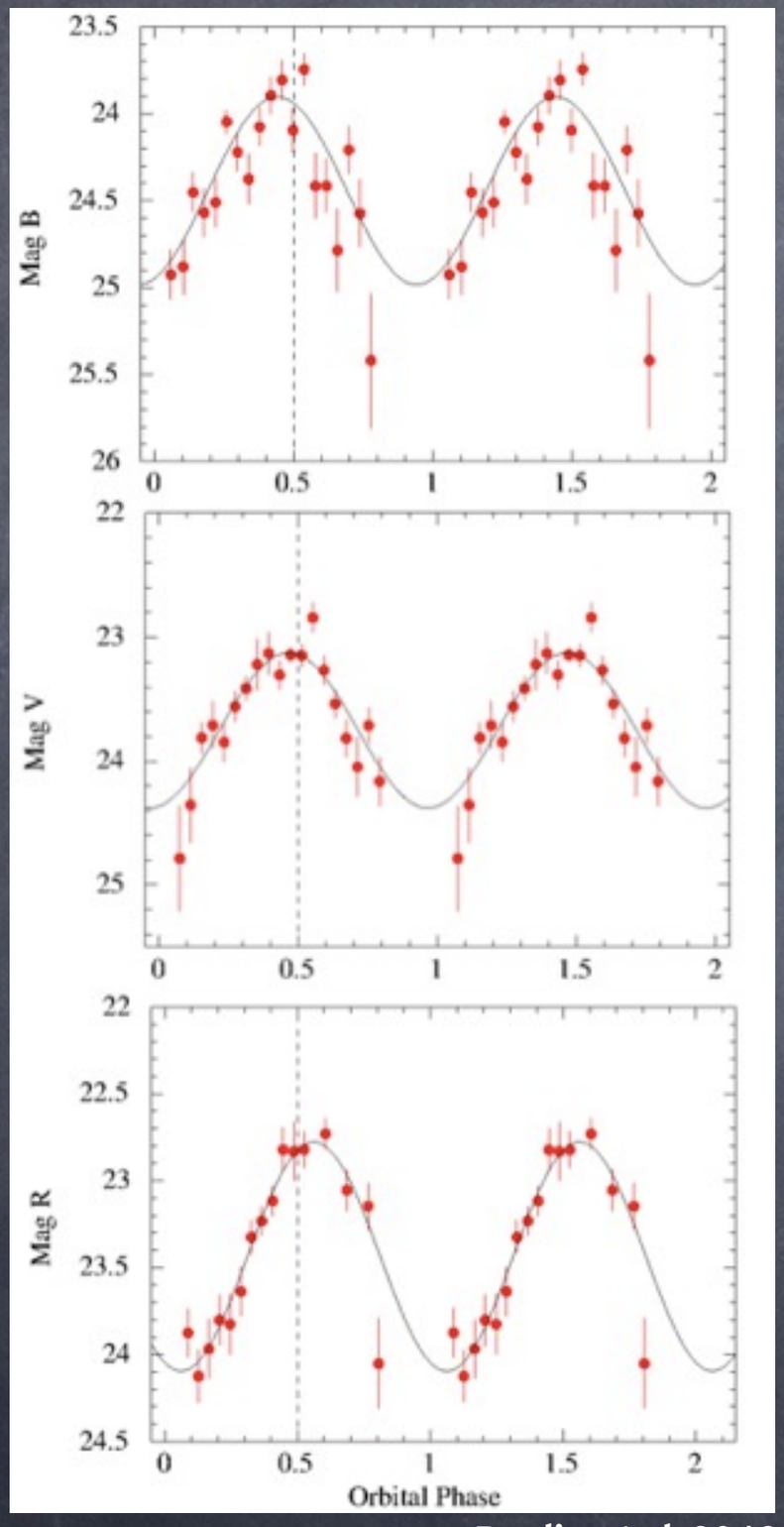

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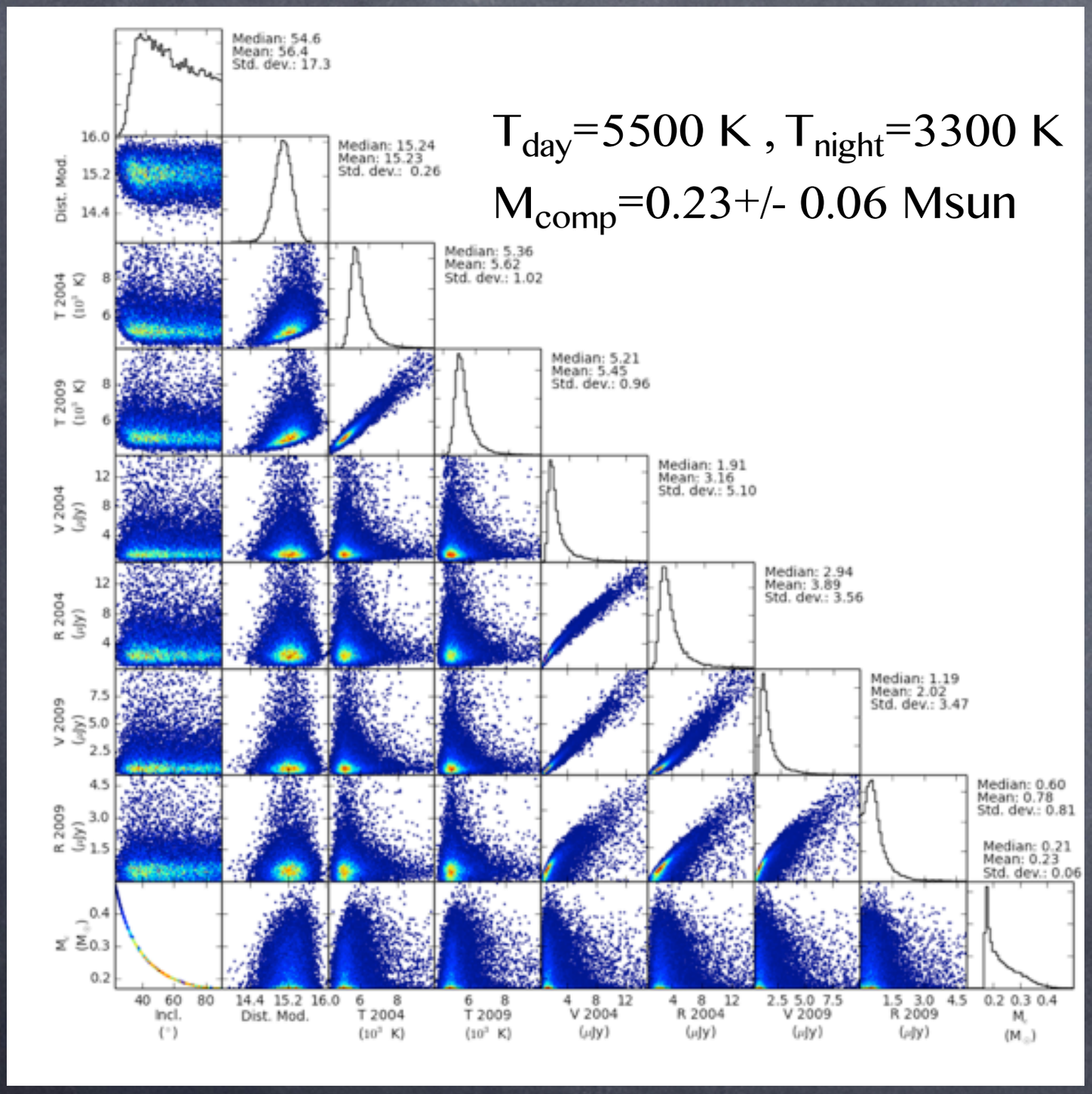
Typical light curves of an irradiated companion star.

The AMXP XTE J1814-338



T_{day}=5500 K , T_{night}=3300 K

M_{comp}=0.23+/- 0.06 Msun

Baglio et al. 2013

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).

$L_{irr} \sim 10^{34}$ erg/s $L_X \sim 10^{32}$ erg/s

↓

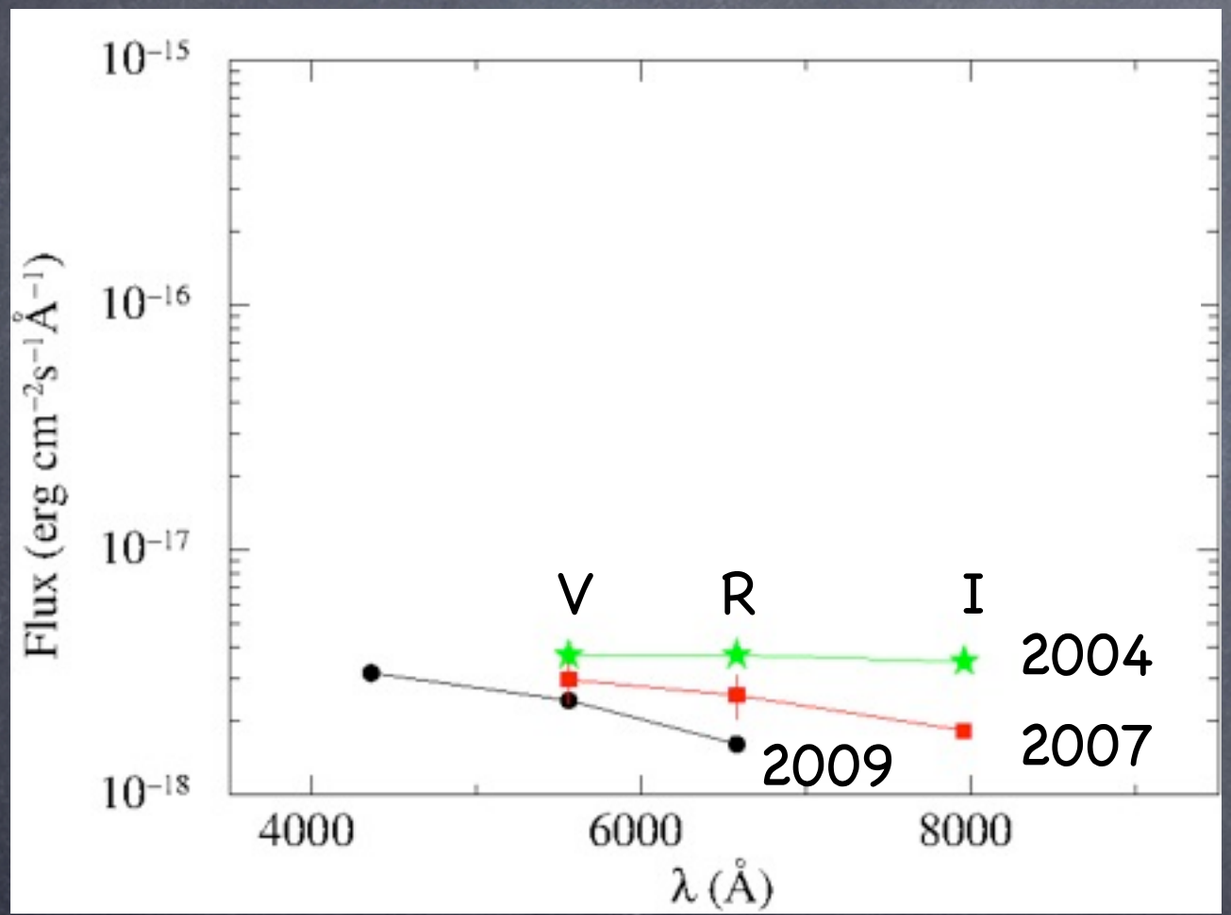
Indirect evidence of a MSP

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

The AMXP XTE J1814-338

Monitoring from outburst (2003)

to quiescence:



Baglio et al. 2013

The AMXP XTE J1814-338

Monitoring from outburst (2003)
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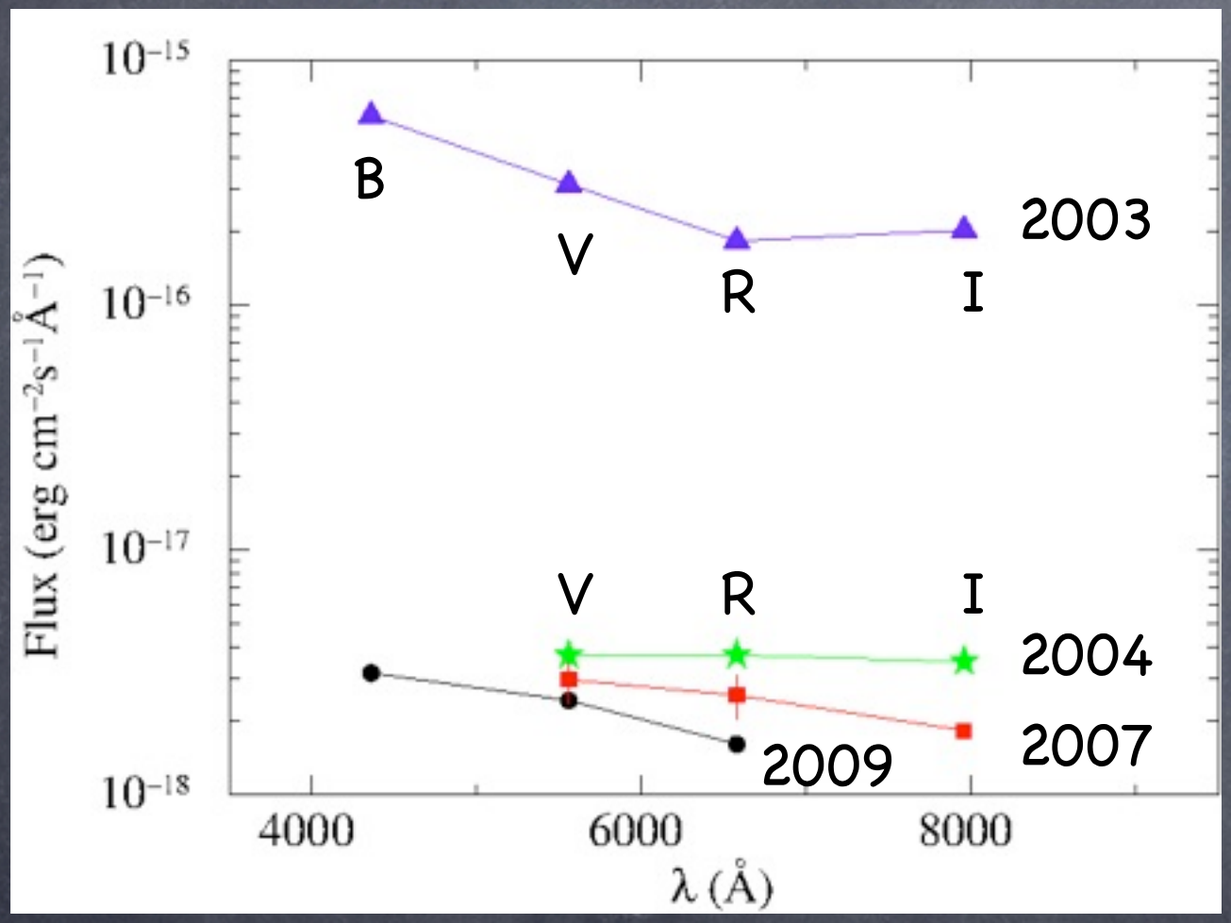


Baglio et al. 2013

Outburst in 2003: Krauss et al.

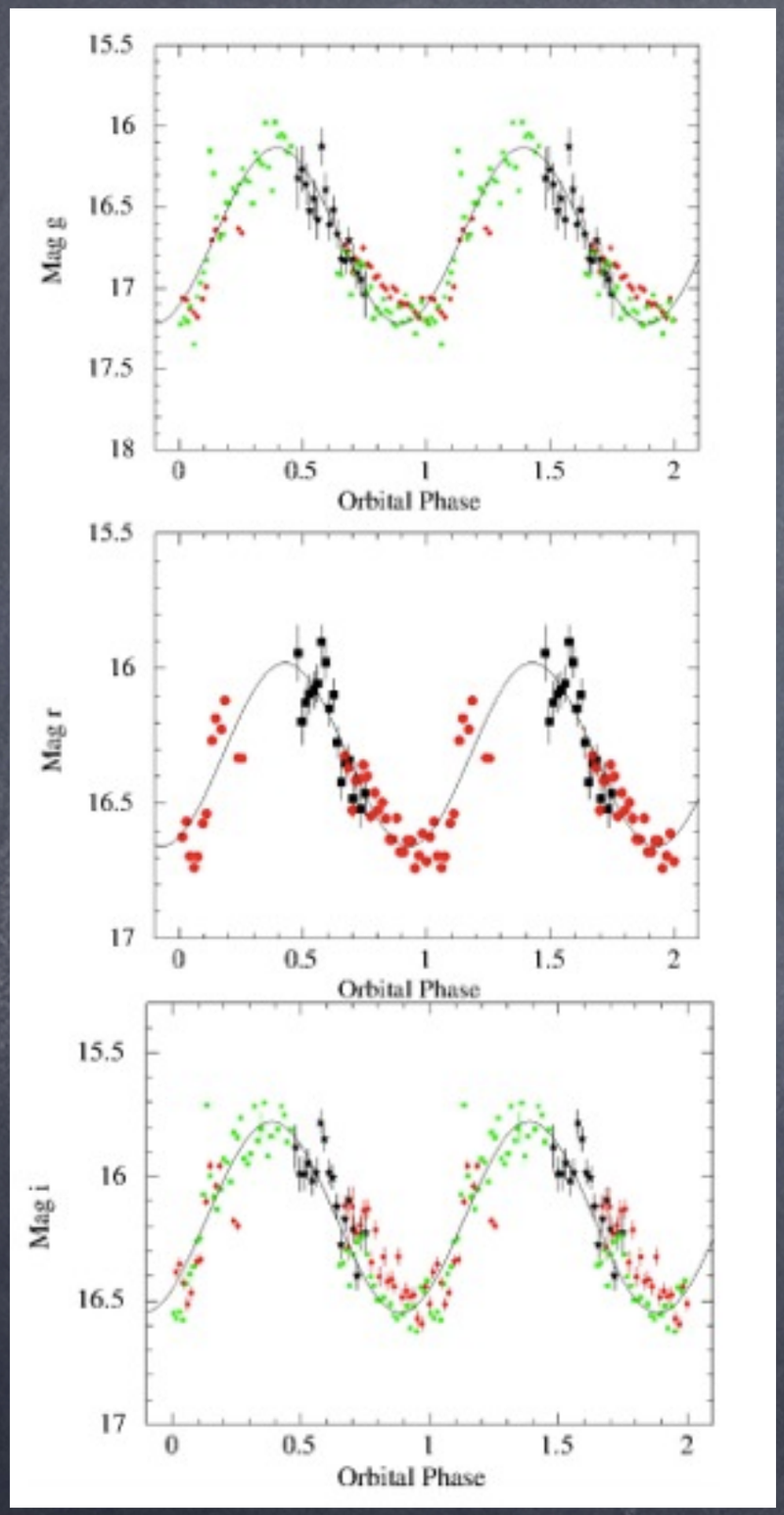
2005: infrared excess

Further component: JET

R-I constant in 2003-2004

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

PSR J1023+0038



Coti Zelati et al. 2014

REM observations:

g, r, i optical filters

J, H, K (NIR)

LT observations:

g, i optical filters

Swift XRT, UVOT:

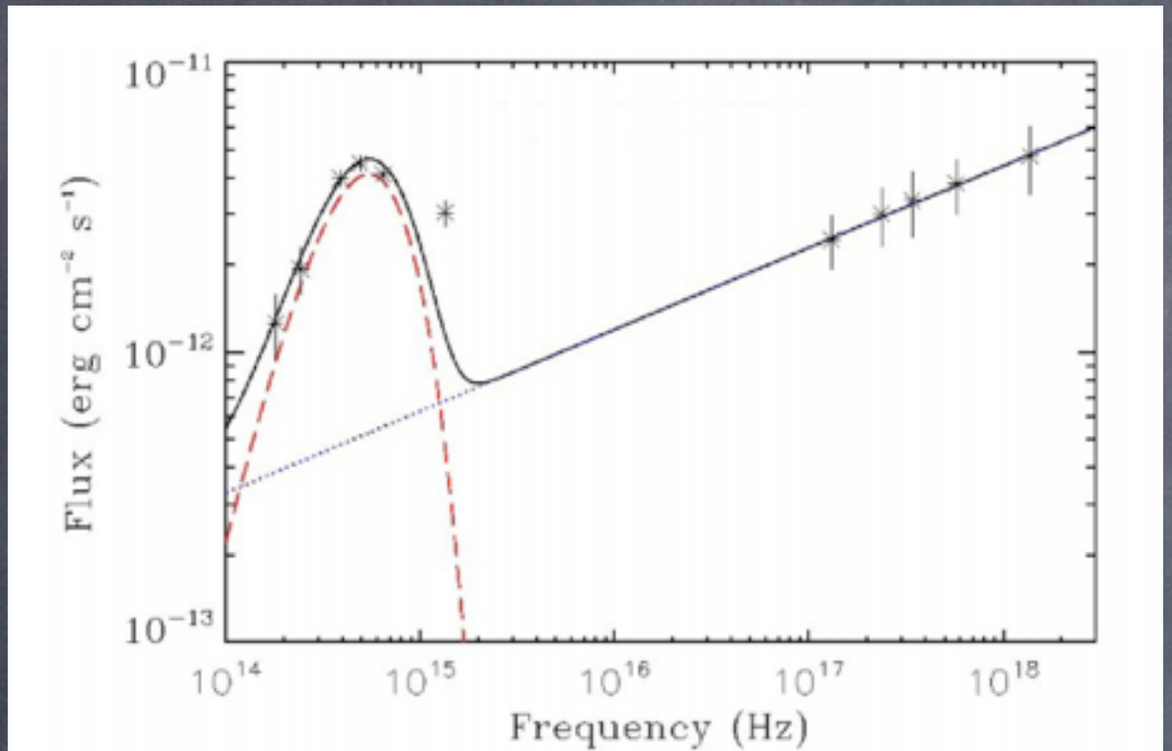
2013 Oct 18 - 2014 May 2

Modulation at the 4.75 h orbital period.

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).

PSR J1023+0038

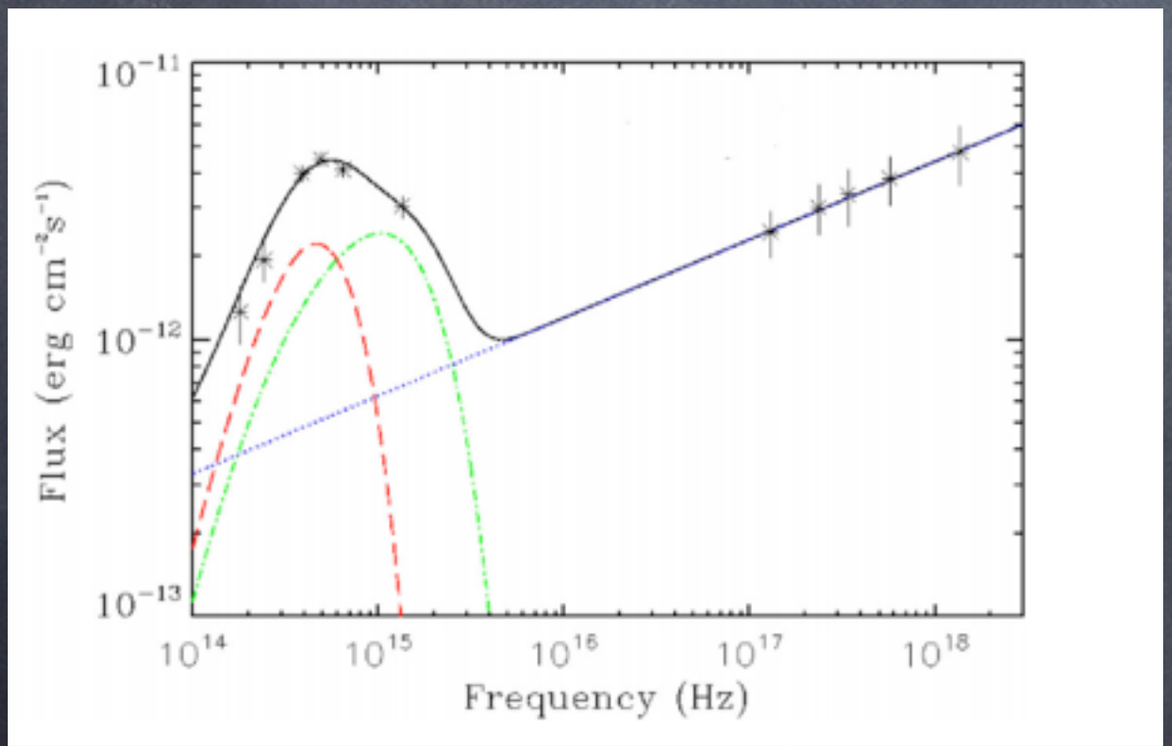


Companion star **black body**

+

shock emission powered by the NS spin down luminosity

The UV point is not interpolated.



Coti Zelati et al. 2014

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 +/- 0.28 %

P_R=1.07 +/- 0.35 %

Baglio et al. in preparation

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THANK YOU!