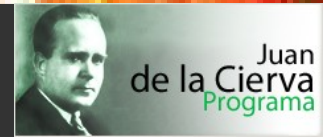


# ULTRA-COMPACT SYSTEMS AND VERY FAINT X-RAY BINARIES: A MULTI-WAVELENGTH APPROACH



**Montserrat Armas**

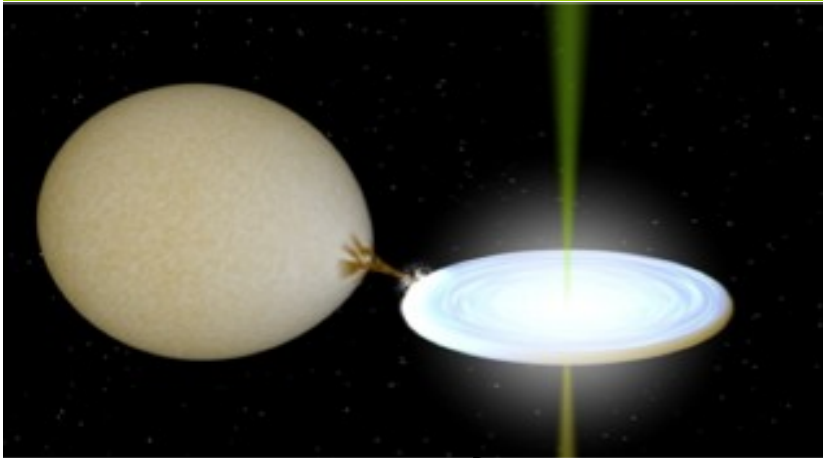
**Basill...**





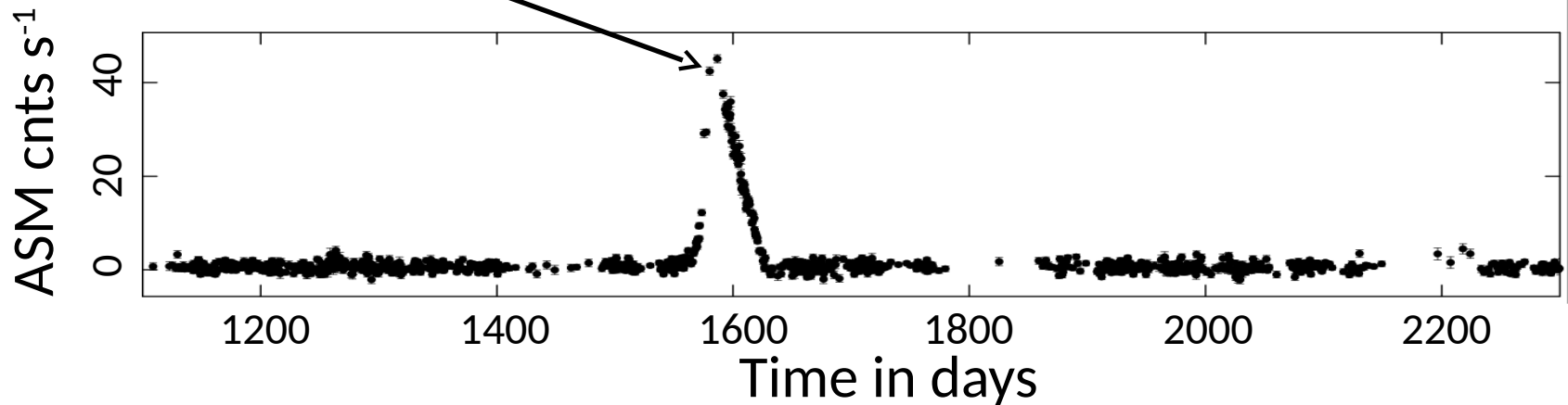
# Classification

## BRIGH systems



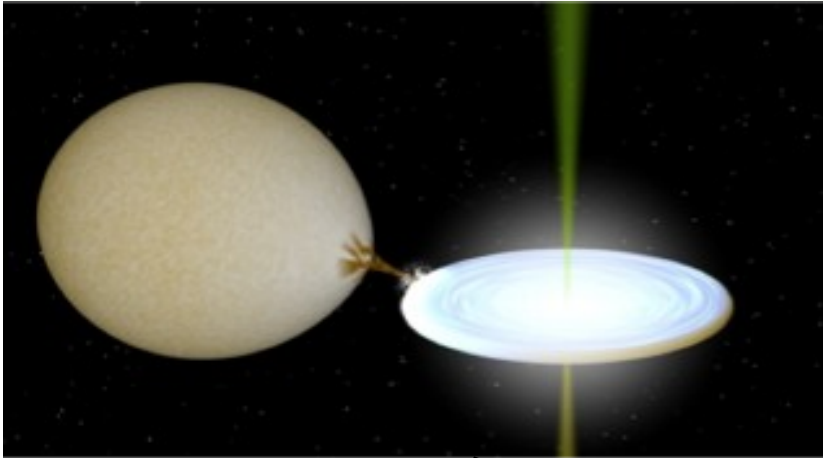
Classical X-ray binaries

$$L_x \sim 10^{36} - 10^{39} \text{ erg s}^{-1}$$

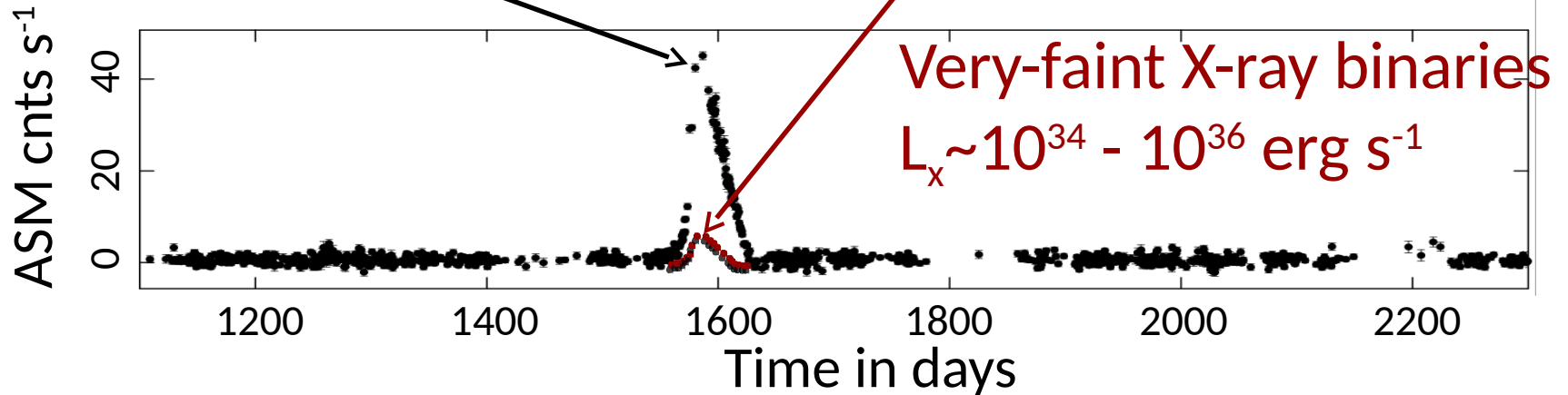
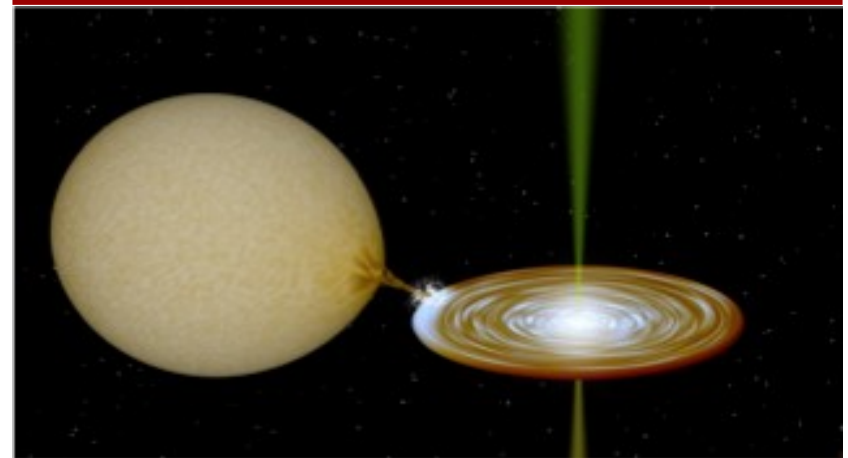


# Classification

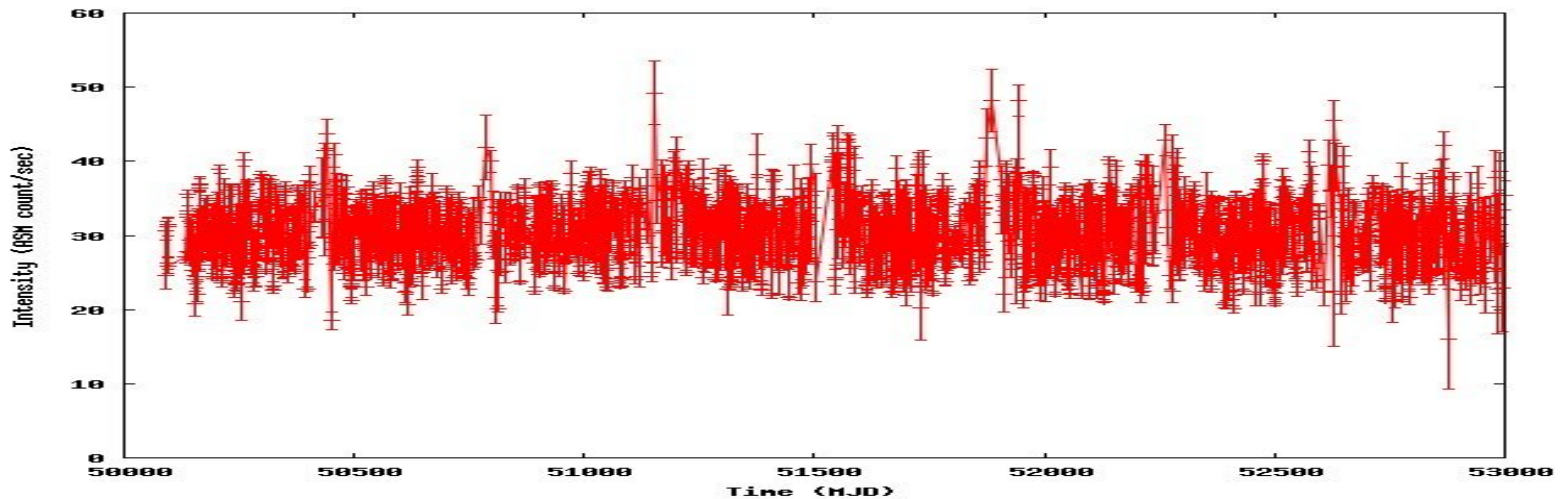
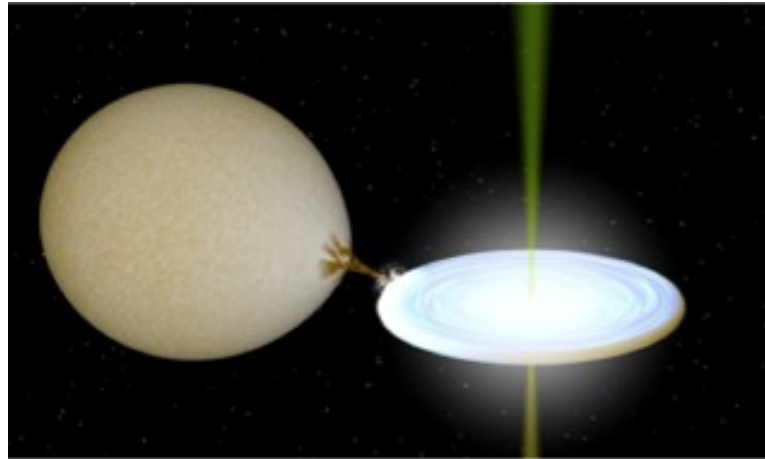
BRIGHTh systems



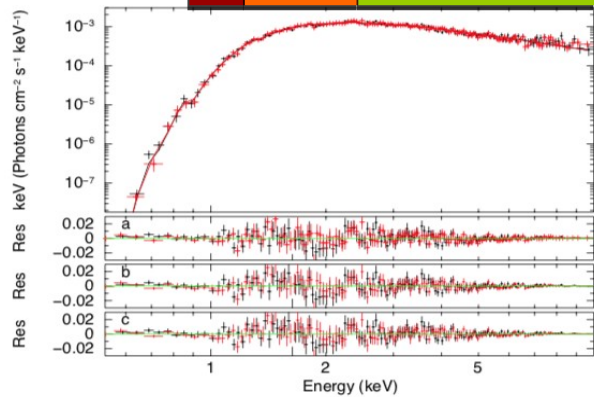
VERY FAINT systems



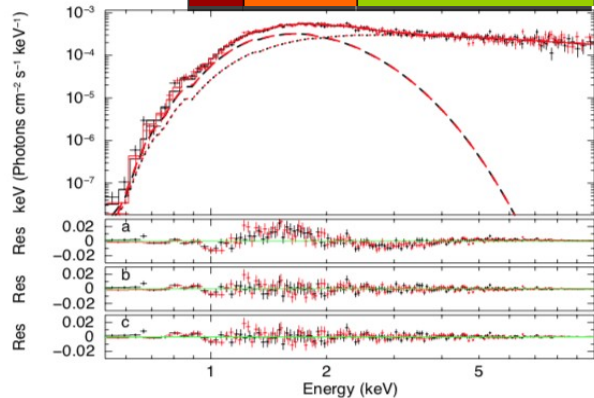
# Very-faint Persistent systems



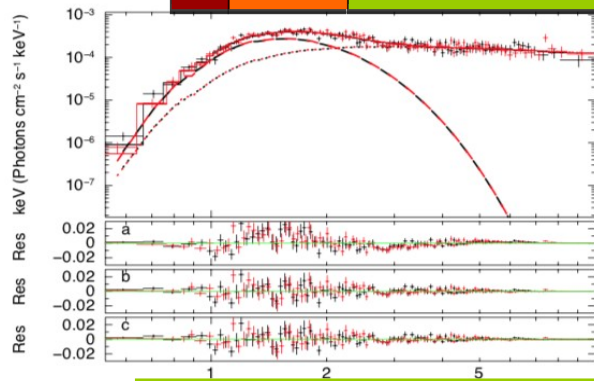
### AX J1754-2754



### 1RXS J171824.2-402934

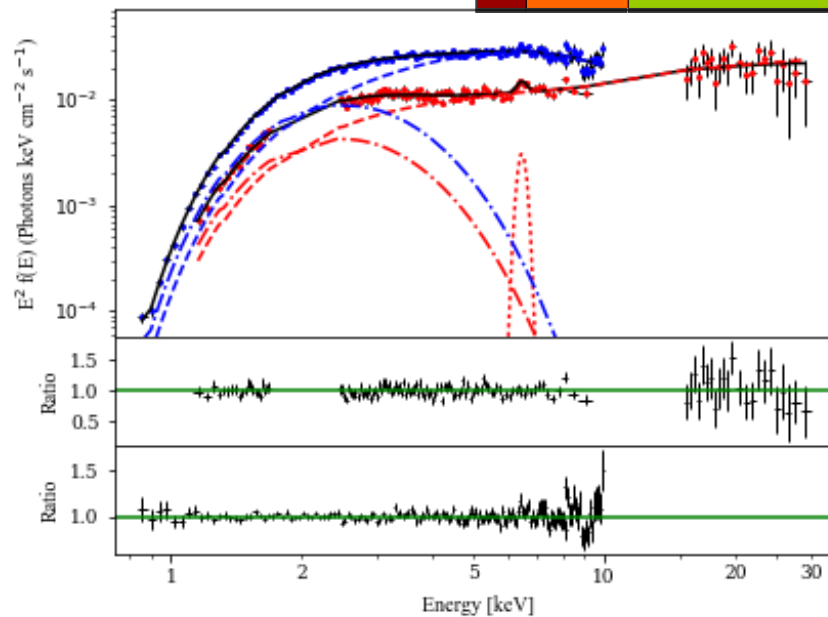


### 1RXH J173523.7-354013



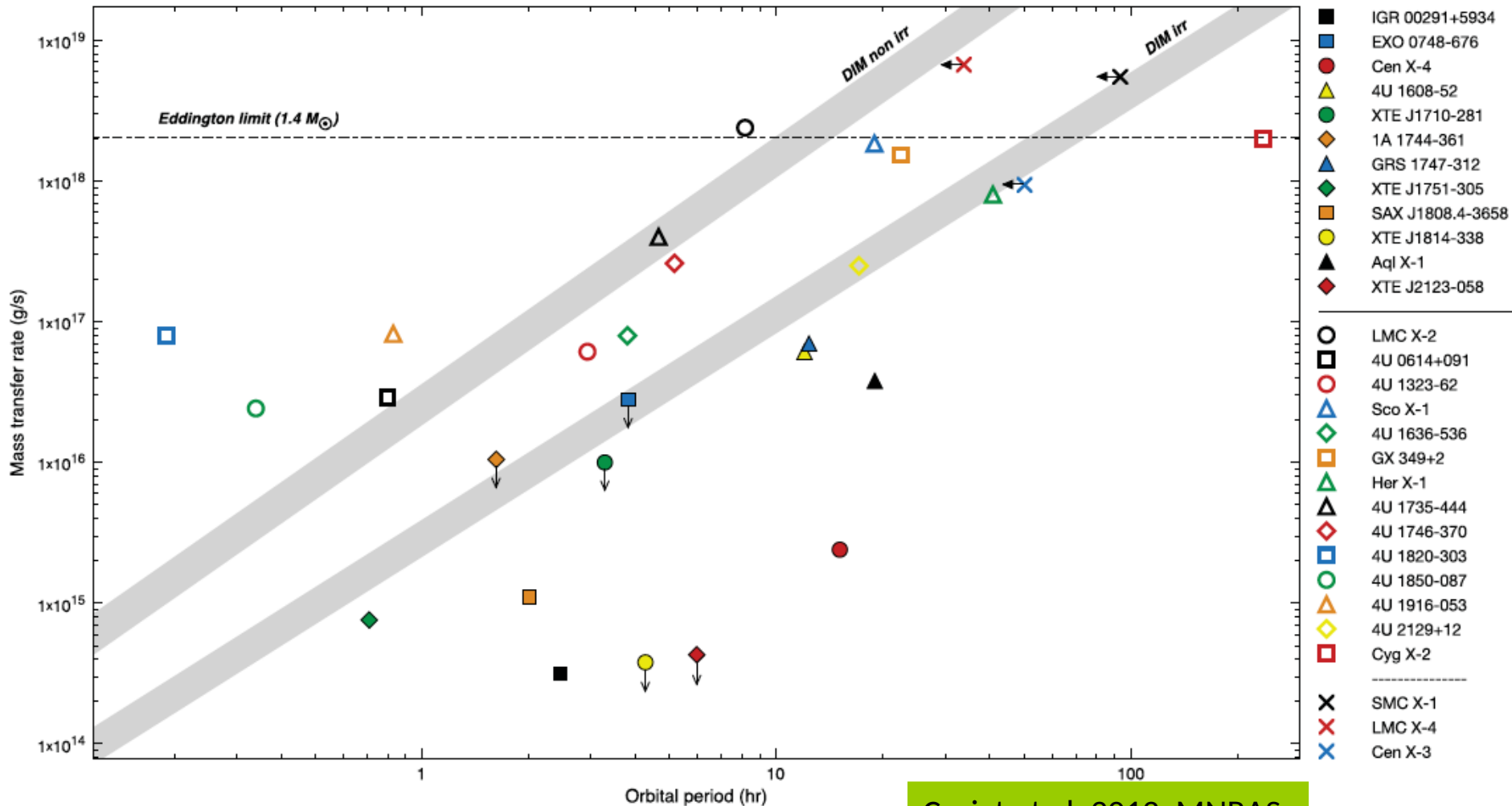
Armas Padilla et al. MNRAS 2013

### SLX 1735-269

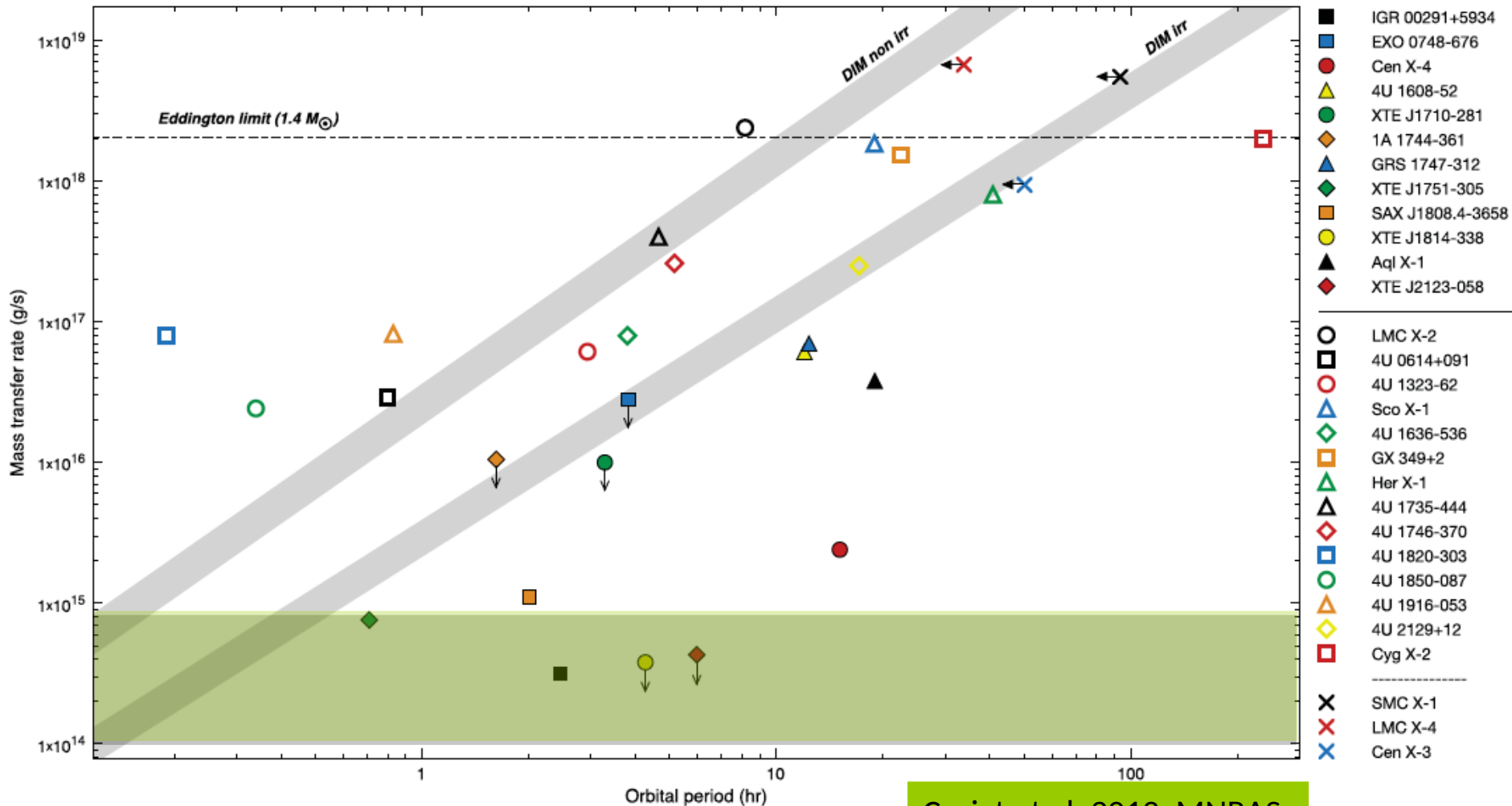


Armas Padilla et al. MNRAS 2018

# Very-faint Persistent systems

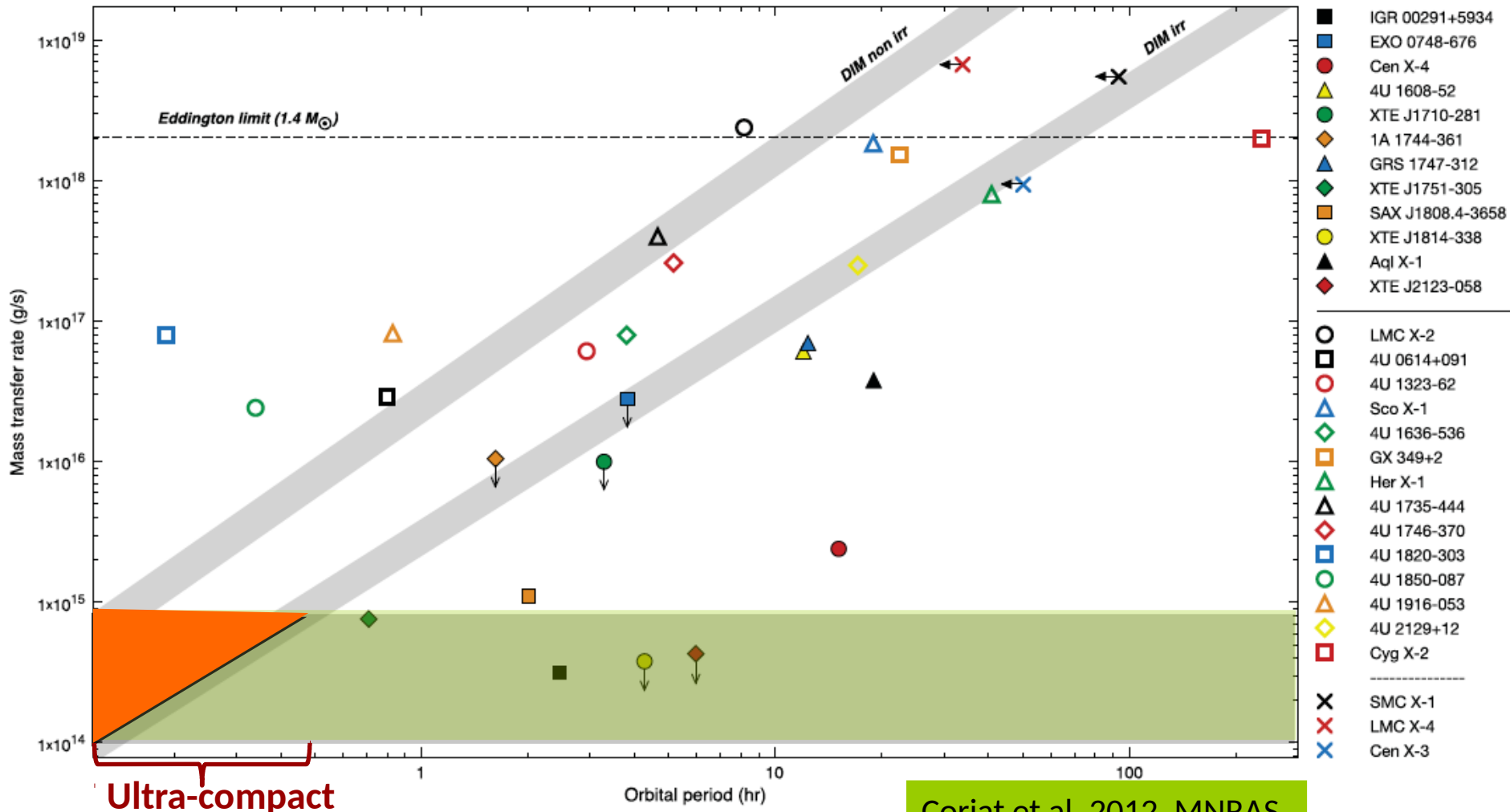


# Very-faint Persistent systems





# Very-faint Persistent systems



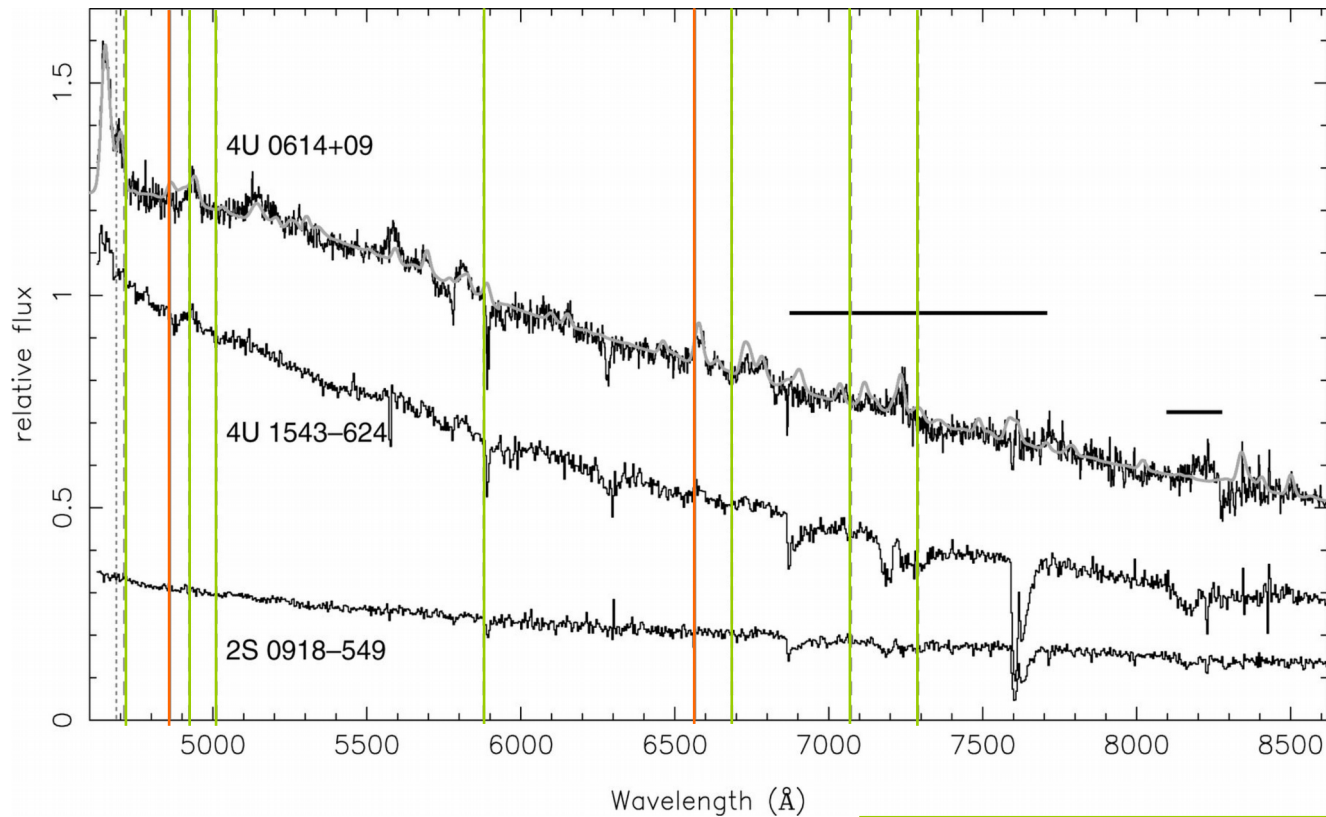
15 UCXB

~3-4

Candidate UCXBs

$$L_{\text{op}} / L_X <$$

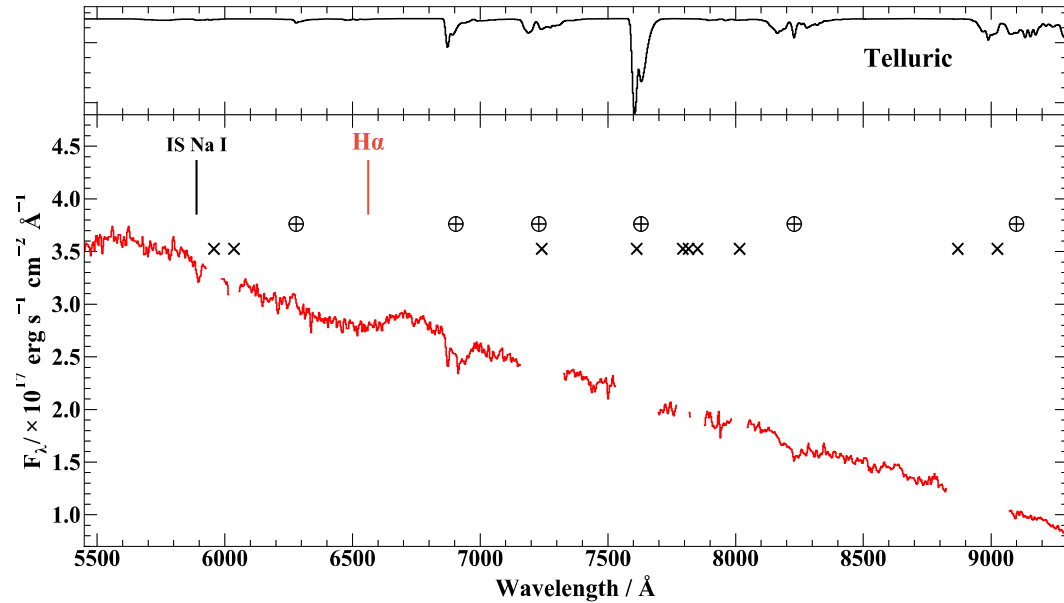
*persistent*  $L_X \ll$



Hydrogen **NOT**  
detected in the  
optical spectrum

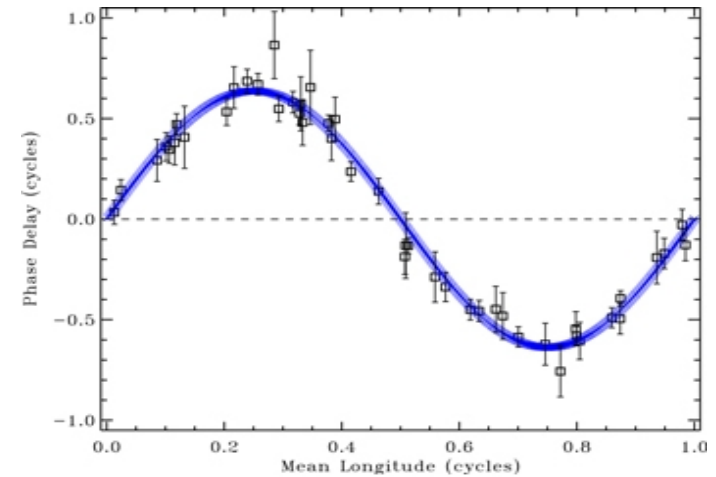
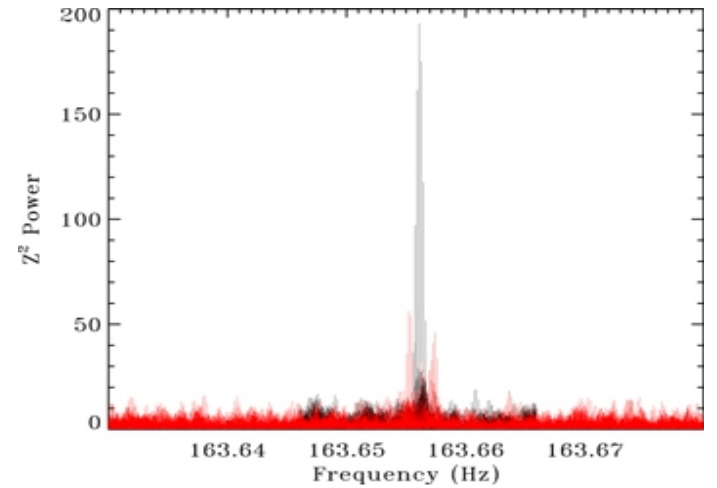
Nelemans et al. 2004, MNRAS

# IGR J17062-6143



Hernández Santisteban et al. 2017, MNRAS

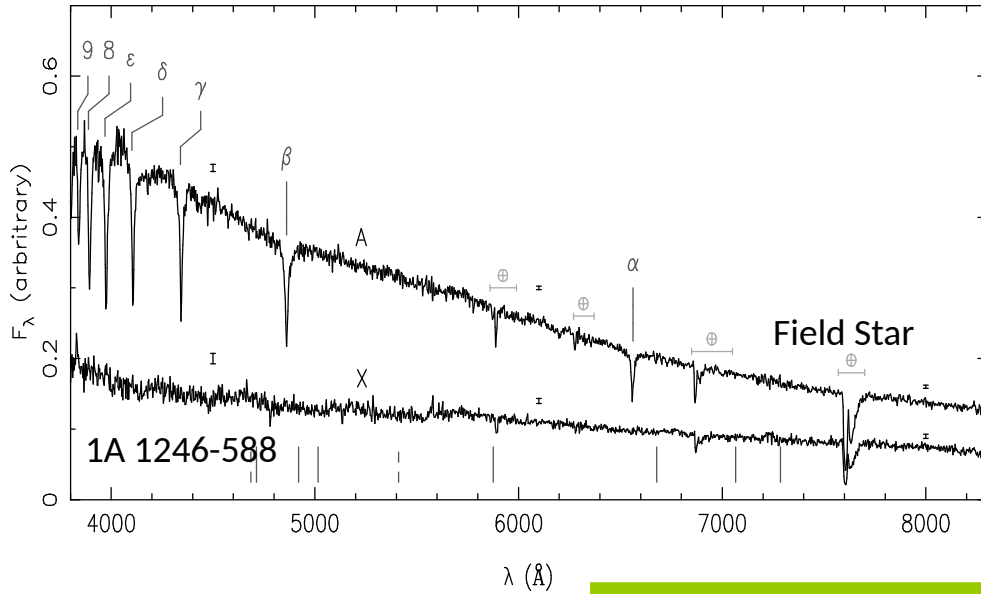
Hydrogen **NOT** detected



Strohmayer et al. 2018 ApJL

$P_{\text{orb}} = 38 \text{ minutes}$

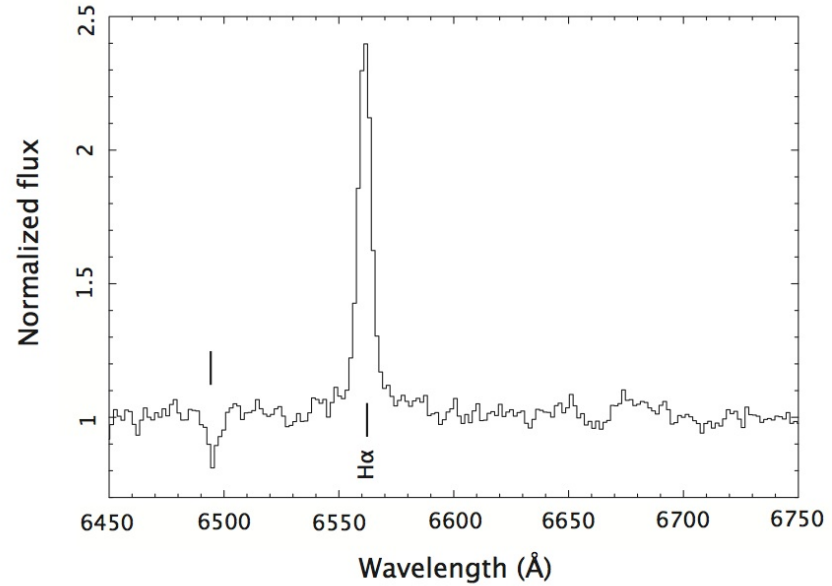
1A 1246-588



in't Zand et al. 2008, A&A

Hydrogen **NOT** detected

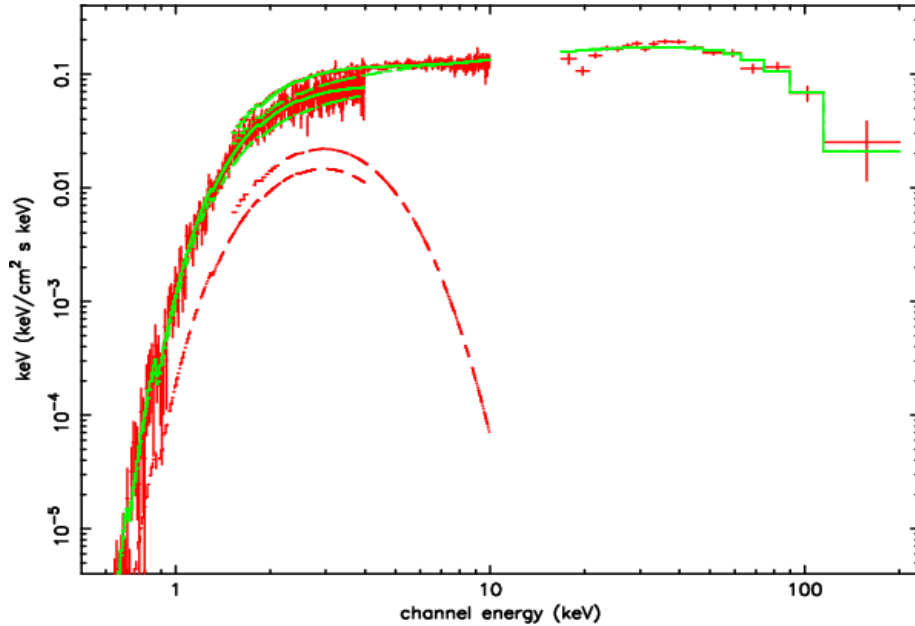
1RXH J173523.7-354013



Degenaar et al. 2010, MNRAS

Hydrogen detection

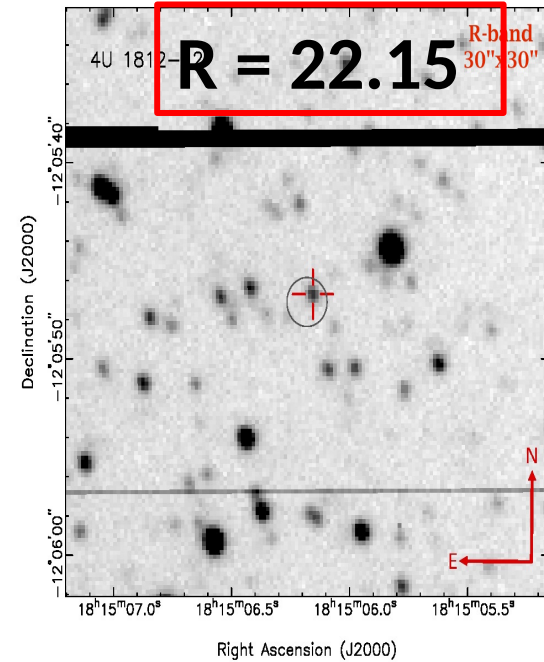
# 4u 1812-12



Tarana et al. 2006, A&A

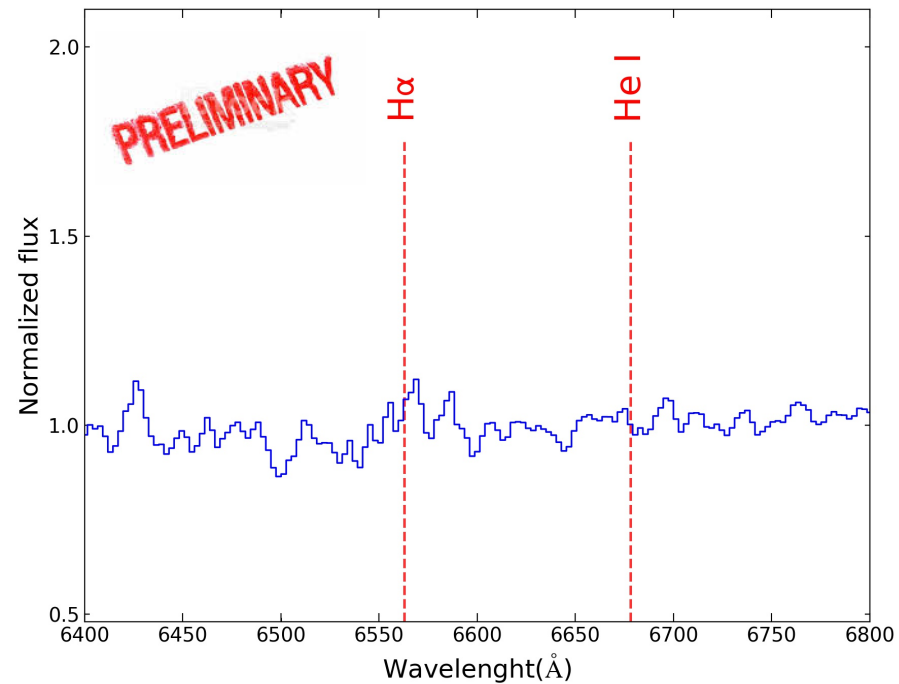
$d = 4.6$  kpc (He) or  $3.4$  kpc (H) Cocchi et al. 2000, A&A

$L(2-10 \text{ keV}) \sim 5-10 \times 10^{35} \text{ erg/s}$



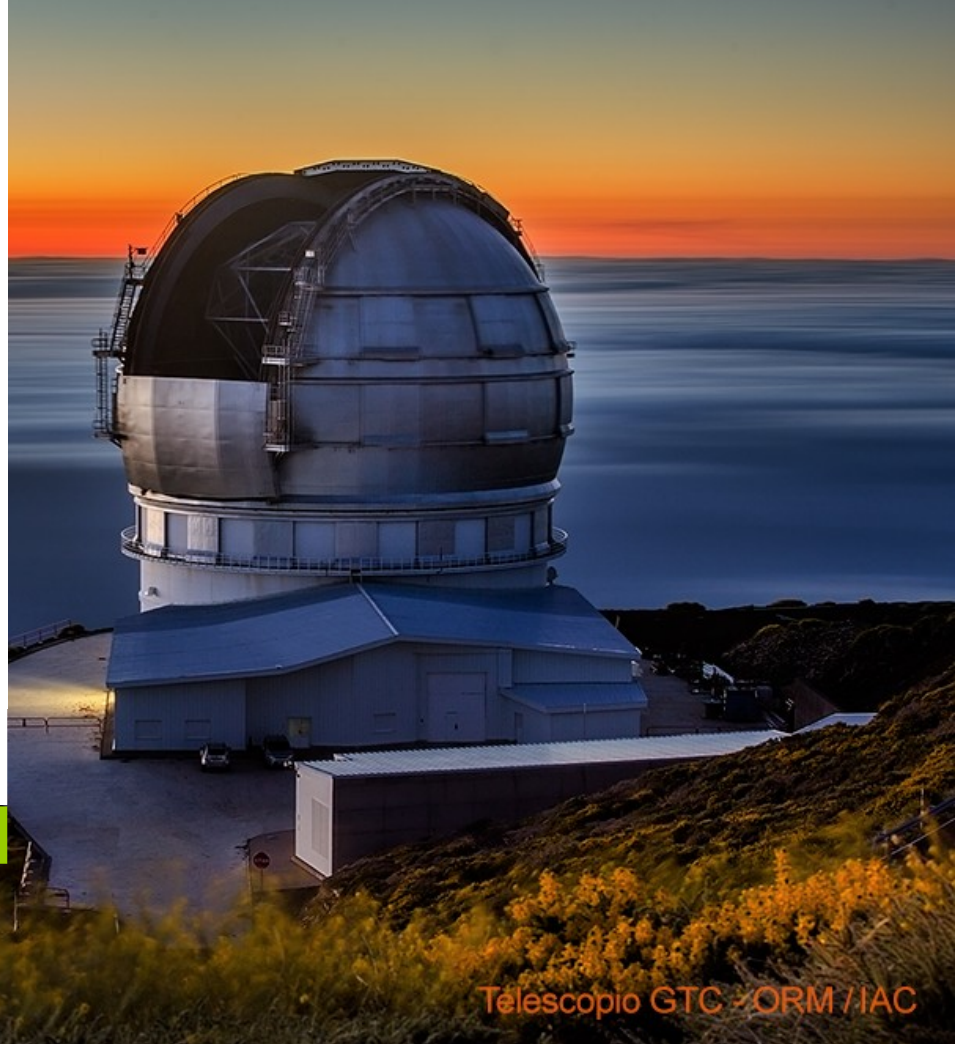
Bassa et al. 2006, A&A

# 4u 1812-12



Hydrogen **NOT** detection

Armas Padilla et al. 2018, in prep.



# Conclusions

➤ VFXB provide new regimes to study X-ray Binaries

➤ Accretion physics

➤ Binary evolution

➤ Disk-instability model:

➤ Persistent VFXBs → Ultra Compact XBs ?

1- Hydrogen **NOT** detected → Confirmed UCXB

2- Hydrogen **NOT** detected

1- Hydrogen **detected**

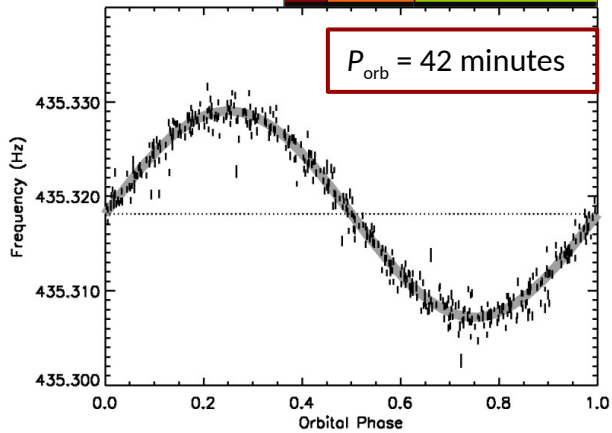
**THANKS!**





### XTE J1751-305

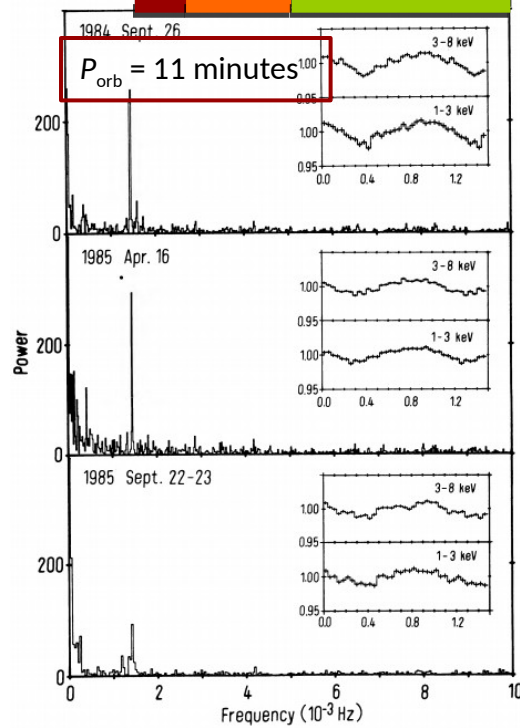
$P_{\text{orb}} = 42$  minutes



Markwardt et al. 2007, ApJ

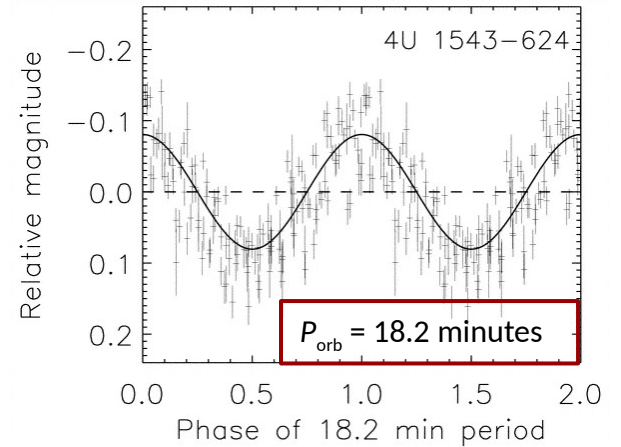
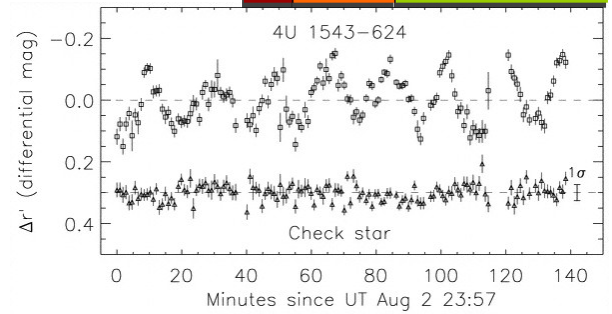
### 4U 1820-303

$P_{\text{orb}} = 11$  minutes



Stella et al. 1987, ApJ

### 4U 1543-624

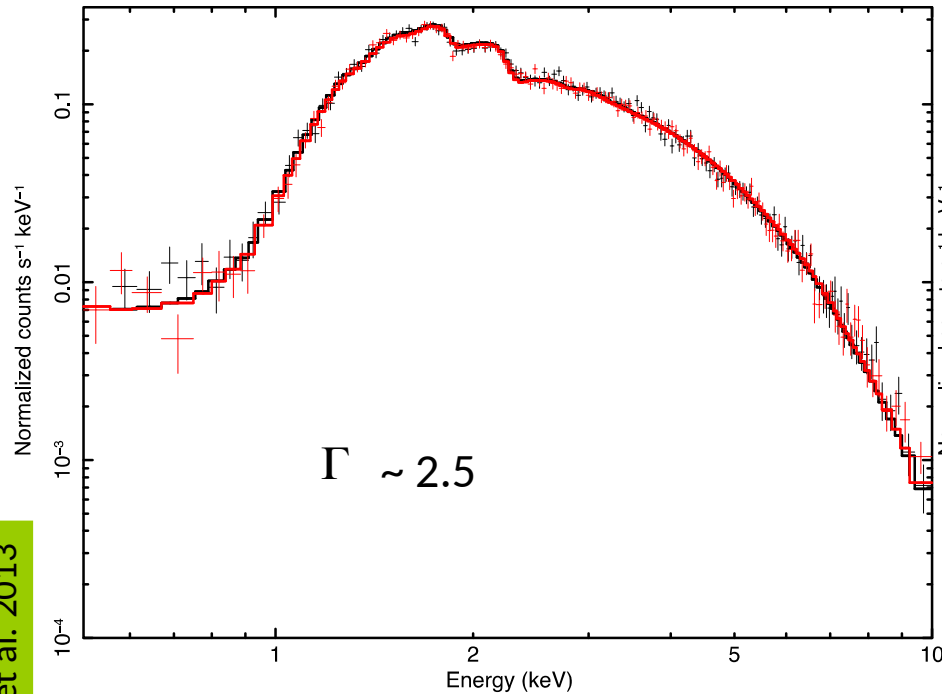


$P_{\text{orb}} = 18.2$  minutes

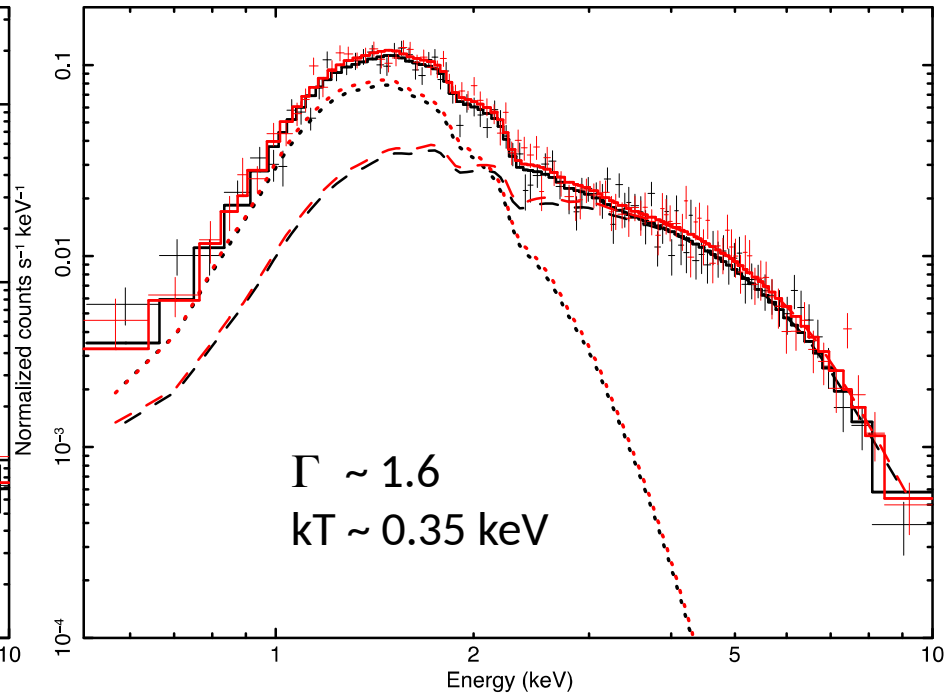
Wang & Chakrabarty 2004, ApJL

# Very-faint Persistent systems

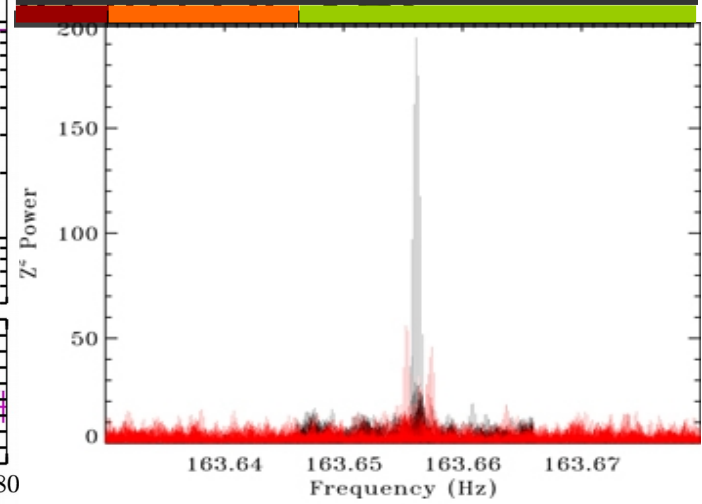
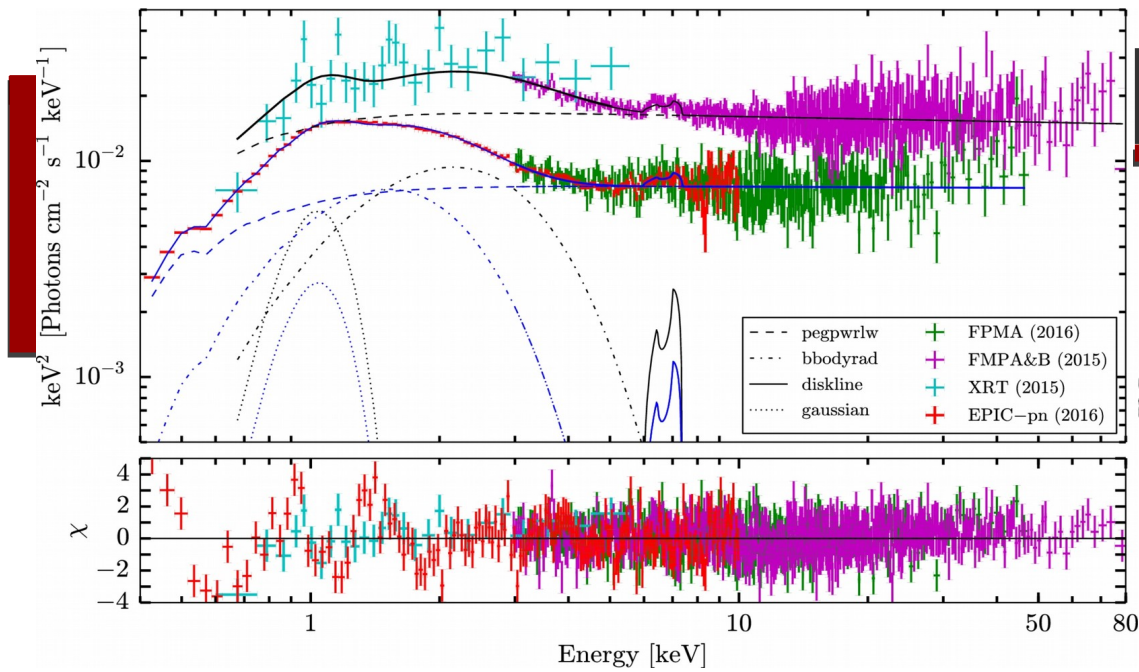
AX J1754.2-2754



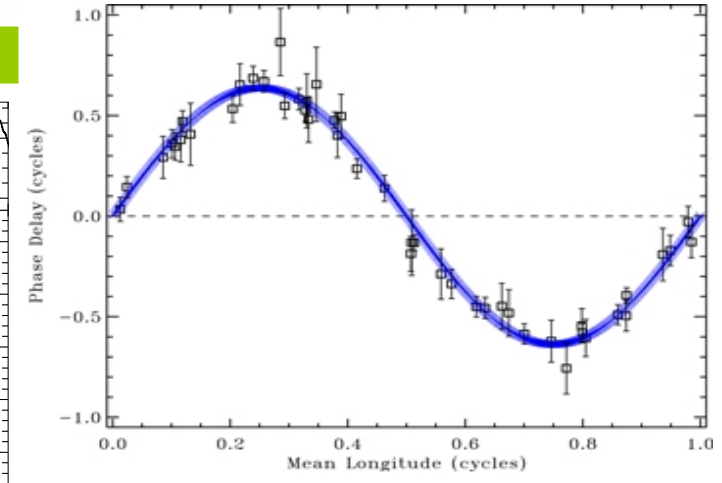
1RXH J173523.7-354013



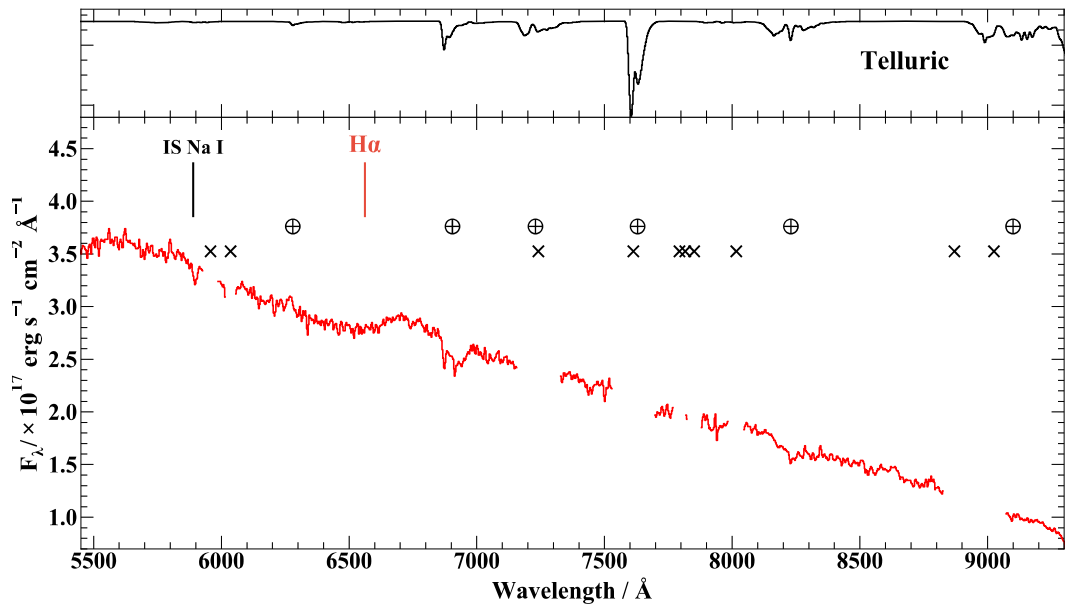
# IGR J17062-6143



van den Eijnden et al. 2018, MNRAS



Strohmayer et al. 2018 ApJL



Hernández Santisteban et al. 2017, MNRAS

$P_{\text{orb}} = 38 \text{ minutes}$