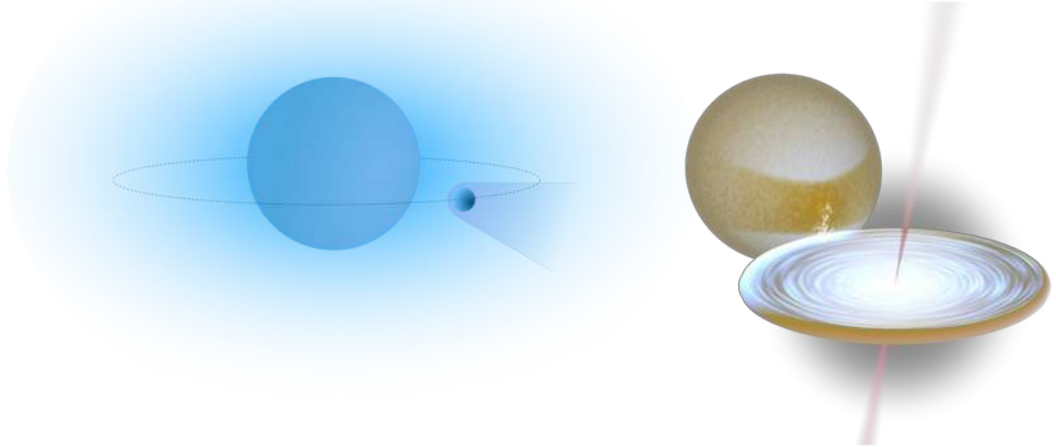
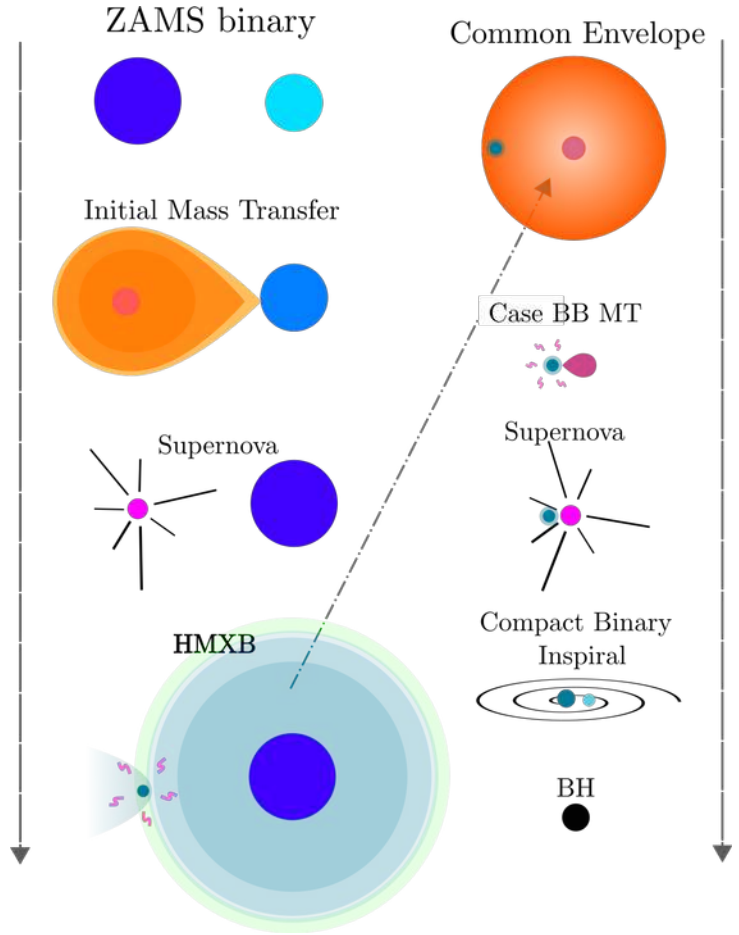
An inventory of X-ray binaries in the Galaxy

-

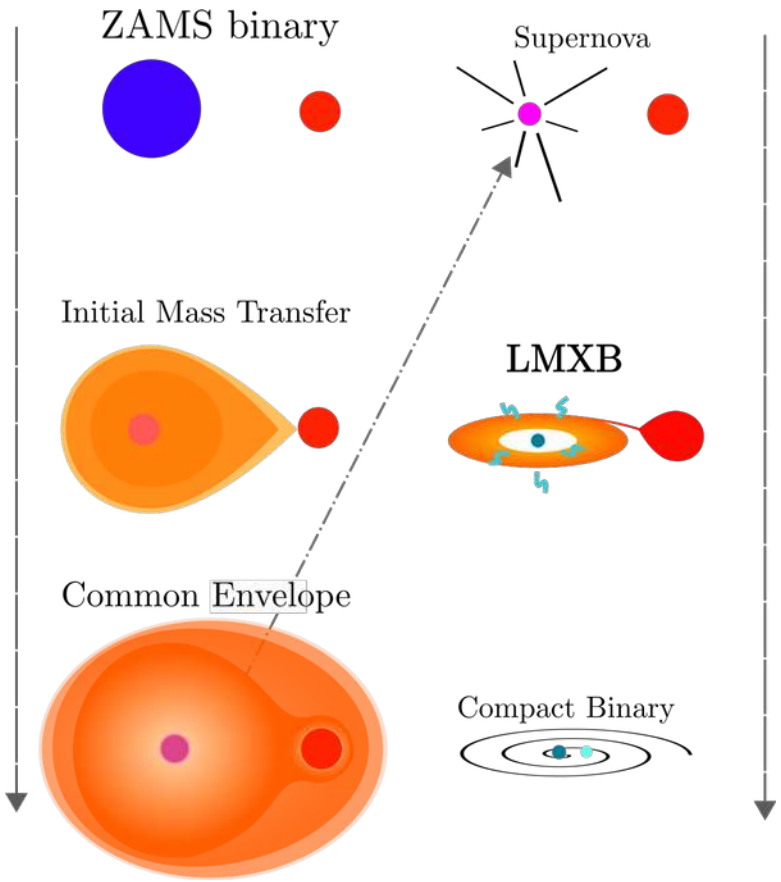
From the *INTEGRAL* to the *Gaia* era



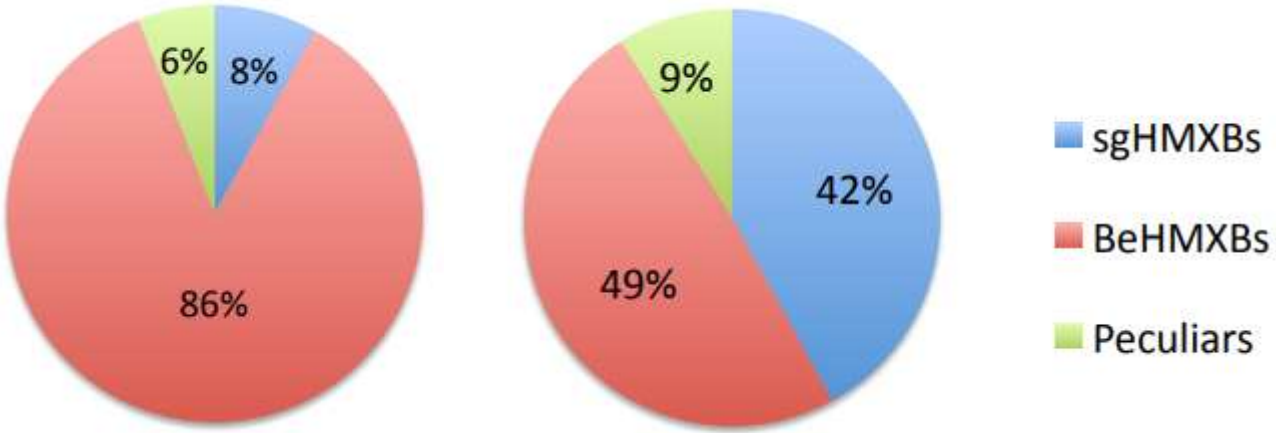
Evolution of X-ray binaries – Progenitors of GWs ?



- Accretion / Ejection
- Supernova Kicks
- Common Envelopes
- Disks, Winds
- Compact objects
- Gravitational mergers



HMXBs – the first decade of INTEGRAL



2000 2013

Coleiro et al. 2013

Increased sensitivity at higher energy ranges lead to the discovery of new subtypes:

Obscured sgHMXBs
(Filiatre & Chaty 2004)

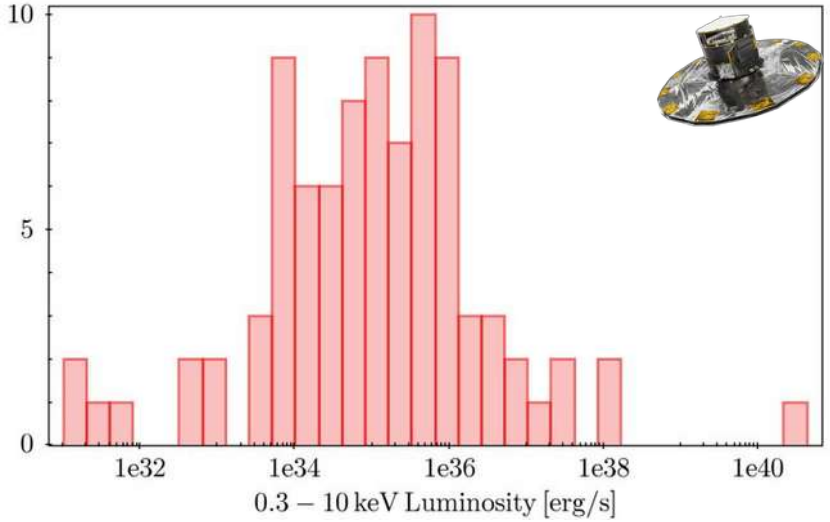
Supergiant Fast X-ray Transients (SFXTs)
(Negueruela et al. 2006b)

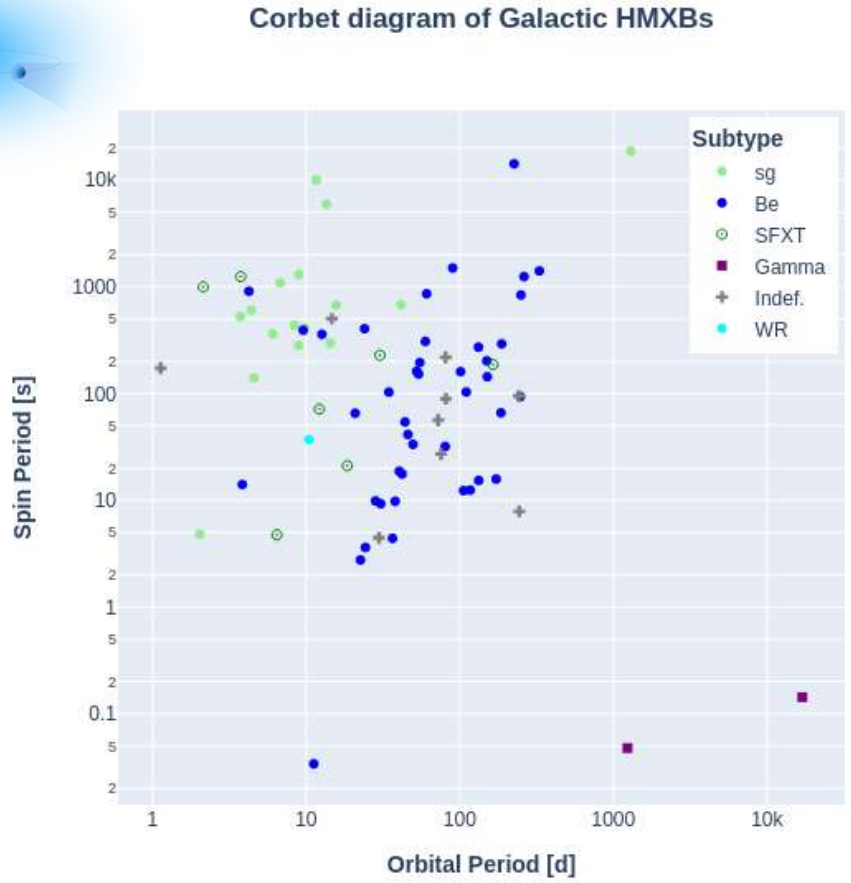
Continuous multi-wavelength efforts with XMM-Newton, Swift, Chandra + ground followup

The new catalogue of HMXBs in the Galaxy

Last catalogue of HMXBs : Liu et al. 2006 [N = 114]
→ many new observations since then
→ INTEGRAL was just beginning !

New catalogue of HMXBs : Fortin et al. 2023 [N = 164+]
→ automated search for multi-wavelength counterparts
→ manual search for spectral types, orbital parameters...

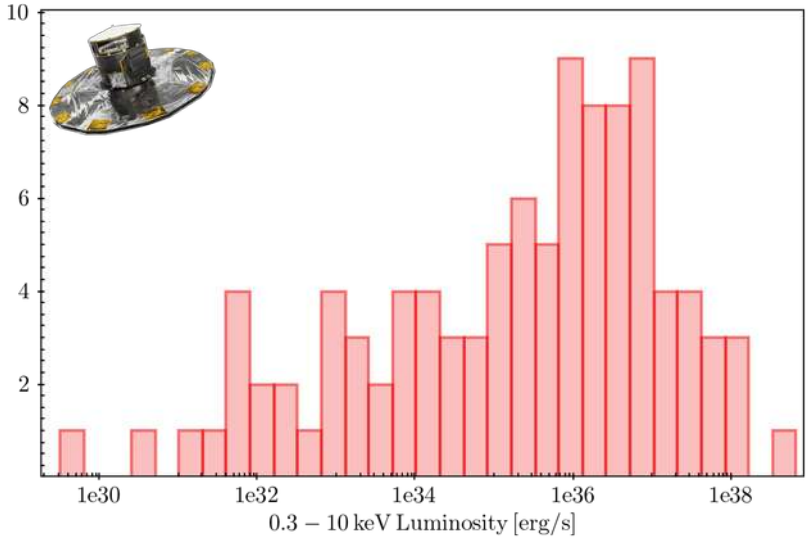


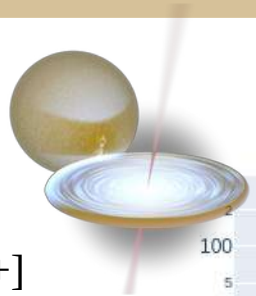


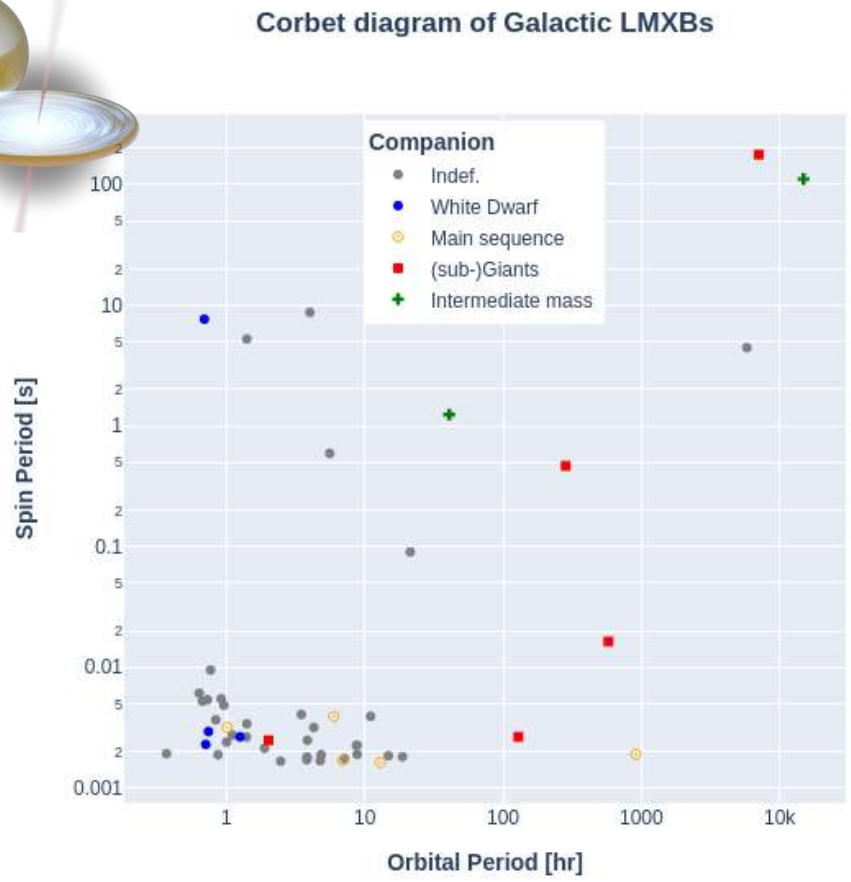
The new catalogue of LMXBs in the Galaxy

Last catalogue of LMXBs : Liu et al. 2007 [N = 187]
→ many new observations since then
→ INTEGRAL was just beginning !

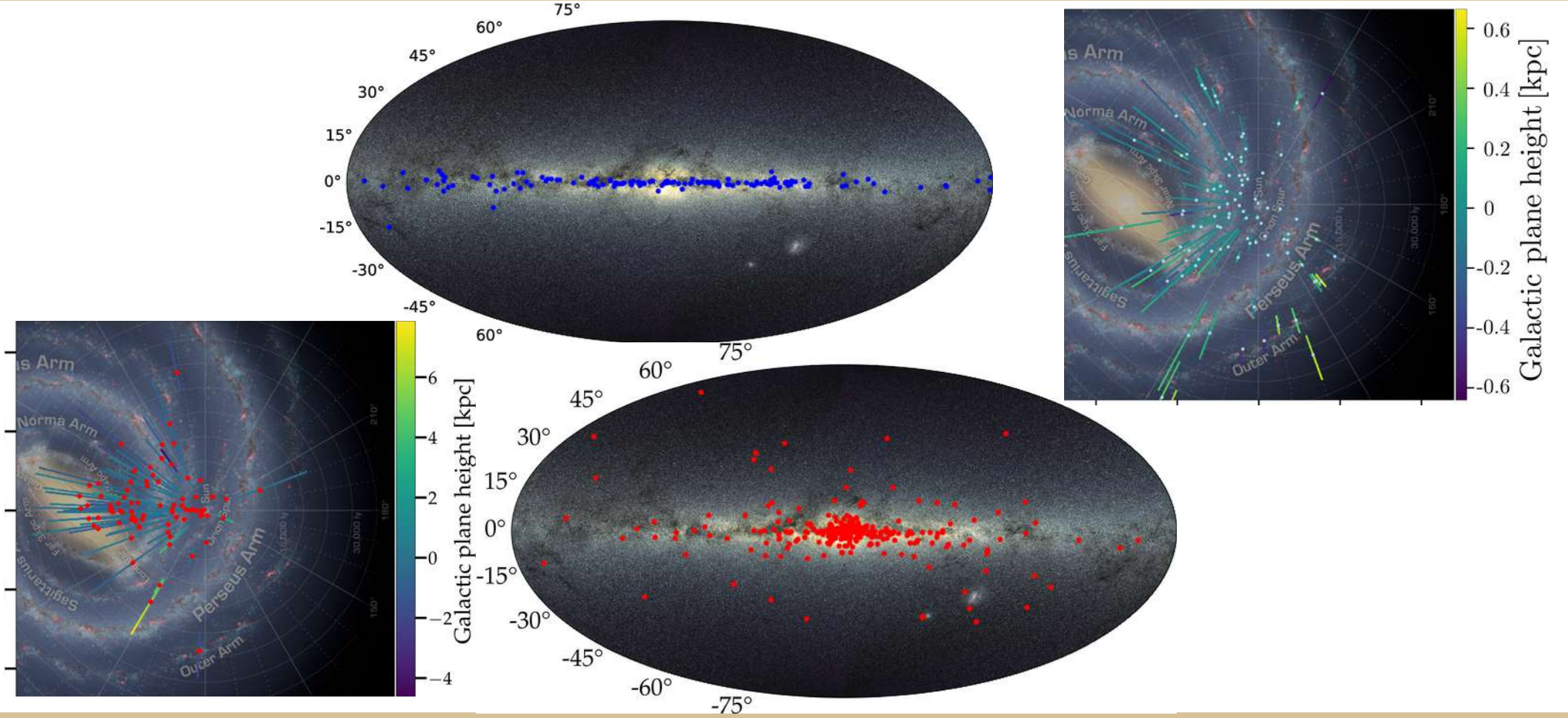
New catalogue of LMXBs : Fortin et al. 2024 [N = 340+]
→ automated search for multi-wavelength counterparts
→ manual search for spectral types, orbital parameters...



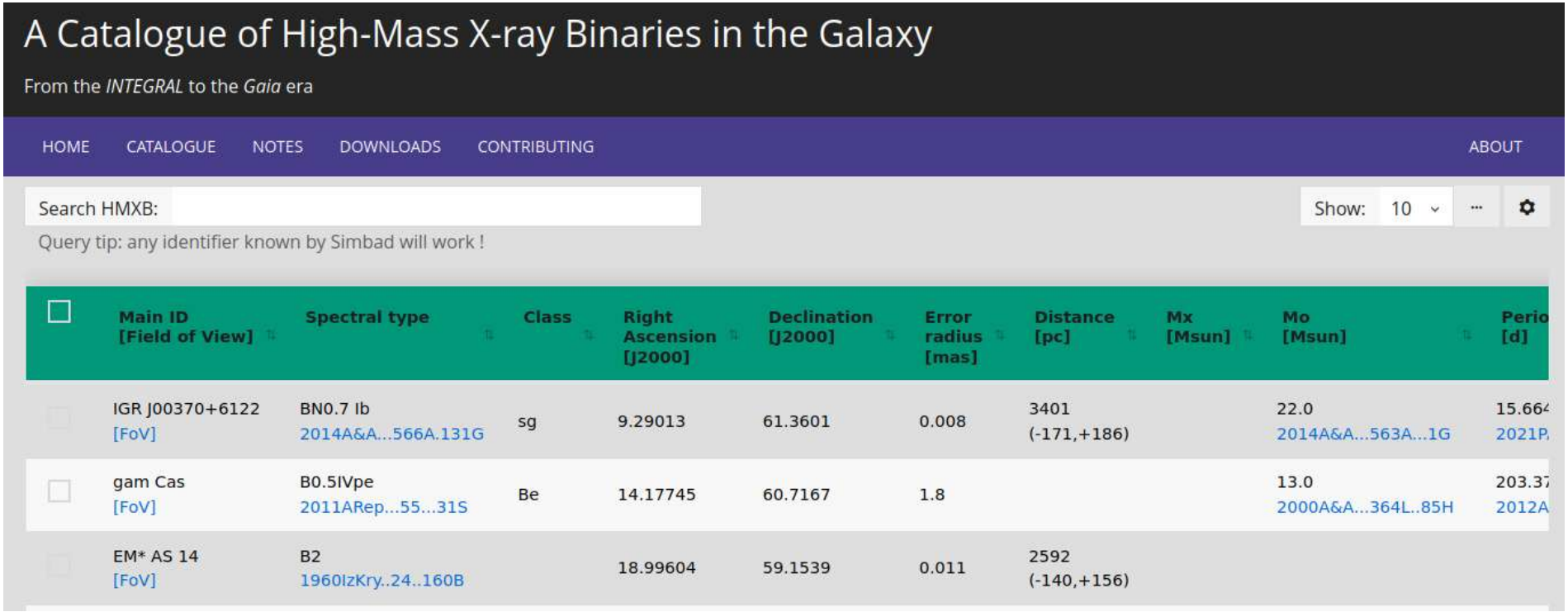




XRBs in the Milky Way



HMXB and LMXB Webcat : participative database



A Catalogue of High-Mass X-ray Binaries in the Galaxy

From the *INTEGRAL* to the *Gaia* era

HOME CATALOGUE NOTES DOWNLOADS CONTRIBUTING ABOUT

Search HMXB:

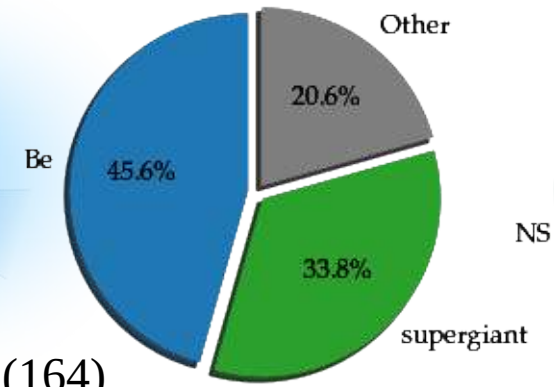
Show: 10

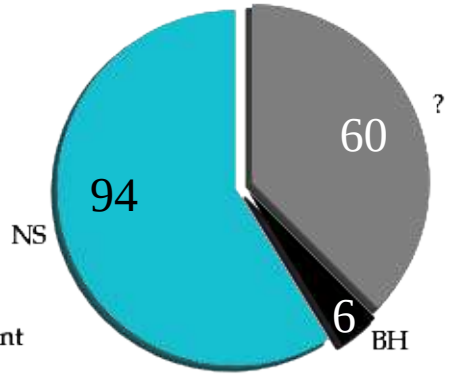
Query tip: any identifier known by Simbad will work !

Main ID [Field of View]	Spectral type	Class	Right Ascension [J2000]	Declination [J2000]	Error radius [mas]	Distance [pc]	Mx [Msun]	Mo [Msun]	Perio [d]
IGR J00370+6122 [FoV]	BN0.7 Ib 2014A&A...566A.131G	sg	9.29013	61.3601	0.008	3401 (-171,+186)		22.0 2014A&A...563A...1G	15.664 2021P
gam Cas [FoV]	B0.5IVpe 2011ARep...55...31S	Be	14.17745	60.7167	1.8			13.0 2000A&A...364L..85H	203.37 2012A
EM* AS 14 [FoV]	B2 1960IzKry..24..160B		18.99604	59.1539	0.011	2592 (-140,+156)			

→ GitHub/HMXBwebcat

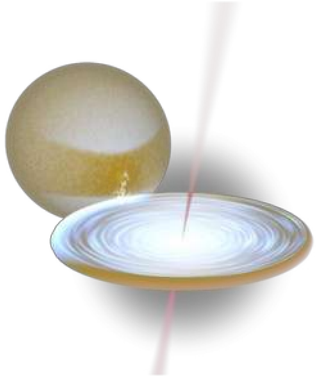
Some statistics on Galactic XRBs

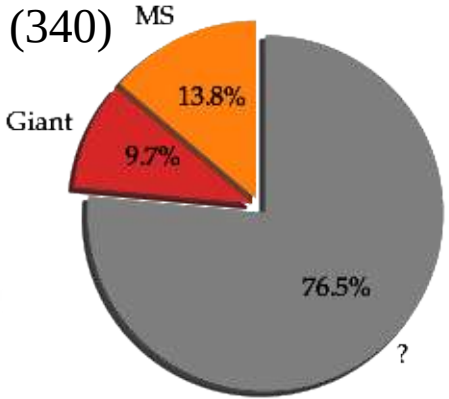


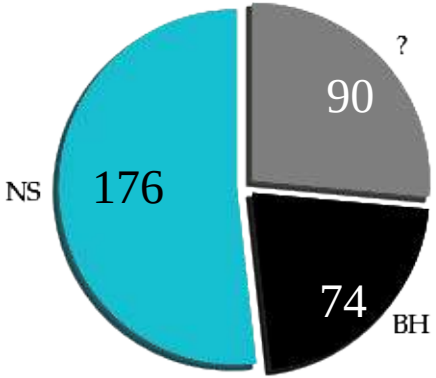


HMXBs (164)

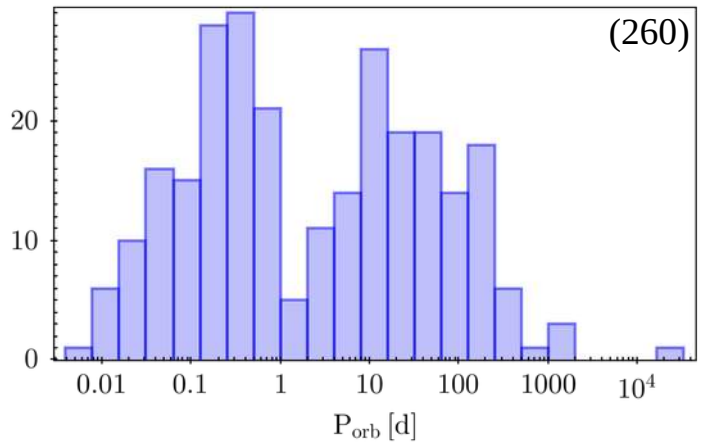
LMXBs (340)

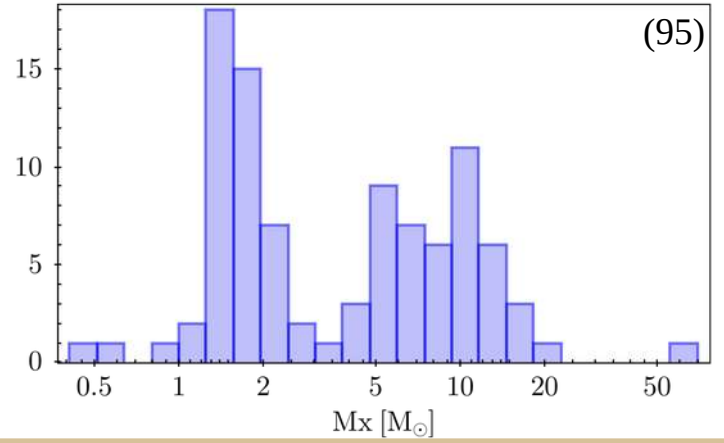




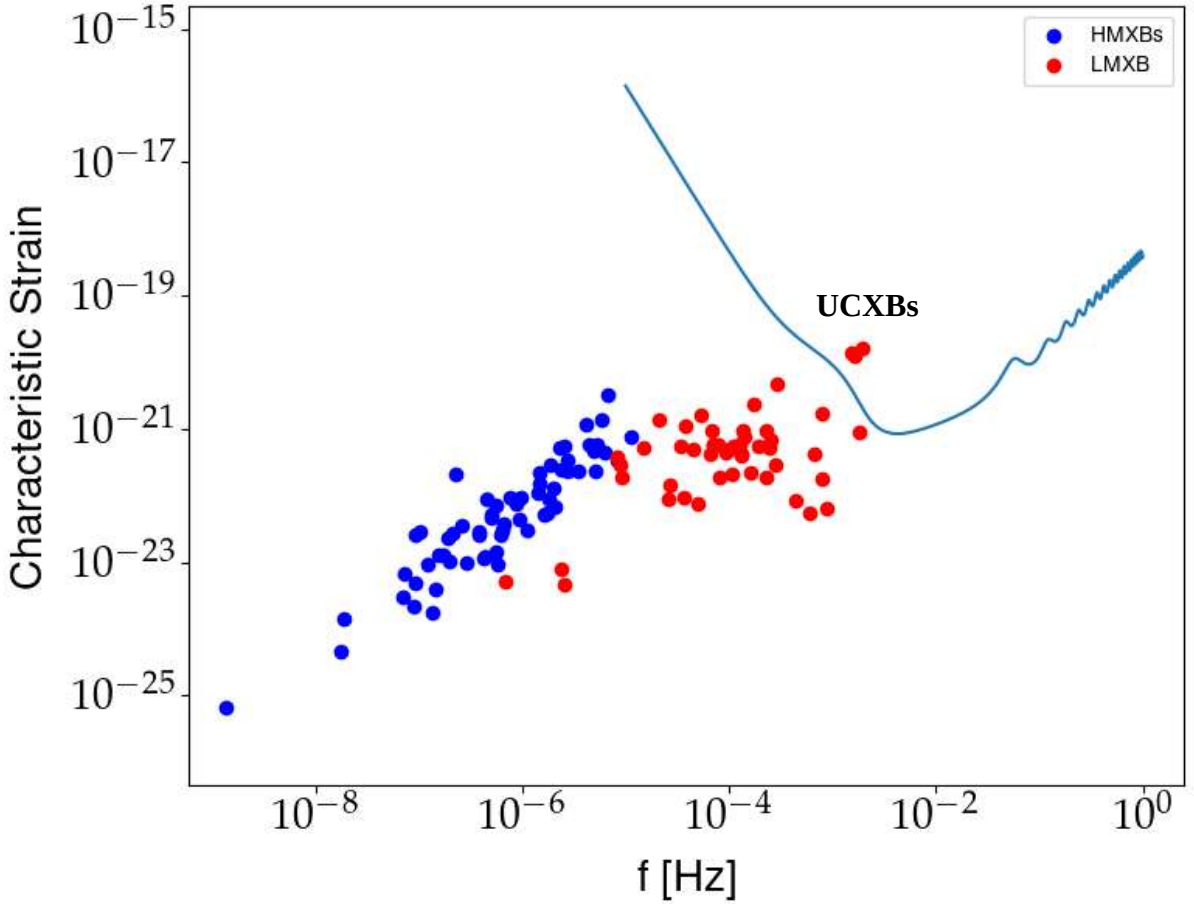


All XRBs



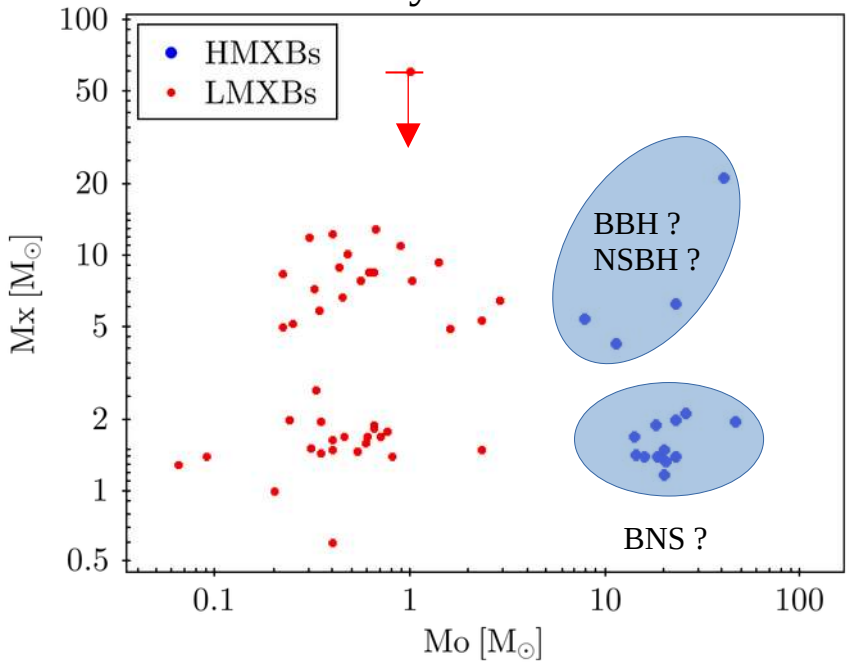


XRBs as GW emitters : LISA

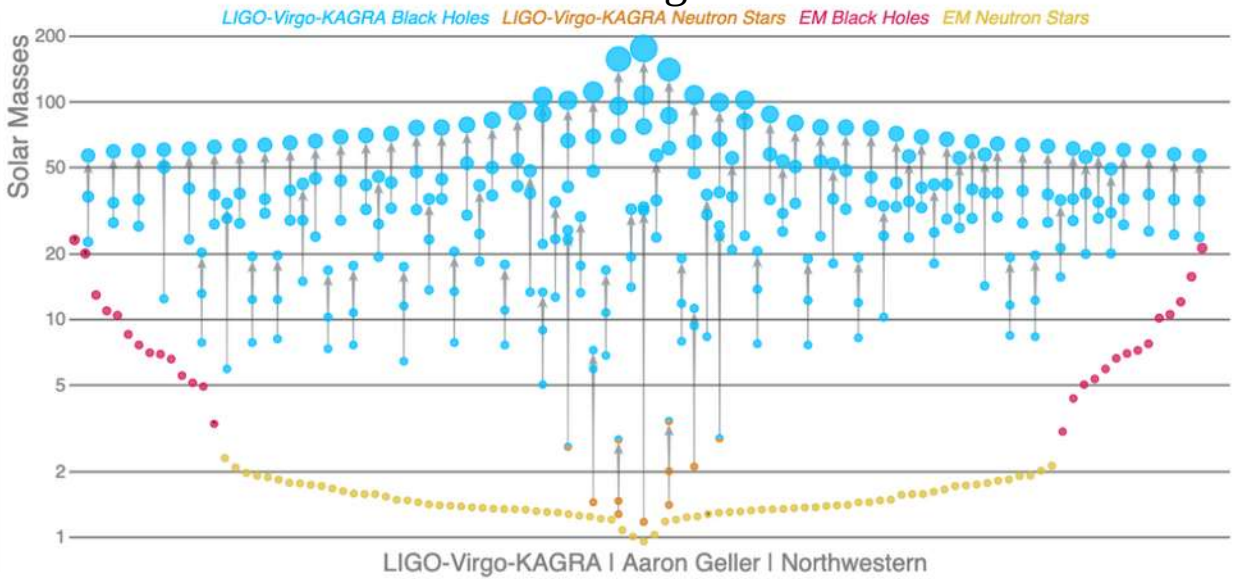


XRB systems vs. LVK GW progenitors

X-ray binaries



GW Mergers



→ Cyg X-1 : likely NSBH (7% survival after kick), maybe BBH in Hubble time (Neijssel+2021)

→ Galactic XRBs vs. far away GW mergers : impact of metallicity ?

Take away messages & questions

→ The number of known XRBs in the Galaxy is **500+**.

→ BH in LMXBs : likely biased towards lower BH masses (Jonker+2021).
  → “hidden” population of BH LMXBs with masses akin to GW BBHs ?

→ GW BBH selection effects + low number of known BH HMXBs : maybe compatible (Fishbach+2022)

→ Different galaxies = different histories: low metallicity allows for Chemically Homogeneous Evolution.
  → up to 3/4 of the GW BBHs coming from isolated binary evolution (Riley+2021) ?

Selection effects ?
Use the caracteristics of XRBs in the Milky Way to calibrate pop synth models ?
Synergy with binary evolution simulations ?
How does the MW compares to other galaxies ?
Can we probe older populations of massive stars in binaries ?

Attendance reward:

ATLAS Comet
Ask me during the coffee breaks for full picture !