Searching Extragalactic X-ray transients in the Chandra Catalog 2.0

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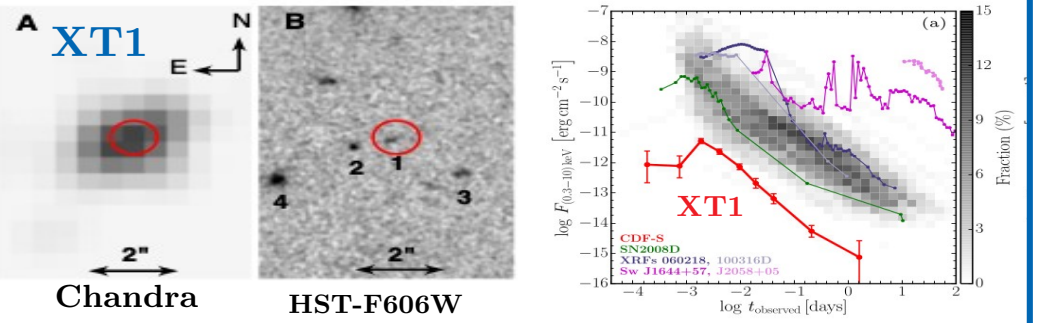
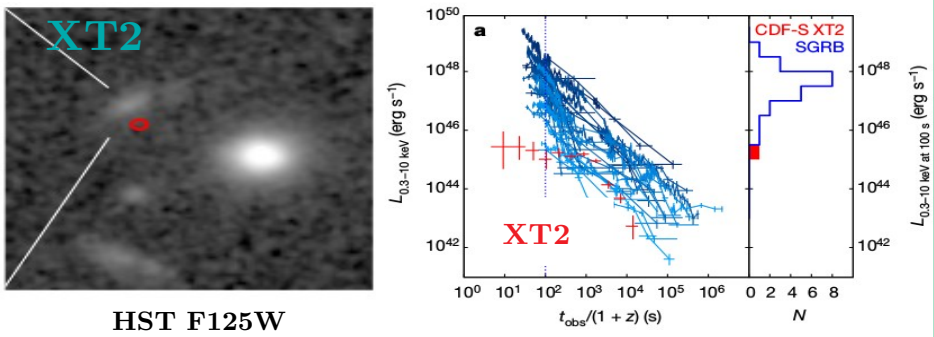
We report the detection of 8 candidate extragalactic fast X-ray transients (FXRTs) from a parent sample of 214,701 sources in the Chandra Source Catalog Release 2.0 (160.96 Ms over 592.4 deg^2). We characterize their X-ray light curves and spectra. **Four FXRTs show a plateau in their light curves and a softening trend in their HR, implying a possible relation with GRBs.** We compute the local event rates, and investigate a possible relation with a central engine scenario, driven by a proto-magnetar emission.

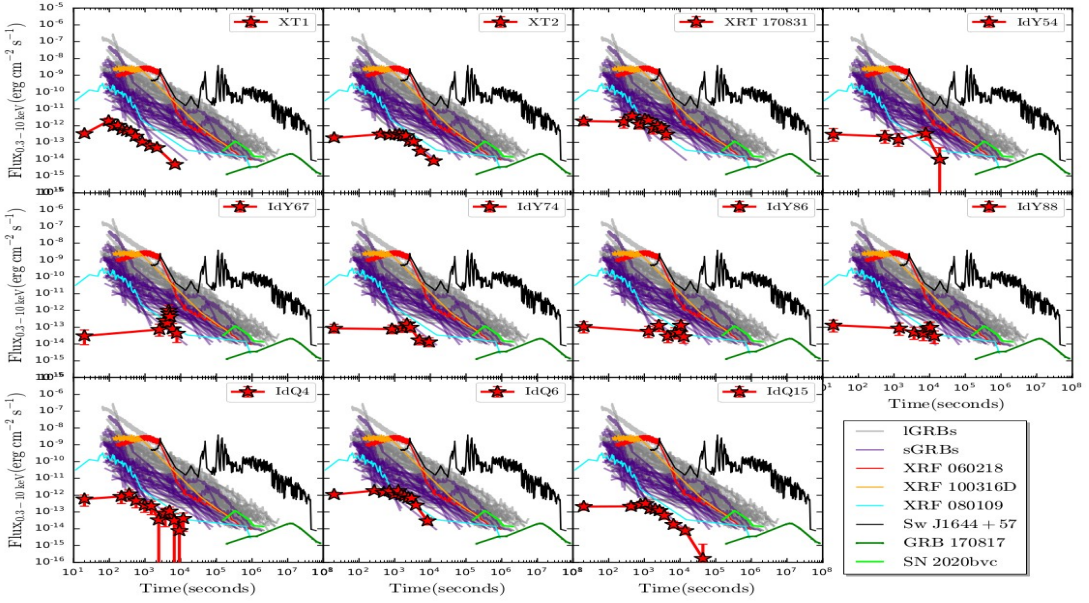
MOTIVATION



XT1 was discovered in the CDF-S, and its X-ray light curve shows a fast rise. It could be related a optically weak GRB or beamed TDE (IMBH-WD) at z_{ph}=2.2. **Bauer F. E., et al., 2017, MNRAS, 467, 4841.**



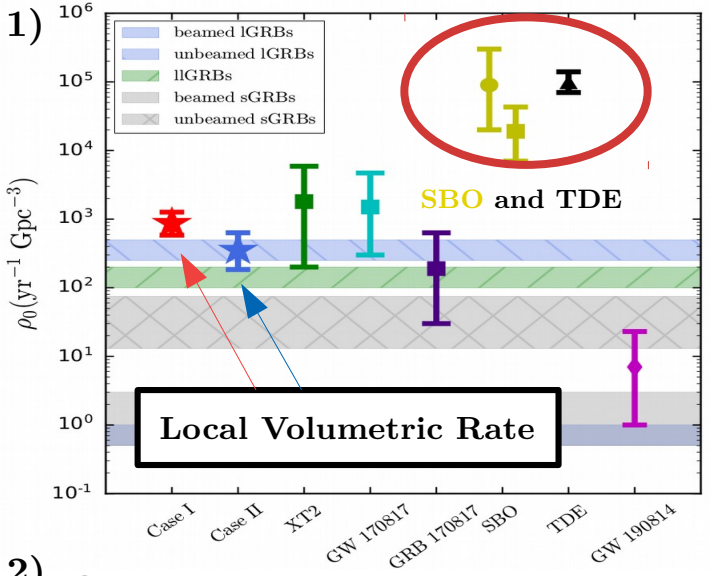
XT2 also was discovered in the CDF-S, and its X-ray light curve shows a plateau (~10^3s), followed by a power-law decay, implying a sGRB (z_{sp}=0.74). **Xue Y. Q., et al., 2019, Nature, 568, 198.**



Given the potential shared traits between FXRTs like XT1 and XT2 and GRBs, it is crucial to understand how they might relate. To enlarge the sample of XT1 and XT2-like objects, we extended a search through the entire CSC2.0.

We find 8 candidate extragalactic fast X-ray transients (FXRTs)

1)



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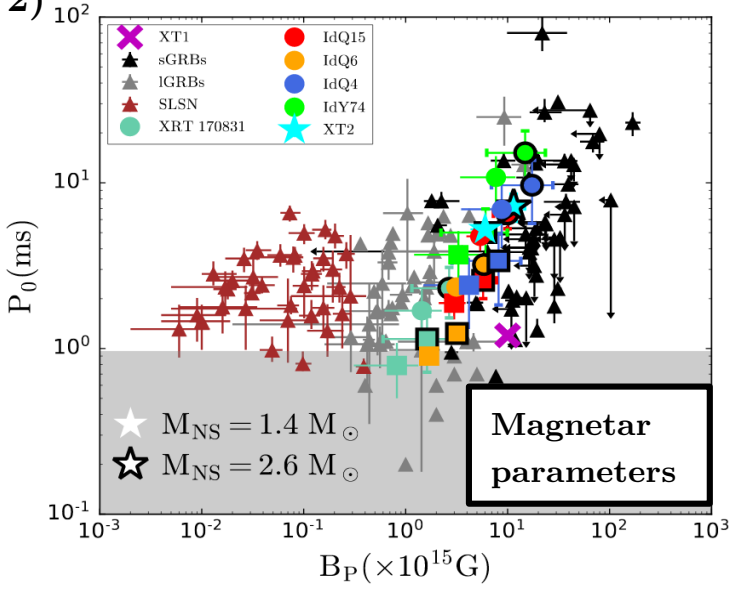
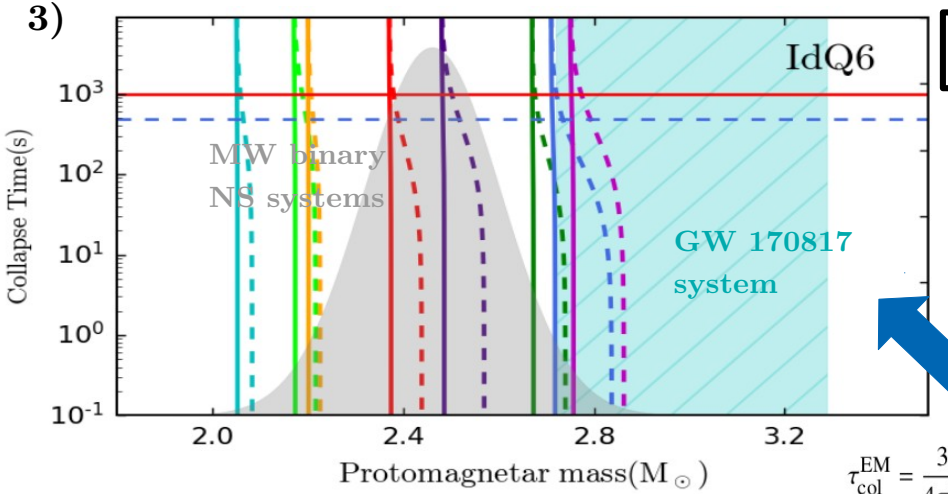


3)



Constraining EoSs

$$\tau_{\mathrm{col}}^{\mathrm{EM}} = \frac{3}{4\pi^2}\frac{c^3 I}{B_P^2 R^6}\left[\left(\frac{M_p - M_{\mathrm{TOV}}}{\hat{\alpha} M_{\mathrm{TOV}}}\right)^{2/\hat{\beta}} - P_0^2\right].$$

CONCLUSIONS

- Local volumetric rate of FXRTs appears to be distinct from TDE and SBO, but consistent with other transients such as GRBs, and GW/GRB 170817.
- Initial rotational period (P_0) and magnetic field (B_P) estimates match well with GRB population.
- The rotational energy lose rates of magnetars, based on fits to the X-ray light curves, provide constraints on their EoSs. The EoSs that fall inside the mass distributions must have M_{TOV}>2.3-2.4 $M_\odot$.

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