

The Chandra Survey of the LMC: investigating the metallicity effect on the formation and evolution of young X-ray binaries



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MOTIVATION

- Constrain the faint end of the XRB Xluminosity functions (XLF); rav Deepest XLFs ever recorded.
- Address the XLF evolution in the 10– 100 Myr range for different metallicites, and the role of the propeller effect.
- Study the X-ray source populations associated with different stellar generations (using the well-known star-formation history of the LMC).
- Directly measure their formation efficiency as a function of age and metallicity.
- Constrain parameters relevant to the formation and evolution of XRB by comparing their population synthesis models.



SURVEY DESCRIPTION

- Chandra Cycle 24 VLP (PI V. Antoniou).
- •10 fields (DF01-DF10; Fig. 1a) sampling young (10-100 Myr) stellar populations matching the similardepth survey of the SMC (Antoniou et al. 2019).
- •Total exposure: 1.0 Ms (100 ks each field).
- Limiting luminosity : ~2 x 10³² erg/s (0.5 – 7 keV).

SURVEY STATUS

 2 observations for DF06 (36.57 ks); 1 observation for DF07 (24.76 ks); 3 observations for DF09 (39.39 ks; Fig. 2)

> Μo yr deg. 2

• 5 scheduled observations for 2023.



Fig. 1 (a) MCELS H α image with the survey fields color coded according to the age of the predominant stellar population based on the SFHs: Red=6.3 Myr; Yellow= 12.6 Myr; **Blue**=50.1 Myr. The existing long (\gtrsim 300 ks) *Chandra* observations are shown in black squares. The known HMXBs and X-ray pulsars are shown as magenta and green points, respectively.

(b) Simulated relative spatial HMXB density ($Lx > 10^{32} \text{ erg s}^{-1}$) based on the LMC SFH (Harris & Zaritsky 2009) and the dart_board population synthesis model of Andrews et al. (2018).

FIRST RESULTS





Fig. 2 Exposure corrected images (0.5 – 7 keV) of the DF06 and DF07 (top) and DF09 (bottom) fields. We detected 140 and 69 X-ray sources, respectively.



Fig. 3 V vs. B-V color-magnitude diagram of the optical counterparts within 1.5" around each X-ray source (29 in DF06-07 and 23 in DF09, shown in blue and red, respectively).