A Very Large Program with *Chandra*: 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 X-ray binaries (XRB) X-ray luminosity functions (XLF); 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 [1]).
- Directly measure the formation efficiency of high-mass XRBs as a function of age and metallicity.
- Constrain parameters relevant to the formation and evolution of XRBs by comparing with population synthesis models.

SURVEY DESCRIPTION

- Chandra Cycle 24 Very Large Project (VLP, PI V. Antoniou).
- 10 deep fields (DFs) sampling young (10 – 100 Myr) stellar populations matching the similar-depth survey of the SMC [2].
- Total exposure: 1.0 Ms (10 fields x 100 ks).
- Limiting $L_X \approx 2 \times 10^{32}$ erg/s (broad-band; 0.5 – 7 keV).

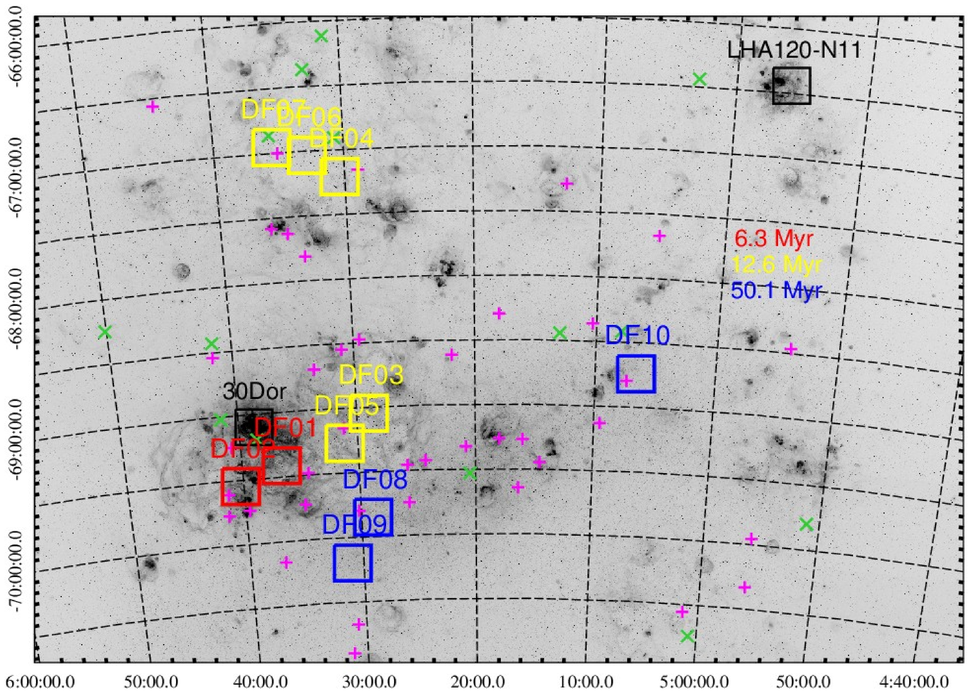
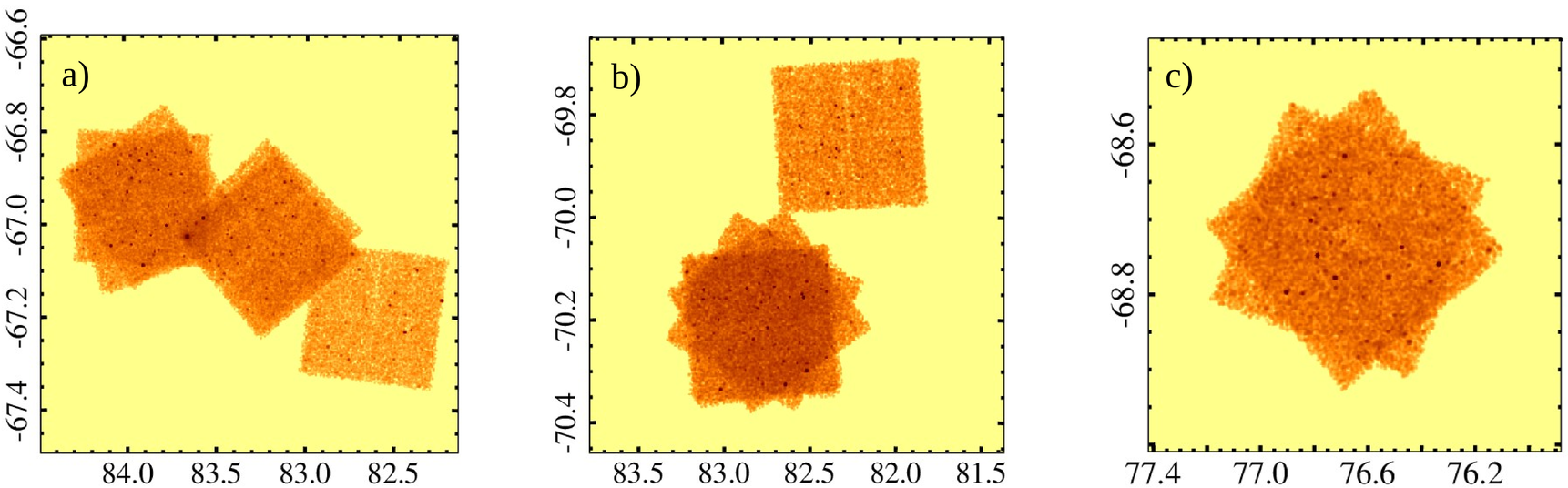


Fig.1 MCELS Hα image with the survey fields color coded according to the age of the predominant stellar population based on the SFHs: **6.3 Myr**; 12.6 Myr; **50.1 Myr**. The archival long ($\gtrsim$ 300 ks) observations are shown in black. The known HMXBs and X-ray pulsars [3] are shown as **magenta** and **green** points, respectively.

Fig.2 Exposure corrected smoothed broad-band images. **a)** Merged DF04 – DF06 – DF07; **b)** Merged DF08 – DF09; **c)** DF10.



SURVEY STATUS

- 1 observation for DF04 (24.59 ks)
- 3 observations for DF06 (66.16 ks)
- 3 observation for DF07 (83.03 ks)
- 1 observation for **DF08** (25.75 ks)
- 5 observations for **DF09** (91.57 ks)
- 2 observations for **DF10** (52.20 ks)

FIRST RESULTS

In the broad-band, we detected **300**, **179**, and **115** X-ray sources in the merged DF04 – DF06 – DF07, merged DF08 – DF09, and DF10 fields, respectively.

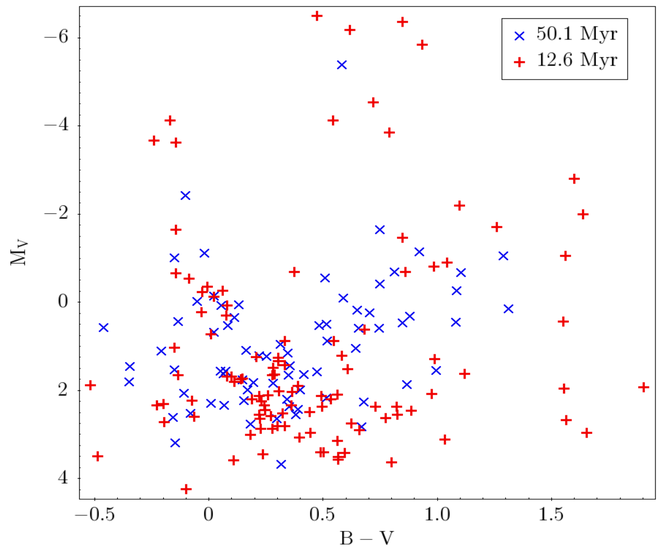


Fig.3 Color-magnitude diagram of the closest identified MCPS [4] optical matches within 1.5". The stellar populations in DF08 – DF10 (red crosses), and DF04, DF06 and DF07 (blue x symbols) have an age of 12.6 Myr and 50.1 Myr [1], respectively.

REFERENCES

[1] Harris J. & Zaritsky D. 2009, AJ, 138, 1243
[2] Antoniou V., et al. 2019, ApJ, 887, 20A
[3] Antoniou V. & Zezas A. 2016, MNRAS, 459, 528
[4] Zaritsky D., et al. 2004, AJ, 128, 1606