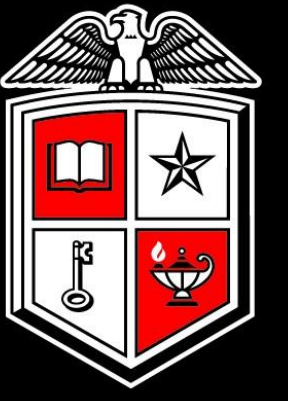


SSCOVaS: Survey for Studying Compact Objects and Variables Stars



TEXAS TECH UNIVERSITY™

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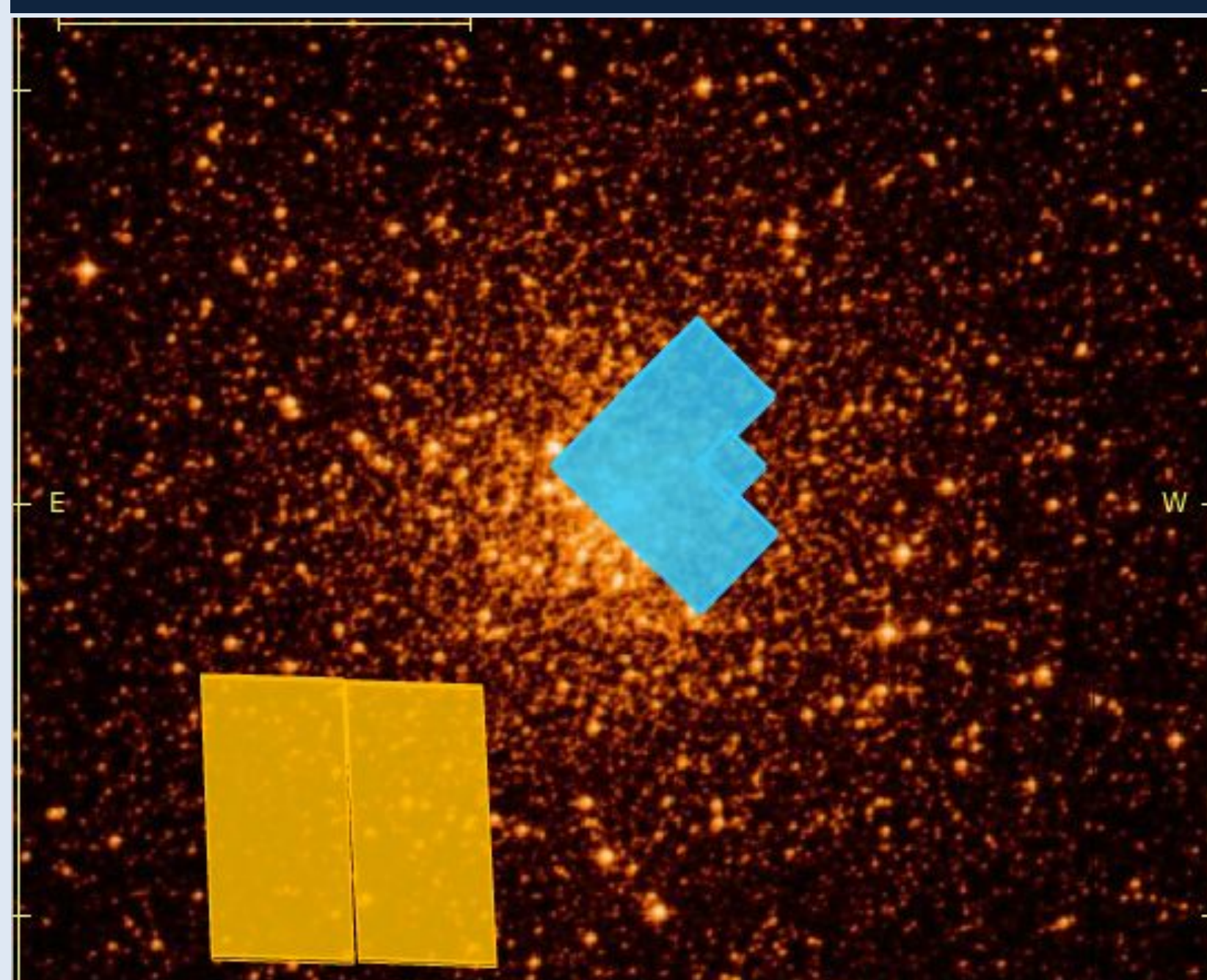
Abstract

Globular clusters (GCs) are very old group of stars. Their age and very dense stellar environment leads to a higher formation rate, compared to the Galactic field, of compact binaries (harboring black holes, neutron stars, and white dwarfs) in tight orbits. Of special interest are the Cataclysmic Variables (CVs), which are accreting white dwarfs from Hydrogen-rich companions. CVs deserve special attention as they are predicted to account for a large fraction of the compact binary population in GCs and can be used to test whether GCs are in fact the efficient factories of compact binaries that we think. **We present an ongoing survey which uses archival Hubble Space Telescope (HST) data to find and characterize the putative sizable population of CVs and compact binaries in 7 globular clusters**, and preliminary findings for the GC NGC 6397. **We were able to find a 1.96 day orbital period for a candidate redback.** That value corresponds to the longest orbital period for known redback candidates and confirmed systems in Galactic globular clusters and one of the few with a period longer than 1 day.

Goals

- First survey not biased to X-rays for faint CVs.
- Measure orbital periods of CVs.
- Identify counterparts to recently detected Chandra X-ray and radio sources.

SSCoVas



- 7 Globular Clusters
 - Core-collapsed (3)
 - Non-CC (4)
- Survey core and outskirts of GCs
- All with Chandra obs
- H α observation (6)

Multiwavelength Obs

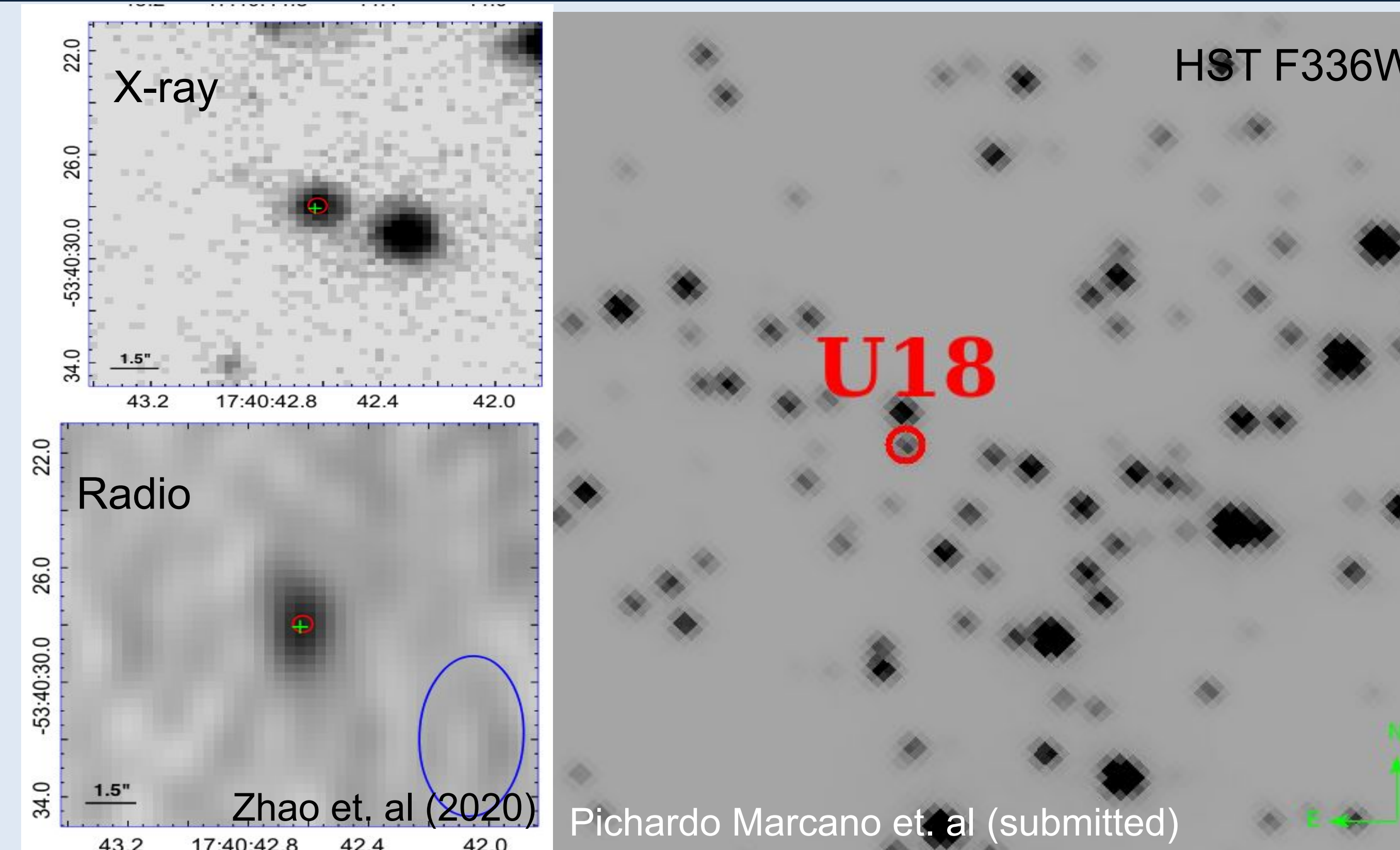


Fig. 3. X-ray (0.5-7 keV), radio (5.5 GHz) (Zhao et. al 2020) and optical (F336W) of the know X-ray source and candidate MSP U18 (Pichardo Marcano et. al submitted).

1.96 d Orbital Period

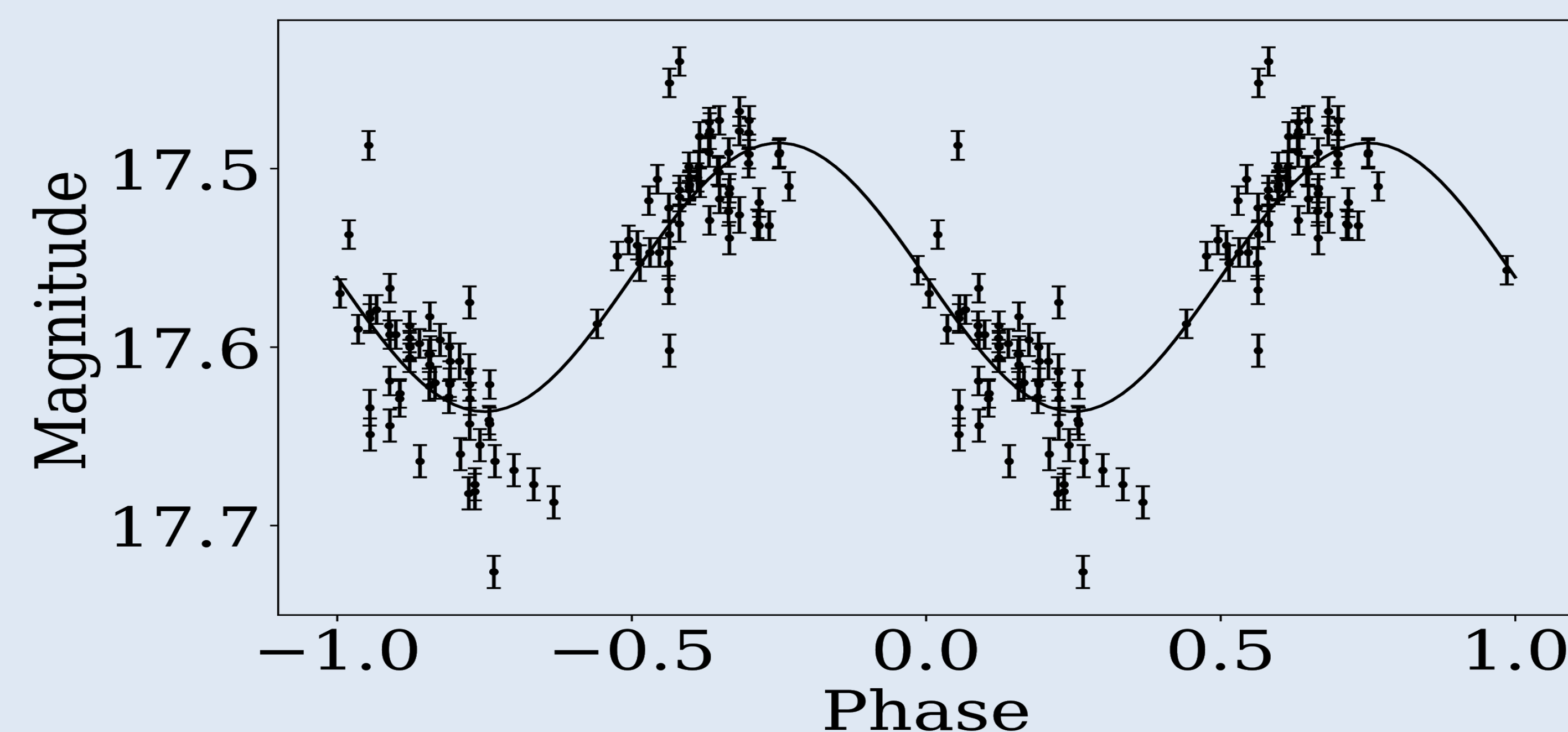


Fig. 4. Phased-folded light-curve light for U18. Folded at the found orbital period of 1.96 days (Pichardo Marcano et. al submitted).

MSP candidate

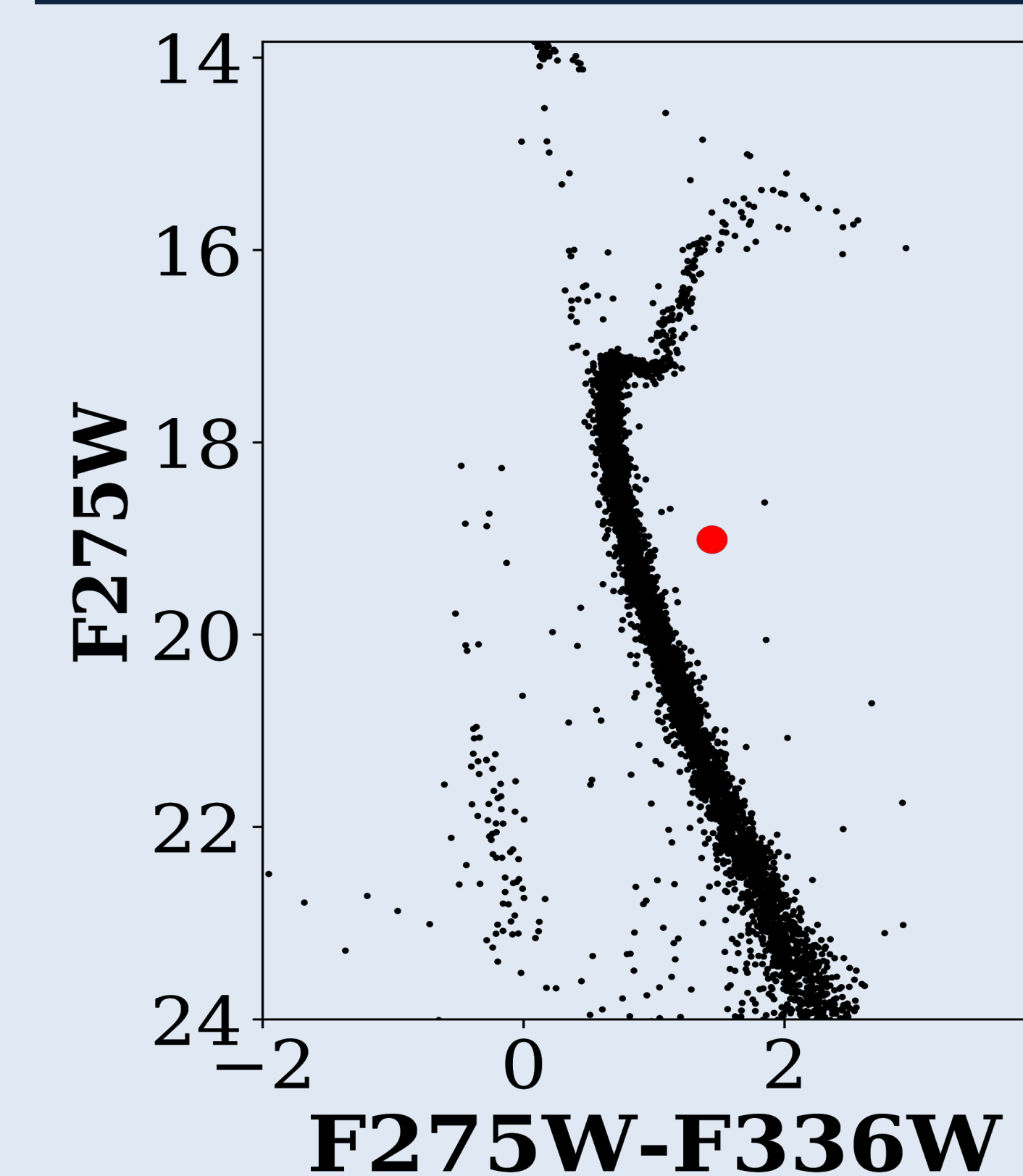


Fig. 5. The red dot represents the position of the optical counterpart for the redback candidate U18. Data from the HUGS catalogue. (Piotto et al. 2015, Nardiello et al. 2018)

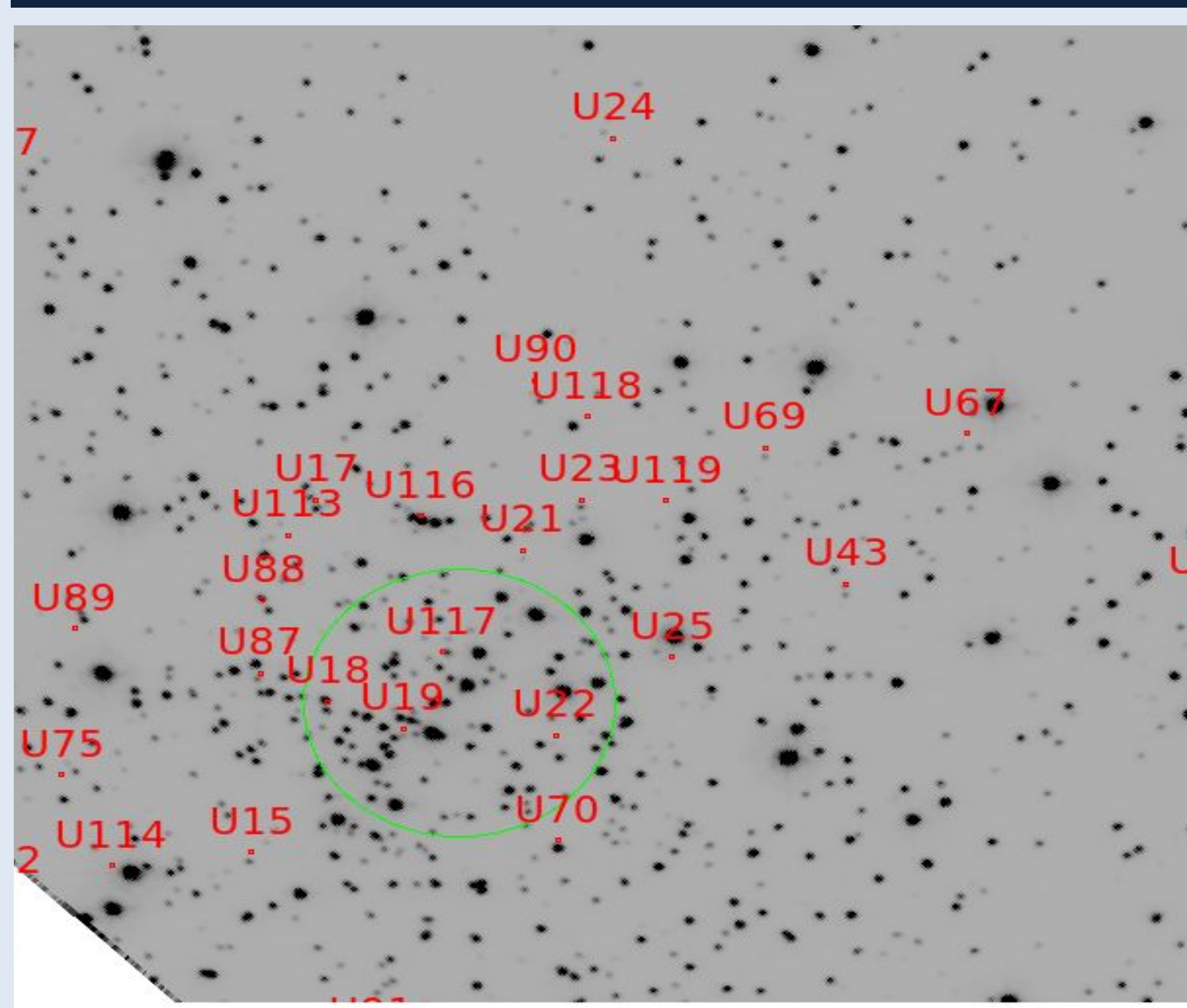
Results & Future Work

- We were able to found the orbital period of the redback candidate U18
- We will construct light-curves for known X-ray & radio sources:
 - 4 CVs in the HST FoV (NGC 6397)
- Construct CMD to identify good candidates for follow up
- 6 other clusters with good HST archival data

References

- [1] Zhao, Y., Heinke, C. O., Tudor, V., et al. (2020) "The MAVERIC survey: a hidden pulsar and a black hole candidate in ATCA radio imaging of the globular cluster NGC 6397," MNRAS, 493, 6033-6049
- [2] Pichardo Marcano, M., Rivera Sandoval, L.E., et al. (submitted) "A 2 day orbital period for a redback millisecond pulsar candidate in the globular cluster NGC 6397"
- [3] Piotto, G., Milone, A. P., Bedin, L. R., et al. (2015) "The Hubble Space Telescope UV Legacy Survey of Galactic Globular Clusters. I. Overview of the Project and Detection of Multiple Stellar Populations," AJ, 149, 91
- [4] Nardiello, D., Libralato, M., Piotto, G., et al. (2018) "The Hubble Space Telescope UV Legacy Survey of Galactic Globular Clusters - XVII. Public Catalogue Release," MNRAS, 481, 3382-3393

NGC 6397



- WFPC-2
- March-April 2005:
 - 126 orbits
 - F814W, F606W and F336W
- Exp time: 500-700 s.

Fig. 2. HST image of the core with known X-ray sources.