



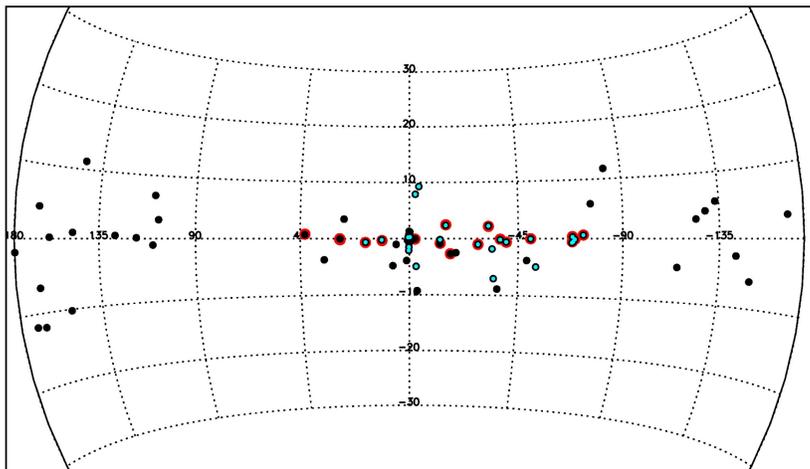
ChaMPlane: The Chandra Multiwavelength Plane Survey

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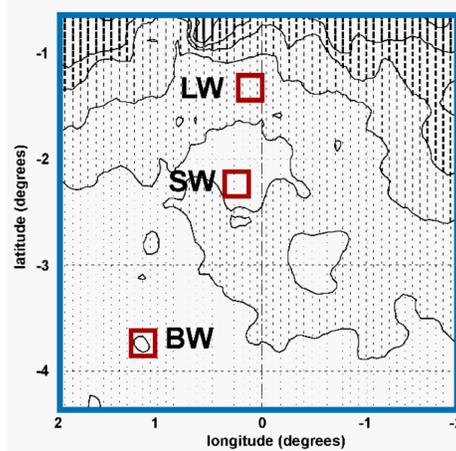


The Chandra Multiwavelength Plane Survey (ChaMPlane) is designed to identify the point X-ray sources discovered by the **Chandra** X-ray Observatory in the Galactic Plane and in particular in the Galactic Center [1]. Based on a multiwavelength dataset, we aim to identify peculiar Galactic populations of objects such as accreting white dwarfs, neutron stars and black holes in order to study the distribution and the evolution of those populations.

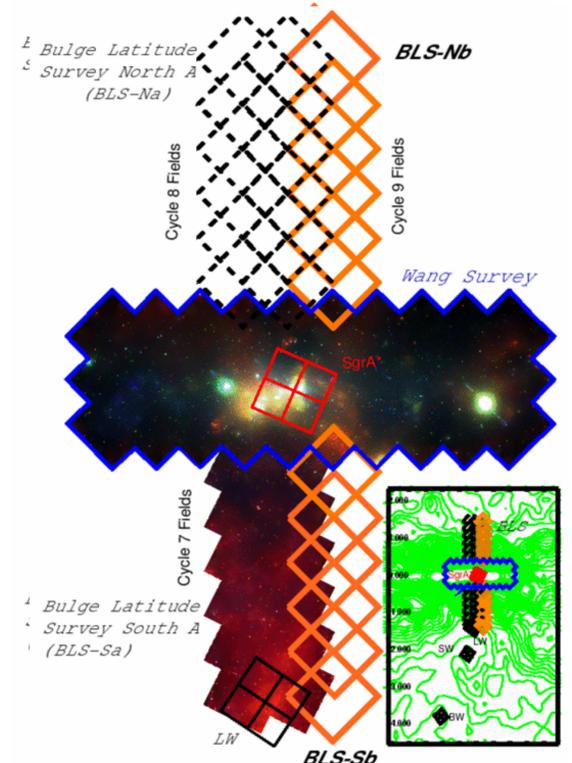
The X-ray survey has now extended through 10 years of Chandra data. 193 pointings were processed specifically in order to produce a catalog of serendipitous sources [2]. We obtained **optical imaging** data for 74 fields (Mosaic @ CTIO 4m, see [3]), and we are now conducting a follow-up **spectroscopy** and **near-infrared imaging** (ISPI @ CTIO 4m) program in order to detect counterparts to the X-ray sources and identify their nature (latest observations performed in the summer 2009 and being processed). We also focus on the Galactic bulge with the **Bulge Latitude Survey** (BLS) and deep observations of 3 **low extinction windows** at 1.4° (Limiting Window), 2° (Stanek's Window) and 4° (Baade's Window) below the Galactic Center.



ChaMPlane fields in Galactic coordinates. **Black dots**: fields observed in optical, **red dots**: fields observed in near-infrared, **blue dots**: multi-object spectroscopy performed for selected sources.



Zoom on the low extinction windows



The Bulge Latitude Survey (3°x1°) Completed in 2009 in X-ray and near-infrared

X-ray
Chandra ACIS-I -S
Latitude $|b| < 12^\circ$
Exposure time > 20 ks
(AO1-10, ~295 obsids)

Optical (V, R, I, H α)
74 pointings
with Mosaic @ CTIO 4m
(2001-2009)

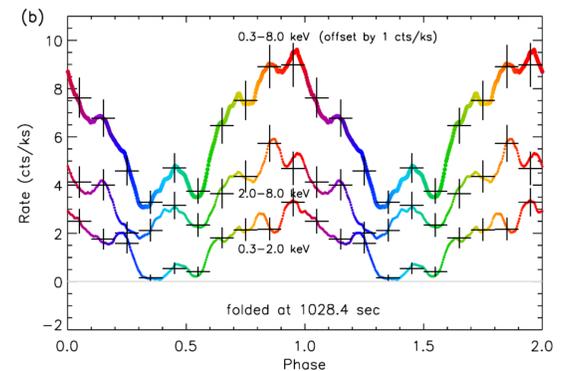
Near infrared (J, H, K)
19 pointings with ISPI @ CTIO 4m
(2007-2009)

Multi-objects spectroscopy
25 pointings Hydra @ CTIO 4m
(2004-2009)

Chandra Discovery of an Intermediate Polar in Baade's Window

Hong J, van den Berg M, Laycock S, Grindlay JE, Zhao P, 2009, ApJ, 699, 1053

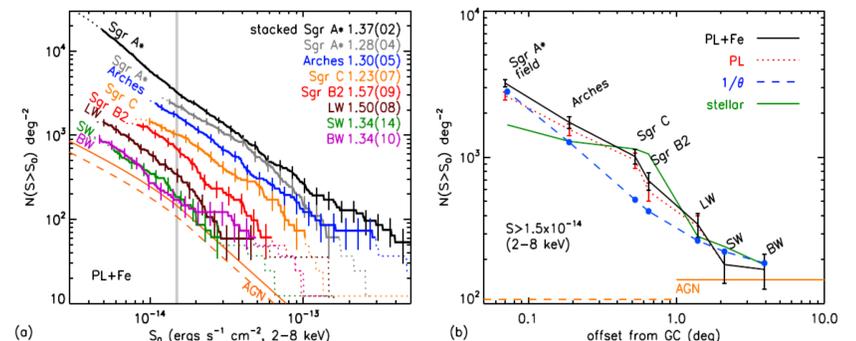
- In the Baade's window (BW), a low extinction region at about 4° south of the Galactic center
- Large X-ray modulations at a **period of 1028.4 s** in the 0.3–8 keV band
- **Hard X-ray spectrum** (photon index $\Gamma = 0.44 \pm 0.05$, $N_H = 1.5 \pm 1.0 \times 10^{21} \text{ cm}^{-2}$)
- **Faint** ($V \sim 22$), relatively **blue** ($B_0 - V_0 0.05$) counterpart with IMACS @ Magellan 6.5m
- **Bright Intermediate Polar** ($\sim 10^{33} \text{ erg s}^{-1}$ at 8 kpc) in the Galactic bulge



Radial Distribution of X-ray Point Sources near the Galactic Center

Hong J, van den Berg M, Grindlay JE, Laycock S, 2009, ApJ, accepted

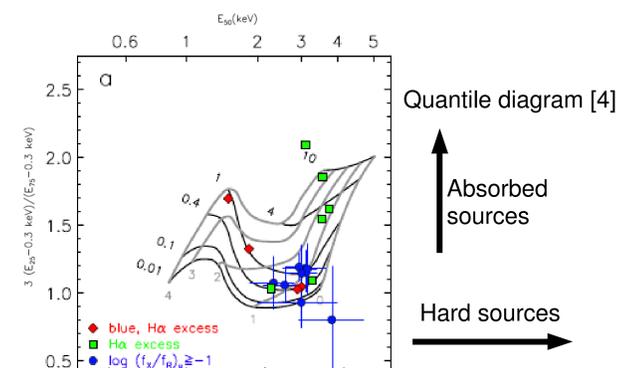
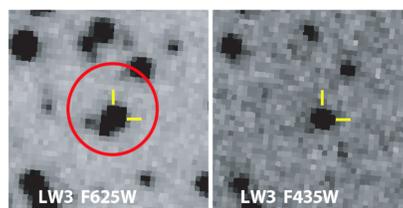
- **LogN-LogS** and **spatial distributions** of X-ray point sources in seven Galactic Bulge (GB) fields within 4 deg from the Galactic Center (GC)
- Highly **concentrated at the center**, more heavily than stellar distribution models
- X-ray luminosity and spectral properties support the idea that the most likely candidate is **magnetic cataclysmic variables (CVs)**, primarily **intermediate polars (IPs)**



ChaMPlane deep Galactic bulge survey. I. Faint accretion-driven binaries in the Limiting Window

van den Berg M, Hong J, Grindlay JE, 2009, ApJ, 700.1702

- Identification through **blue optical colors**, excess H α fluxes, and high X-ray to optical flux ratios
- **3 compact binaries**, probably cataclysmic variables
- 22 candidates accreting binaries
- Possibly a majority of **magnetic cataclysmic variables**



References

- [1] Grindlay et al. 2005 [2] Hong et al. 2005 [3] Zhao et al. 2005 [4] Hong et al. 2004
See also the website: <http://hea-www.harvard.edu/ChaMPlane/index.html>