

Low-Mass X-ray Binaries in NGC4342

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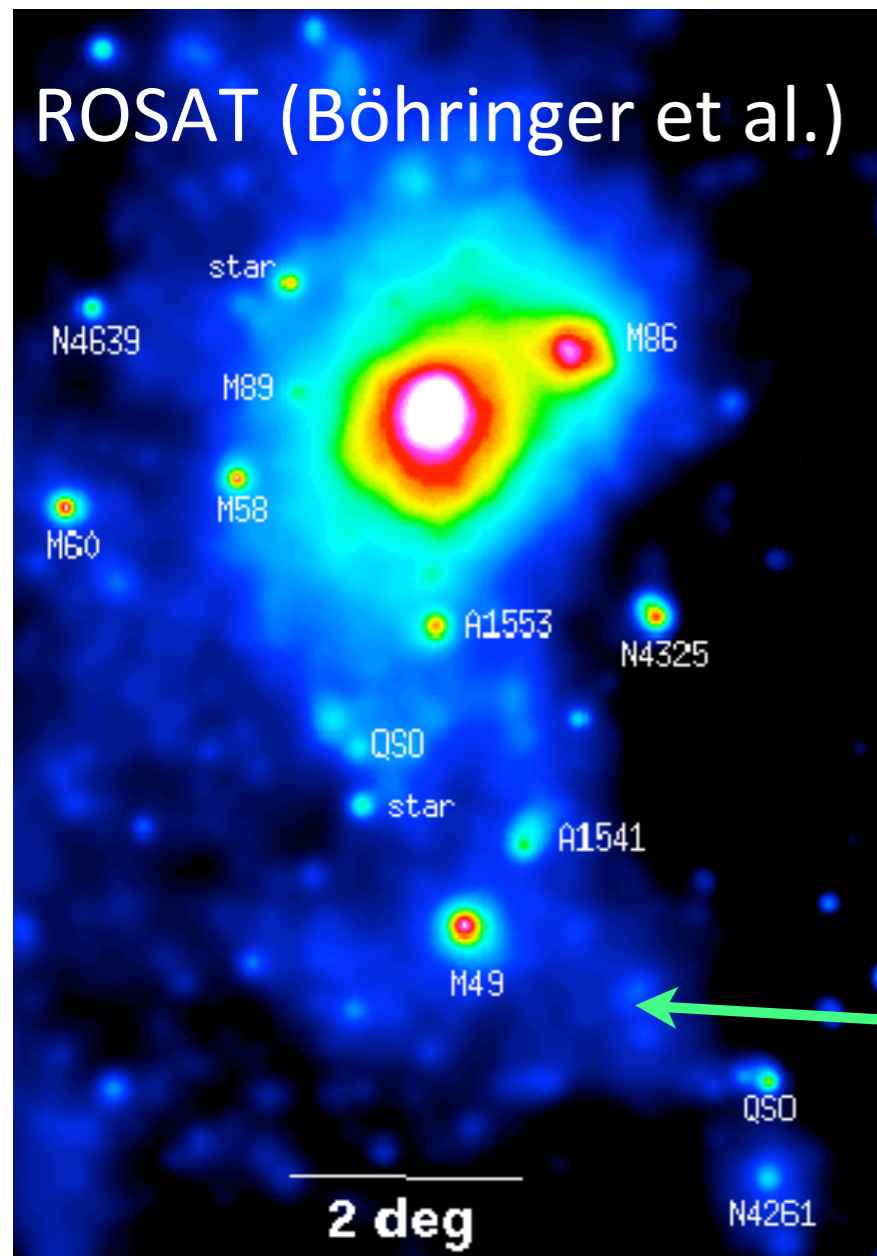
Einstein fellow

**W. Forman, I. Zhuravleva, C. Mihos, C. Blom, Z. Zhang,
R. Kraft, P. Harding, Q. Guo, Z. Li, E. Churazov, A. Vikhlinin,
R. Scott, P. Nulsen, S. Schindler, C. Jones**



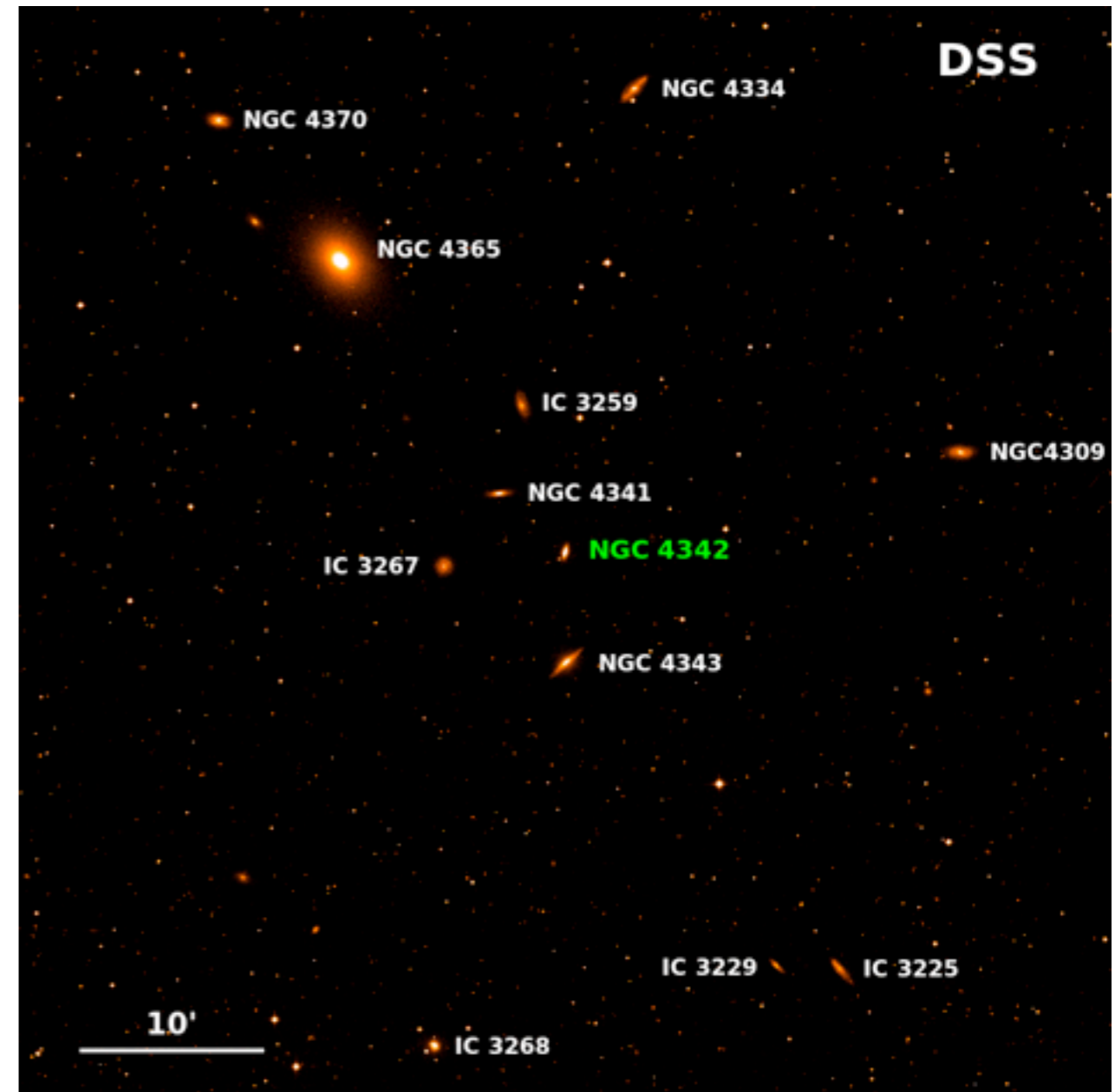
The environment of NGC4342

ROSAT



NGC4342

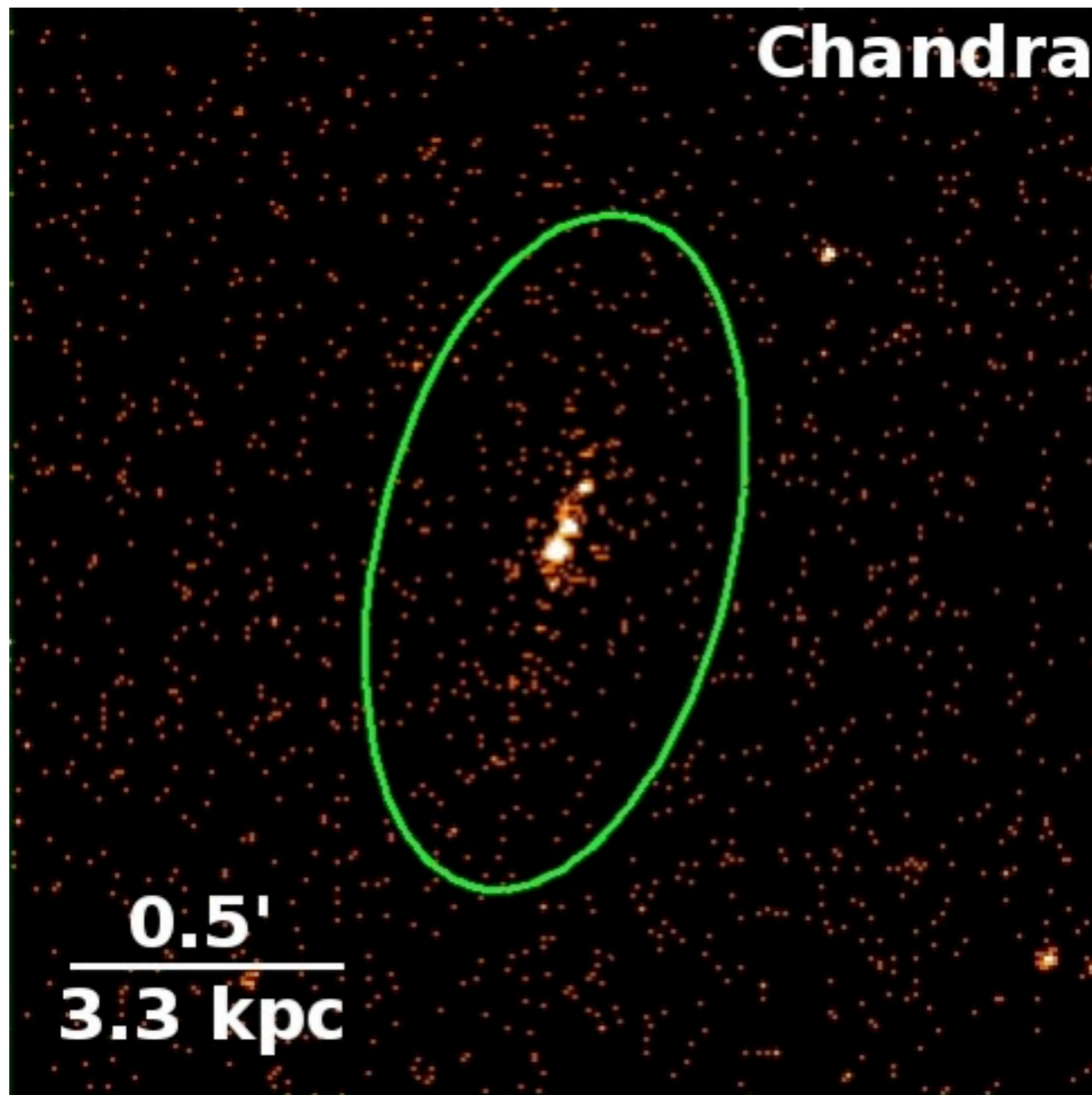
DSS



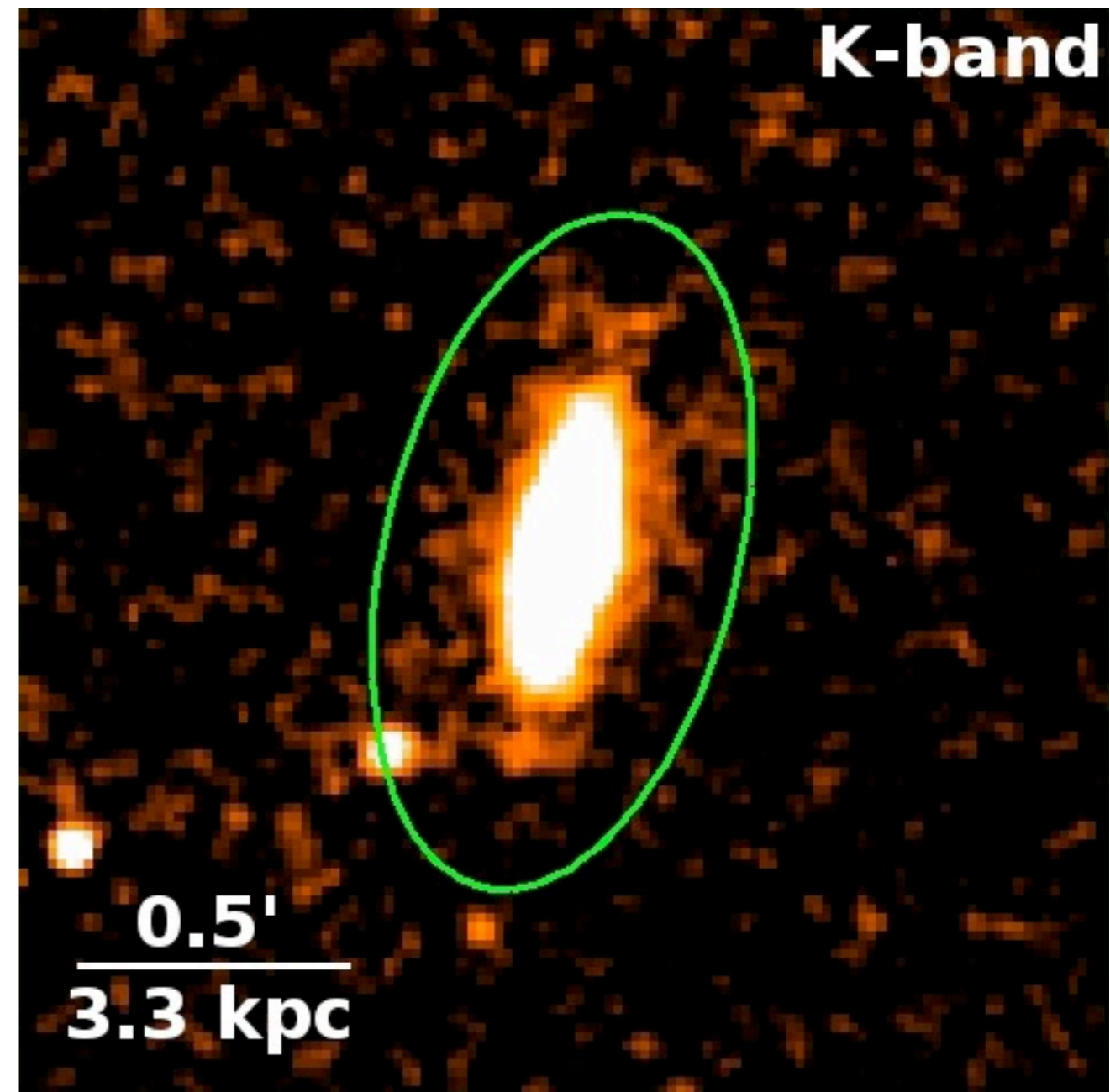
- NGC4342 is located in the outskirts of Virgo cluster
- In projection: 5.25 Mpc from M87, 0.5 Mpc from M49
- In projection: 130 kpc from the large galaxy NGC4365

NGC4342, a low-stellar mass galaxy

Chandra hard band



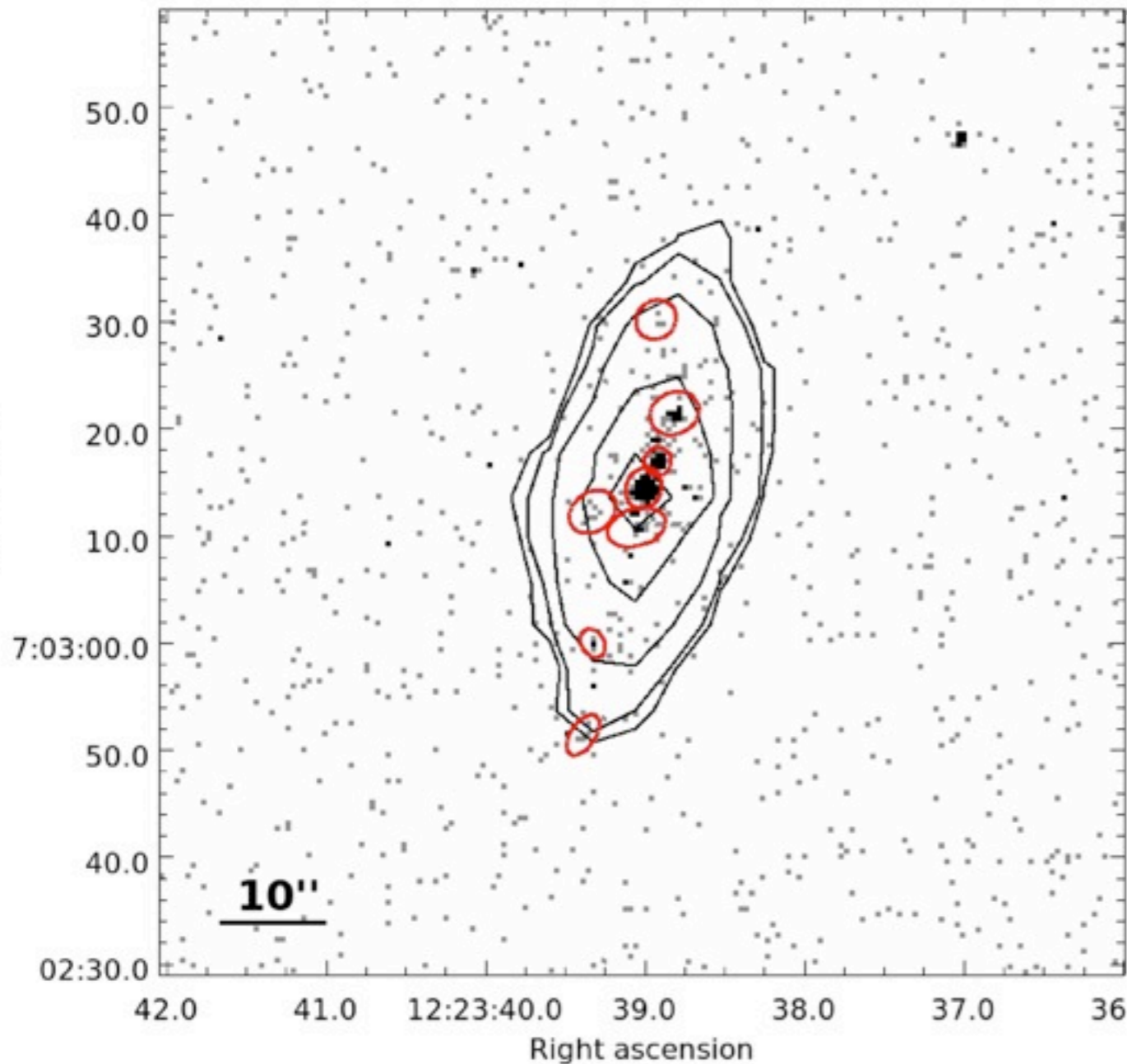
K-band



- Low stellar mass early-type galaxy: $M \sim 2.2 \times 10^{10} M_{\text{sun}}$
- Bright X-ray sources and unresolved X-ray emission

NGC4342, a low-stellar mass galaxy

Chandra hard band

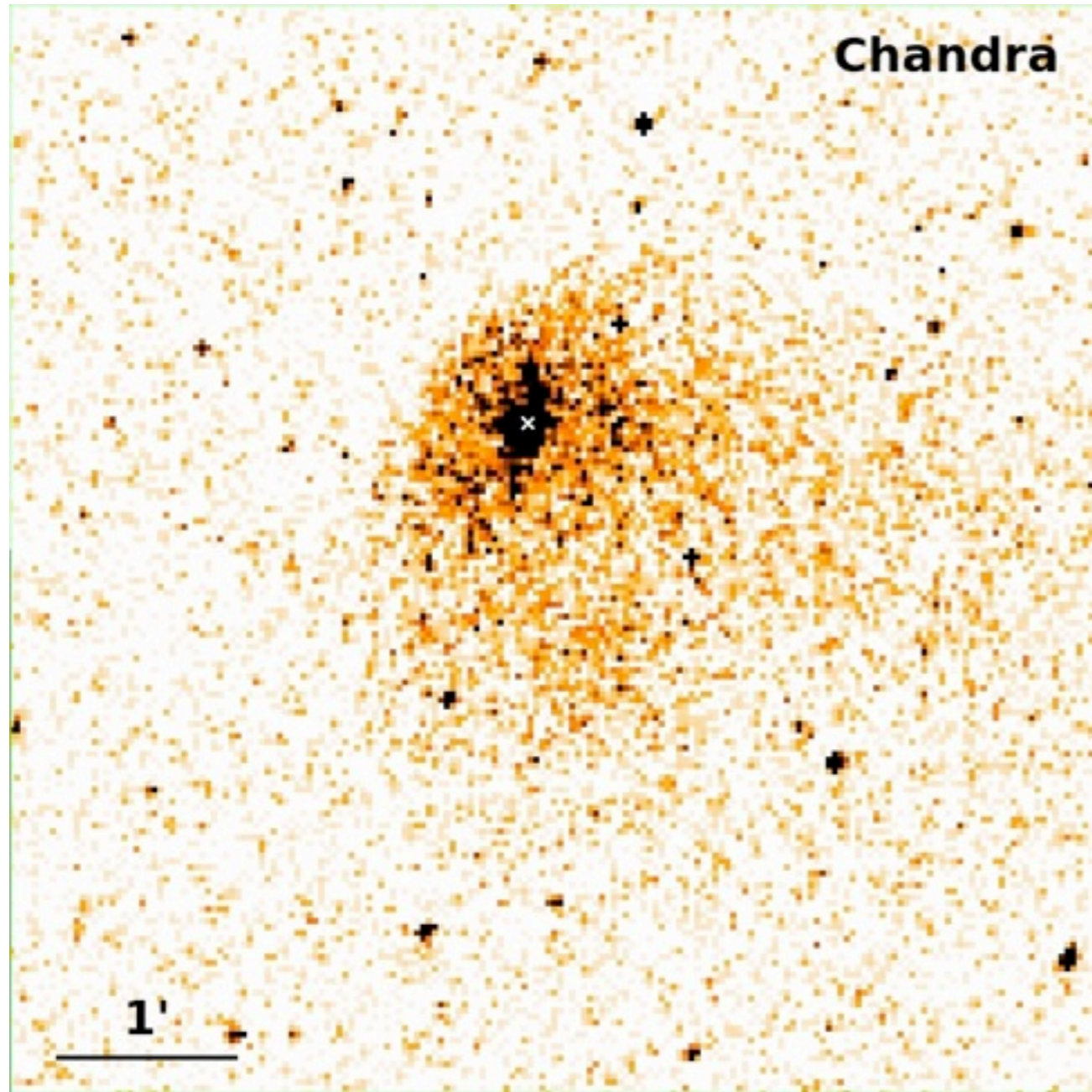


Red: detected point sources
Contours: K-band

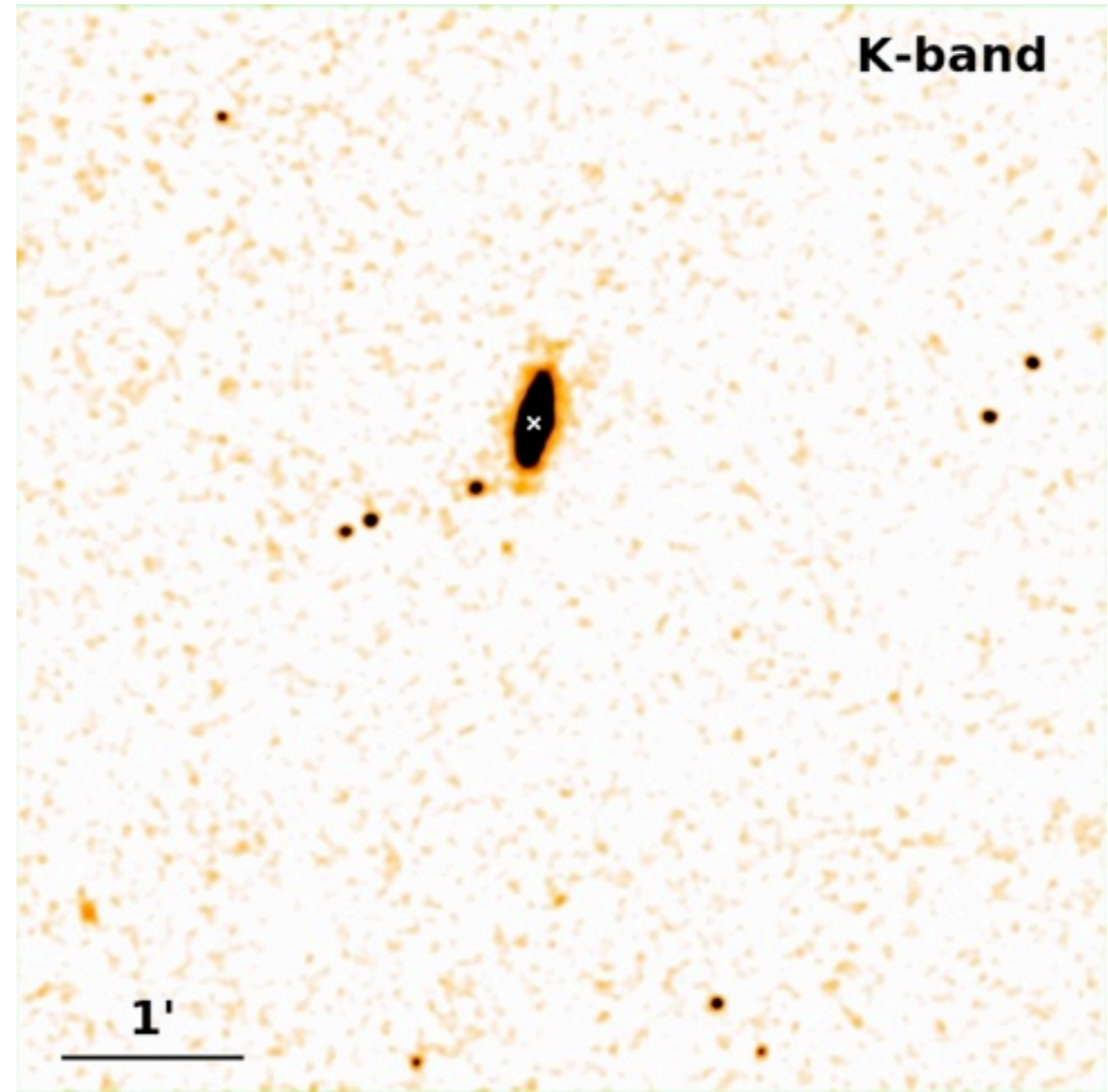
- ★ Bright central source
 - $L_X = 2.6 \times 10^{39}$ erg/s
 - $M_{BH} = 4.6 \times 10^8 M_{sun}$
(Cretton & van den Bosch 1998)
- ★ 7 non-central sources
 - mostly LMXBs
 - in agreement with Gilfanov (2004)
- ★ Unresolved emission
 - unresolved LMXBs
 - unresolved CVs and ABs

NGC4342, an X-ray gas-rich galaxy

Chandra soft band



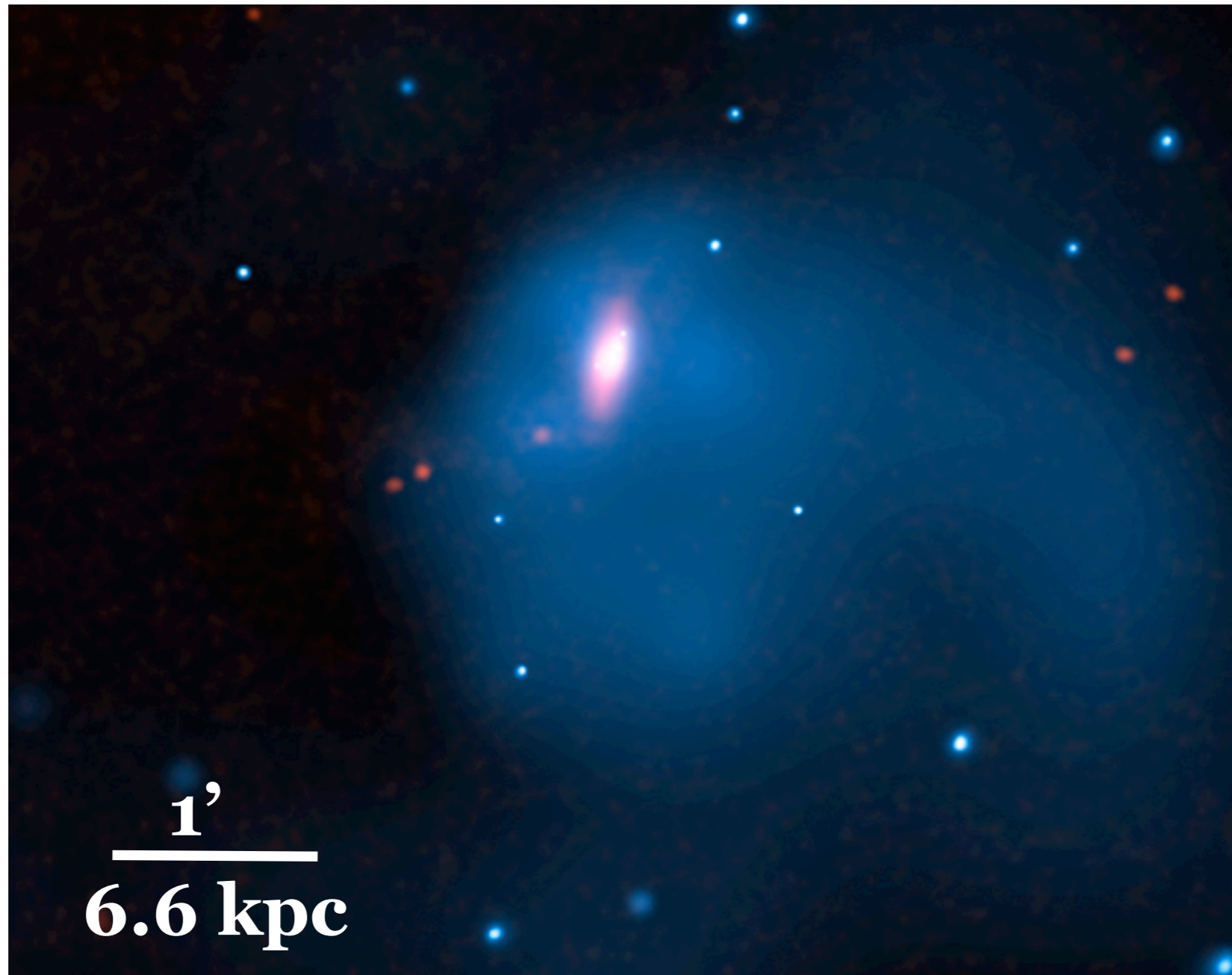
K-band



- Very bright X-ray corona from 0.5 keV gas
- Unusually X-ray luminous for its stellar mass
- Sharp surface brightness: contact discontinuity/cold front

NGC4342, an X-ray gas-rich galaxy

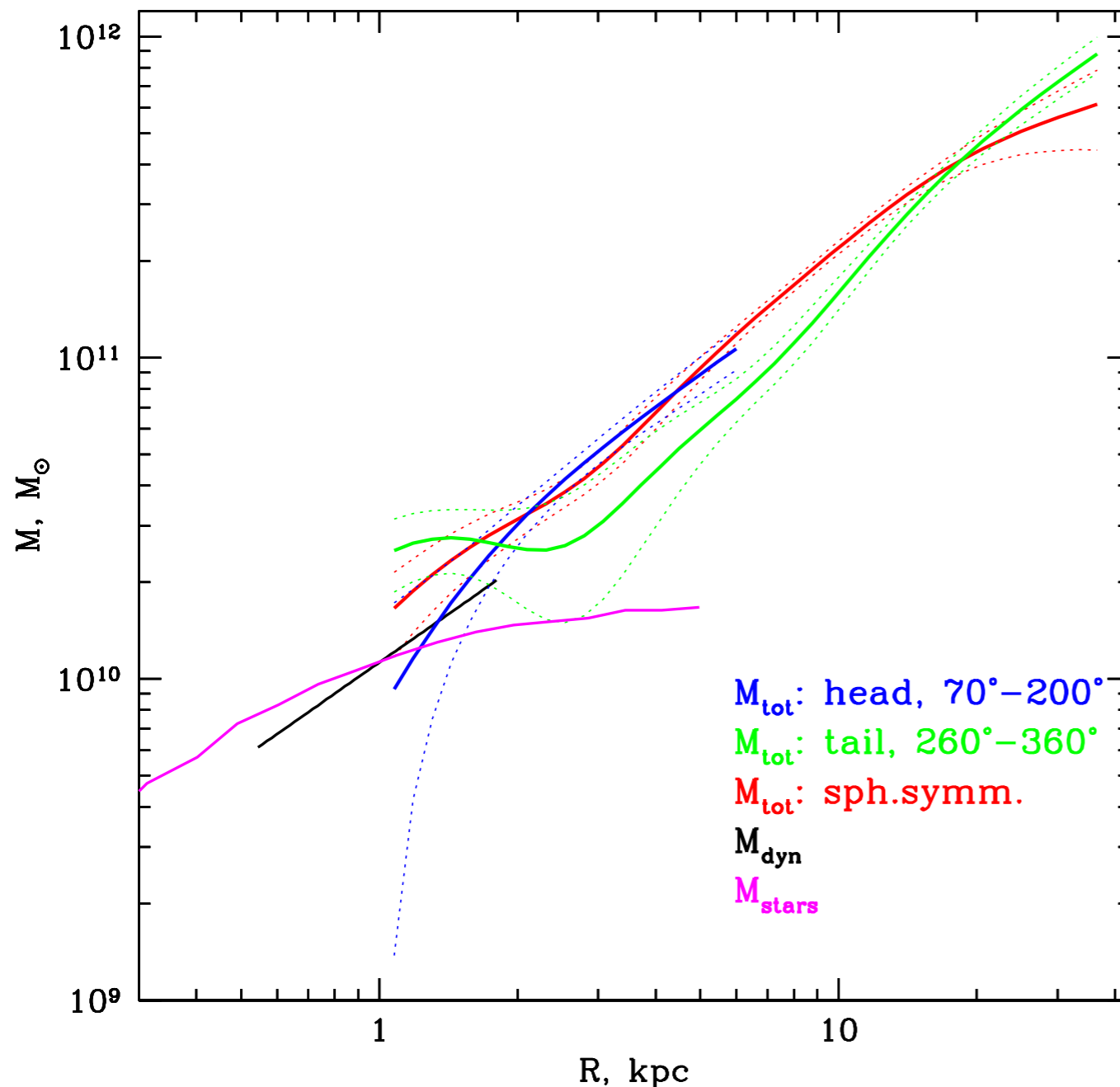
Soft band X-ray — K-band composite image



- Very bright X-ray corona from 0.5 keV gas
- Unusually X-ray luminous for its stellar mass
- Sharp surface brightness: contact discontinuity/cold front

Gravitating mass profile of NGC4342

- ★ NGC4342 is a low stellar mass galaxy
- ★ Gravitating mass assuming hydrostatic equilibrium
- ★ NGC4342 has an extended dark matter halo!



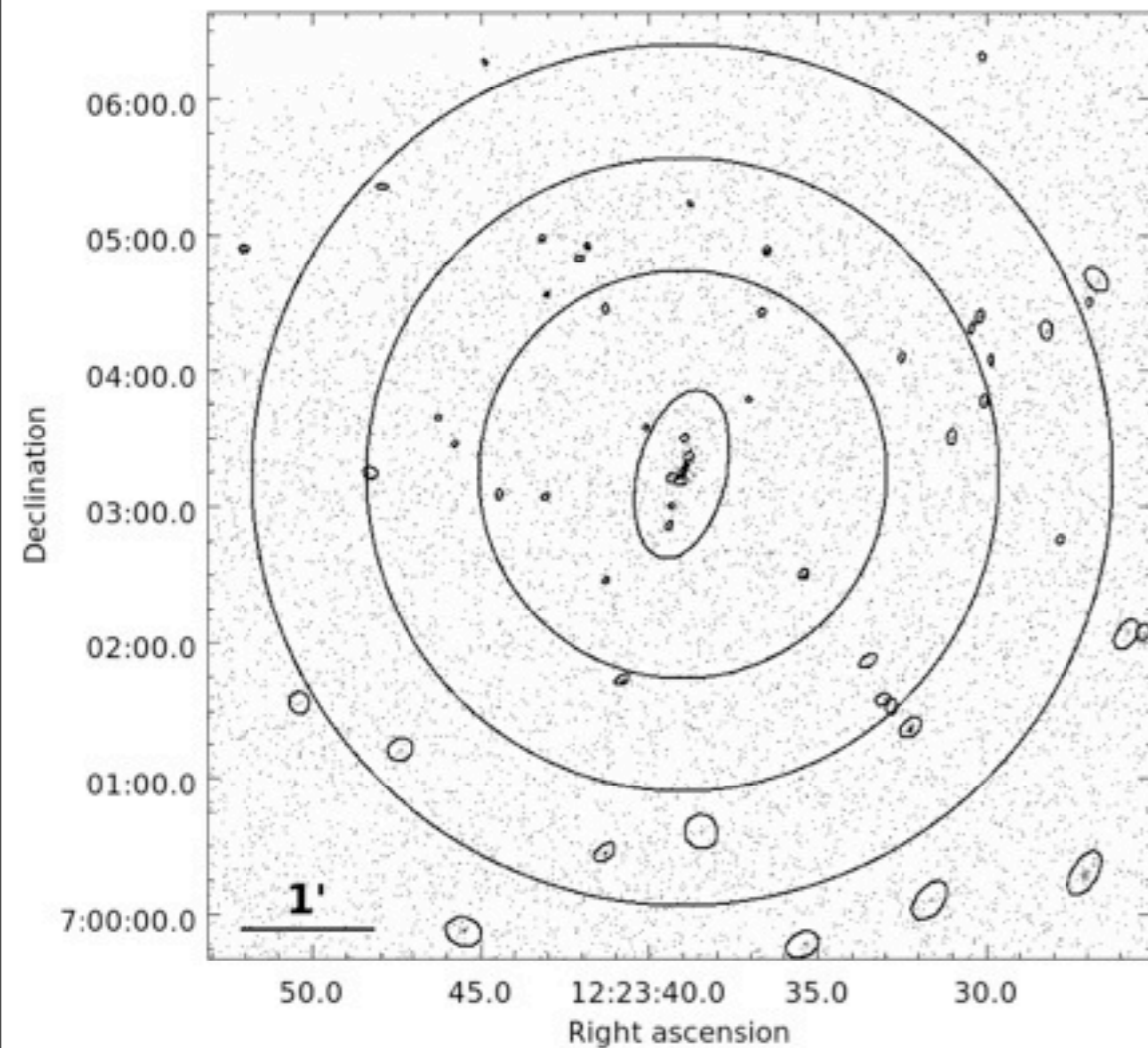
**Total gravitating
mass exceeds
stellar mass!**

**At 10 kpc:
(1.4-2.3) x 10¹¹ M_{sun}**

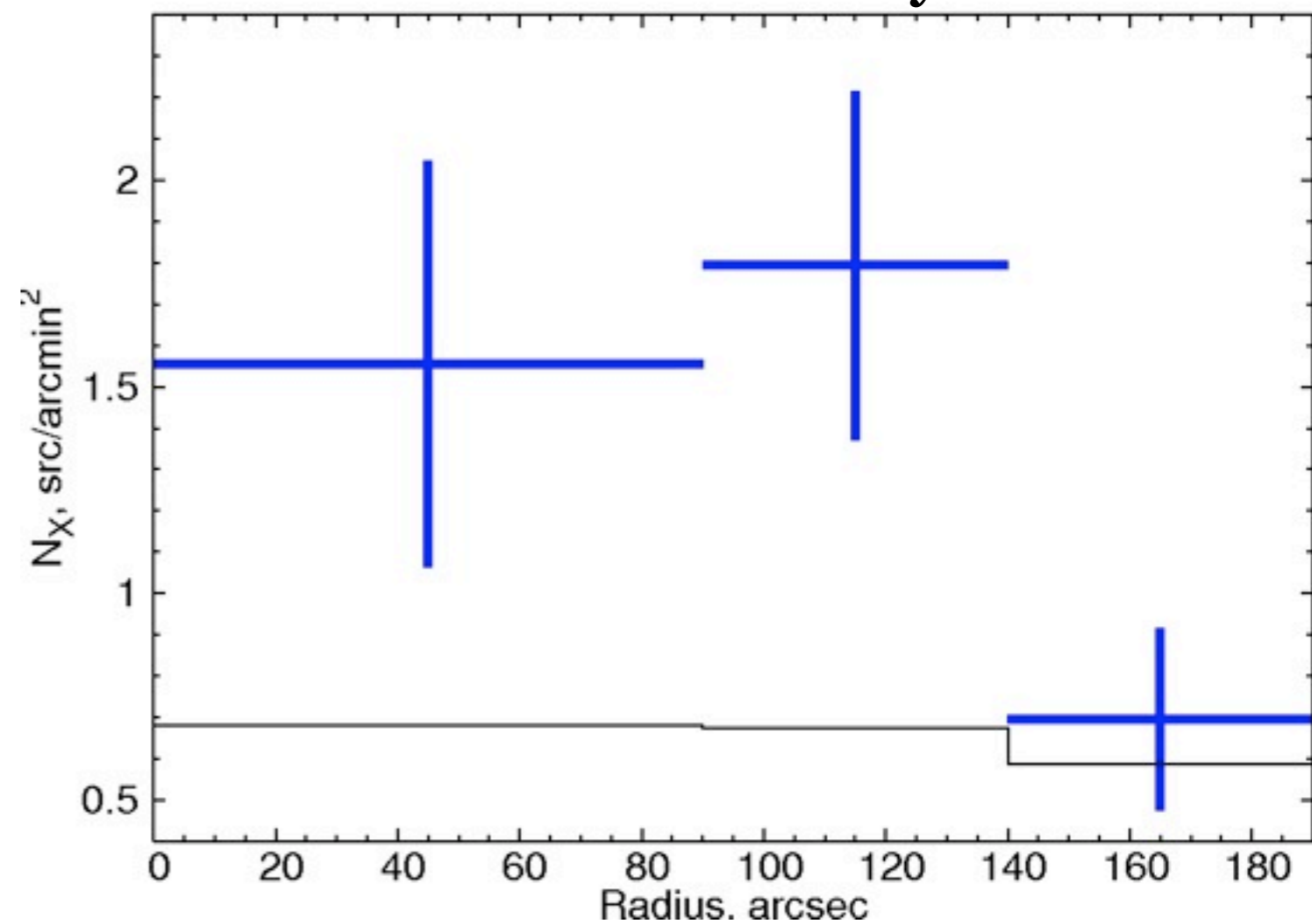
X-ray sources around NGC4342

Within 140" (15.5 kpc) 28 X-ray sources observed but only 11 cosmic X-ray background sources are expected!

Chandra hard band



Distribution of X-ray sources



Origin of the excess X-ray sources

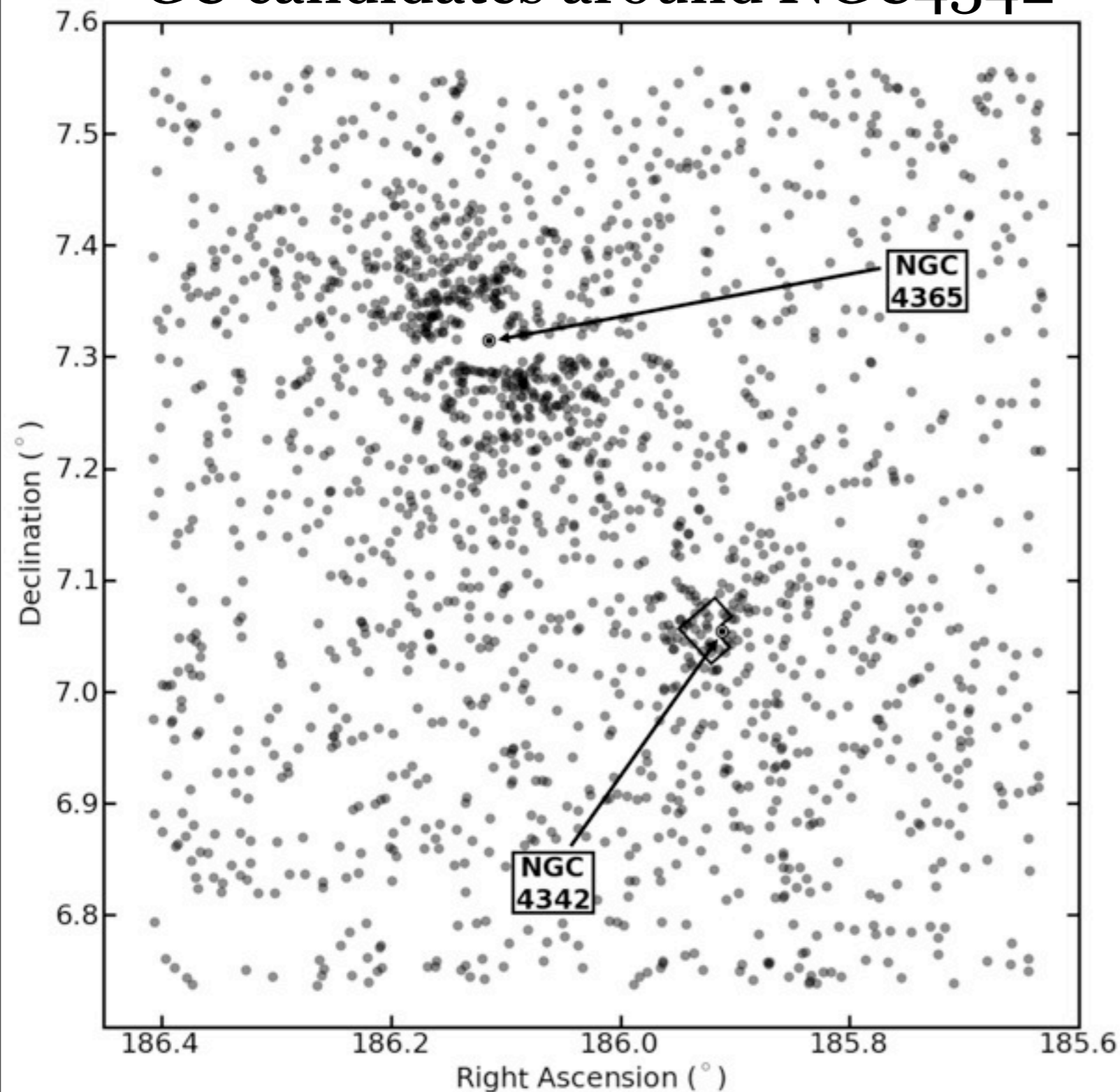
- ★ Not from fluctuation of CXB level
- ★ LMXBs associated with globular clusters (GCs)?!
- ★ On average 1-2% of blue GCs host bright LMXBs
- ★ ~17 excess sources around NGC4342



NGC4342 may host 850-1700 GCs!

Origin of the excess X-ray sources

GC candidates around NGC4342



- Optical data from: Canada French Hawaii Telescope
- Confirms large GC population around NGC4342
- HST analysis in progress
- **$N_{GC} = 1200 \pm 500$**
- **$S_N = 19.9 \pm 8.3$**

GC-LMXB around NGC4342

- ★ $S_N = 19.9 \pm 8.3$ is among the largest observed values
- ★ Clean way to study GC-LMXBs
 - Absence of stellar light beyond ~ 2 kpc
 - Small field-of-view, fewer CXB sources
 - Very few possible kicked field sources
- ★ Analysis of HST data/source identification
- ★ More results to come!

Bogdán et al., Apj, 753, 140, arXiv 1203.1641

Bogdán et al., Apj, in press, arXiv 1203.1642

Thank you!