

X-ray Properties of Star Clusters
In NGC 2139

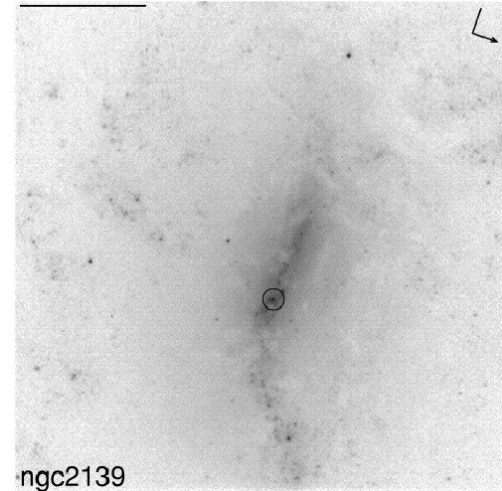
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NGC 2139:

Scd galaxy, $d = 23.6$ Mpc

Central star cluster:

- Single age, 4×10^7 yrs
- $M = 8 \times 10^5 M_{\odot}$
- Emission line wings ± 200 km/s
- Offset ~ 300 pc from kinematic center
- A “proto-nuclear cluster”?



Does the proto-NC have a black hole?

Diagnostic: x-rays, Chandra 40 ksec

Limiting $L_x \approx 7 \times 10^{37}$ erg/s

Detect 30 point sources within $r \leq 4'$

16 within $r \leq 1'$, 7 ULX

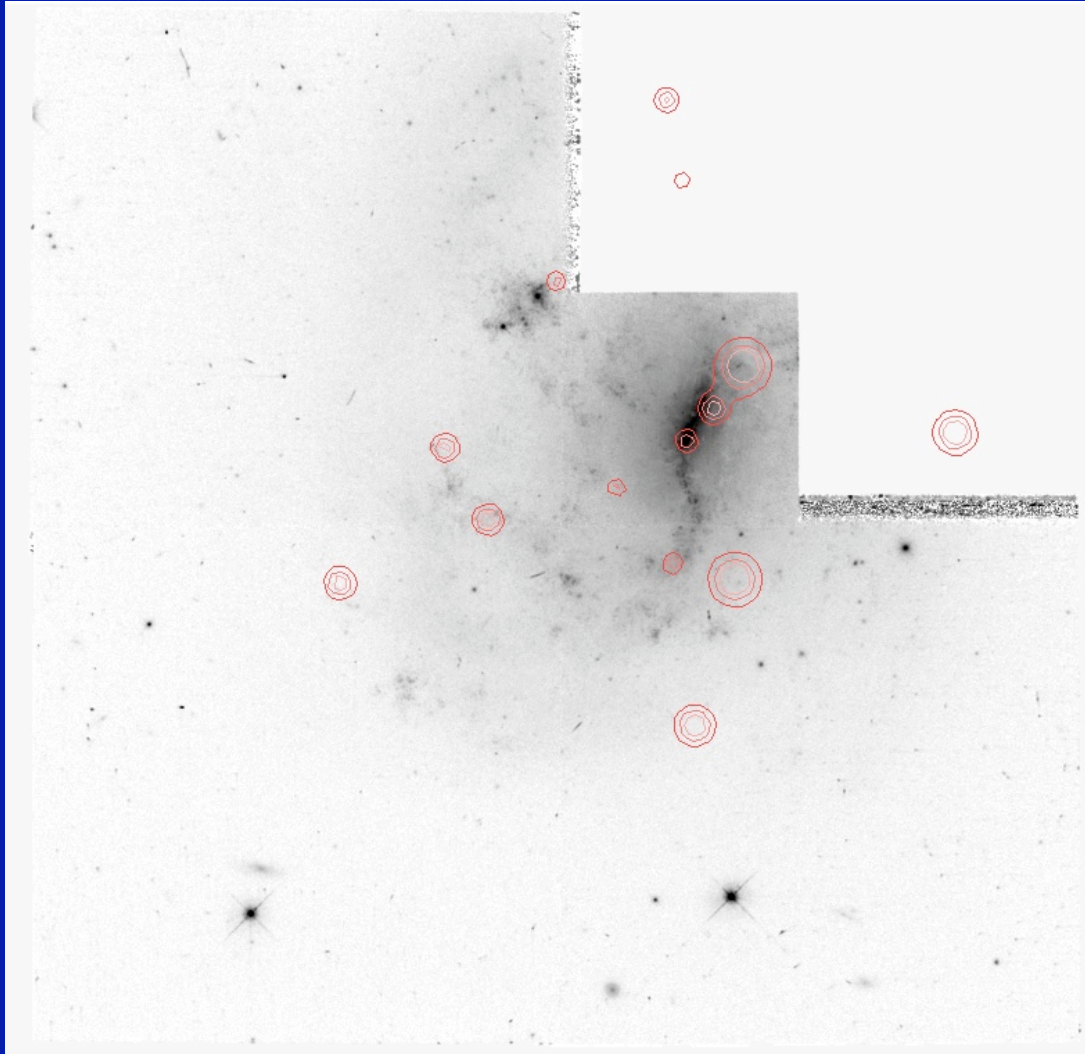


Image: I-band HST

Contours: X-ray sources

Optical counterparts:

proto NC ($m_l = 19.3$)

$$L_X = 7.1 \times 10^{38} \text{ erg/s}$$

Hardness ratio $\Rightarrow \Gamma \sim 1.6$,

XRB or AGN

Additional sources?

2 candidates:

$$m_l = 20.3, L_X = 1.6 \times 10^{39} \text{ erg/s}$$

$$m_l = 21.6, L_X = 1.4 \times 10^{38} \text{ erg/s}$$

NGC 2139 Summary:

- Proto-NC is an x-ray source
- Either stellar binary or weak AGN
- Numerous ULX sources \Rightarrow Post-starburst