# The First Isolated Maps of Supernova Remnant Sgr A East

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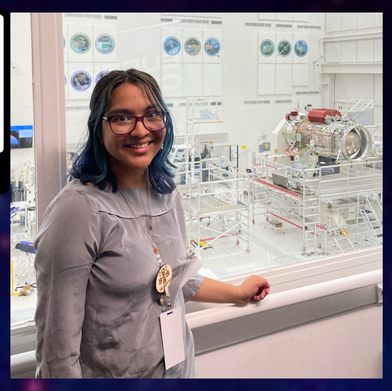
SCAN ME



## ABSTRACT

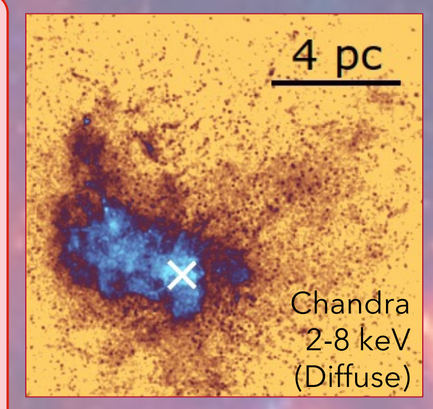
SNR Sgr A East is heavily blended with stellar wind–fed plasma from Sagittarius A*. Using pGMCA (Poissonian Generalized Morphological Component Analysis) on Chandra ACIS-I data, we isolate the remnant, identify a centrally concentrated Fe core consistent with a mixed-morphology SNR, and find a lower ionization age and higher electron density, indicating strong interaction with dense ambient material.

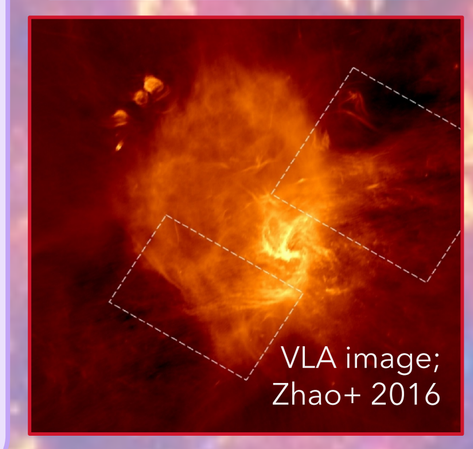
## BACKGROUND

### SNR Sgr A East

**Problem:**

- GC X-ray emission is blended
- Hard to measure intrinsic SNR properties

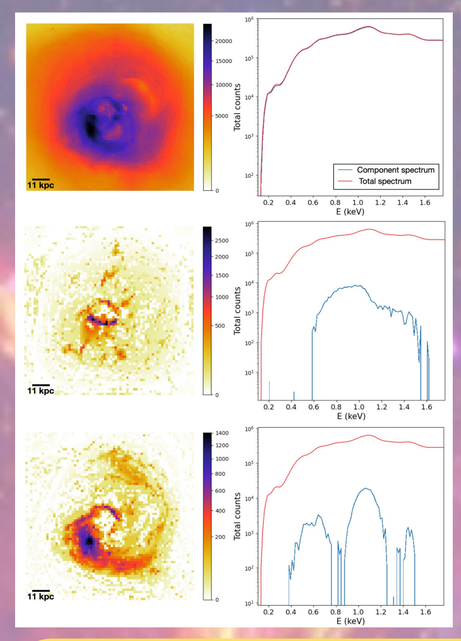



**Goal:** Separate Sgr A East from surrounding plasma

### pGMCA

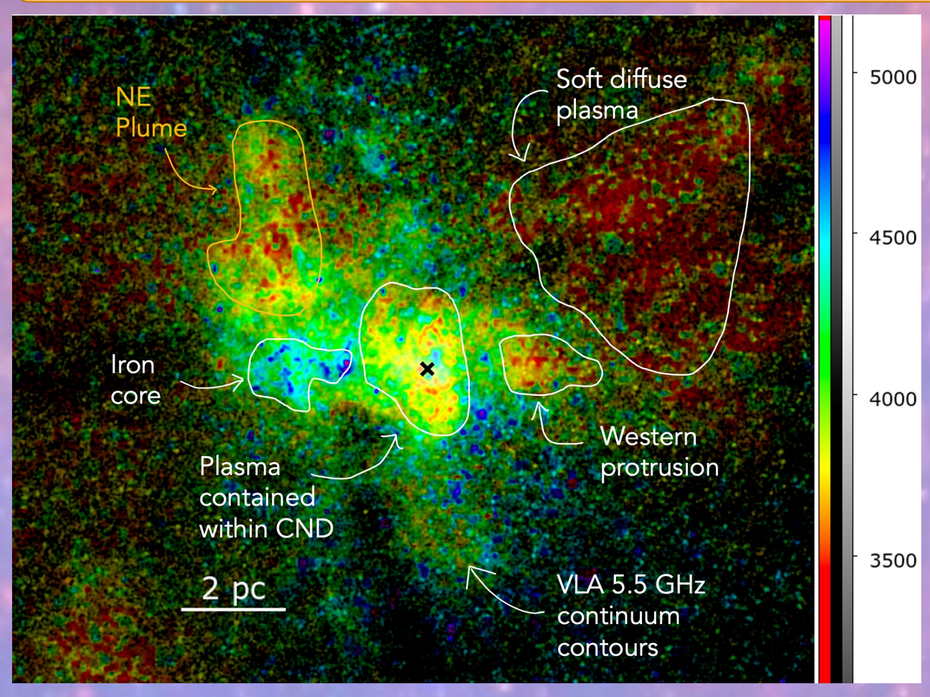
Applied to Perseus cluster:




- pGMCA can separate overlapping components using spectral differences + spatial structure
- Sgr A East is blended with Sgr A* plasma along line-of-sight

We decompose the X-ray cube into physically distinct components without assuming a model.

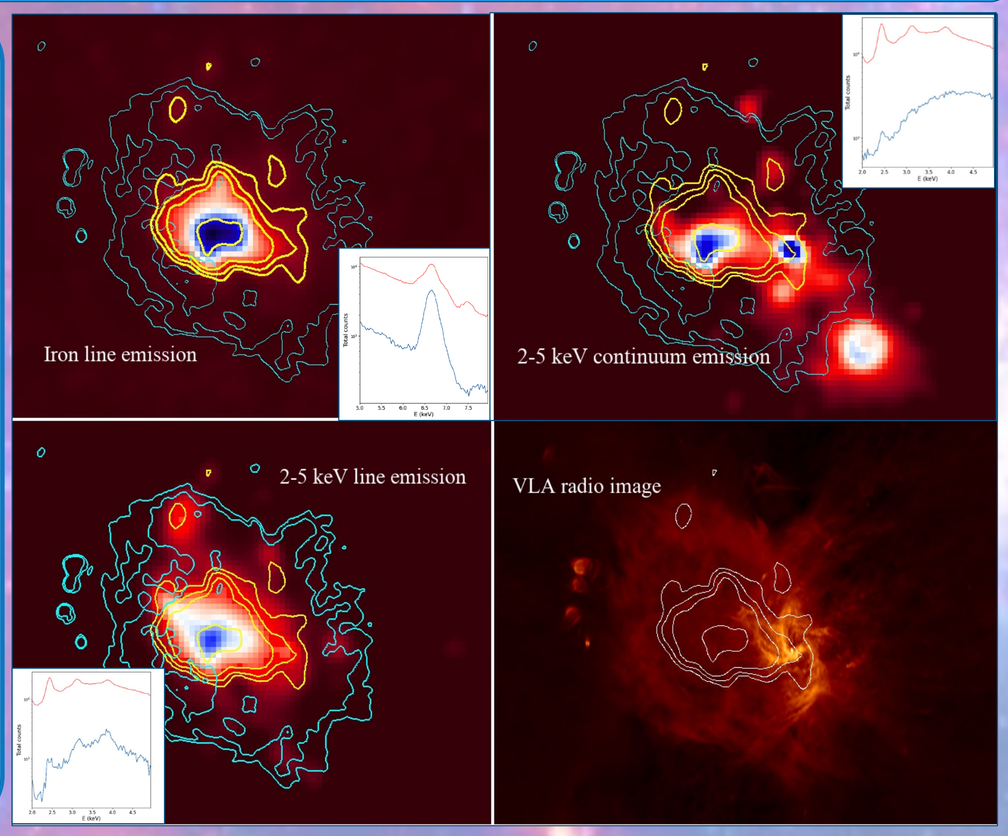
## THE CHANDRA DATASET



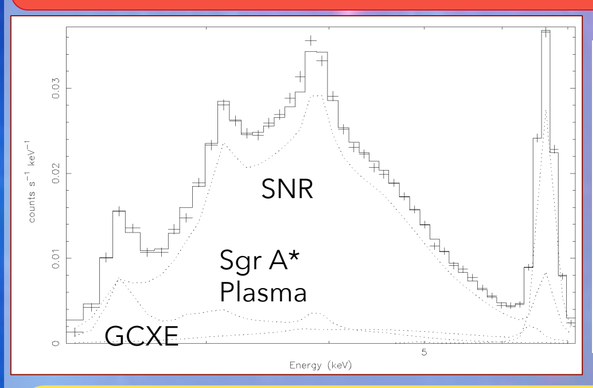

Mean photon energy map of Chandra data. (Higher saturation = more X-ray bright) Iron-rich SNR core is visible but confused with surrounding plasma.

## APPLYING GMCA

- 2-5 keV emission is more extended
- Iron core compact due to interaction with molecular cloud

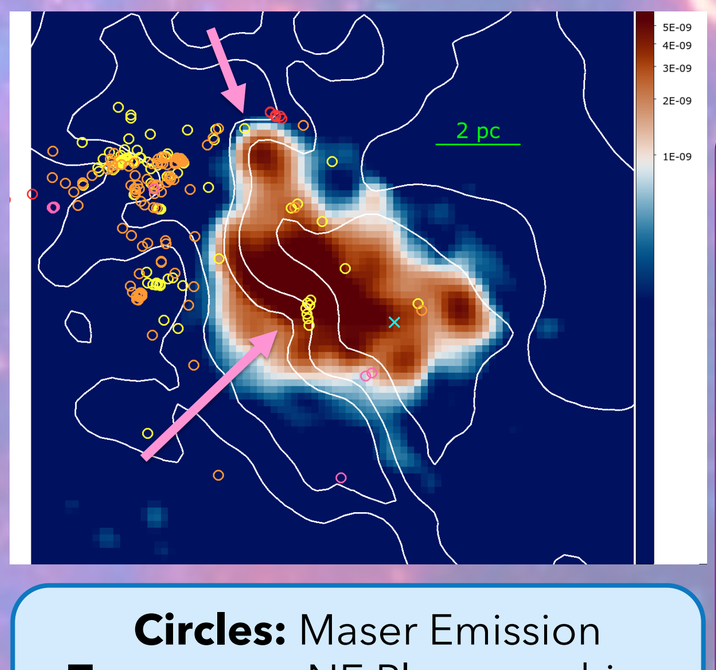



## Spectral Fitting




| Parameter | SNR Comp | Sgr A* Plasma Comp | GCXE Comp |
|---|---|---|---|
| $N_H$ ($10^{22}$cm$^{-2}$) | $15.4^{+3.1}_{-1.7}$ | $19.8^{+0.2}_{-0.4}$ | $11.6^{+0.7}_{-1.2}$ |
| $kT$ (keV) | $4.1^{+0.5}_{-1.7}$ | $1.3^{+0.04}_{-0.02}$ | $0.9 \pm 0.1$ |
| Si ($Z_\odot$) | $4.95^{+0.05}_{-0.5}$ | $4.2 \pm 0.2$ | 2 (fixed) |
| S ($Z_\odot$) | $0.75^{+0.4}_{-0.2}$ | $1.2^{+0.1}_{-0.2}$ | 2 (fixed) |
| Ar ($Z_\odot$) | $0.7^{+0.1}_{-0.2}$ | $1.8^{+0.1}_{-0.3}$ | 2 (fixed) |
| Ca ($Z_\odot$) | $4.9^{+0.1}_{-1.0}$ | $2.1^{+0.3}_{-0.5}$ | 2 (fixed) |
| Fe ($Z_\odot$) | $4.9^{+0.1}_{-0.8}$ | $1.9^{+0.1}_{-0.4}$ | 2 (fixed) |
| Ionization Age (cm$^3$/s) | $3.7^{+1.3}_{-0.6} \times 10^9$ | - | - |
| Gaussian $E_0$ (keV) | - | - | $6.643 \pm 0.007$ |
| Gaussian $\sigma$ (keV) | - | - | $0.05 \pm 0.01$ |

We find a lower ionization temperature than previous results (XRISM collaboration et al. 2025). Our abundances for the Sgr A* plasma are consistent with new mid-IR JWST observations.




**Circles:** Maser Emission
**Top arrow:** NE Plume pushing through hole in molecular cloud (softer in X-ray due to lower absorption)
**Bottom arrow:** Reflected shock

## REFERENCES

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