

**Galactic Center Molecular
Cloud "Bridge" Reaching
Peak X-ray Luminosity
after 20 Years of Brightening**

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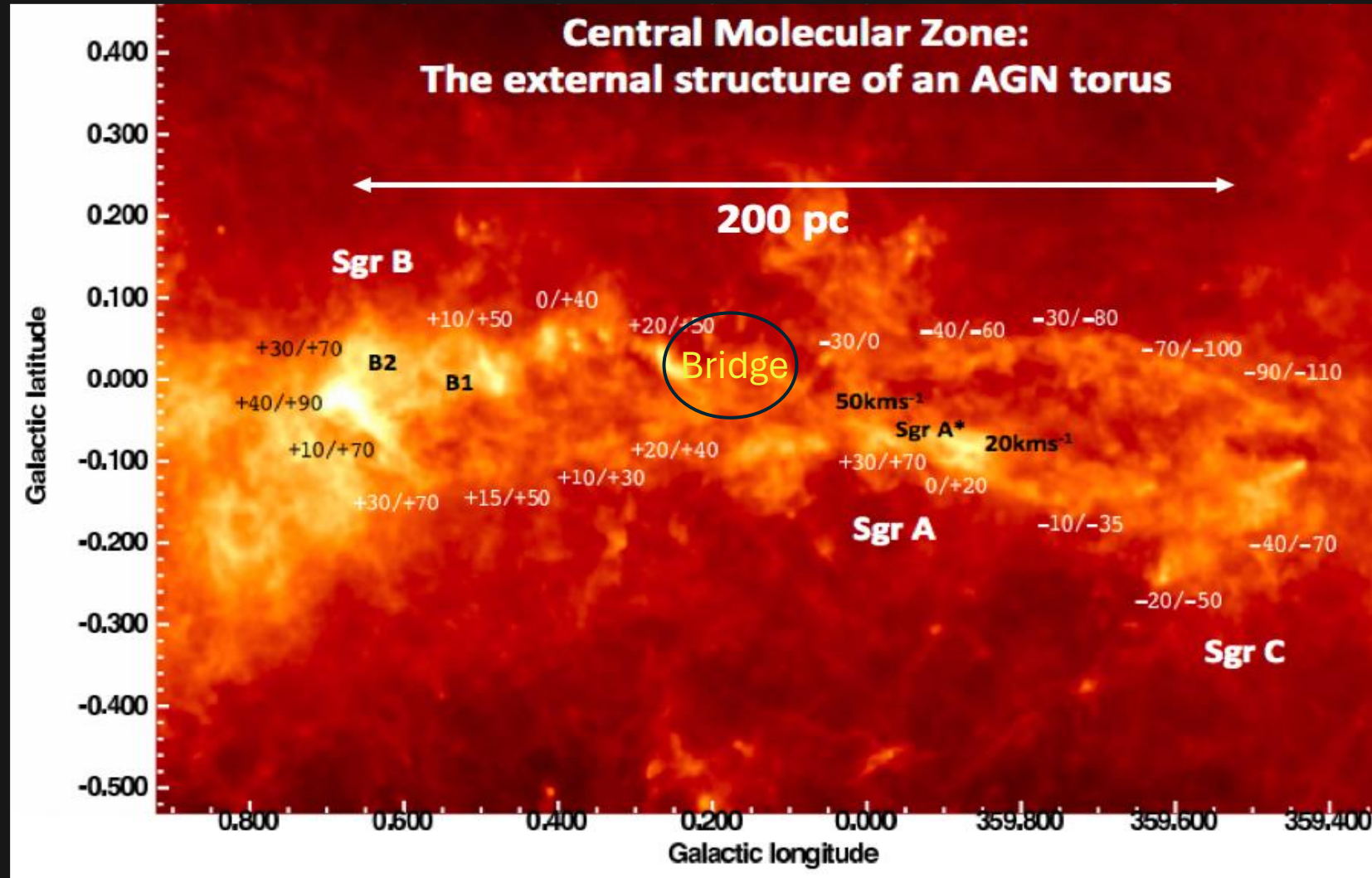
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Molecular Gas in the Galactic Center

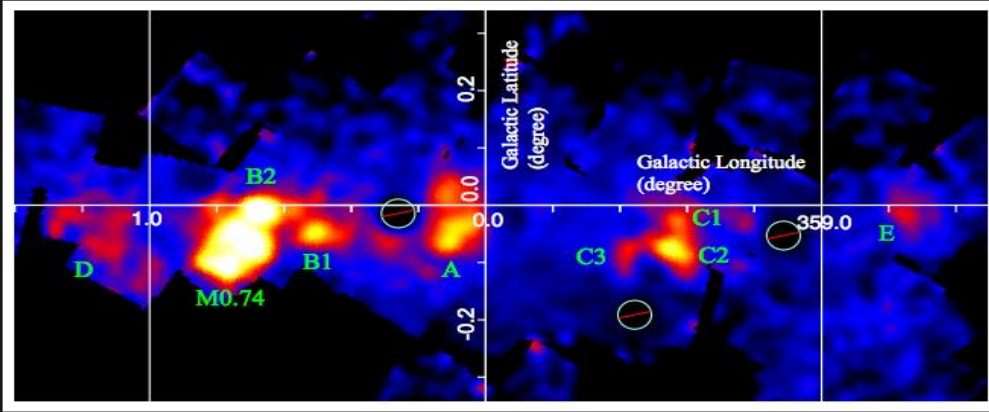
Twisted, elliptical ring of cold and dense molecular clouds, 100pc in radius

5-10% of all molecular gas in Milky Way

Bright and variable X-ray features: 6.4keV emission line with continuum to 100keV



Reconstructing Sgr A* Outburst History Using X-ray Emissions from Molecular Clouds



Past Sgr A* outburst luminosity can be calculated via iron fluorescence or continuum emission

Iron Fluorescence

$$L \propto I_{Fe} d^2 \tau_T^{-1}$$

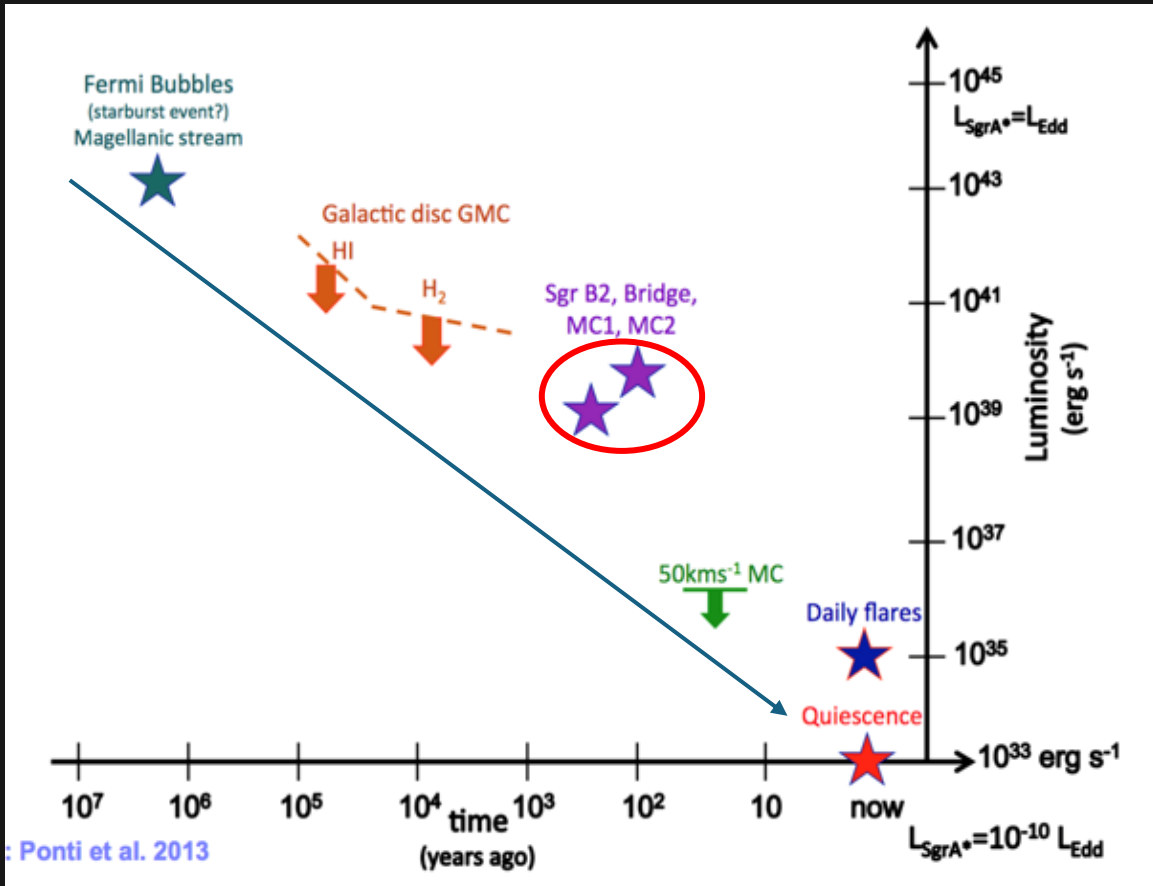
Sunyaev & Churazov (1998)

Compton Scattering

$$L \propto I_{cont} d^2 \tau_T^{-1} f(\theta)$$

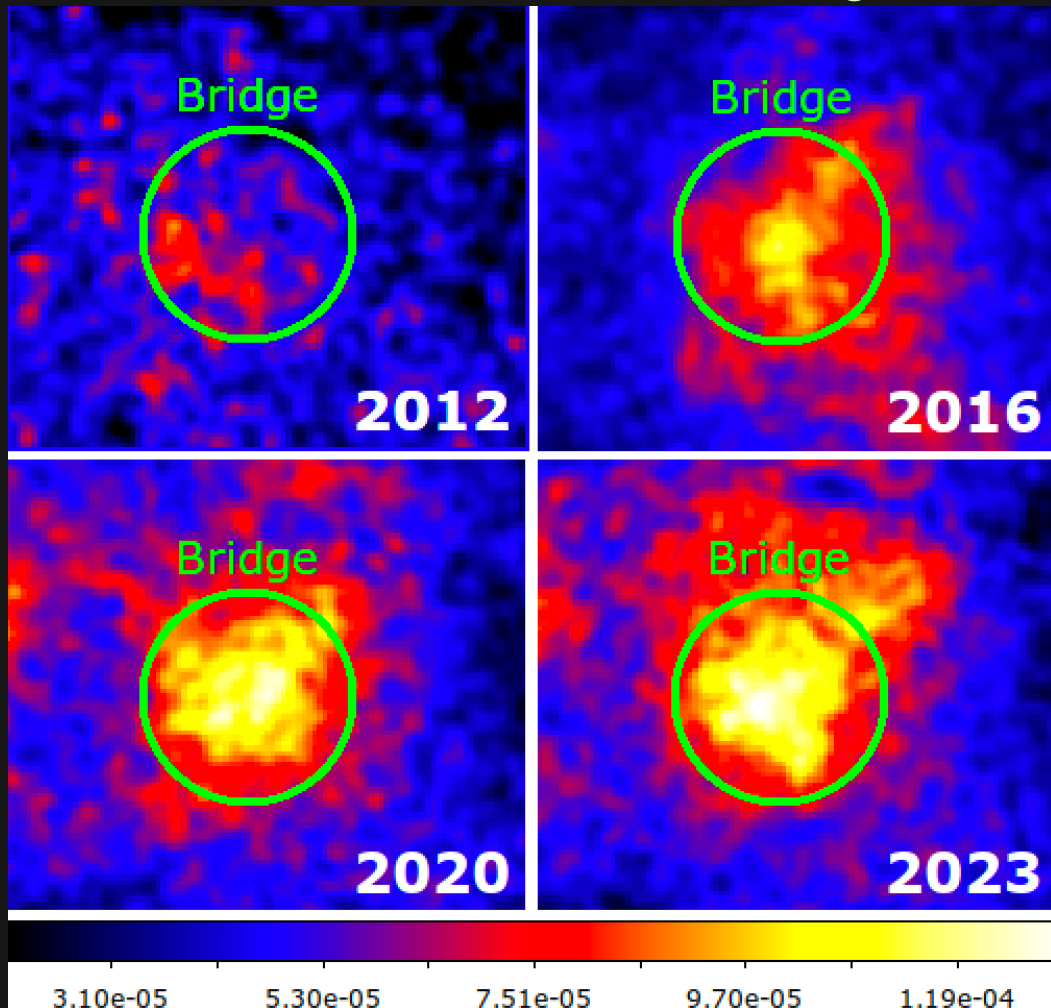
Zhang et. al. (2015)

Observations suggest decrease in luminosity of Sgr A* X-Ray activities in last few hundred years

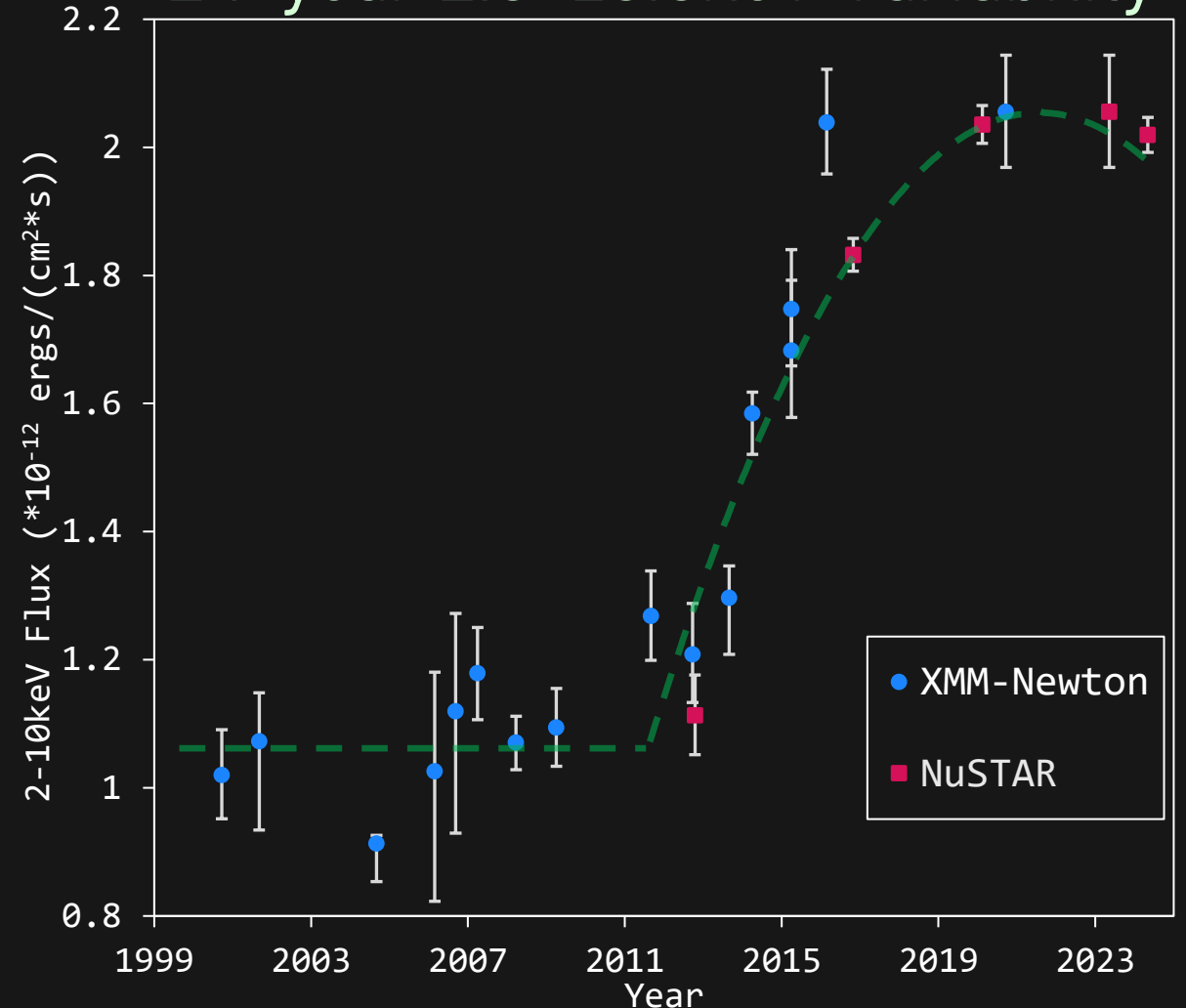


Bridge Molecular Cloud Reaches Peak X-ray Luminosity

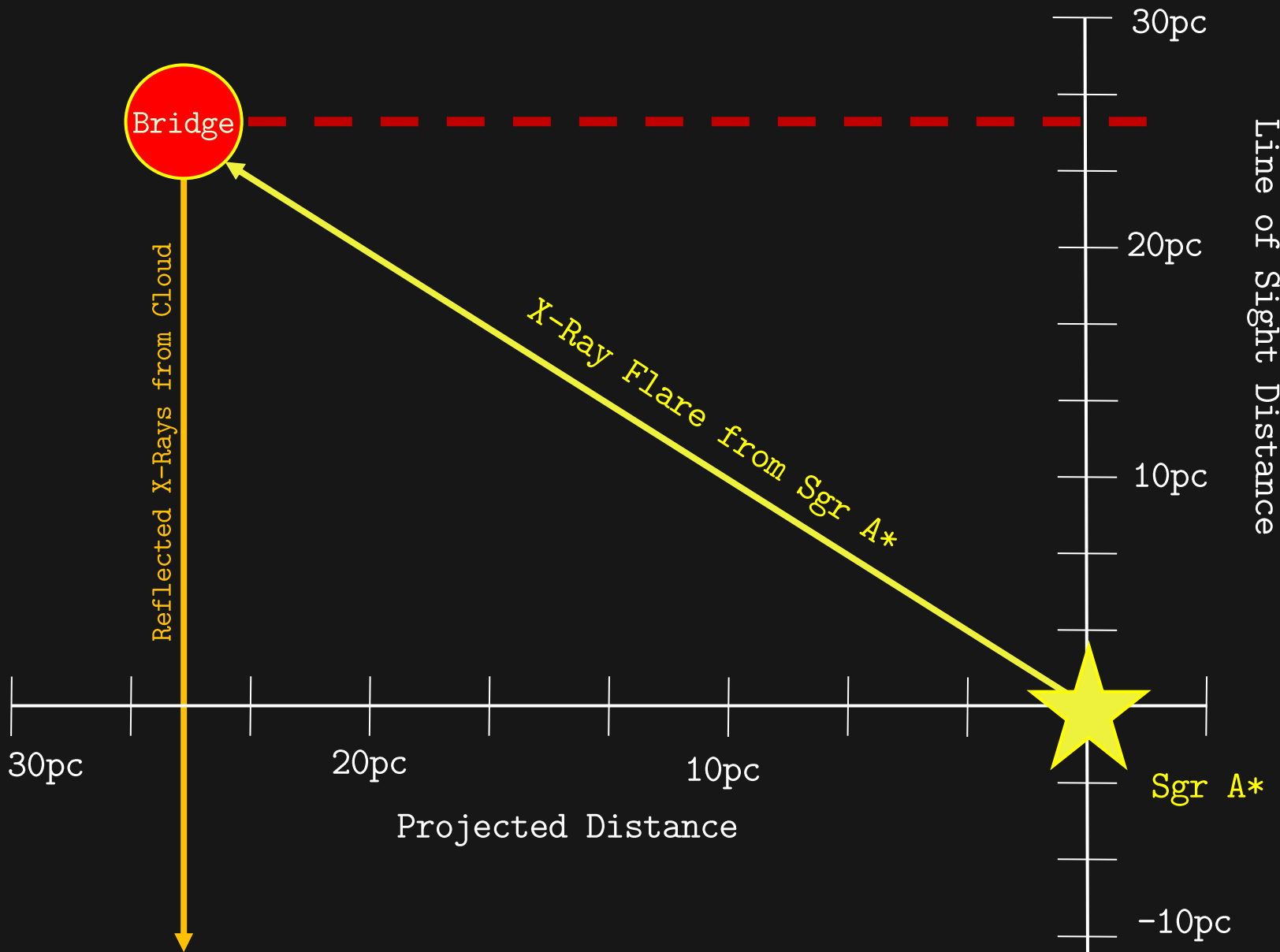
2012-2023 3-79 keV Images



24-year 2.0-10.0keV Variability



X-Ray Reflection Model Interpretation



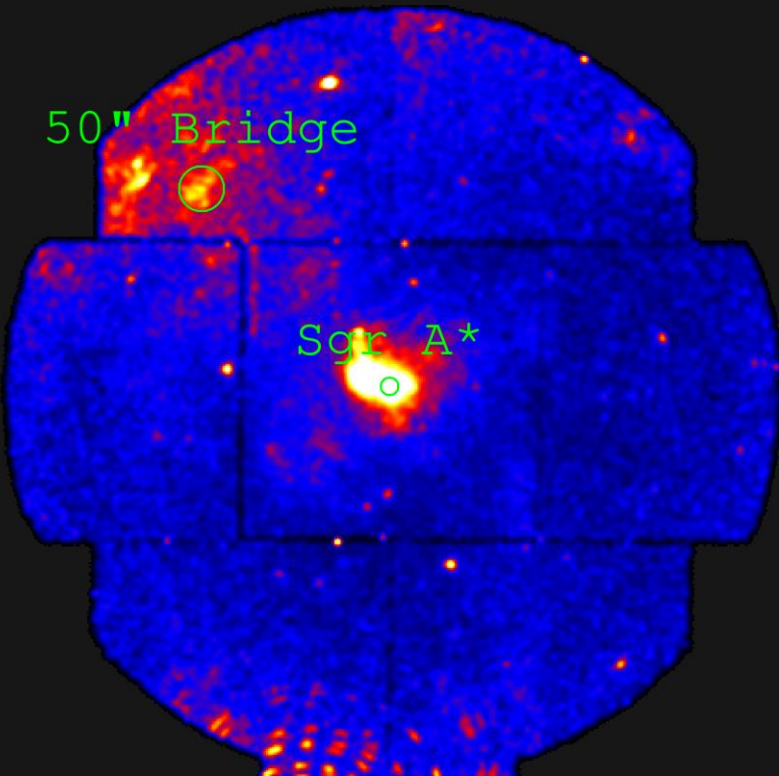
Sgr A* outburst ~200 years ago 5 orders of magnitude above quiescence

Luminosity $L_{g \geq 1.11} \approx 1.11 \times 10^{38}$ erg/s

Line of sight distance from IXPE polarization (Marin et. al. 2023)

Summary

- Galactic Center molecular cloud Bridge at peak brightness around 2021 ± 2 years
- Sgr A* outburst luminosity ~ 200 years ago reached $L_g \geq 1.11 \times 10^{38}$ erg/s, ~ 5 orders of magnitude higher than current quiescence
- Future monitoring will constrain outburst duration



Uteg, Zhang, & Jones (2024; in prep)

CONTACT INFORMATION

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