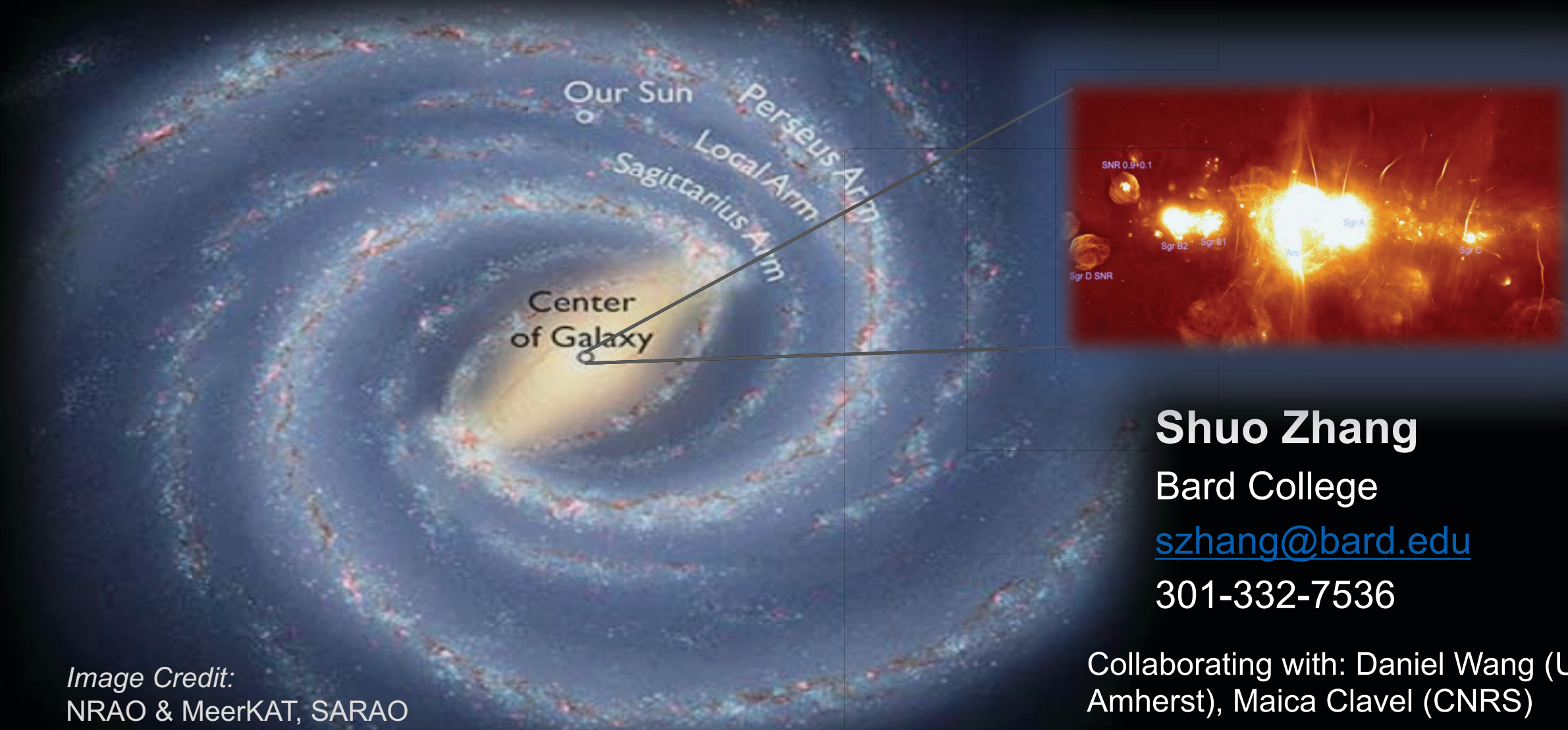


# Revealing the Powerful Particle Accelerator in the Galactic Center



**Shuo Zhang**

Bard College

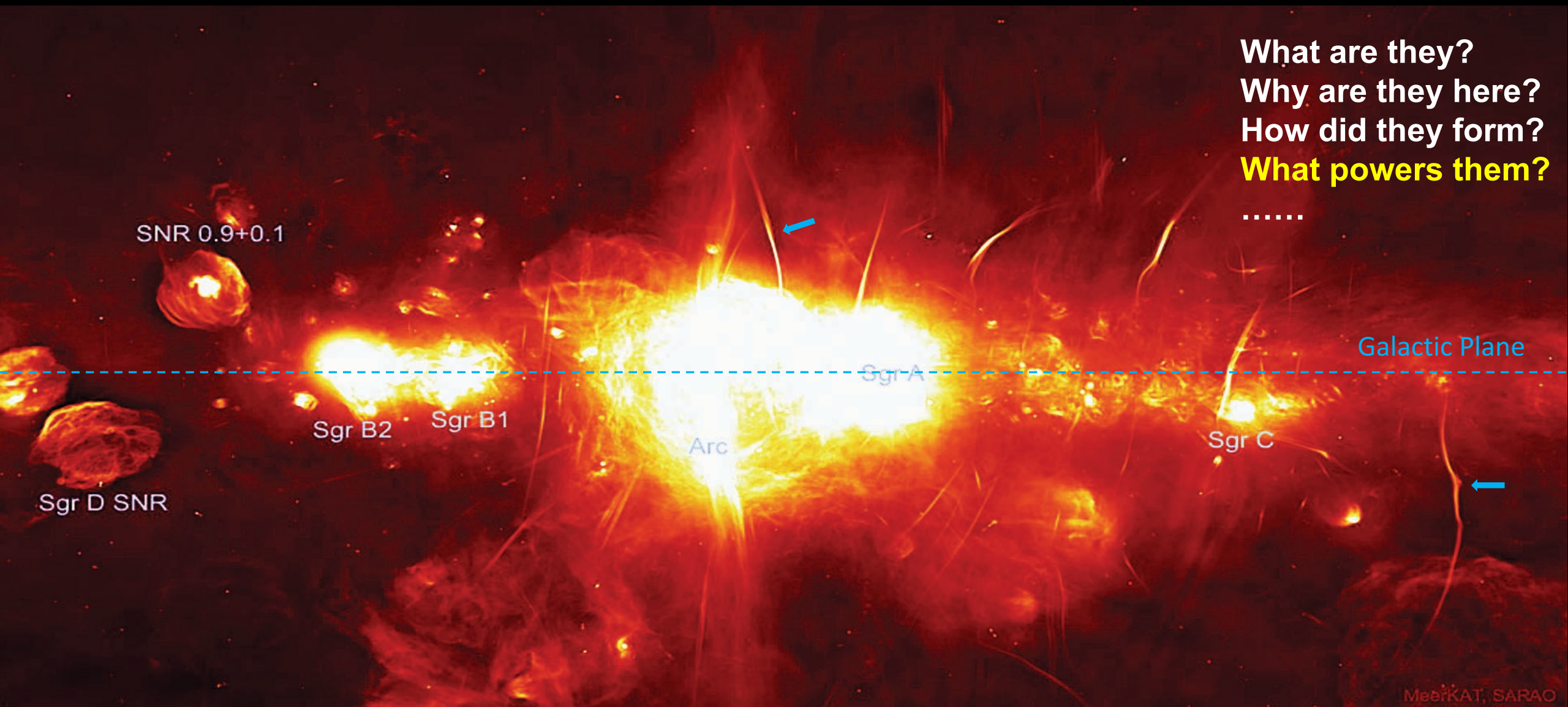
[szhang@bard.edu](mailto:szhang@bard.edu)

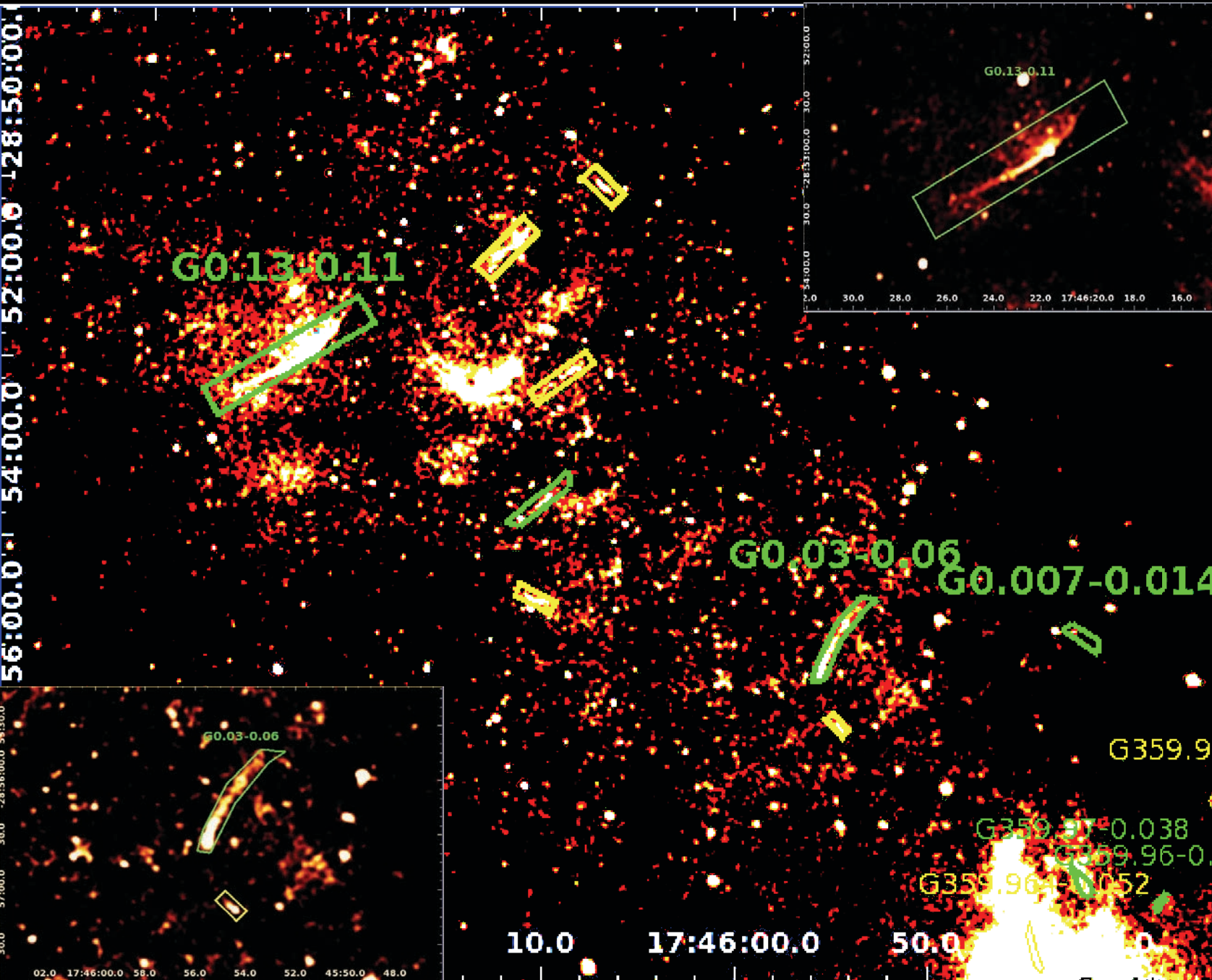
301-332-7536

Collaborating with: Daniel Wang (UMass-Amherst), Maica Clavel (CNRS)

*Image Credit:*  
NRAO & MeerKAT, SARAO

# MeerKAT observed >100 radio filaments within 430 parsecs of Galactic Center: Tracing locally and globally **ordered magnetic field** and **relativistic particles**



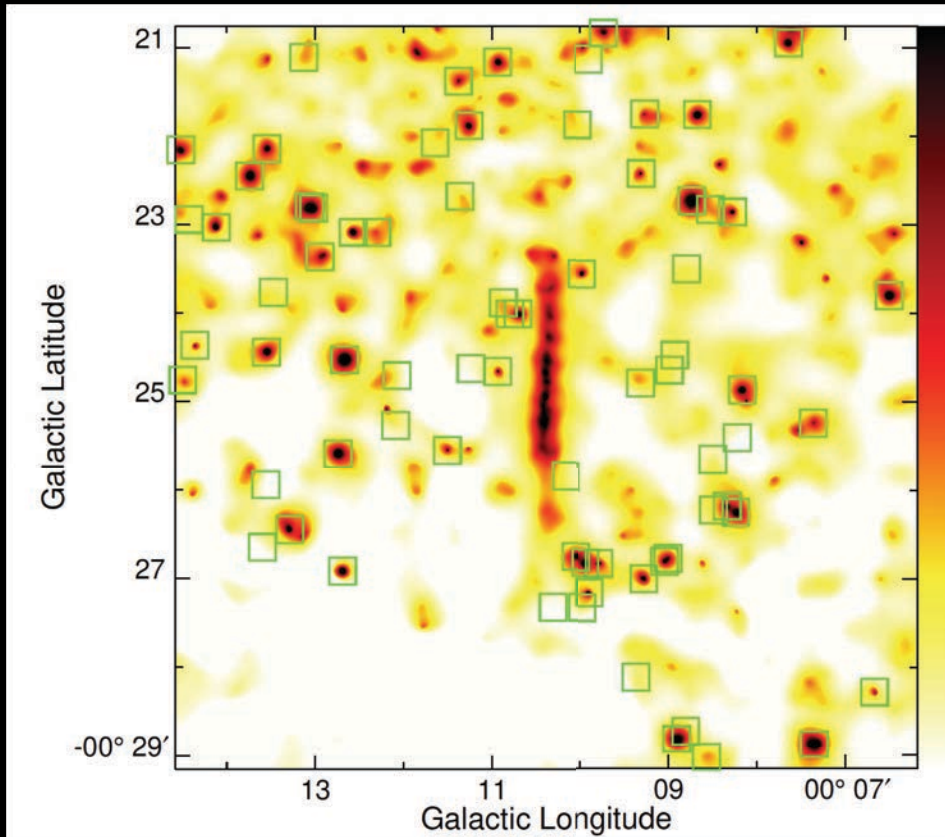


## Recent Deep Chandra Galactic Center Observations Revealed New X-ray Filaments

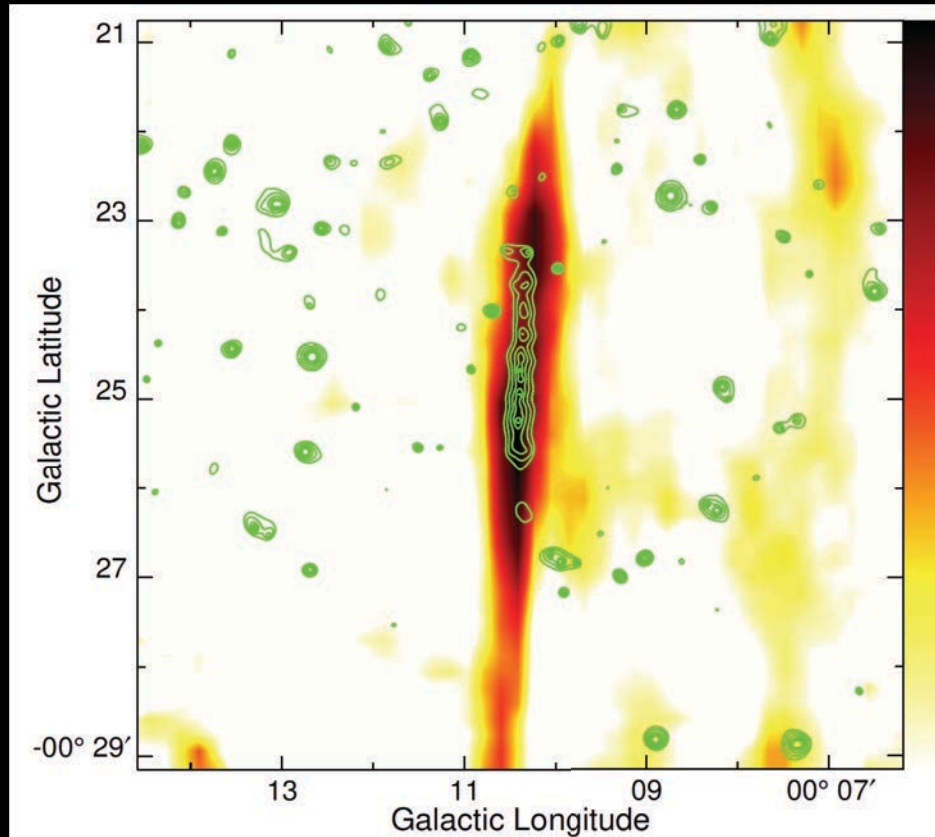
- > 10 X-ray filaments captured, about half newly discovered
- New deep *NuSTAR* observation came in this spring (PI: Zhang)

Zhang et al. in prep.

# Multi-wavelength Studies on Galactic Center Filaments

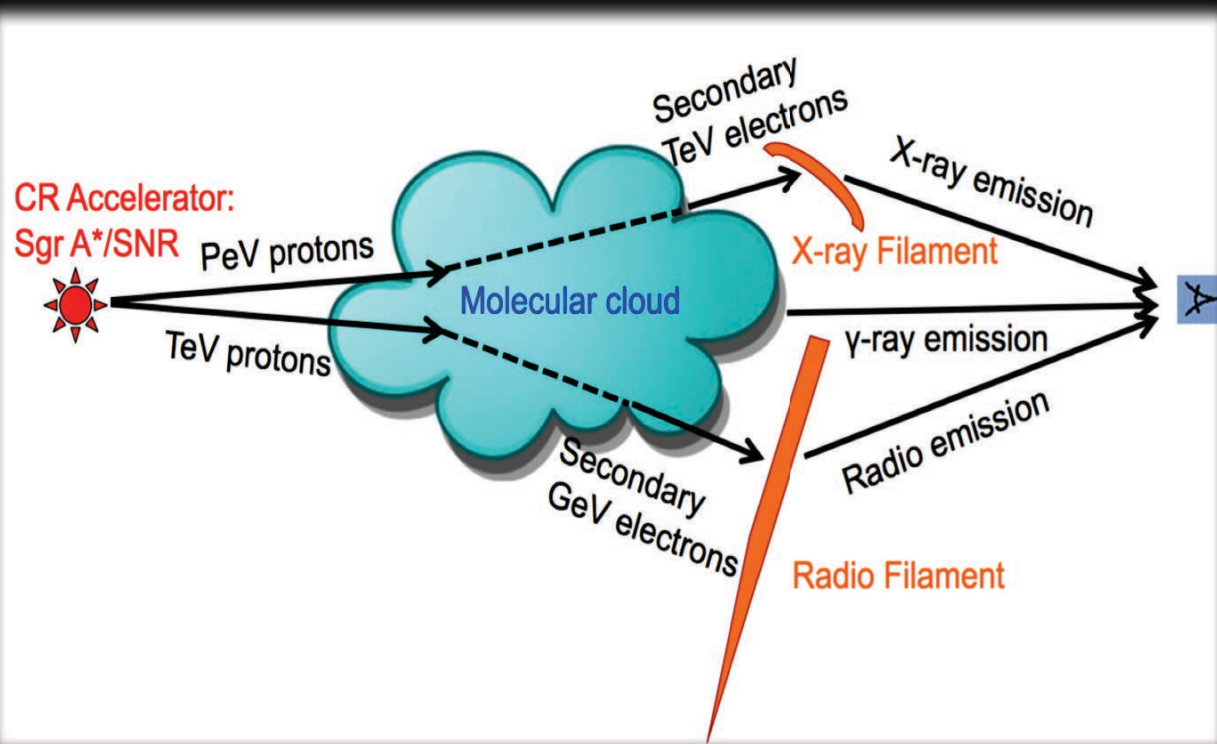


Chandra X-ray Image of Filament G0.173-0.4

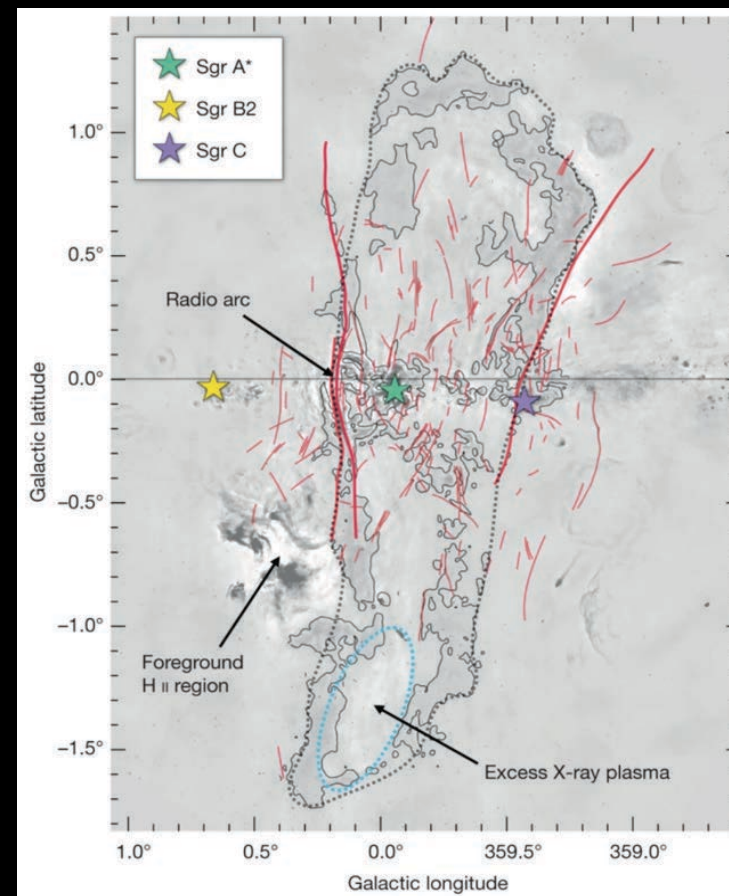


MeerKAT radio Image of Filament G0.173-0.4 overlaid with Chandra X-ray contours

# The Galactic Center Supermassive Black Hole as Engine of Relativistic Particles Lightning up Filaments



**Global mechanism:** Origin of relativistic electrons from hadronic process, connected to Black Hole activity (Zhang et al. 2014, 2020)



Heywood et al. 2019

# Revealing the Powerful Particle Accelerator in the Galactic Center

- Filaments serve as probes for powerful particle accelerator(s) in the Galactic center
- Discovered new X-ray filaments in the Galactic center region
- Proposed a global mechanism for the filaments: Supermassive black hole is the engine!
- Systematic multi-wavelength studies on the filaments is the key to further test the mechanism

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