Detection of a Magnetized Dust Ring in the Galactic Center

Speaker: **Natalie Butterfield** (NRAO; **nbutterf@nrao.edu**)

Collaborators: **David Chuss** (PI; Villanova), **Jordan Guerra** (CIRES), **Dylan Paré** (Villanova), and the **FIREPLACE Collaboration**

Far-**I**nfra**R**ed **P**olarimetric **L**arge **A**rea **C**MZ **E**mission Legacy Survey

ArXiv: **FIREPLACE I -** 2306.01681

FIREPLACE II - 2401.01983

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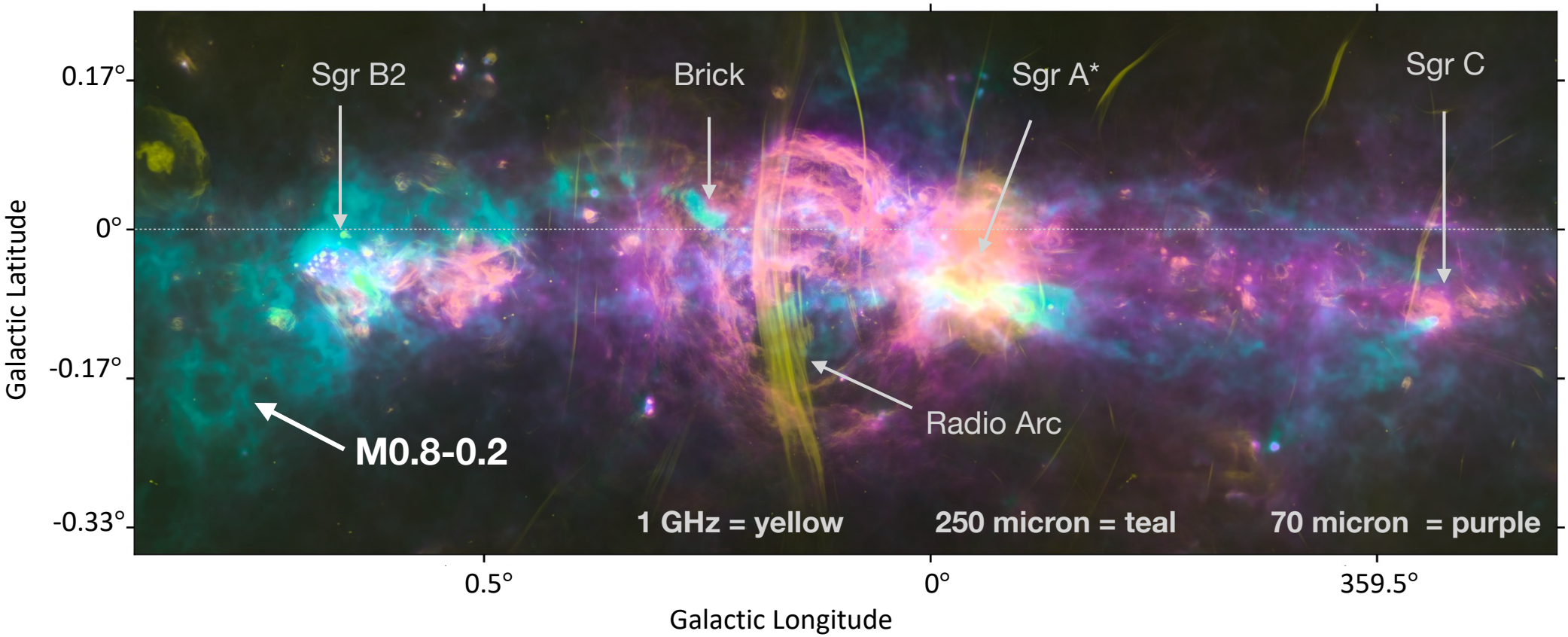
Magnetic Fields in the Galactic Center

- 10^7 Solar masses of dense clouds
- Close proximity of clouds
- Extreme environment only found in other galactic nuclei and early galaxies
- Magnetic fields are measured to be stronger (100s μG)
- Bimodal population of magnetic field directions (FIREPLACE I)



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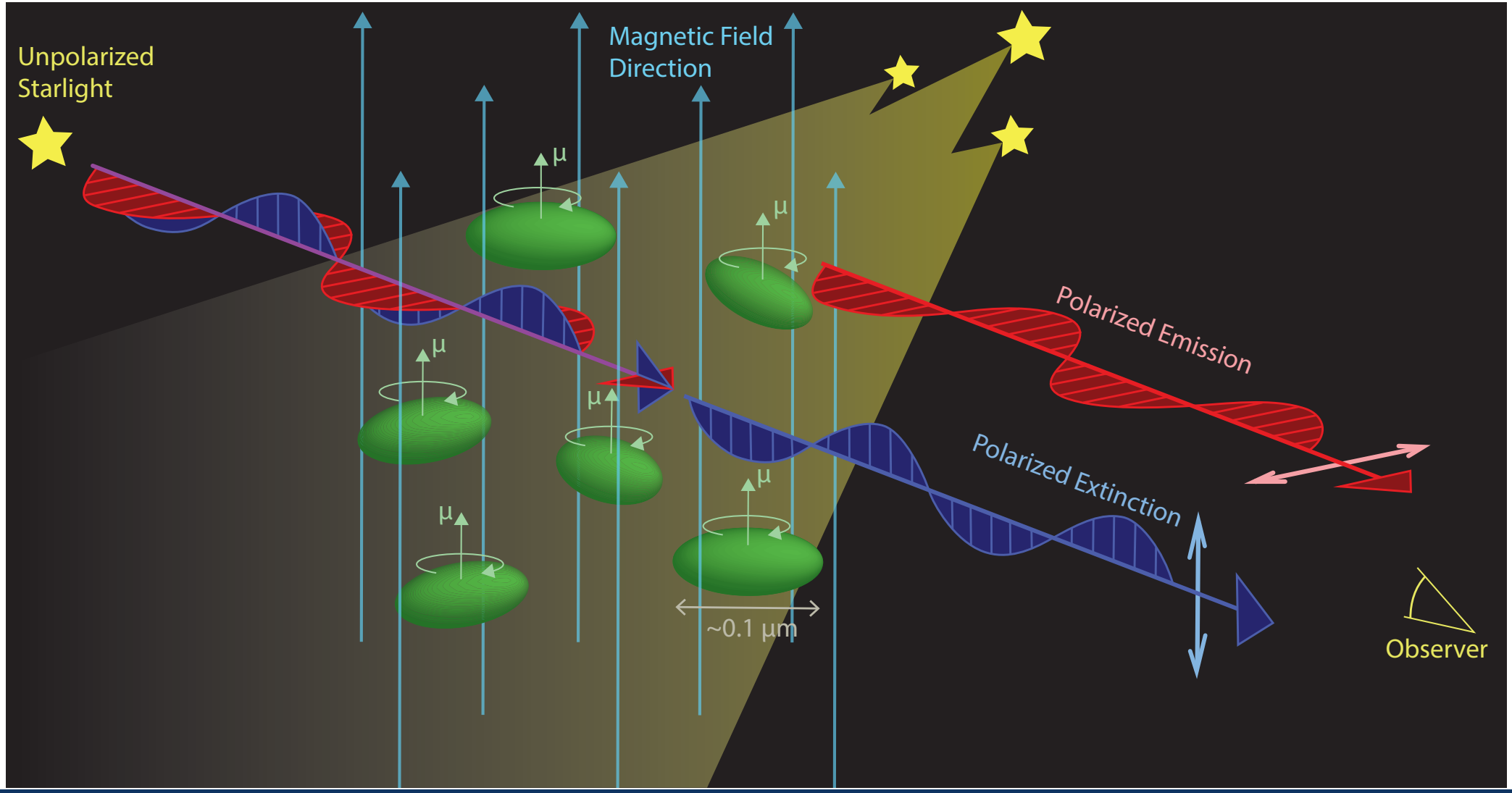
Dust Polarization (B-RAT Theory)

- Dust grains align with the magnetic field
- Radiated IR emission is polarized and detected by SOFIA



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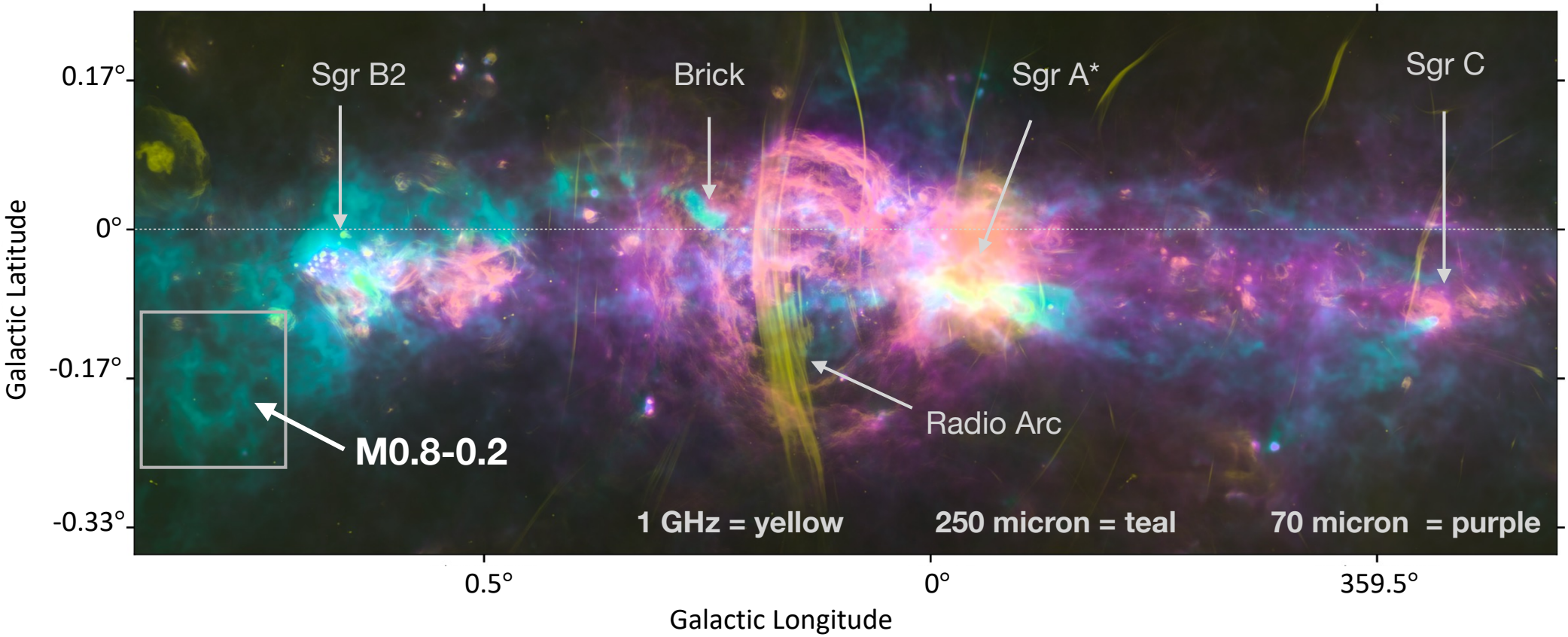

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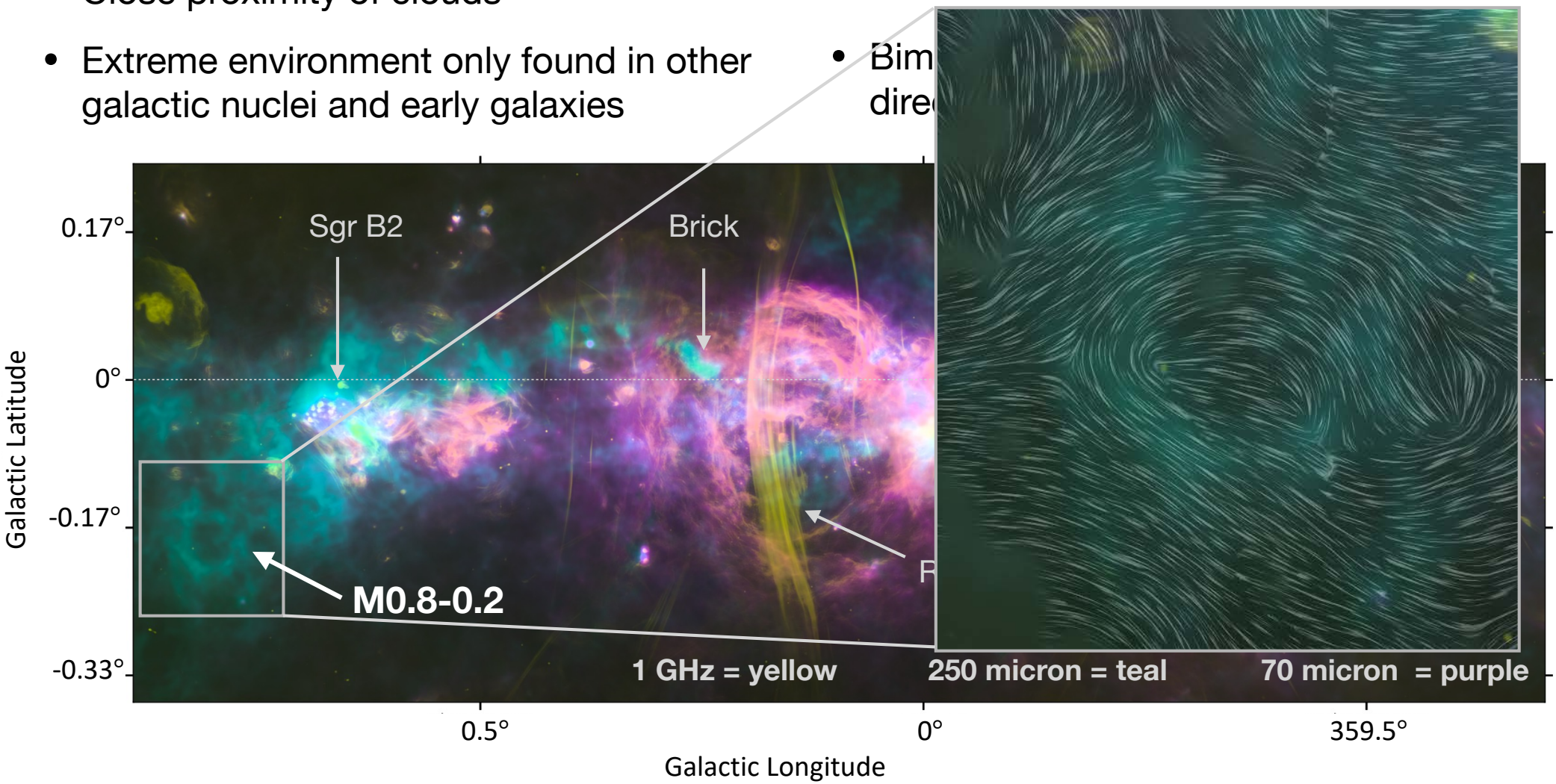

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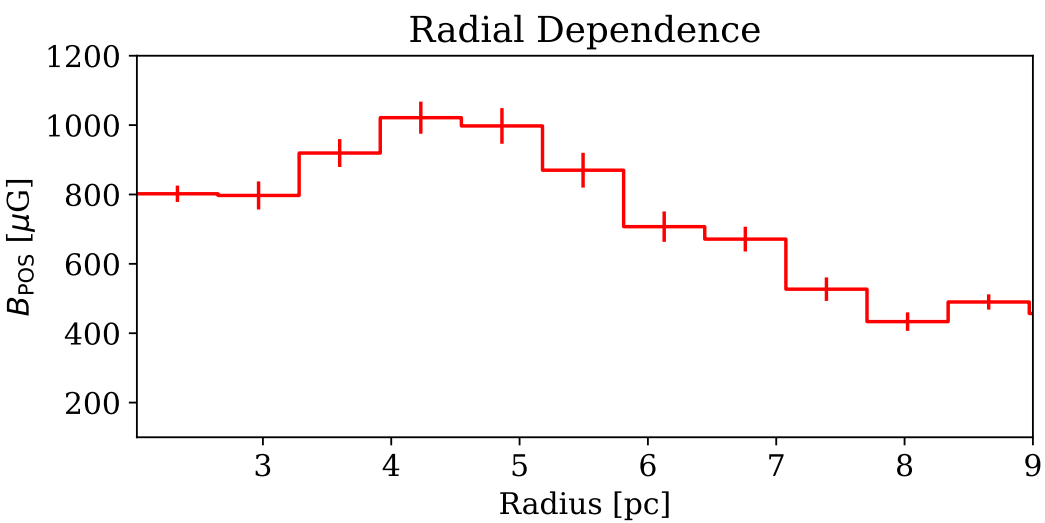
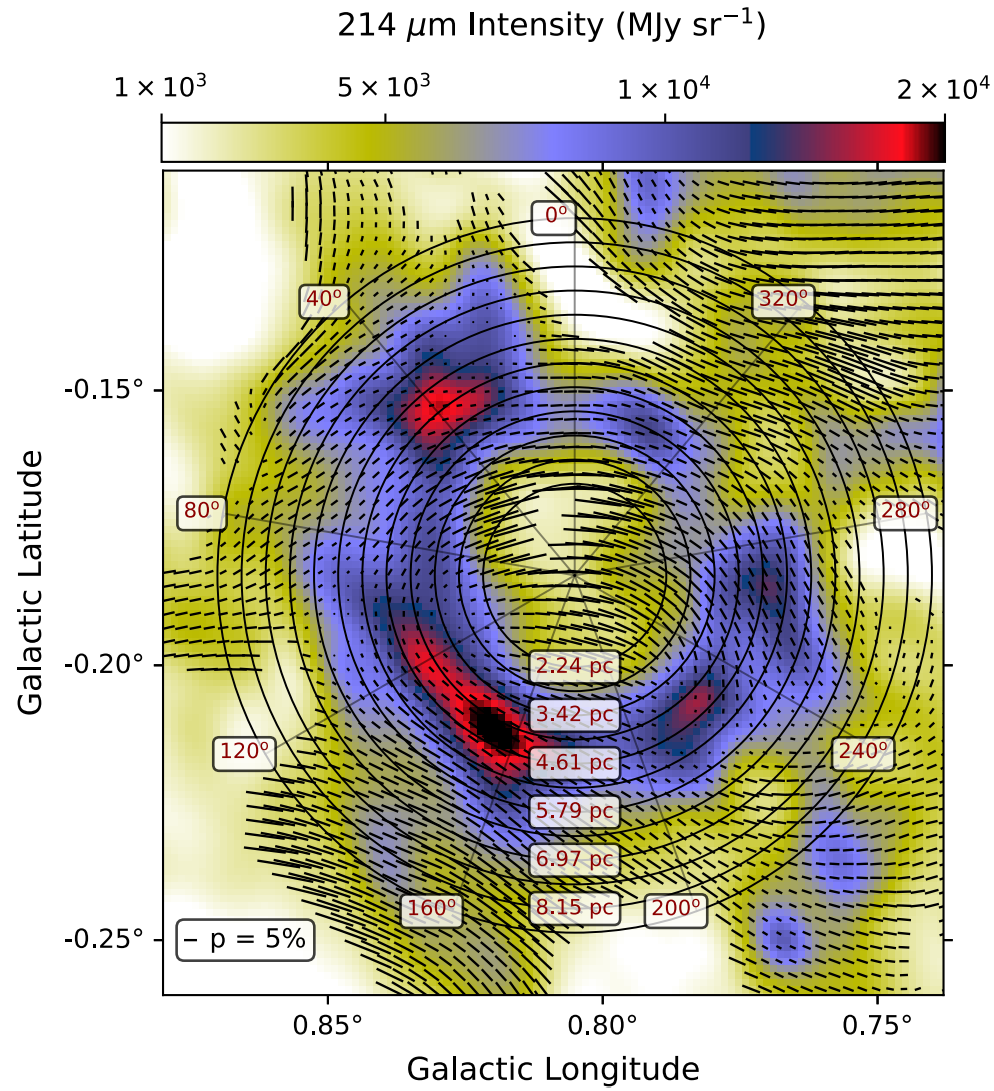
Detection of a Magnetized Dust Ring

- Magnetic fields show a curved structure that traces the ring morphology
- DCF analysis shows field strengths of ~1 mG
  - Field strength decreases with radial distance away from center
- Expanding shell is sweeping up material and compressing magnetic fields ➔ Resulting in an increased field strength





Butterfield et al. (2024) https://arxiv.org/abs/2401.01983

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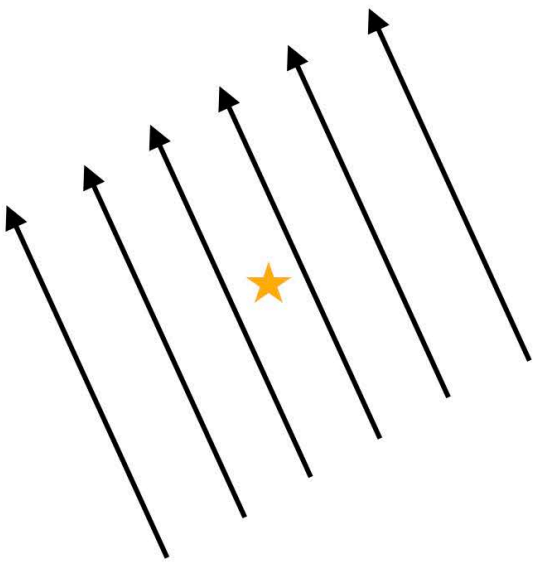
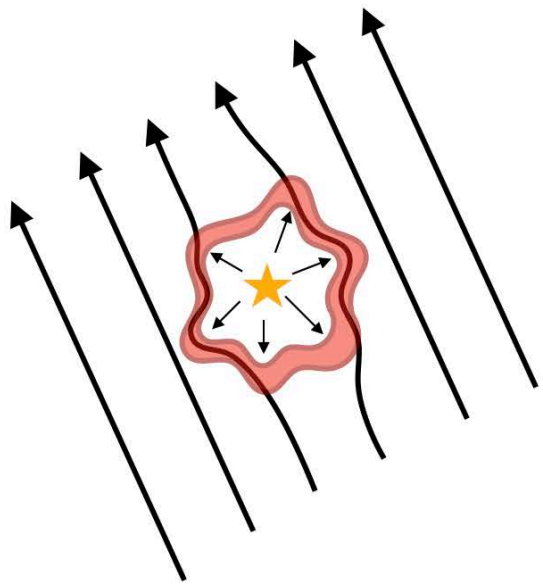
Schematics of an Expanding Shell in a Magnetic Field

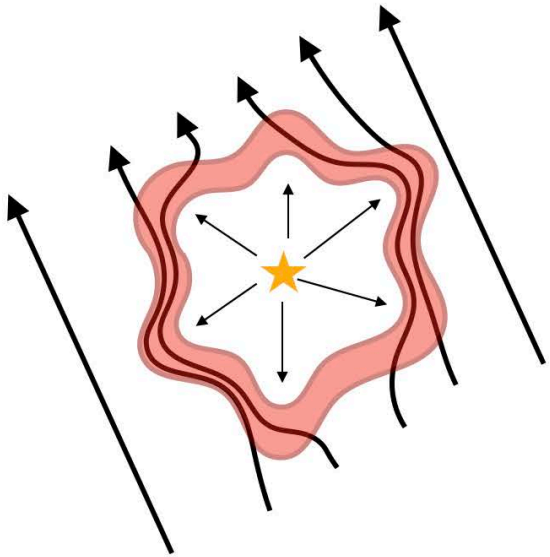
The compression of the magnetic fields by the expansion causes an increase in field strength



1. Ambient GC field with point source



2. Expanding shell impacts B-field



3. Expansion sweeps up B-field

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