A VLA Study of Newly-Discovered Southern Latitude Non-Thermal Filaments in the Galactic Center: Polarimetric and Magnetic Field Properties.

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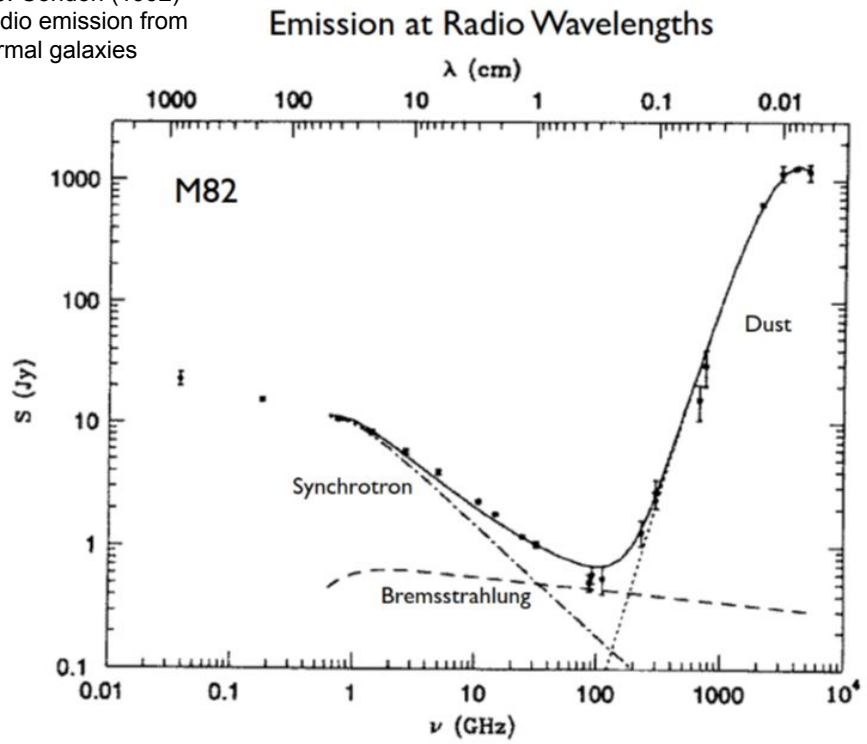
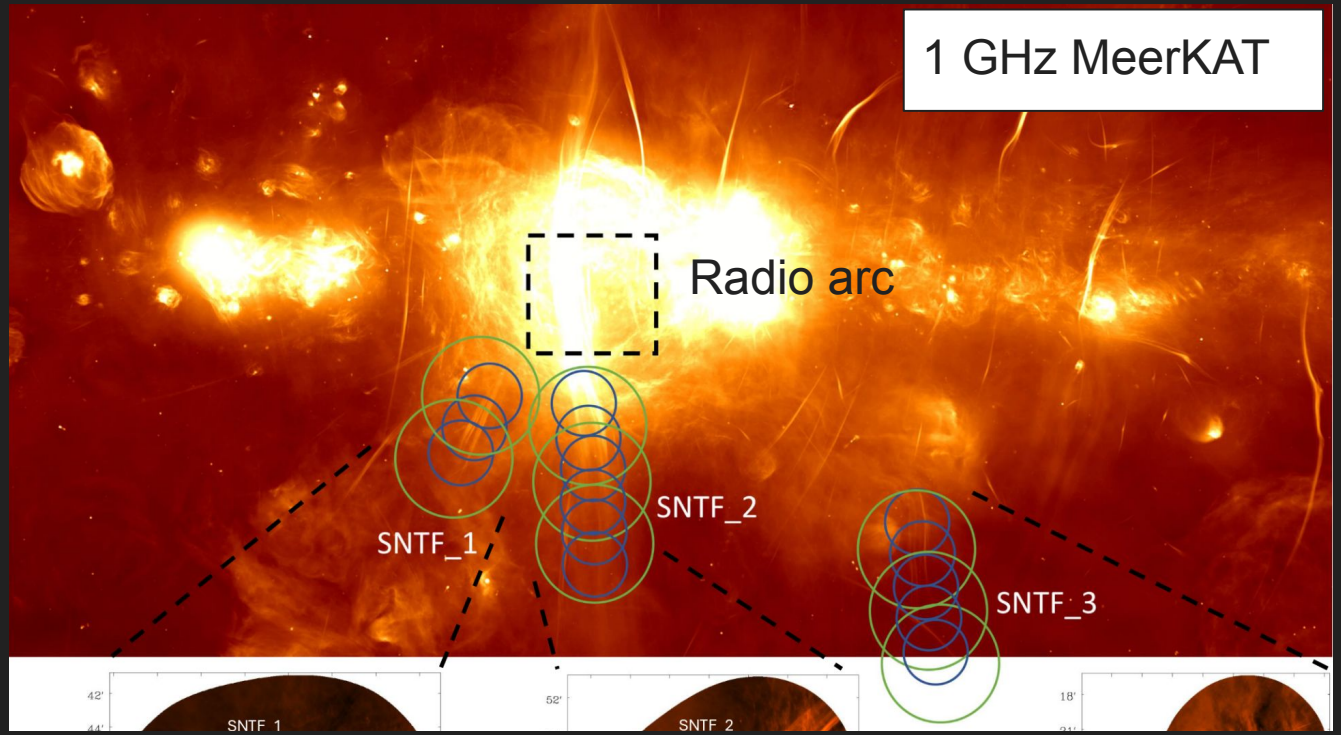
Synchrotron Radiation

J. J. Condon (1992)
Radio emission from
normal galaxies



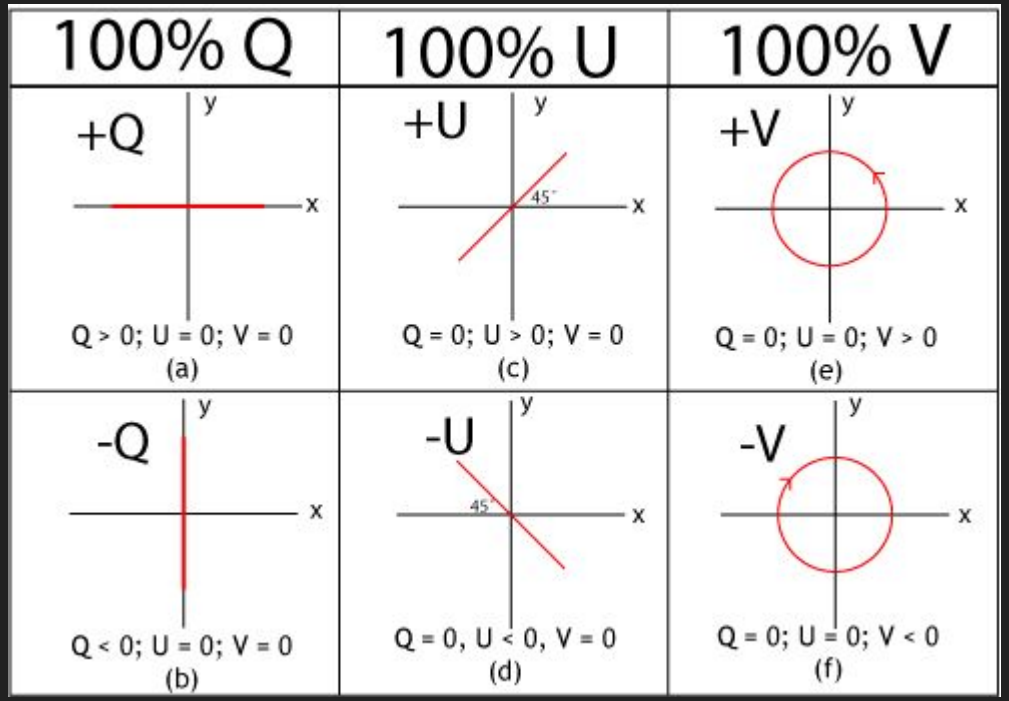
- Synchrotron Radiation is dominant at very low wavelengths
- Synchrotron radiation occurs because of relativistic particles moving through magnetic fields

Non-Thermal Filaments (NTFs)



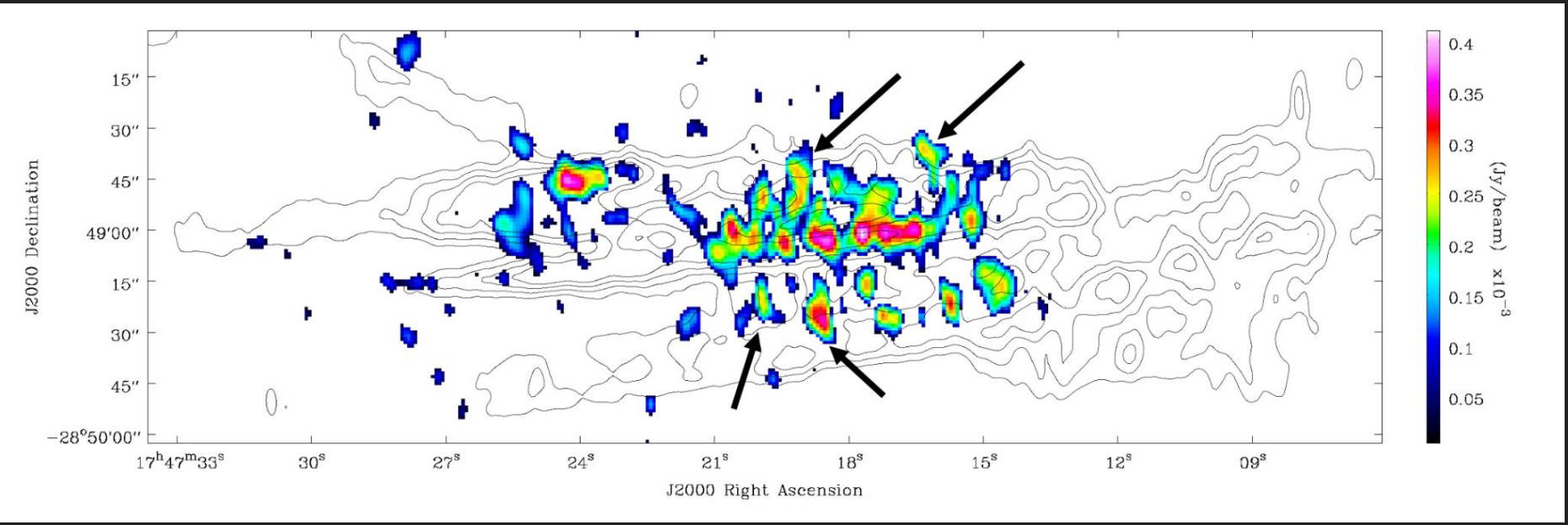
- Very Large Array C- and X-band (6 and 10 GHz)
  - 6 GHz field of view: Green
  - 10 GHz field of view: Blue

Stokes Parameters



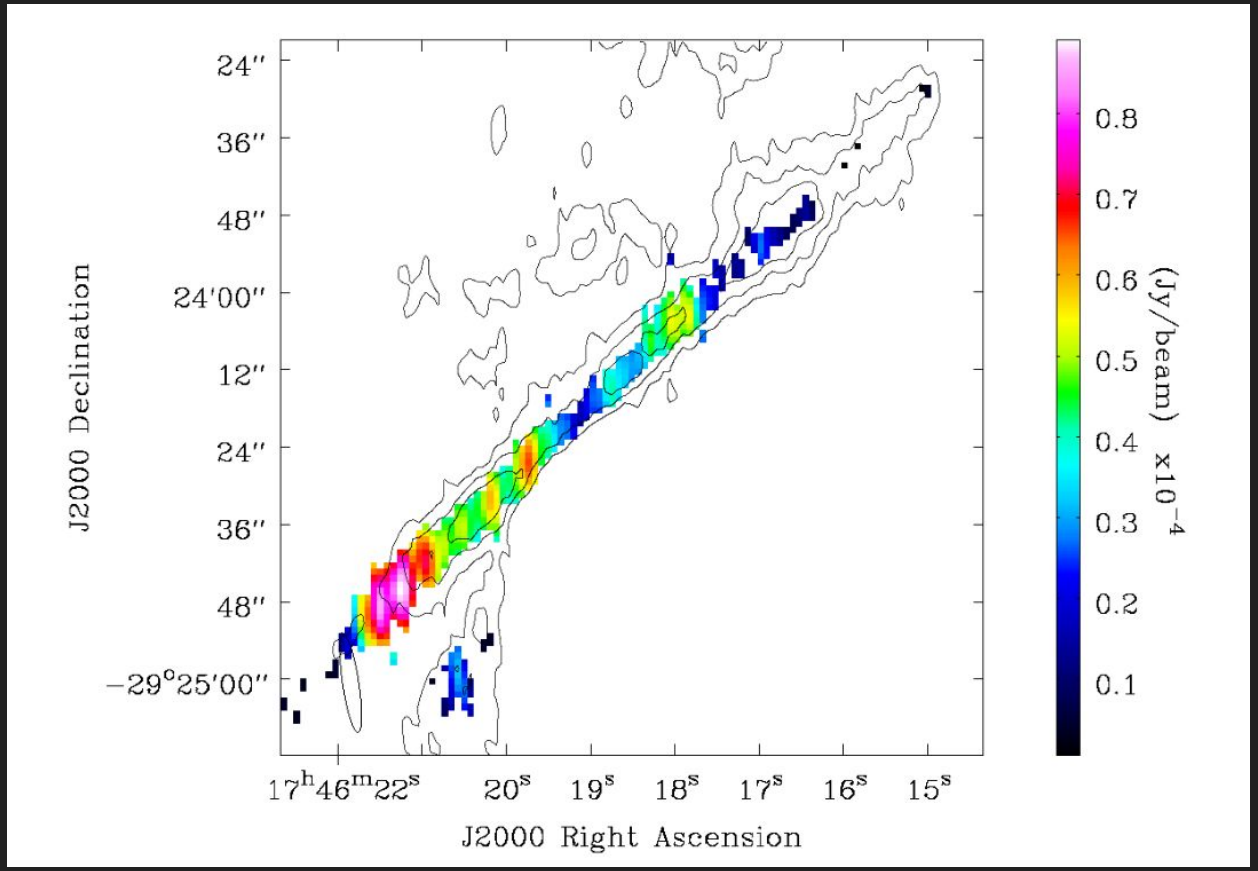
- Stokes Parameters describe polarization of radiation
- Circular polarization is not detected for NTF's in the Galactic center.
- The total linear polarization was used to calculate total polarized intensity

SNTF 1 Polarized Intensity



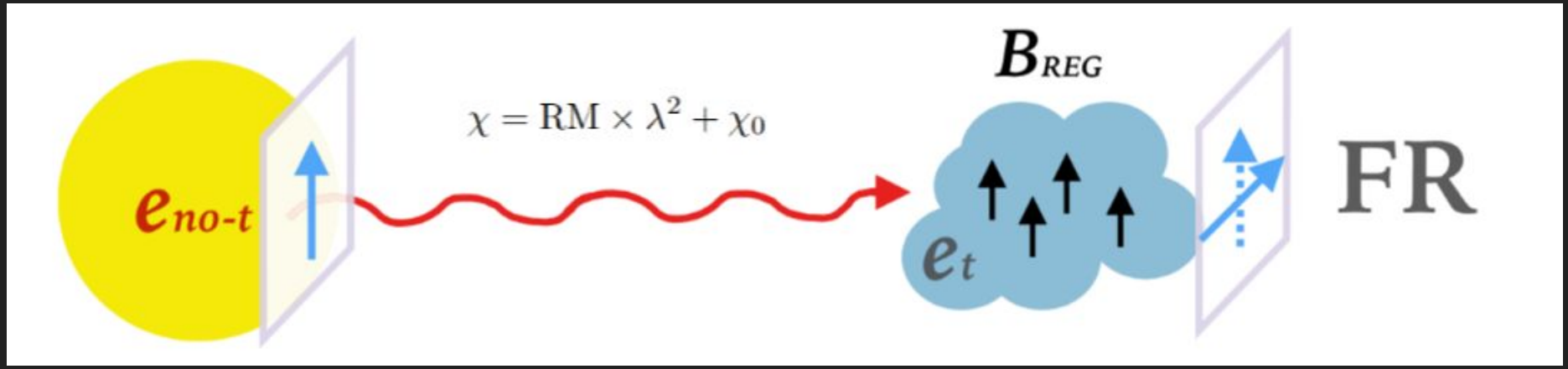
- Contours are 10 GHz total intensity
- Polarized intensity is “patchy”, similar to the radio arc and previously observed NTFs
- Non-parallel extensions “thorns”
  - External structure like in radio arc, can’t resolve large scale

SNTF 3 Polarized Intensity



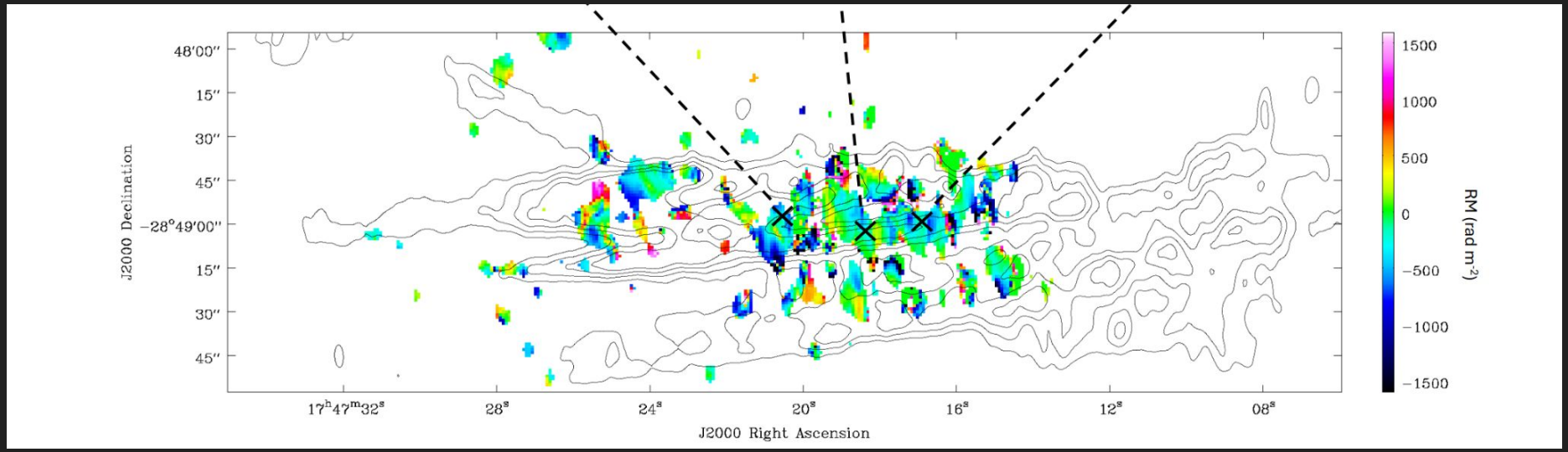
- SNTF3 polarization is contiguous unlike the former
- Latitude dependence on “thorny” features
- Faint emission could be missing “thorny” features
- SNTF2 does not have significant polarized emission

Rotation Measure (RM)



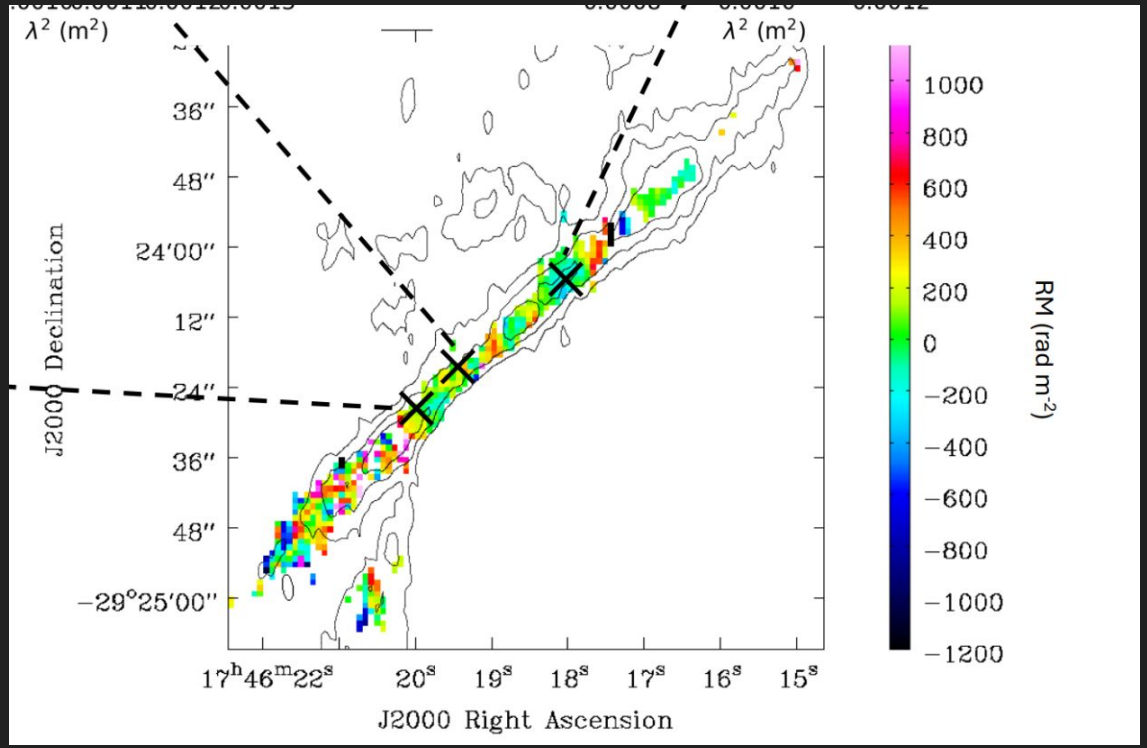
- Rotation Measure describes the rotation of the plane of polarization due to Faraday rotation
- Faraday rotation is Induced by passage through magnetized plasma

SNTF 1 RM distribution



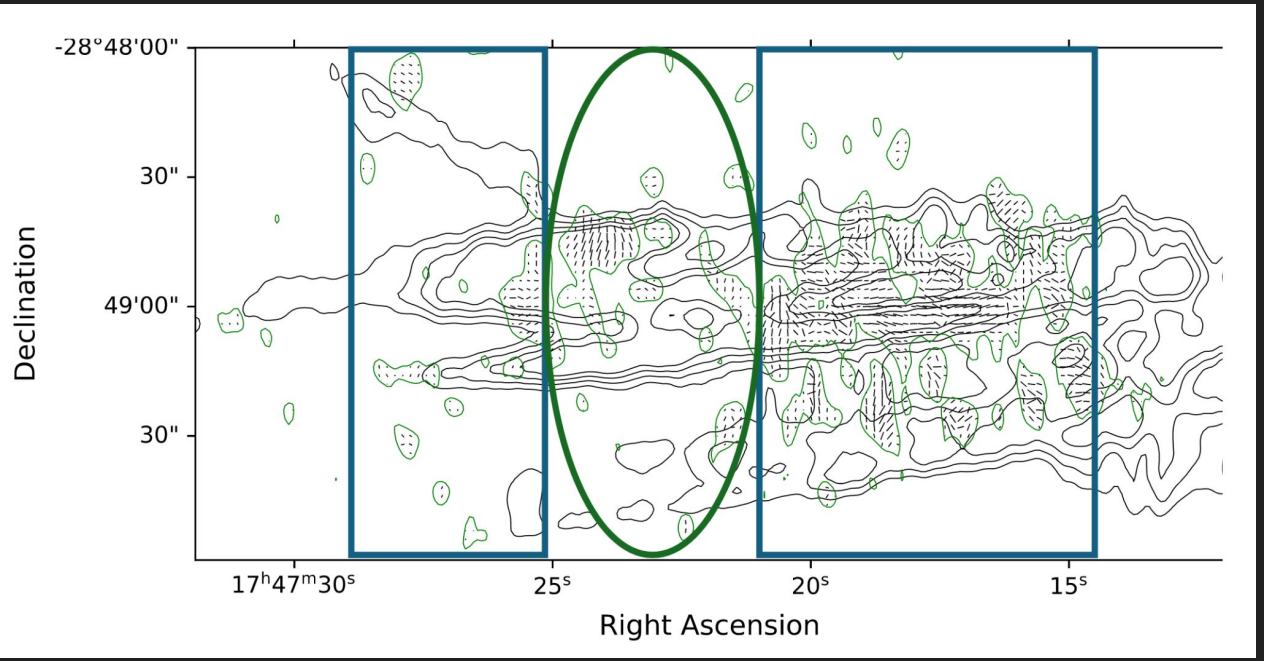
- Relatively Flat RM distribution
- Indicates lack of foreground magnetized medium
- Indicates “thorns” could be associated with background or local structure

SNTF 3 RM distribution



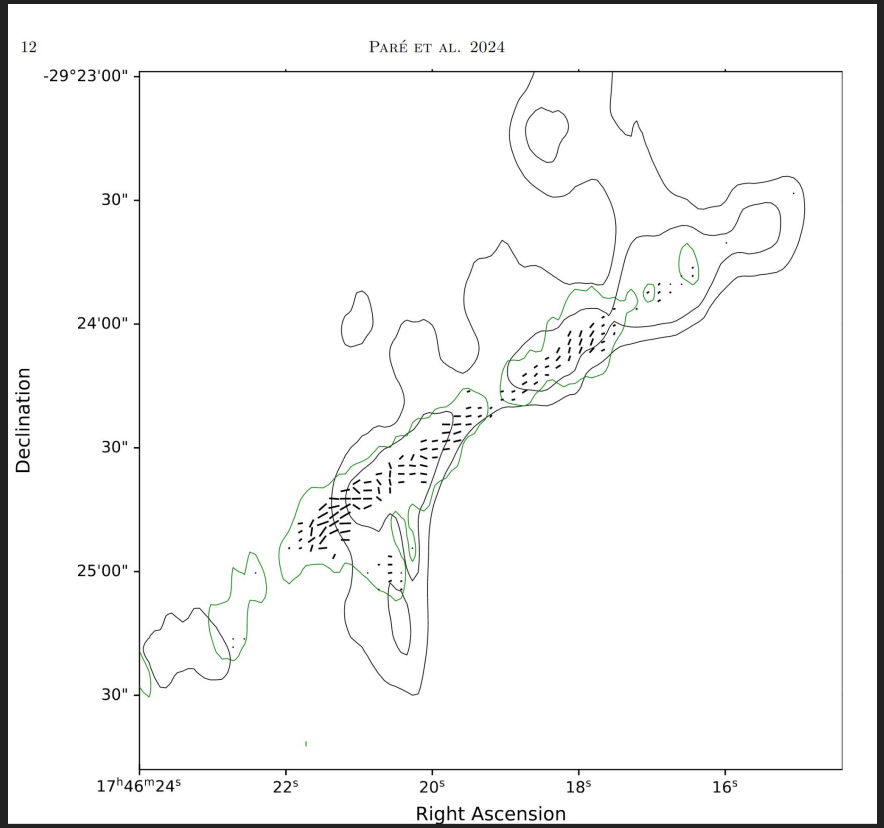
- Relatively flat RM distribution
- Slight increase in the south
- Coincident with an H II region as well

Intrinsic Magnetic Field orientations SNTF 1



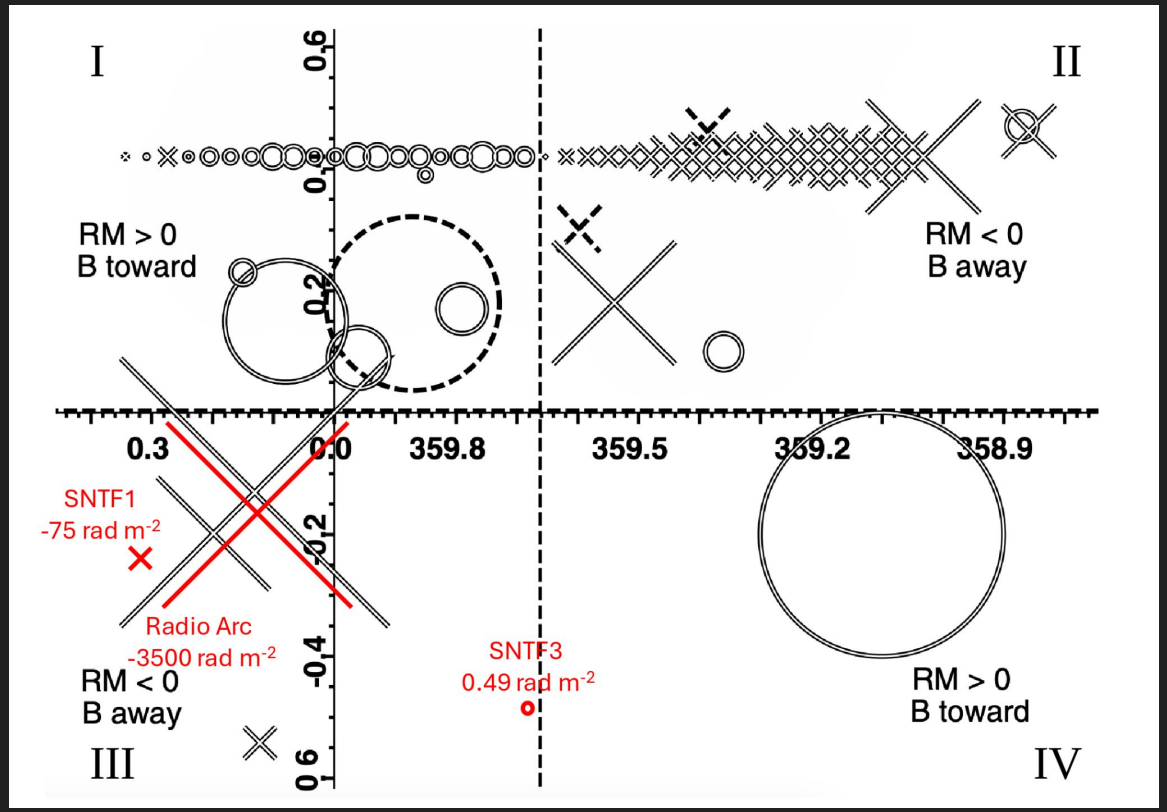
- Fields inside green are perpendicular to the filaments
- Fields inside the blue are parallel to the filaments
- Parallel fields could be from Faraday Rotation that isn't fully corrected

Intrinsic Magnetic Field orientations SNTF 1



- Almost uniformly parallel with total intensity
- This agrees with previous observations of NTFs

Large scale RM distribution



- Large Scale RM distribution creates a checkerboard pattern
- This checkerboard pattern is due to the magnetic field being disturbed by orbital motion
- These observations agree with previous literature

Conclusions

- SNTF1 exhibits extensions not seen in continuum or total intensity,
  - This could be due to H II regions
- The magnetic field is spatially variant in SNTF1, SNTF3 is mostly parallel.
  - SNTF1 could be because of a magnetized foreground object, or HII regions
- Large scale RM distribution suggests disturbance of the magnetic field through orbital motion

Questions?