

# The ASKAP Variables And Slow Transients Survey

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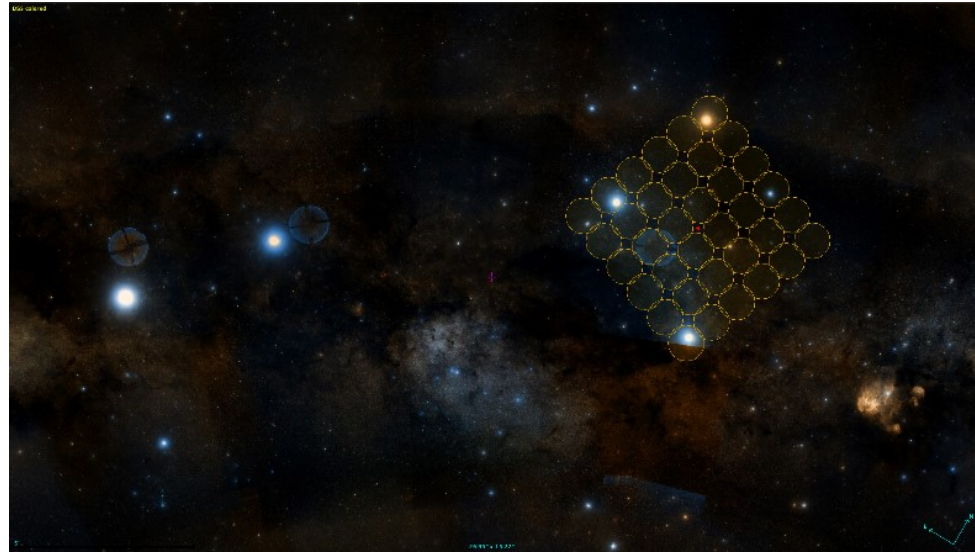
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*VAST Project Scientist*



# The Australian Square Kilometre Array Pathfinder

- 36 antennas
- 6km max. baseline
- 30 deg<sup>2</sup> Field of View
- 288 MHz bandwidth
- 0.9-1.6 GHz central freq.
- 10 hr. sensitivity:  $\sim 35 \mu\text{Jy}$



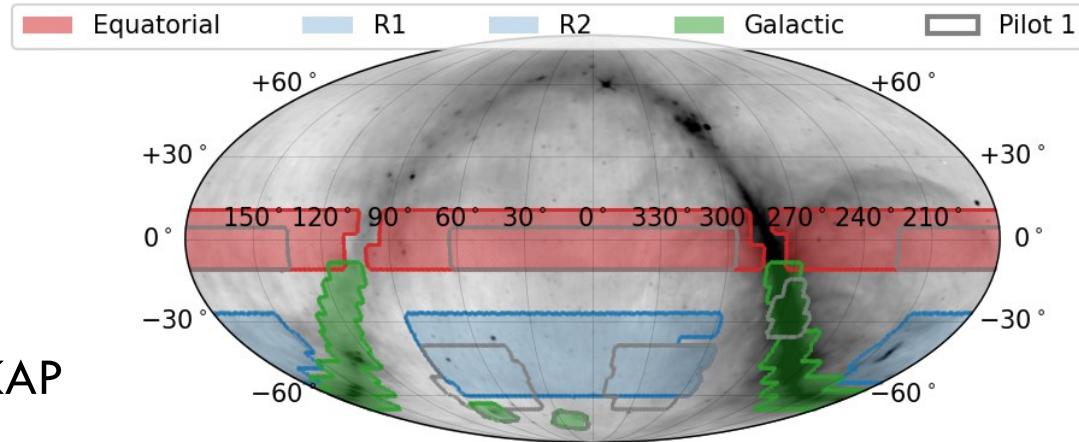
# VAST Survey Goals

**Carry out a deep, wide,  
long-term, unbiased search  
for variable radio sources**

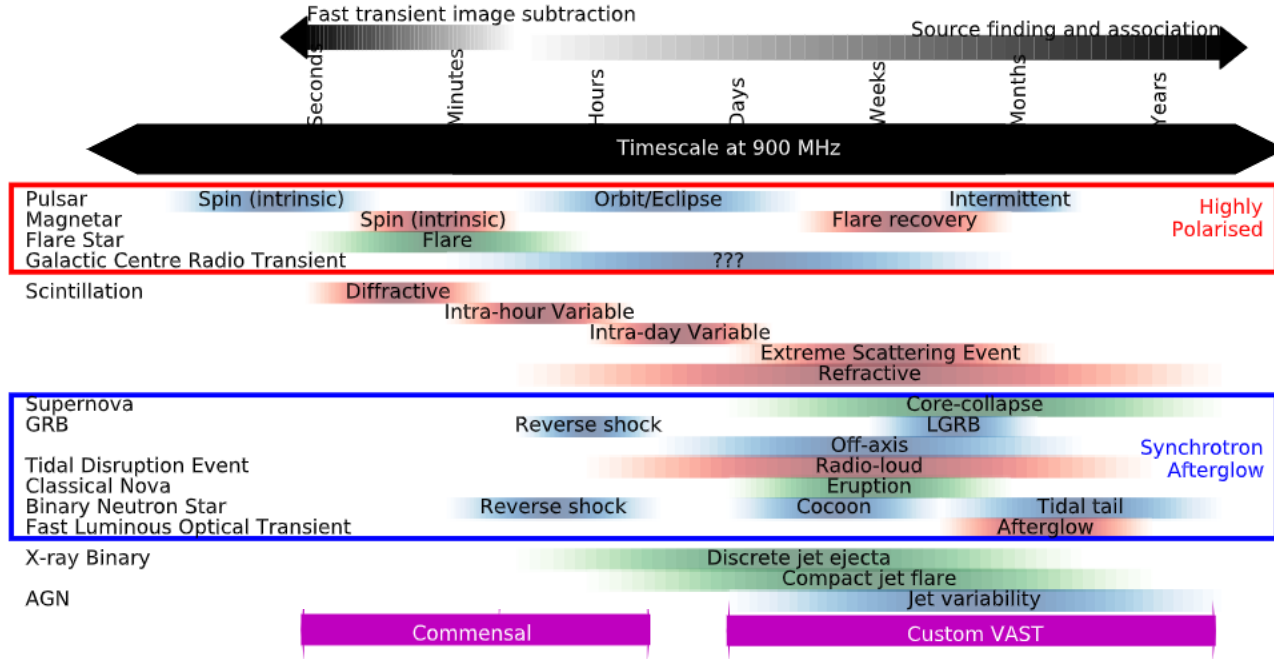
- Detect and monitor “orphan” gamma-ray burst afterglows to understand their nature
- Conduct an unbiased survey of radio supernovae in the local Universe
- Discover flaring magnetars, intermittent or deeply nulling radio pulsars, and rotating radio transients through changes in their pulse-averaged emission
- Detect and monitor flare stars, cataclysmic variables and X-ray binaries in our Galaxy
- Discover previously unknown classes of objects.

# VAST Survey Design

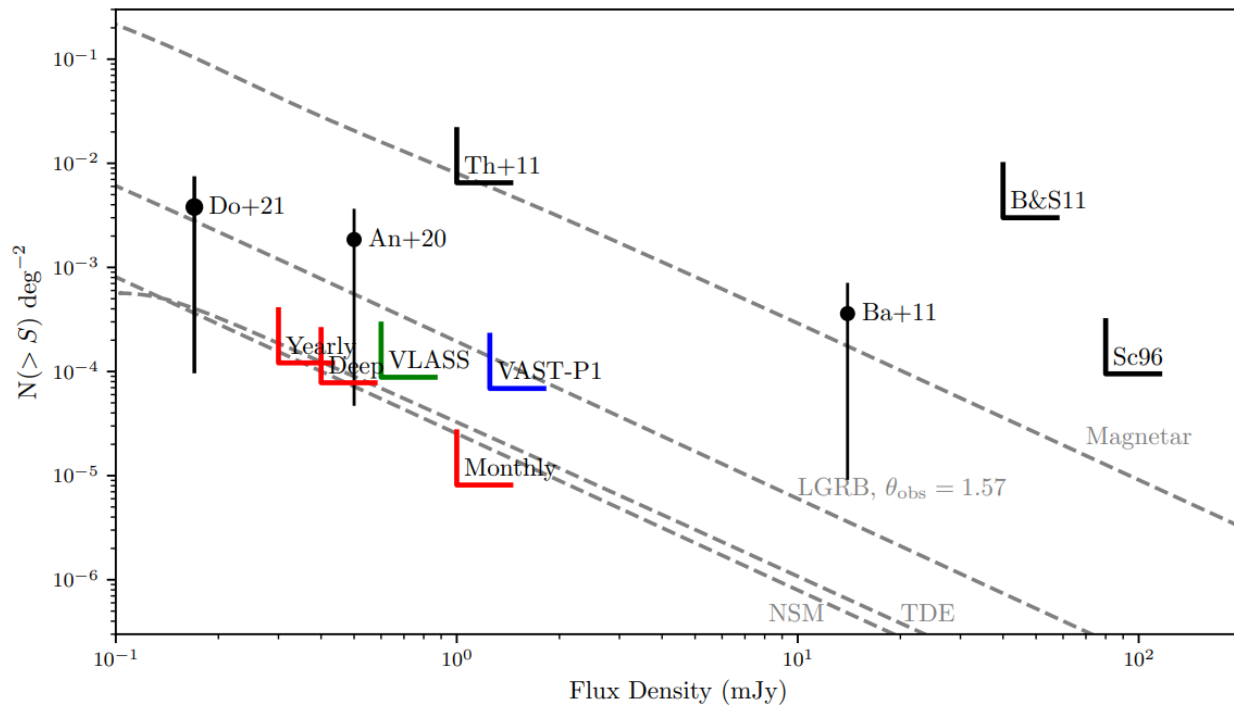
- 5 year ASKAP surveys
- Custom VAST survey
  - ~8000 sq. deg to 0.2 mJy/beam
  - Multiple epochs/year
- Commensal surveys
  - VAST has access to all ASKAP data
  - Other surveys generally do long single pointings



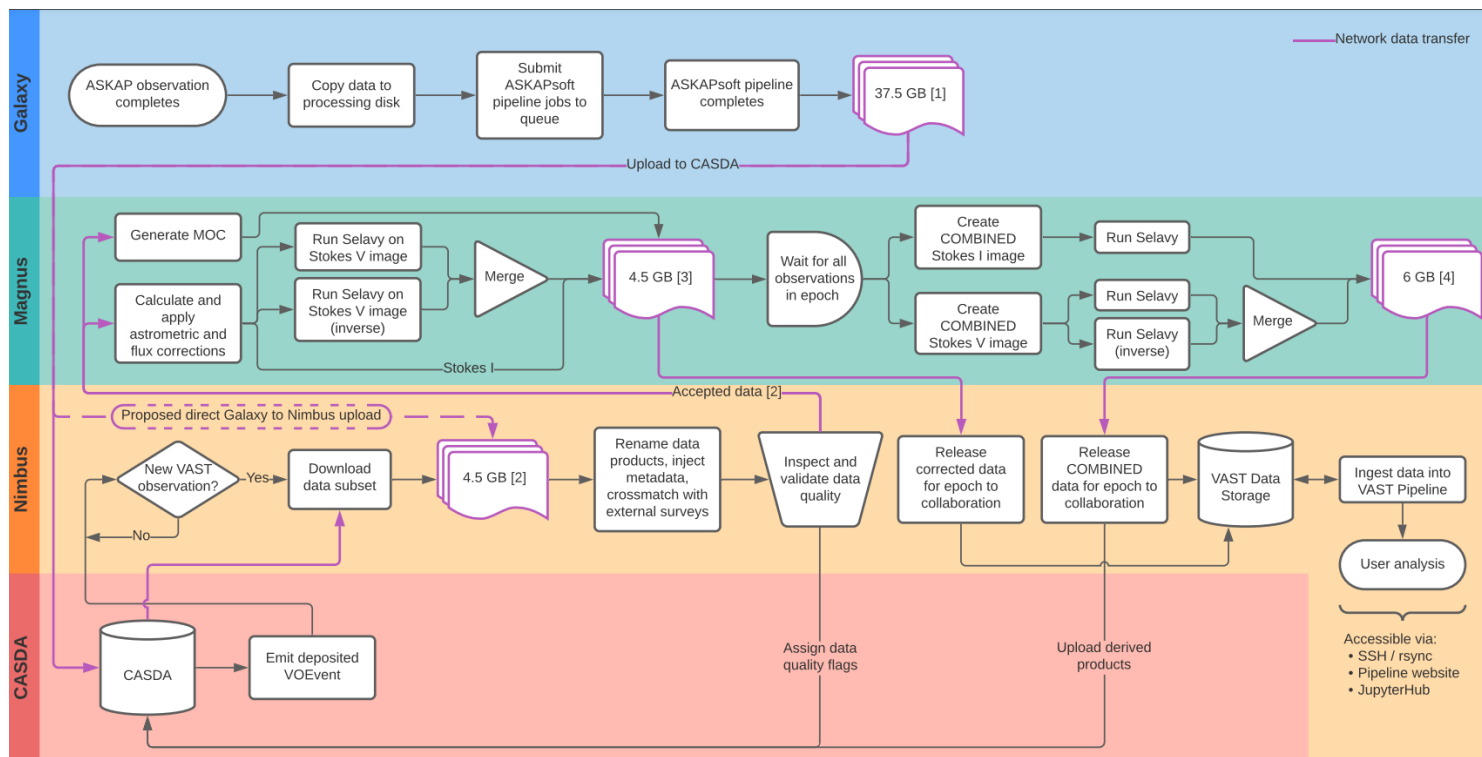
# Transient Timescales



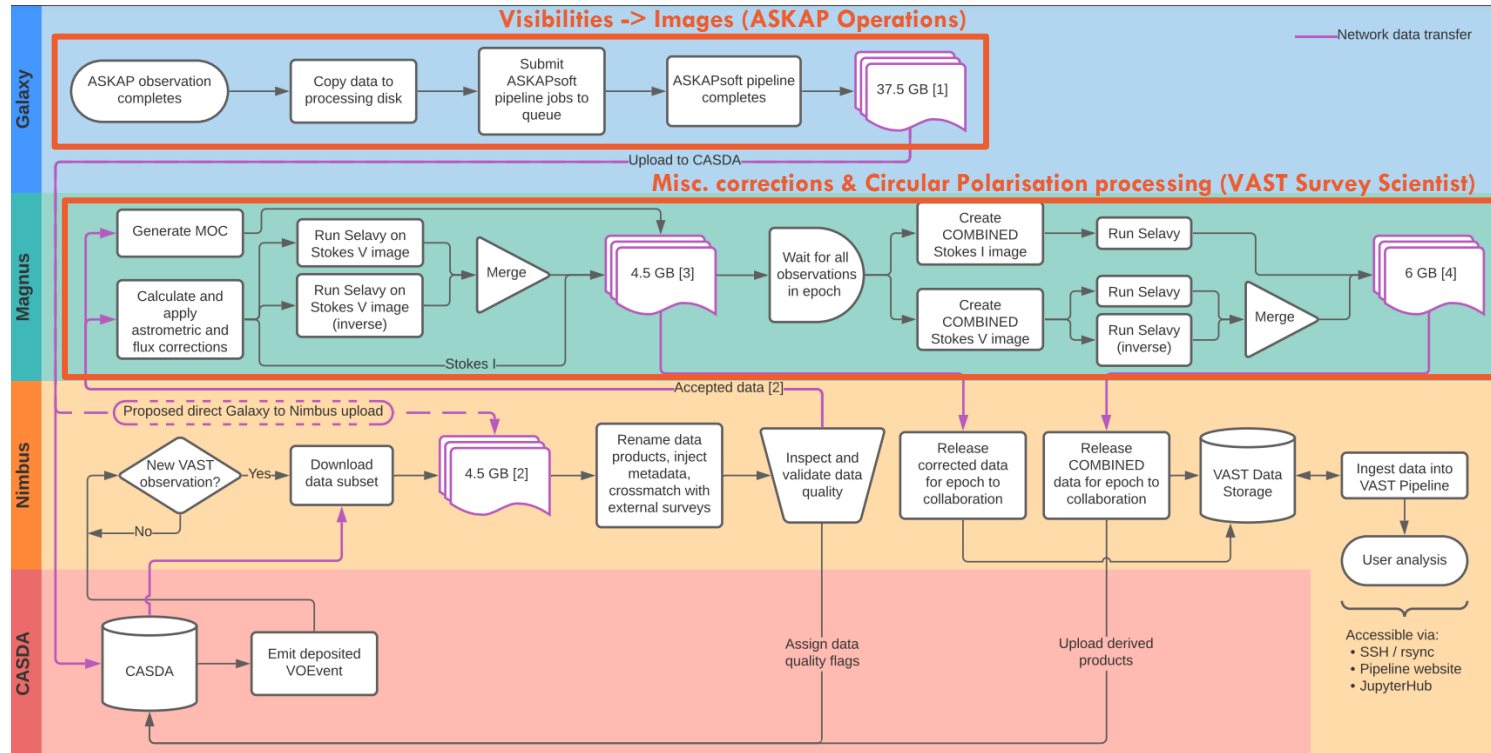
# Afterglow Phase Space



# VAST Workflow



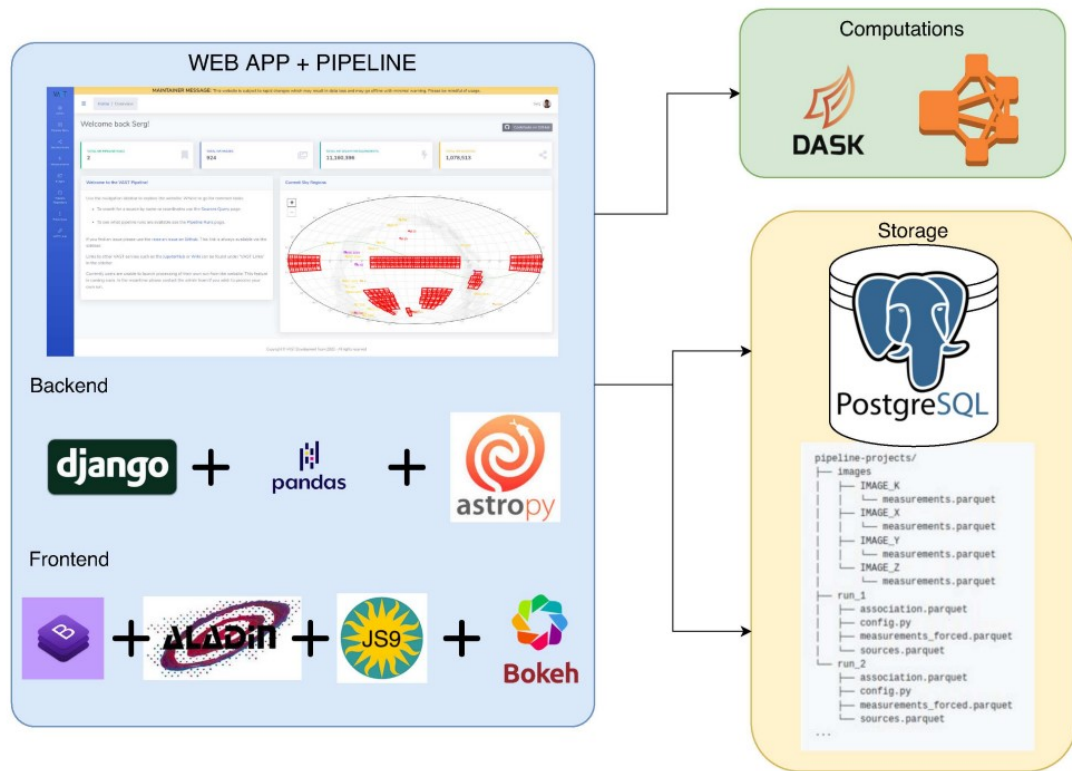
# VAST Workflow



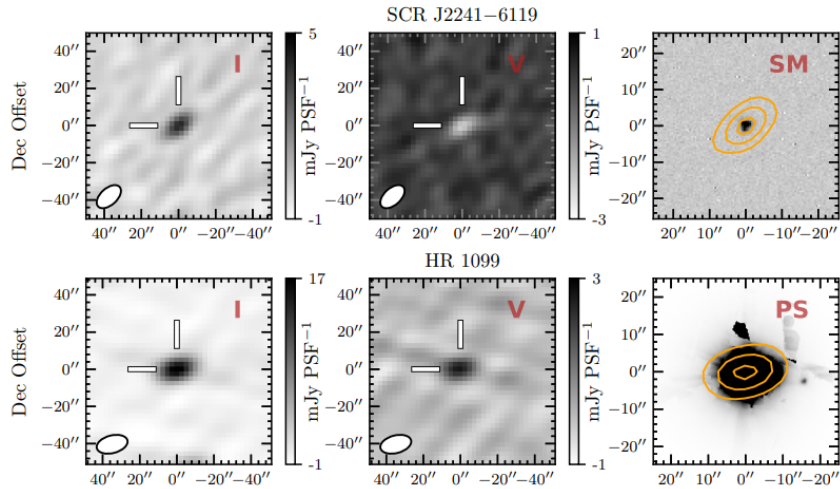


# VAST Pipeline

- Ingest images, run source association, calculate variability metrics
- Open source, scalable
- Can be queried via web-interface or Python package

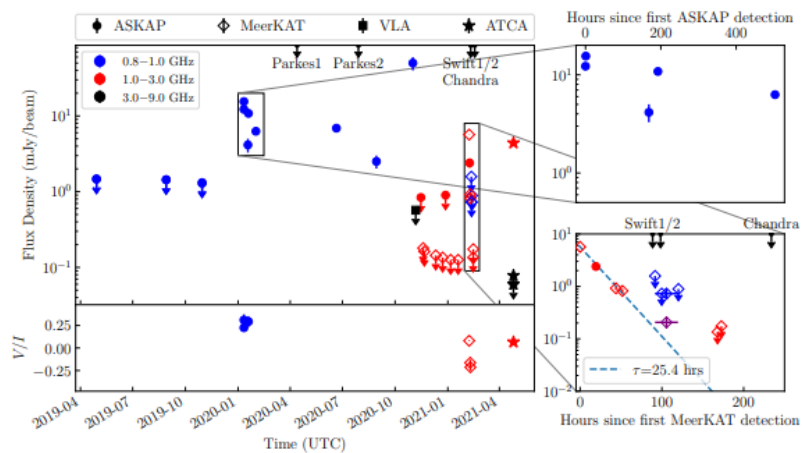


# Radio Stars

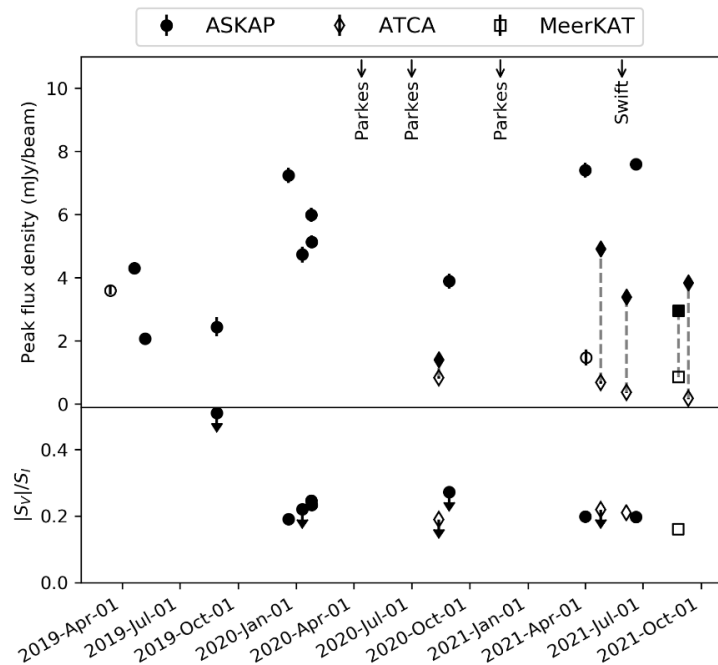


- Pritchard et al. (2021)
- Pritchard et al., Edwards et al. (in prep.)
- Found  $\sim 75$  new radio stars in search to-date

# Polarised Transients and Variables



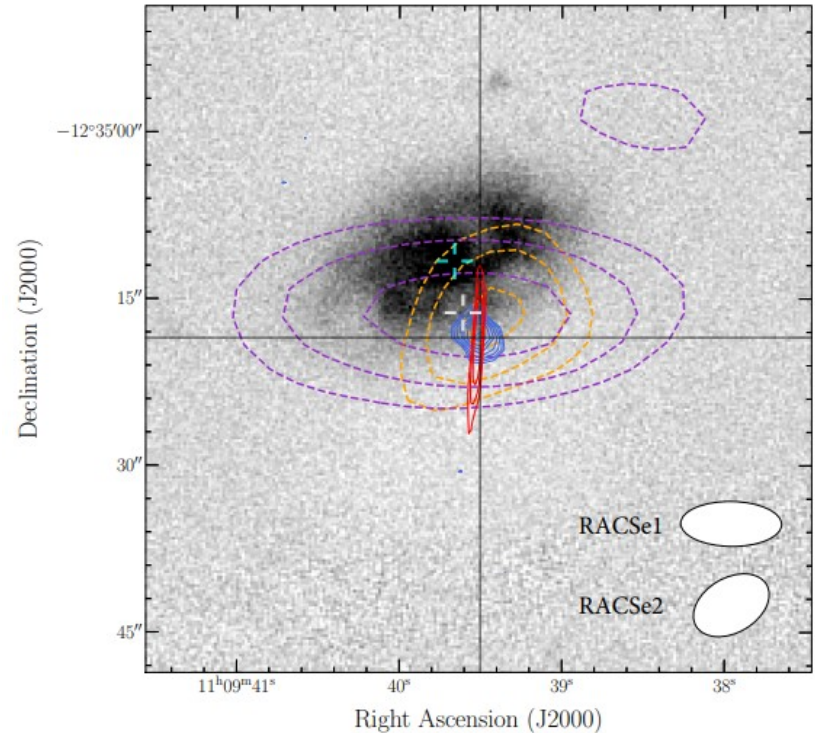
Z. Wang et al. (2021)



Y. Wang et al. (accepted, ApJ)

# GRB afterglows

- Leung et al. (2021)
- GRB afterglow found in single-epoch all-sky search
- Two-epoch all-sky search is currently ongoing



# Summary

- ASKAP and VAST will open a new window into the variable universe
- Important infrastructure in-place, but room for improvements
- Science ongoing, but will ramp up as main surveys begin