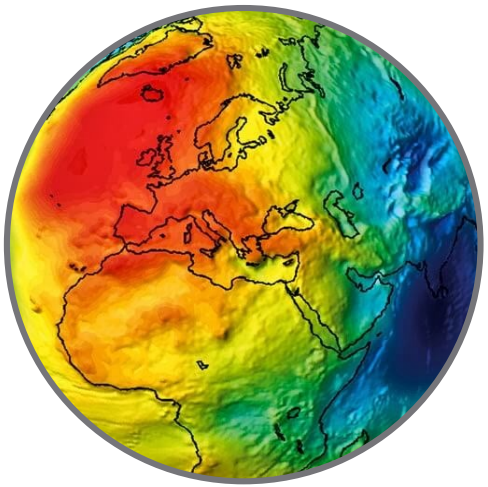
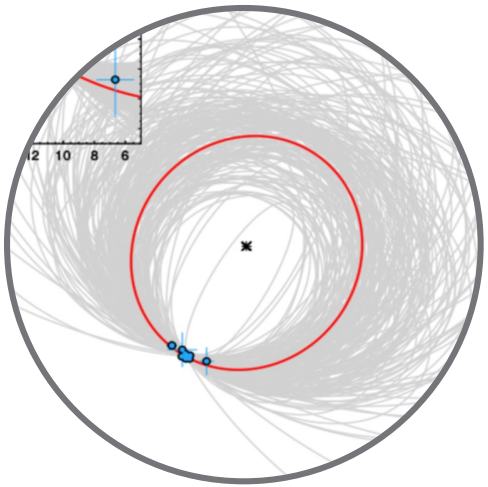
Australia's National Science Agency

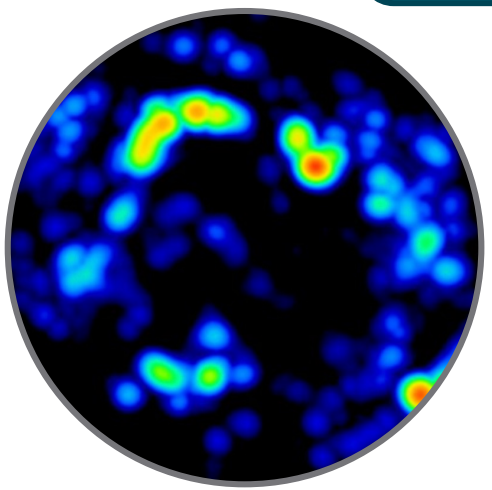
Broad Bandwidths are Better

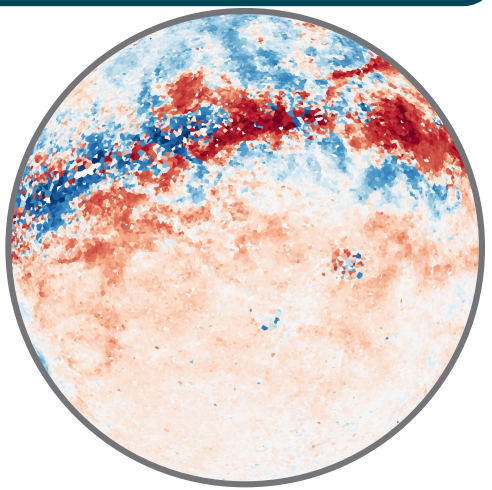
Thanks, Dongjin for the earlier motivation!

Jane Kaczmarek



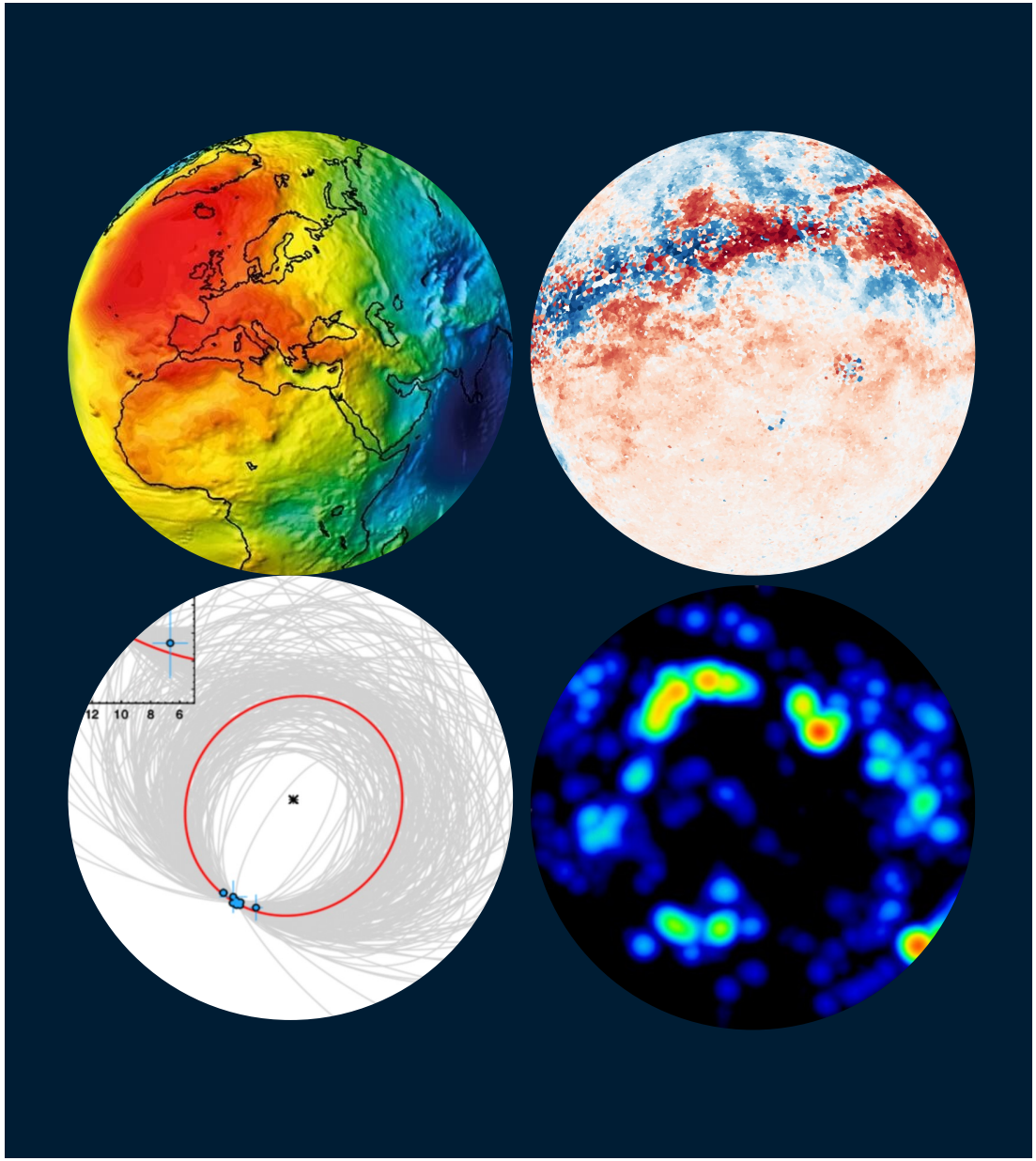




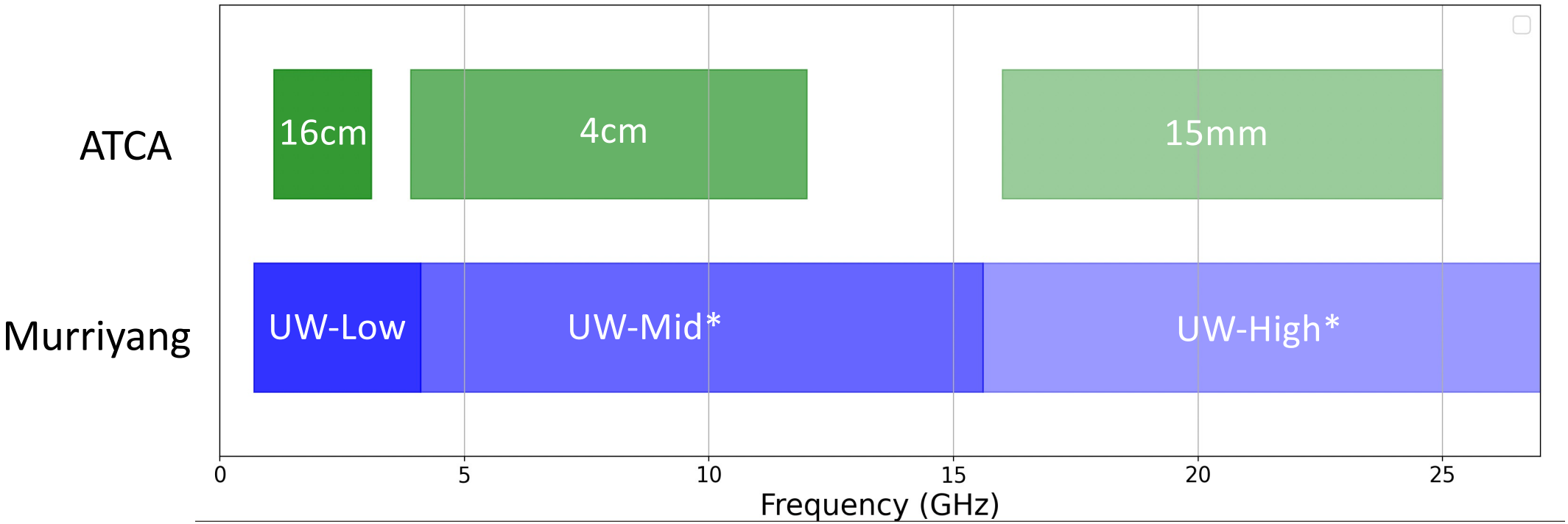


More is more

- Broadband VLBI is not new
  - E.g. VGOS spans 2-15 GHz (Petrachenko+ 2012; Niell+ 2018)
- Multiple “standard” VLBI science cases benefit, e.g.:
  - Geodesy
  - Astrometry
  - Wideband spectral modeling
  - Spectral lines & masers
  - Polarimetry
  - …



ATNF Wideband Receiver Fleet



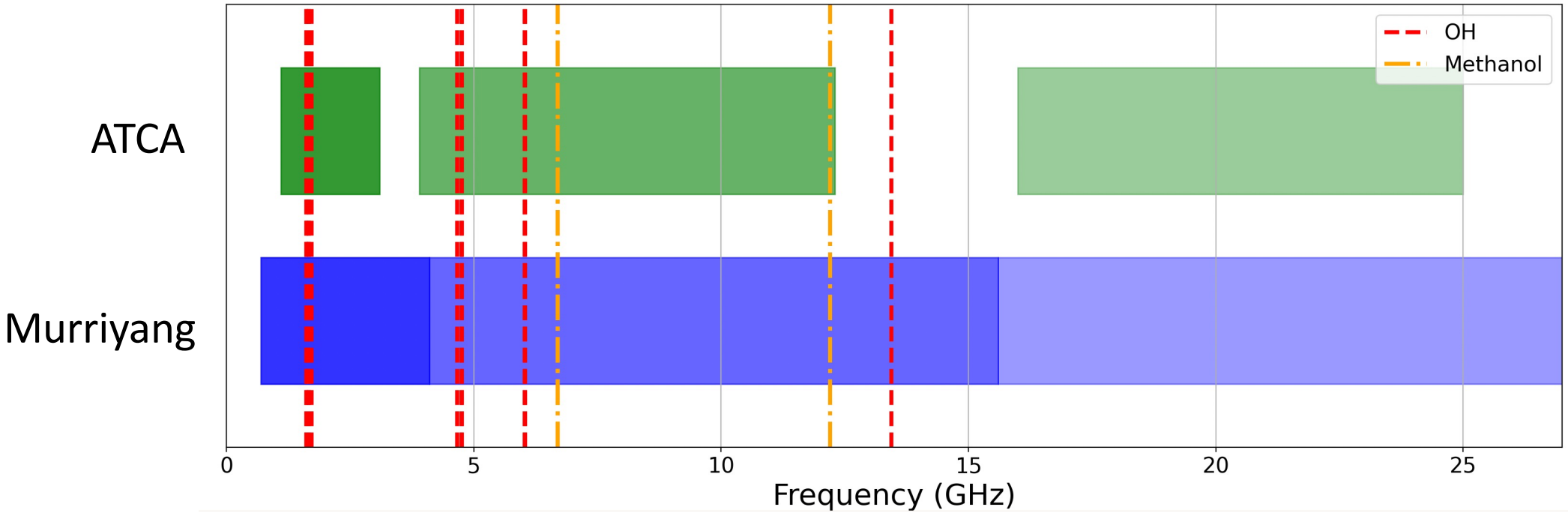
Murriyang

- The “Ultra Wideband” fleet will offer continuous frequency coverage from 0.704 – 27.1 GHz
  - Up to 11.5 GHz of instantaneous bandwidth
- Expected late 2027

ATCA

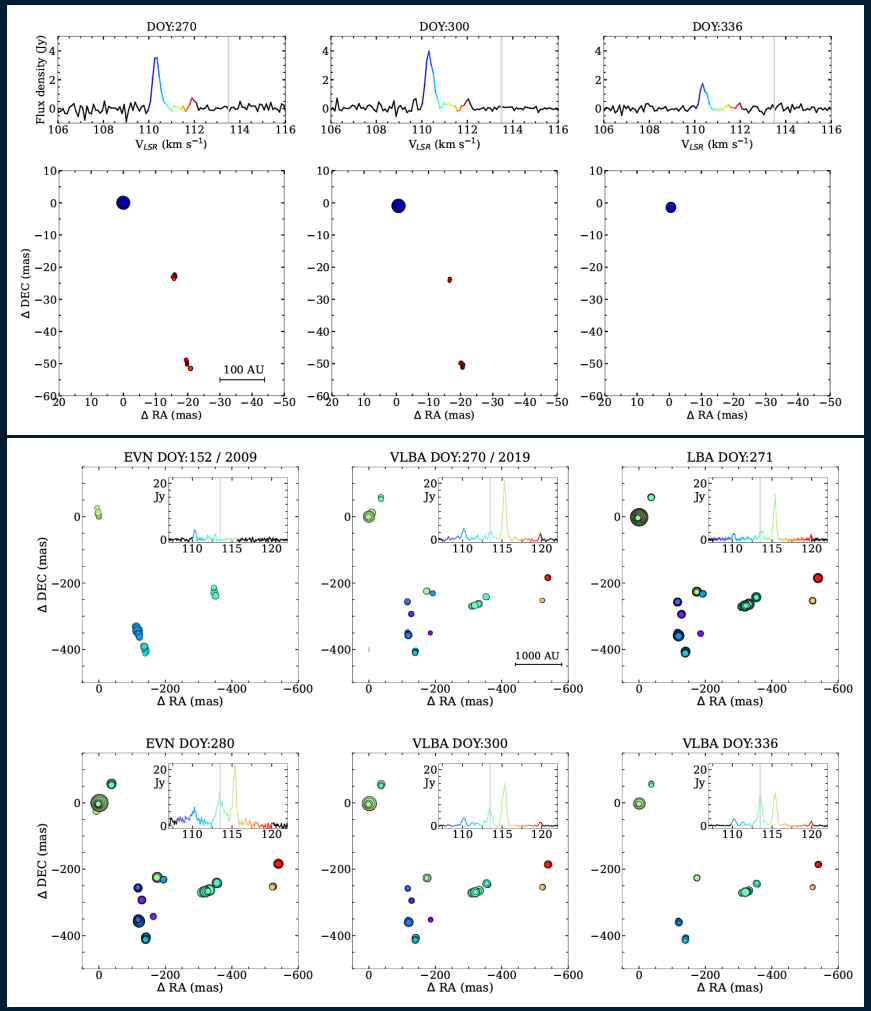
- BIGCAT will deliver instantaneous bandwidths of up to 8 GHz (see Chris Phillips talk later)
- Expected mid 2025

Commensal Spectral Line Observations



Commensal Spectral Line Observations

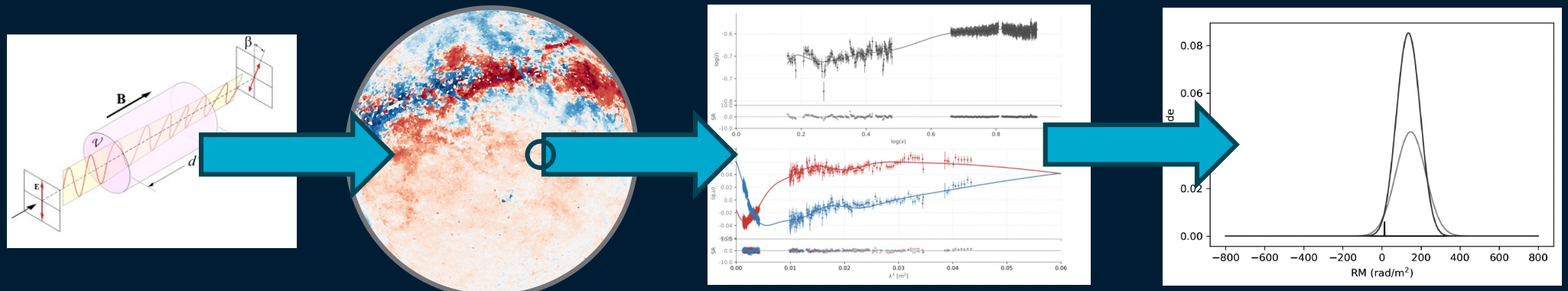
- Numerous maser transitions span one receiver combination
  - Not to mention radio recombination lines!
- Observe multiple lines simultaneously for real-time evolution studies
- Vastly decreases overheads, etc.



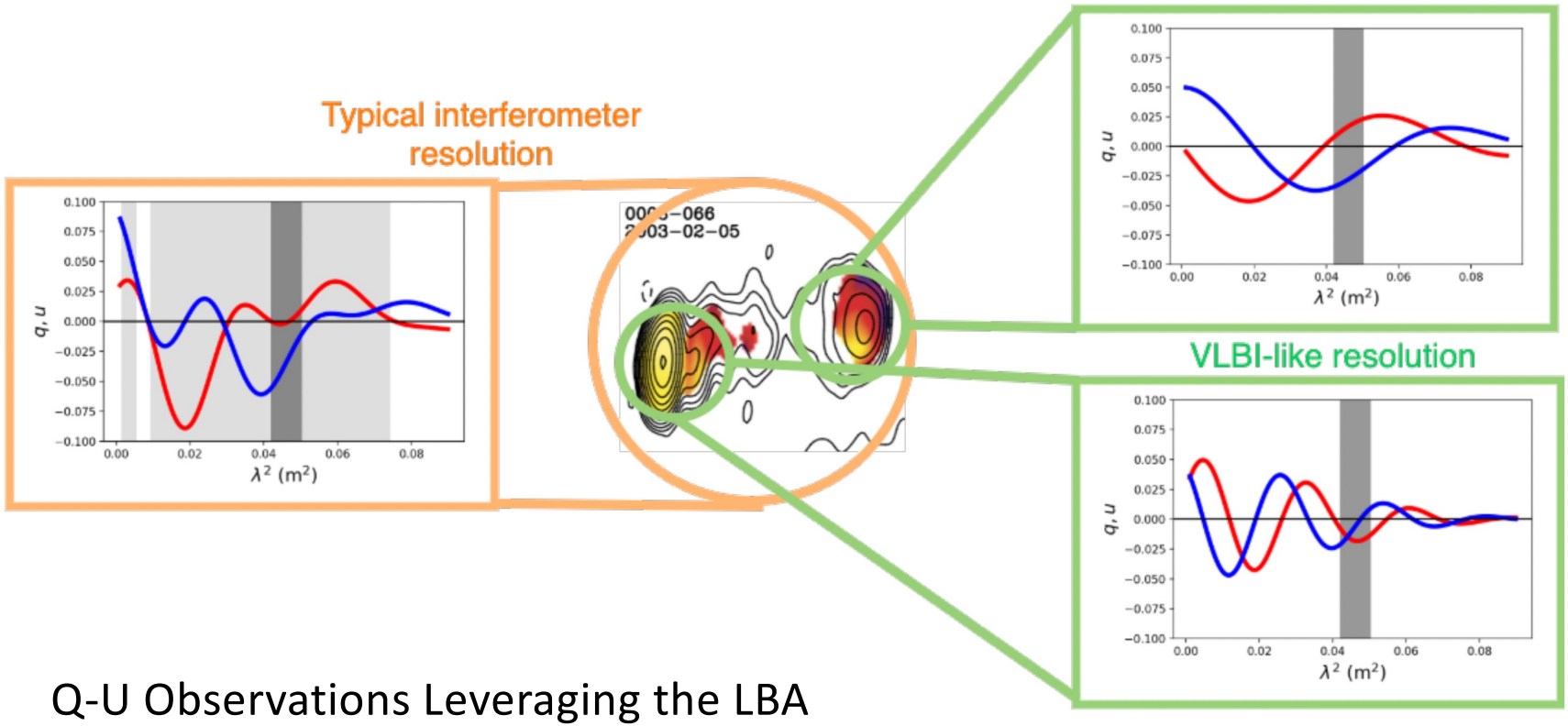
Kobak+ 2023

Resolving Complex Polarisation

- Faraday rotation is a direct probe of magnetic field structure and strength along the line-of-sight
  - Measurement is directly related to λ^2
- "Faraday complexity" arises when there are multiple magneto-ionic components within a synthesized beam



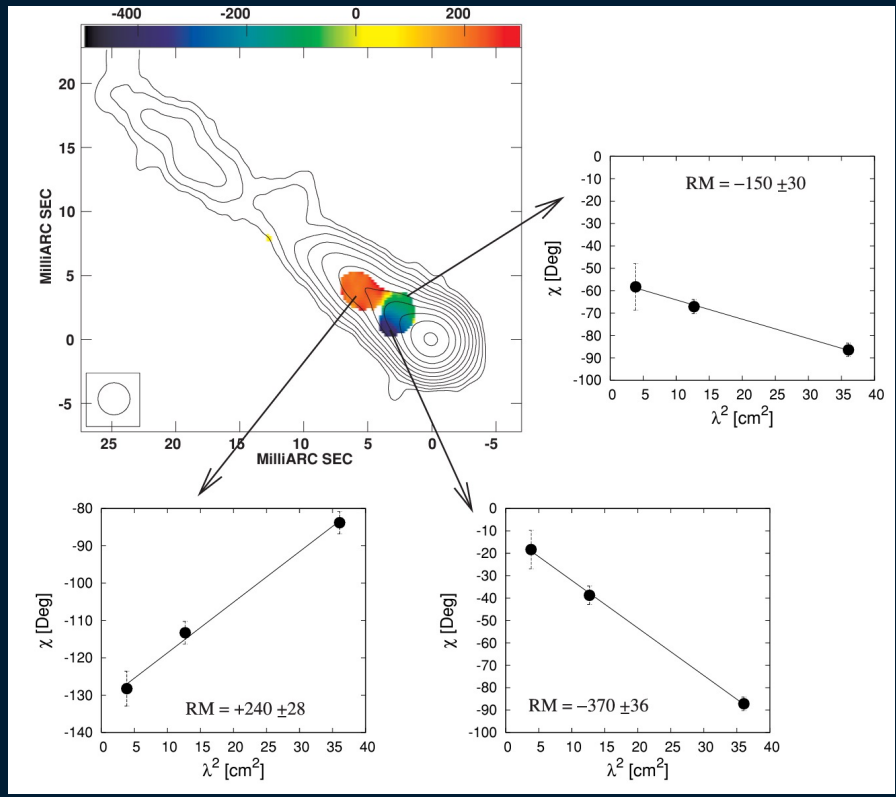
Disentangling Complex Sightlines



Q-U Observations Leveraging the LBA

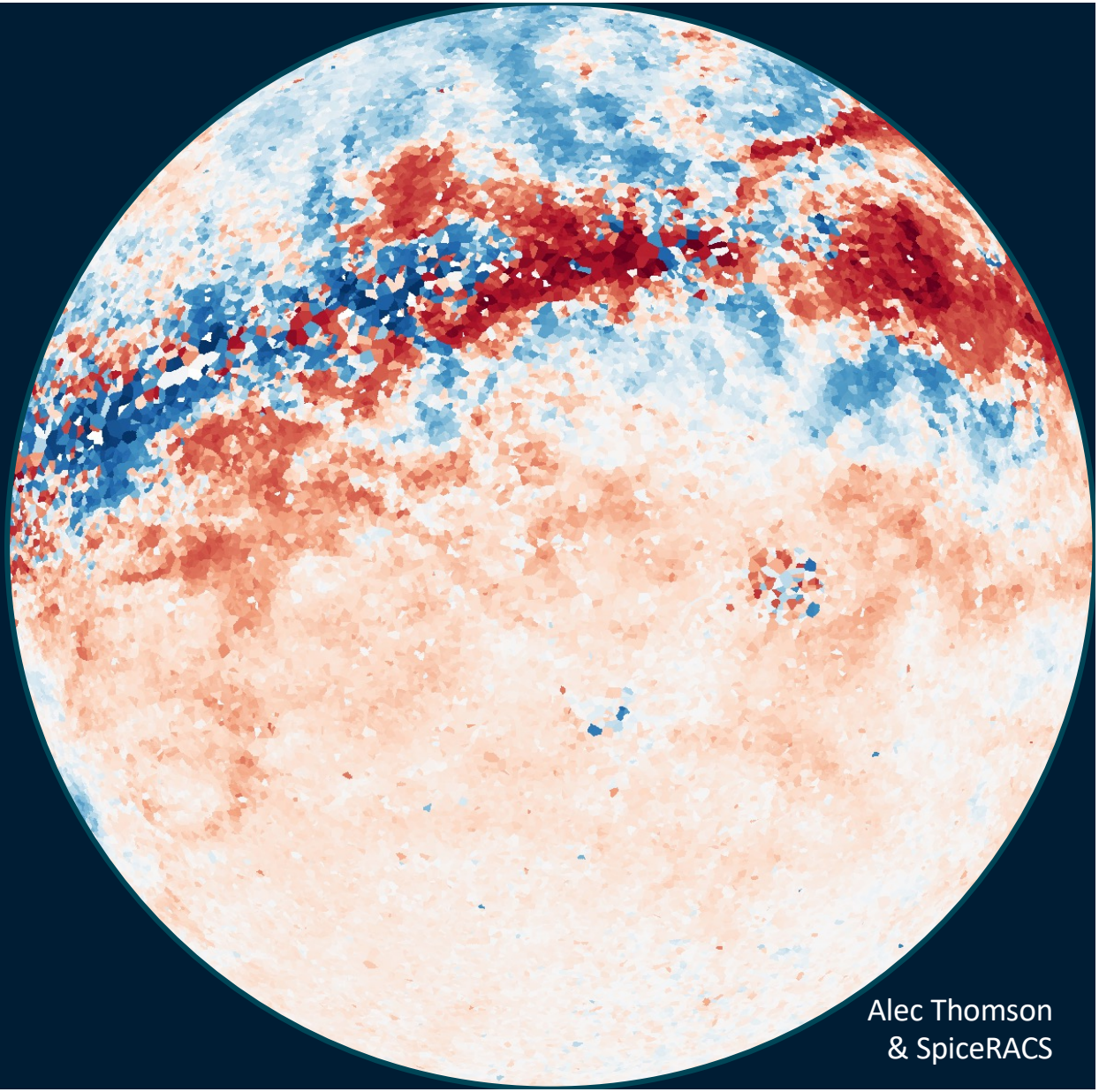
Polarisation *is* Complex

- "Simple" RM fits to complex environments are likely not physical
- Broadband observations will reveal true Faraday spectra
  - Detailed studies of AGN jets
  - Disambiguation of unresolved complex sources
- Watch this space! (and listen to George Heald's talk later)



Kharb+ 2009

Broad bandwidths make better science



Alec Thomson
& SpiceRACS

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