Resolving Quasar 3C 334 with e-MERLIN and the Jansky VLA

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Introduction

- Jets produced from AGN remain some of the most obscure objects in extragalactic research. These massive outflows are believed to contribute to galaxy growth through feedback and may hinder star growth through the creation of strong, heated winds that collide with the interstellar medium.[1] For many years progress in the field had been limited by the resolution of radio telescopes.

  The e-MERLIN jets legacy project has chosen bright, radio sources to produce images in L and C bands. Among the samples is the powerful quasar 3C 334. JVLA and e-MERLIN data are being combined to produce images with good transverse resolution to compare brightness profiles with current models.

Outstanding Jet Problems

- What are jets made of?
- How are they launched?
- What is the speed of the jet?
- What impact do jets have on the intergalactic and interstellar gas?
- How do jets remain well-collimated from sub-parsec to mega-parsec scales?

e−MERLIN Specifications

Operated by The University of Manchester and Science and Technology Facilities Council, e-MERLIN is a radio telescope array composed of seven telescopes spread across the UK. e-MERLIN stretches from 11 km to its maximum baseline 217 km[1].

- L-Band
  - Frequency Range: 1.3—1.8 GHz
  - Resolution: 150 mas
  - Field of View: 30 arcmin
- C-Band
  - Frequency Range: 4—8 GHz
  - Resolution: 40 mas
  - Field of View: 7 arcmin

Figure 1: The Lovell radio telescope is one of seven telescopes that are part of the e-MERLIN interferometer array.

Current Work with 3C 334

- Reduction of VLA data in A **&** B configurations to provide necessary short baselines for e-MERLIN data (Fig. 3).
  - $\sim$ 1 arcsecond resolution
- e-MERLIN data imaged without VLA data reveal newly resolved substructures (Fig. 4).
  - $\sim$ 0.24 arcsecond resolution

Figure 2: VLA image of 3C 334.[3]

Conclusion

- The e-MERLIN array is a powerful tool for AGN jets studies. The high-resolution is expected to provide clues to some of the long-standing questions about AGN jets and should reveal resolved sub-structures that were previously undetected.

VLA Image

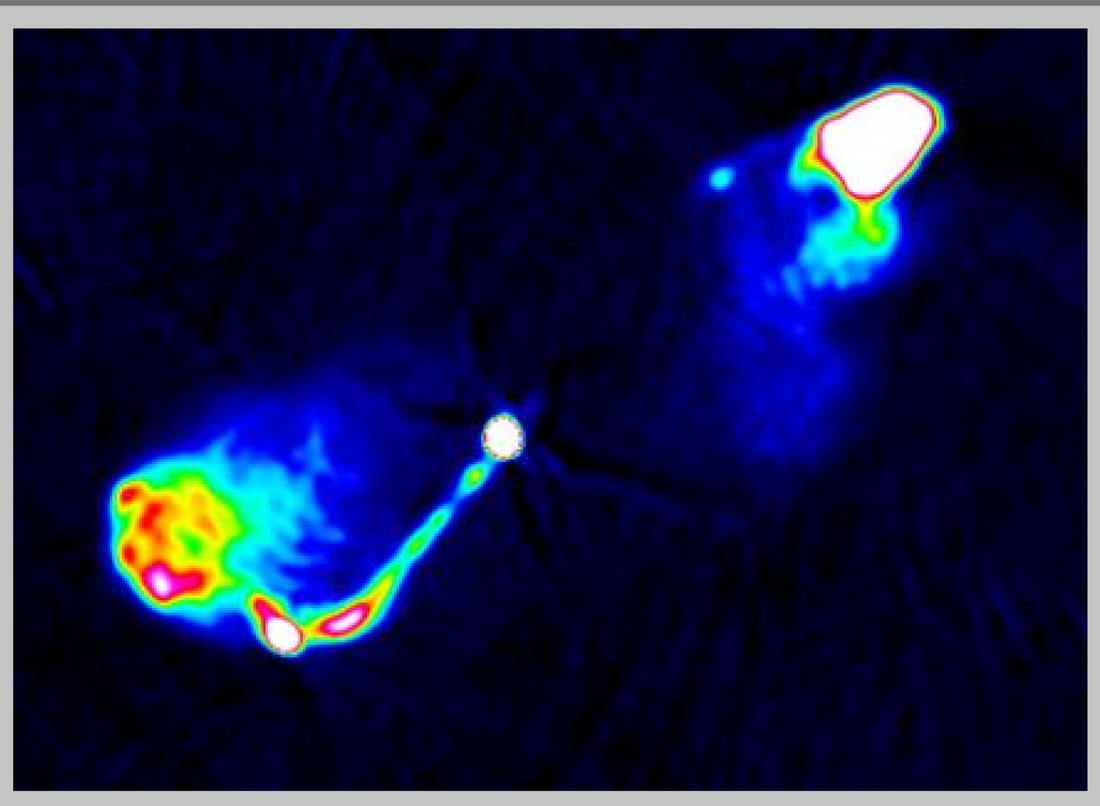

Figure 3: VLA image of 3C 334.

e-MERLIN Image Progress

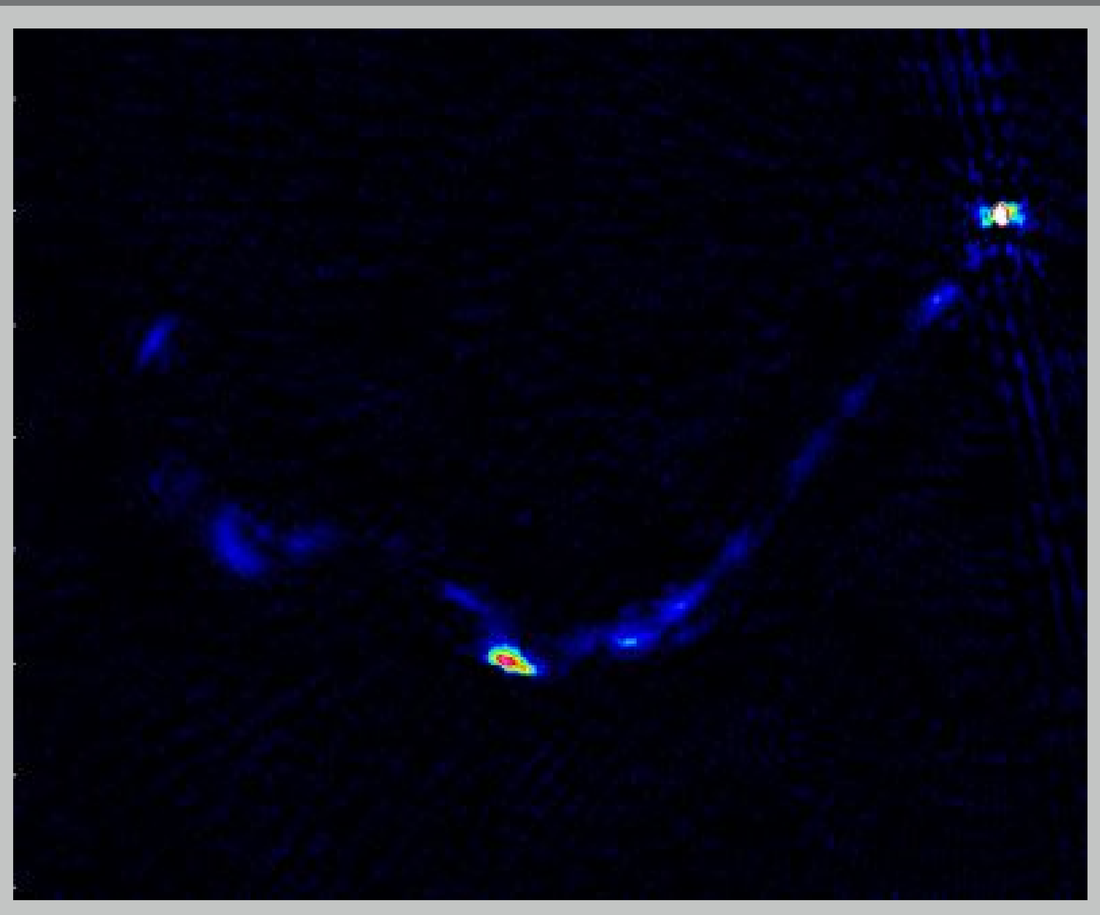

Figure 4: Preliminary image of 3C 334's southern jet using e-MERLIN.

References

[1] K. M. Dasyra et al. ALMA reveals optically thin, highly excited CO gasin the jet-driven winds of the galaxy IC 5063, Astronomy **&** Astrophysics (2016). DOI: 10.1051/0004-6361/201629689

[2] Argo, M.K., (2015). The e-MERLIN Data Reduction Pipeline. Journal of Open Research Software. 3(1), p.e2. DOI: http://doi.org/10.5334/jors.bp

[3] http://images.nrao.edu/Telescopes/VLA/299

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