A long overdue synthesis image of Centaurus A

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Centaurus A is by far the closest active supermassive black hole in the Universe. But until now only about 1% of its radio morphology has been imaged at high resolution with aperture synthesis. Why? Because its large angular size (9°x5°) and low surface brightness outer lobes made imaging this radio galaxy daunting and expensive in time. Only now are image processing algorithms sophisticated enough to deal with the high dynamic range (10⁵) and large field-of-view to properly image Centaurus A. The mosaic that we are making will have a spatial resolution of 600pc over a radio source 600kpc in size. It will be the most detailed image ever of a radio galaxy!



This image is a *preliminary* first full aperture synthesis image of Centaurus A. This 1.4GHz continuum image was made with only two of the four 750m ATCA array configurations needed for a full synthesis. It includes the existing 1.4GHz continuum image made with the Parkes 64m (courtesy Norbert Junkes). The final image will include new Parkes spectropolarimetric observations matched to the ATCA frequency and bandwidth.

The inset of the image shows the optical DSS image of the host galaxy NGC 5128 with 1.4GHz VLA (gold) and ATCA (brown) contours of the central 1% of Centaurus A that has been imaged at high resolution (Burns et al. 1983; Morganti et al. 1999).

This image is far from complete but already detailed filamentary structure is emerging in the outer lobes. Of order 1500 background radio sources are present in this image. The linear feature near the top of the southern radio lobe is most likely a background radio galaxy.

The science goals are to:

• Explore feedback between the polarised radio jets/lobes and the environment of the Centaurus group of galaxies to look for jet-cloud interactions and jet-induced starformation.

• Exploit Centaurus A as a background polarised screen to probe the magnetic fields of HVCs and galaxies residing in front of the radio lobes.

 Derive Faraday rotation measures for the polarised radio sources behind the lobes to probe the magnetic field structure of Centaurus A itself.

The final ATCA image specifications are:

Stokes= I, Q, U, V

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Stokes= 1, Q, O, V

Mosaic Pointings= 409

Observing frequencies = 1384, 1432MHz

Bandwidth = 2x128MHz

Spectral Resolution = 4.4MHz

\sigma_{rms} = 0.1 \text{ mJy/beam}

\sigma_{sb} = 0.03K

\delta\theta \sim 40^{"}

\Sigma t_{obs} = 1200 \text{ hours}
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Want more information?

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