A low-frequency radio continuum study of the FRI radio galaxy 3C 31 with LOFAR

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Fun facts:

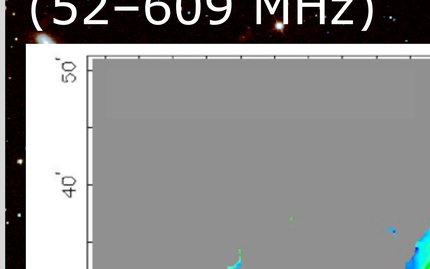
- Below image is only 1/8 th of the LOFAR HBA field of view (~8 degrees)
- The gap between LBA and HBA is to avoid RFI from the FM frequencies (88–108 MHz)
- The observations (LBA and HBA, 10 hr each) took about 1 Terabyte to store after compression in time and frequency

1 degree = 1.2 Mpc

3C 31 factfile:

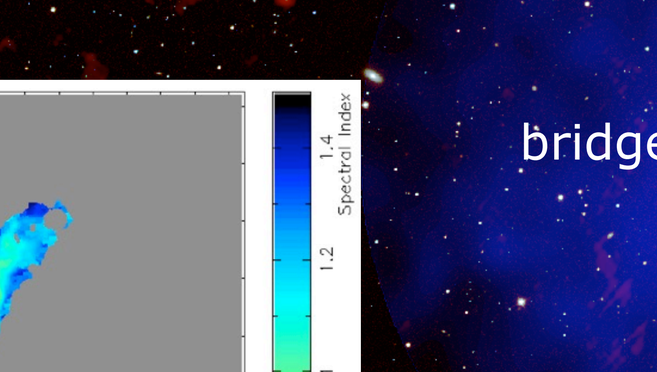
- D = 73.3 Mpc / z = 0.0169
- Member of the 'Arp chain' of galaxies
- Low-power FR I radio galaxy

AGN in jet mode



Heckman & Best (2014)

Pressure profiles in 3C 31



Croston & Hardcastle (2014)

LOFAR HBA 145 MHz

CHANDRA X-ray

SDSS r'+g'+u'-band

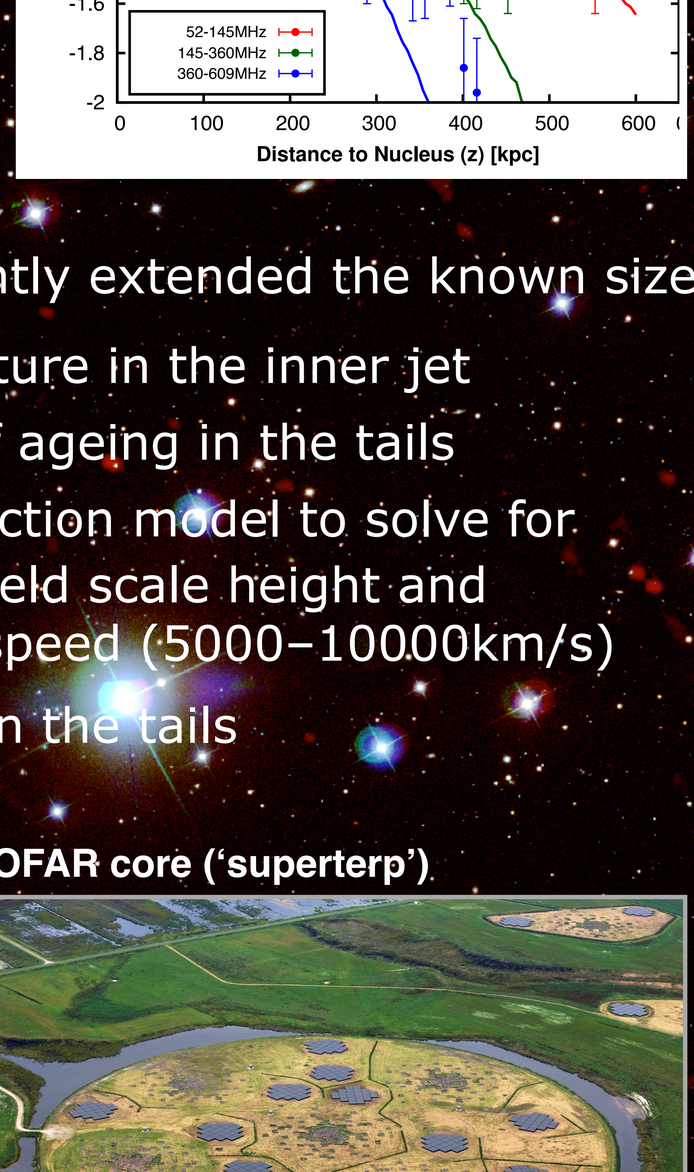
bifurcation

Northern tail

bridge

Southern tail

Northern tail



Radio spectral index (52–609 MHz)

Strong spectral steepening indicates dominant radiation (synchroton + IC) losses

- ✓Significantly extended the known size
- ✓No curvature in the inner jet
- ✓Effects of ageing in the tails
- ✓Use advection model to solve for magnetic field scale height and advection speed (5000–10000km/s)
- ✓B ~3μG in the tails

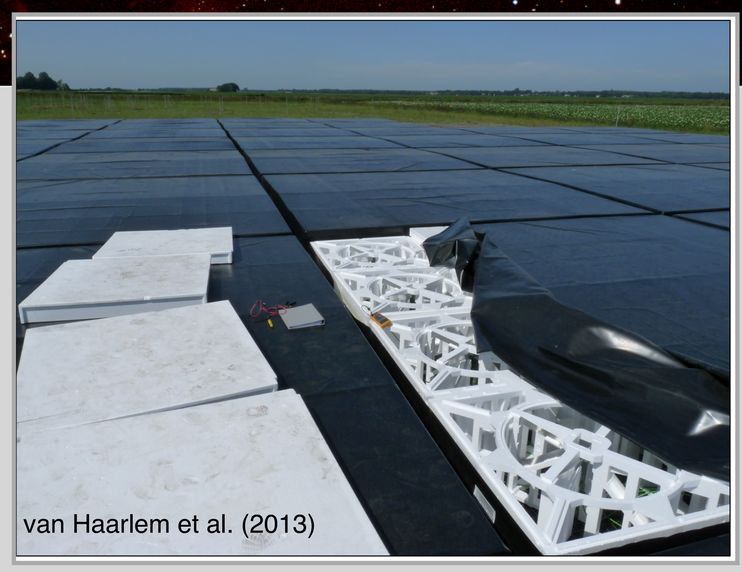
LOFAR core ('superterp')

van Haarlem et al. (2013)

LBA (30–87 MHz) antenna

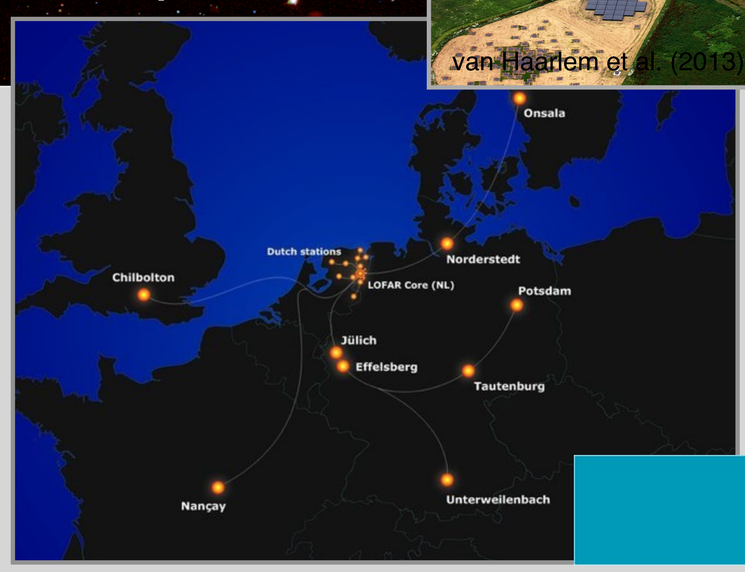
A.R. Offringa

HBA (115–178 MHz) antenna tile



van Haarlem et al. (2013)

International LOFAR telescope



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NRAO

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