

# Radio Science: Lecture 3

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RATT INTERFEROMETRY COURSE

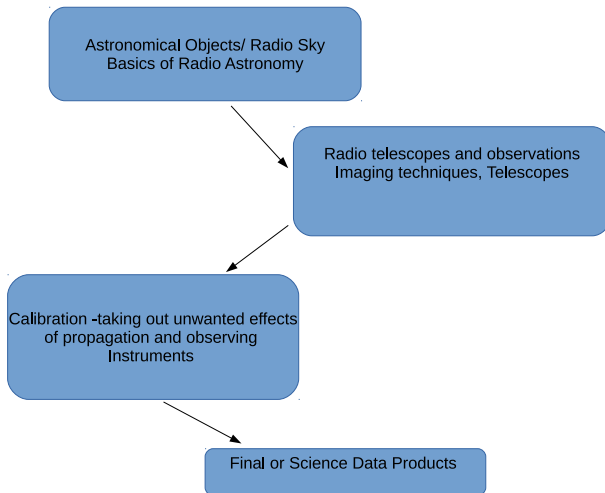
February 20, 2015



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- 2 Observing diffuse emission vs compact emission
- 3 Detecting compact emission: Cen A core
- 4 Detecting diffuse emission: Tidal trails in M81





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# Observing diffuse emission vs compact emission

- ▶ Resolution and baselines
- ▶ Detecting diffuse emission
- ▶ Compact components of emission



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# Centaurus A - core

- ▶ Cen A - one of the closest radio sources (3.8 Mpc).
- ▶ Excellent 'speciman' to study the AGN/jet physics.
- ▶ Detailed observations of radio jets very close (sub-pc scales) to the SMBH.

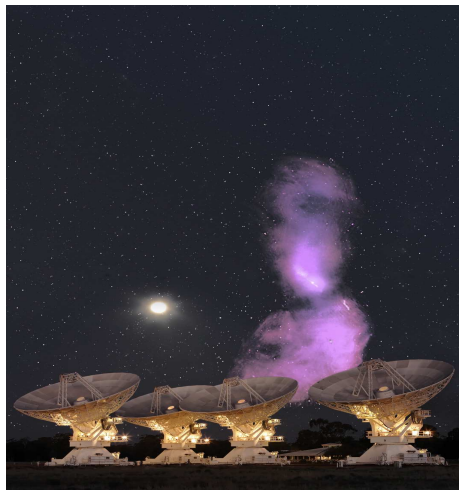


Figure : Image courtesy of APOD



# Why VLBI?

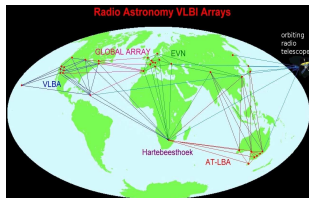
- ▶ Aim: to probe the subparsec structure of radio jets of Cen A.
- ▶ Distance to Cen A: 3.8 Mpc - 1 pc  $\leftrightarrow$  50 mas.
- ▶ At a frequency of  $\sim$  few GHz, this requires a baseline of  $\sim$  1000 km.

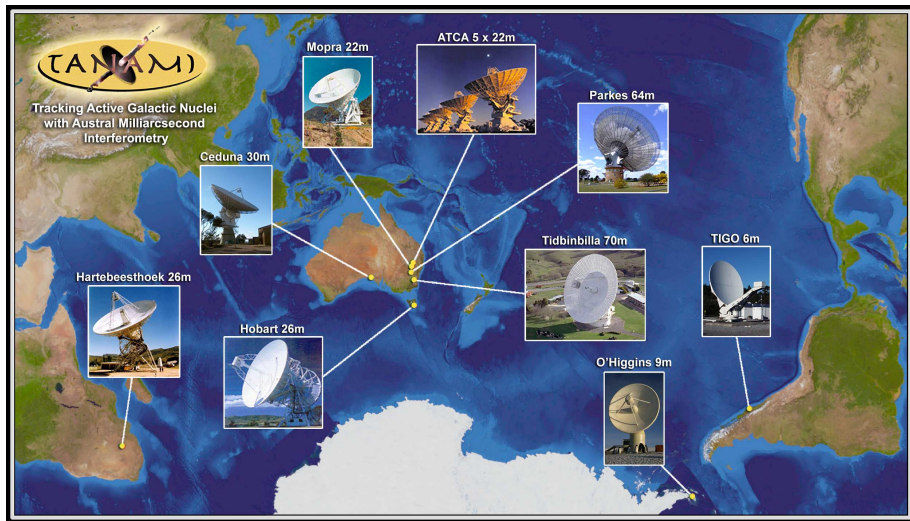




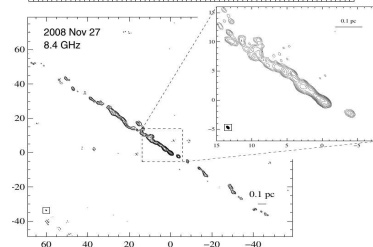
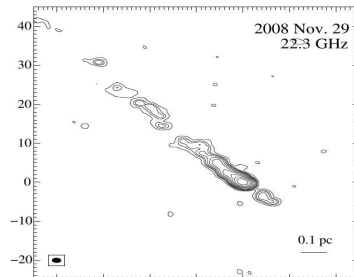
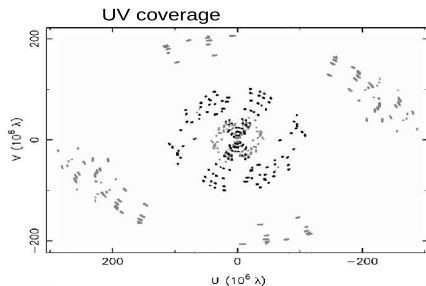
# VLBI Telescopes Around the World

- ▶ VLBA
- ▶ EVN
- ▶ LBA

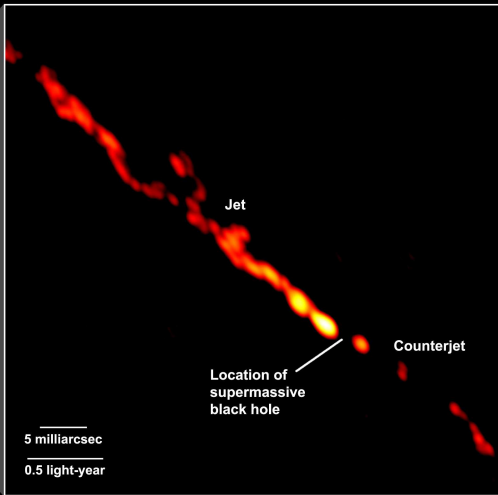




# Observing the Cen-A core



## Centaurus A's Inner Jets



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## Diffuse HI Emission in Tidal Filaments: M81 system

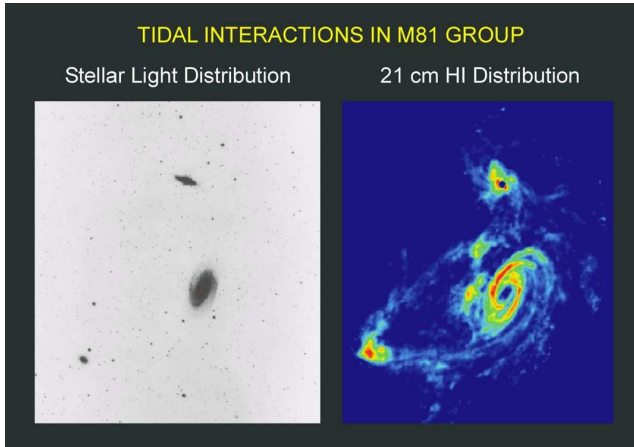


Figure : Image Courtesy of NRAO/AUI

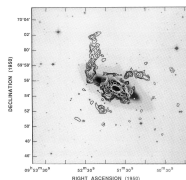
# Observational Needs

- ▶ Detecting structure of diffuse HI emission.
- ▶ Velocity/channel resolution.
- ▶ At a distance of 3.3 Mpc - scale :  $1' = 150 \text{ kpc}$
- ▶ Typical distance to probe: tens of kpc.
- ▶ Looking for HI - frequency?

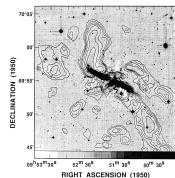


# VLA Observations of M82 Tidal Streams I

- ▶ Observations with VLA C array : resolution :  $\sim 17''$
- ▶ Observations with VLA D array : resolution :  $\sim 65''$
- ▶ Velocity resolution: 10 km/s
- ▶ Total bandwidth : 3.14 MHz



Compact Emission



Diffuse Emission

Figure : Yun et al., 1993, ApJ



# VLA Observations of M82 Tidal Streams II

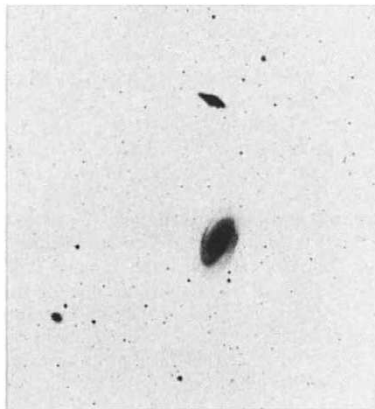
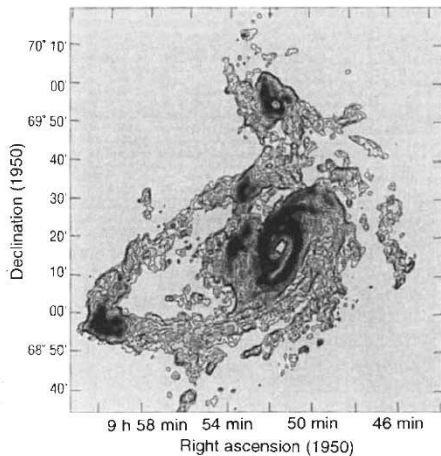


Figure : Yun et al., 1994, Nature