Neutral Gas in Galaxies

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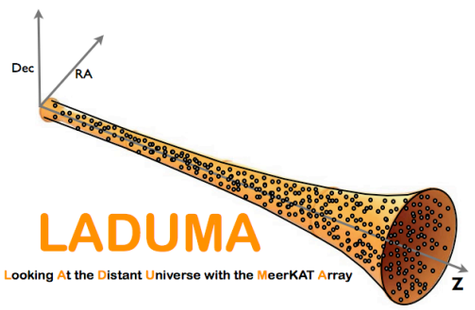
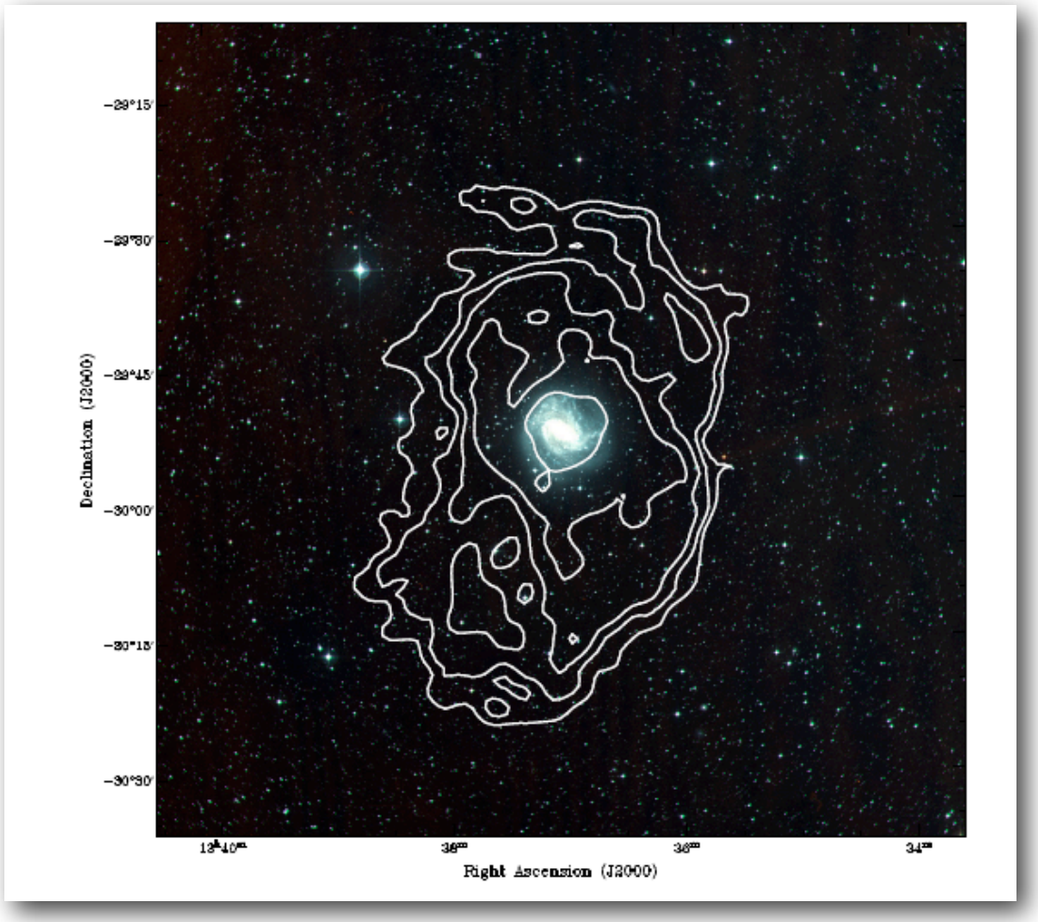
MFAA2014
February 2014



HI in galaxies

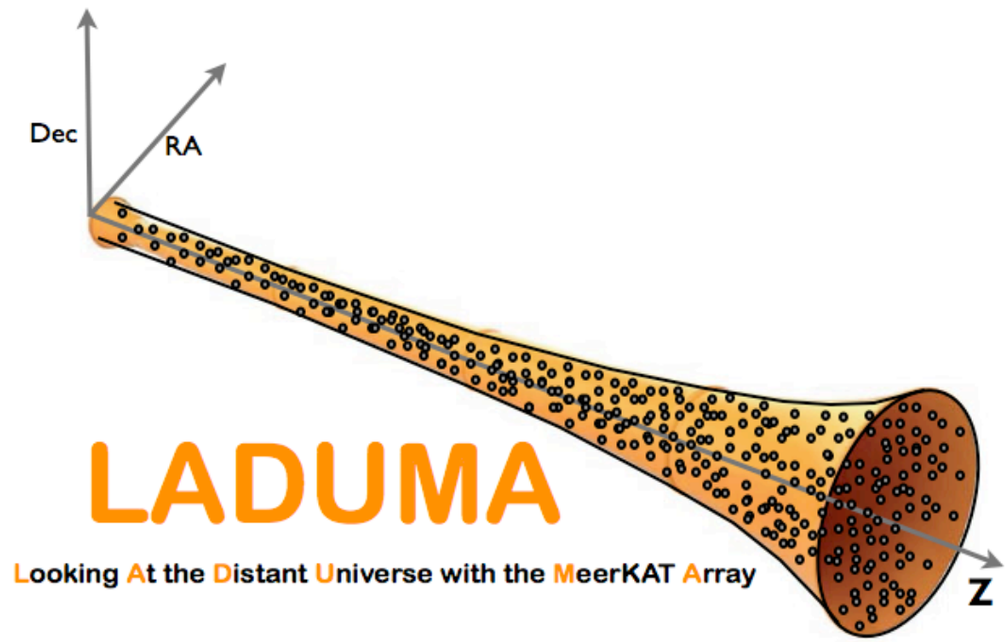
There is a broad range of scales involved in studying HI in galaxies:

- Highly detailed (spatial & velocity) studies of **nearby** galaxies



M83 with KAT-7 (Heald et al.)

- Studies of gross HI properties **vs. z**



- ALWAYS combined with multi-wavelength data to maximise scientific insights...

HI in galaxies

There is a broad range of scales involved in studying HI in galaxies:

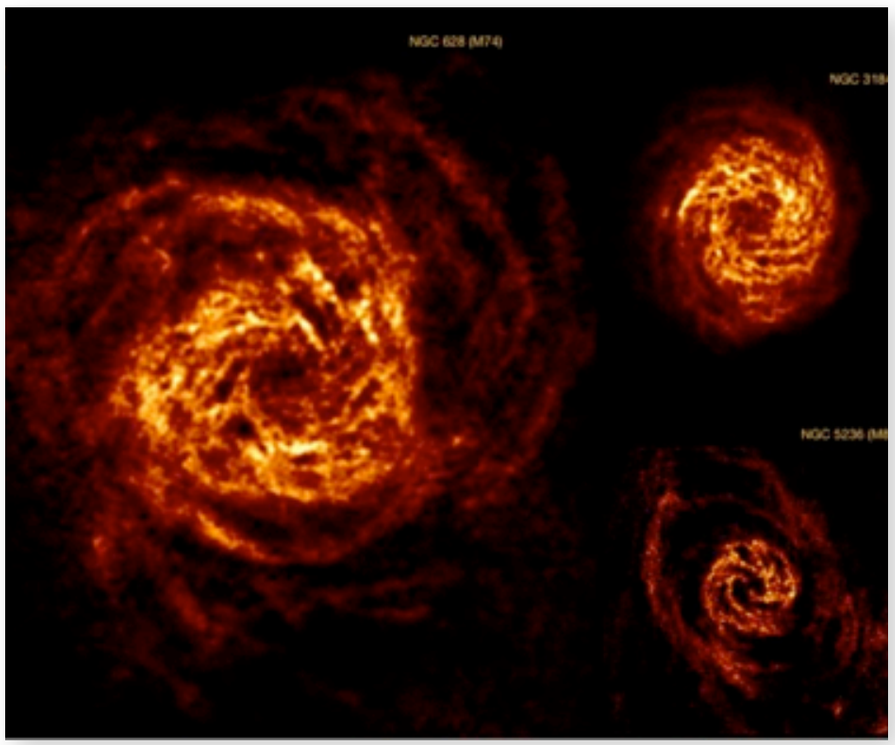
- Highly detailed (spatial & velocity) studies of **nearby** galaxies

  - extension to very low column density regions on outskirts
  - rotation curves
  - detailed studies of ISM, turbulence, etc.
  - inflows & outflows
  - cosmic web

- Studies of gross HI properties **vs. z**

  - HIMF vs. z (vs. env.)
  - Cosmic neutral gas density in emission, vs. z (vs. env.)
  - HI mass vs. stellar/halo mass in range of environments
  - Tully-Fisher relation (baryonic) vs. z

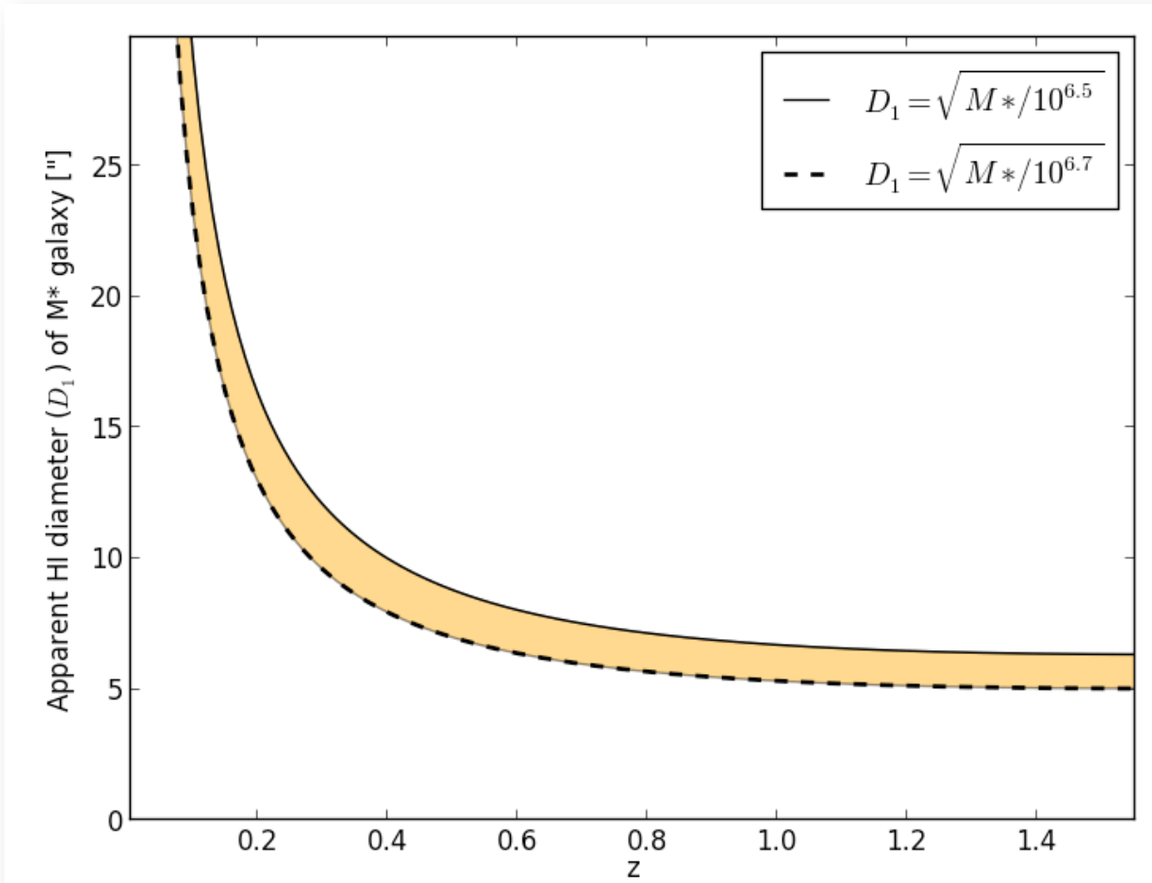
Spatial resolution

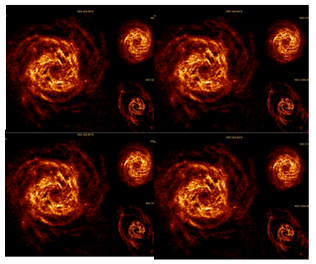


The available spatial resolution limits what we can study i.t.o HI in galaxies

- ISM & galaxy structure studies require very high resolution (30" - 1")
- Rotation curves: ~few beams per galaxy
- Gross properties (HI mass, rotation widths): galaxies can be unresolved BUT beware confusion...

- At z=0, AERA^3 res~43"
- ... But AERA^3 res at 300 MHz ~ 200" ?





Possible HI niche for AERA^3

With the available resolution, perhaps most exciting area would be to probe the low column density (N~10^{18} cm^{-2}) environments around and between nearby galaxies...

- low(ish) resolution and very large field of view may allow to probe the nearby cosmic web
- nearby galaxies studies - statistical sample due to large FoV (BUT WALLABY on ASKAP will be doing this already...)
- More calculations / simulations needed...
- **With longer baselines, i.e. SKA2-era MFAAs will allow very wide, very deep HI galaxy surveys...**