Southern Local Group Dwarf Irregulars with KAT-7

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Outline

- Background
- Motivation
- Observations & Results
- On going work
- Conclusion

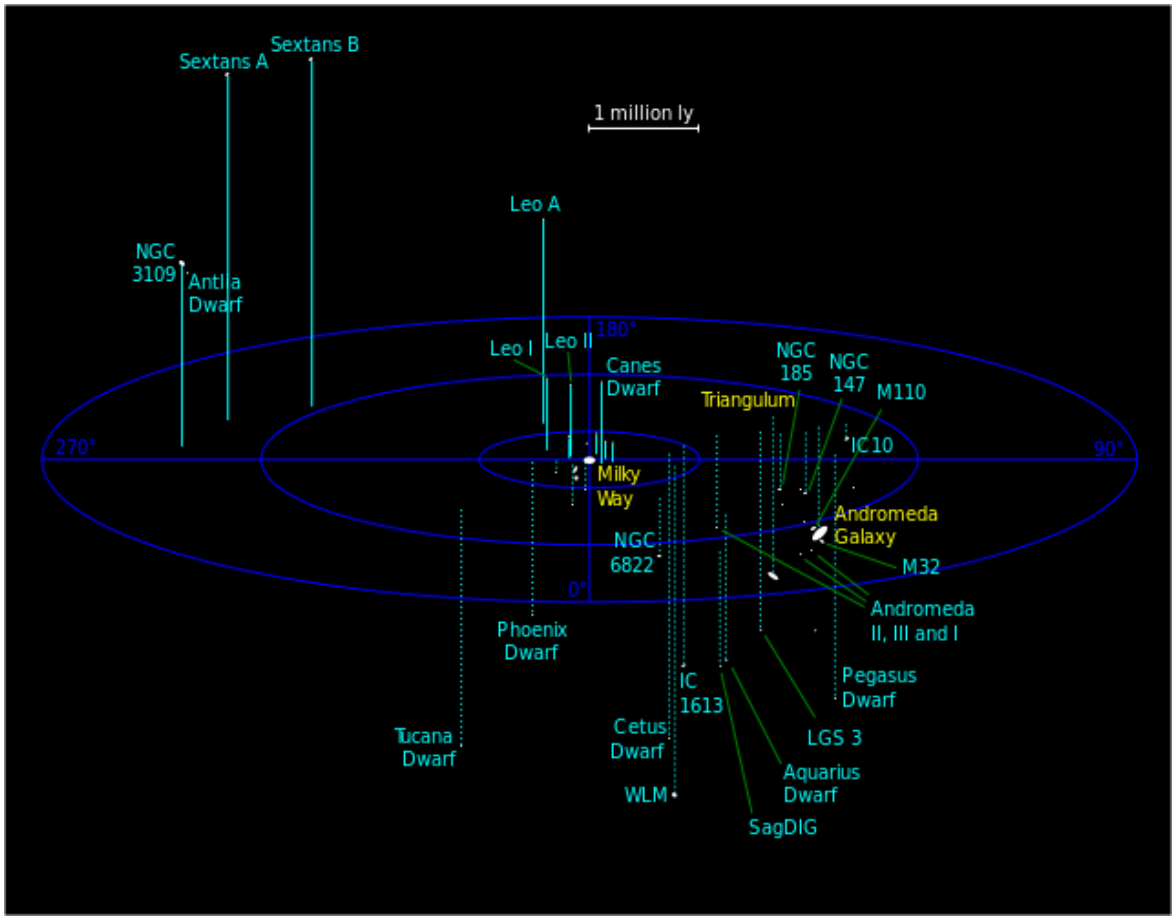
Background

Why the Local Group of galaxies?

~10 million light years across

~54 galaxies

Dwarfs most abundant



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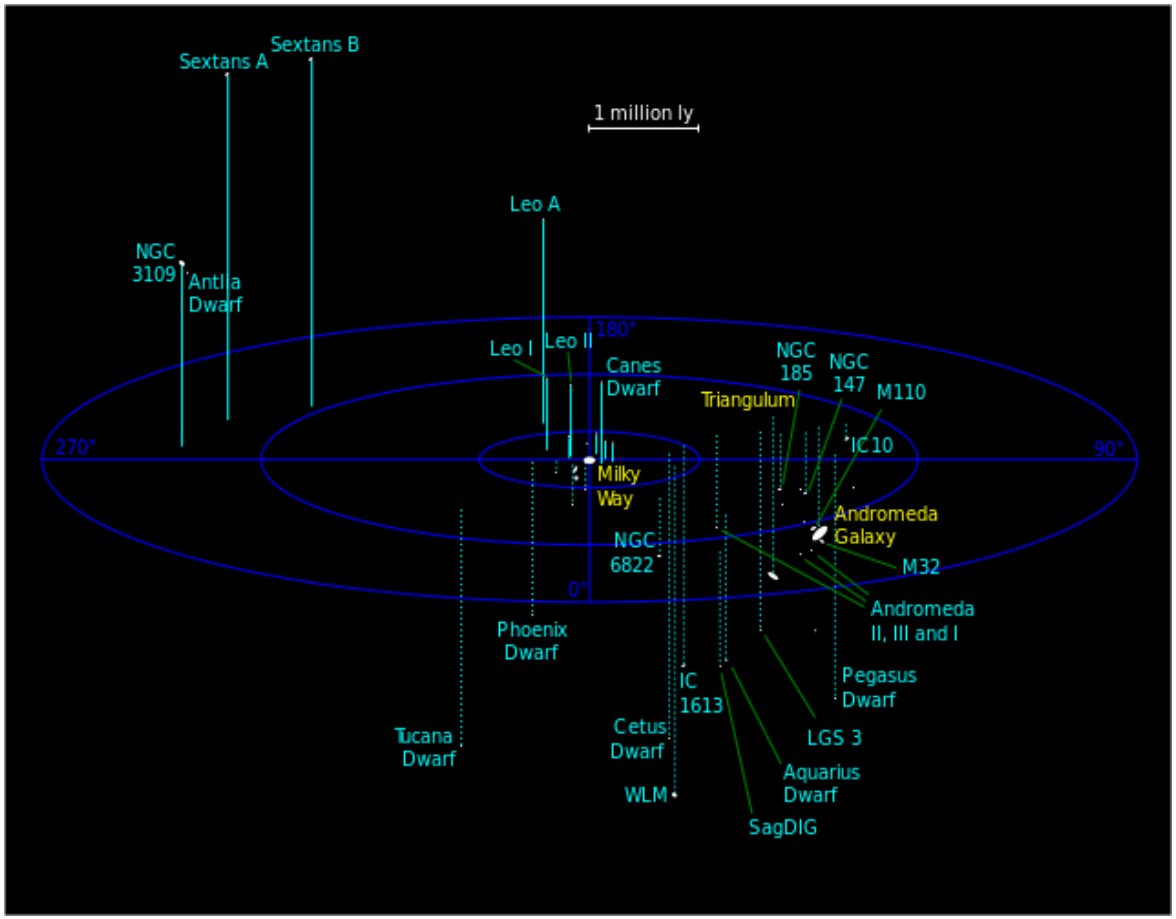
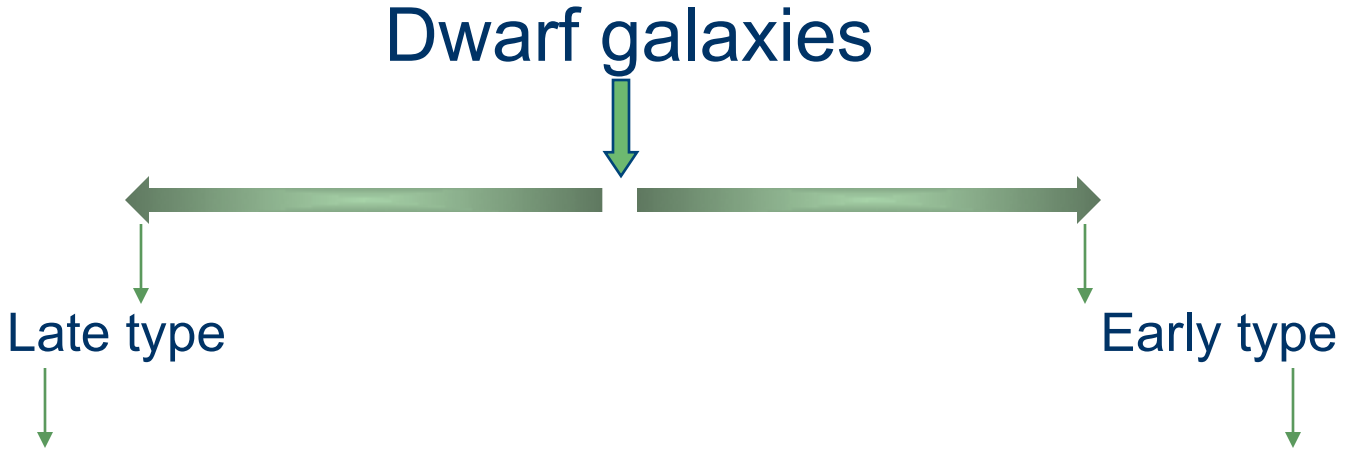


Background

Types of dwarf galaxies & why are they interesting.



Dwarf Irregular galaxies

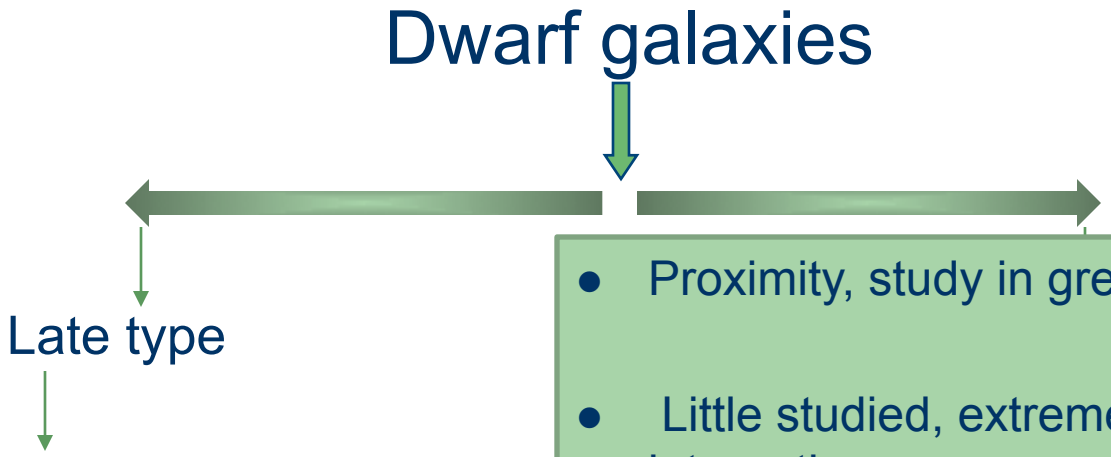
Gas rich, star formation, gas kinematics.

Dwarf spheroidal/dwarf elliptical

Little/no gas, little/no star formation, stellar kinematics.

Background

Types of dwarf galaxies & why are they interesting.



Dwarf Irregular galaxies

Gas rich, star formation, gas kinematics.

- Proximity, study in greater details
- Little studied, extremely faint long integration
- Simple structure, without dominant bulges, spiral arms.

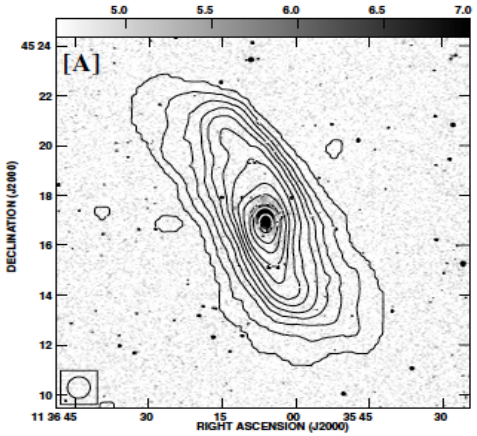
Background

What can we learn from HI observation? –previous results

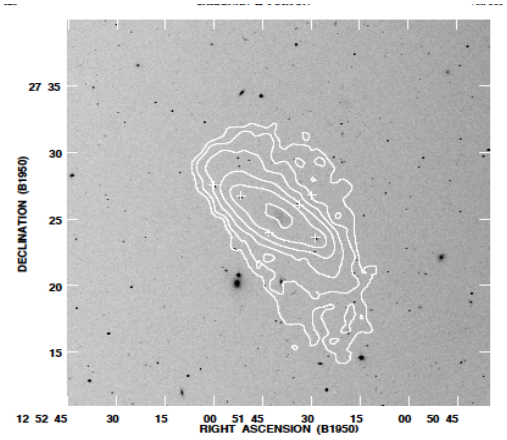
Low column density extended HI envelopes : < 5 time optical disk

**superb for studying large scale kinematics

** Estimate the actual mass of galaxies



NGC 3741 HI diameter = 8.3 times Holmberg radius (A.Begum et al, 2005, GMRT)



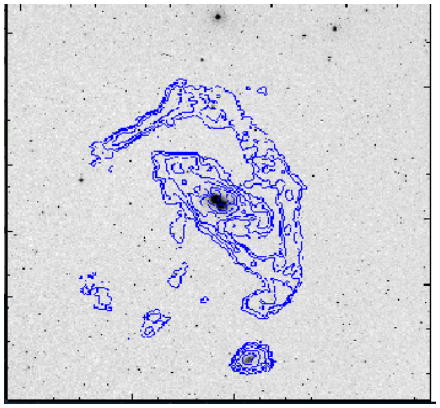
DDO 154 6 times Holmberg radius, extended rotation curve (Carignan et al, 1998)

Background

What can we learn from HI observations? –previous results

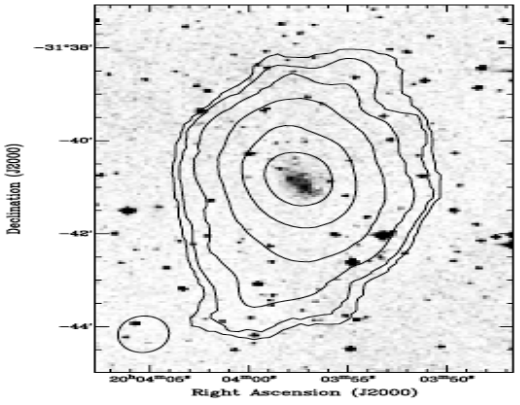
Environment of extended HI disks

**disrupted HI disks



NGC 4449 complex network of streamers that represents the remains of an HI disk disrupted by an encounter with another galaxy (VLA) (Hunter et al, 1998)

** quiescent disks smooth extensions



KK 246, large, quiescent disks that are simply smooth extensions (K .Krechel et al,2011, VLA)

- Most of these observations are high resolution or single dish. What new idea does this study bring?

Motivation

why this project?

**Unique array in southern hemisphere

**KAT-7 compact low temperature (Tsys ~26K) (sensitive to large scale low surface brightness emission.

KAT-7 array

Motivation

why this project?

**Unique array in southern hemisphere

**KAT-7 compact low temperature (Tsys ~26K) (sensitive to large scale low surface brightness emission.

*Search for extended HI envelopes
(undetected by array such as VLA and ATCA.

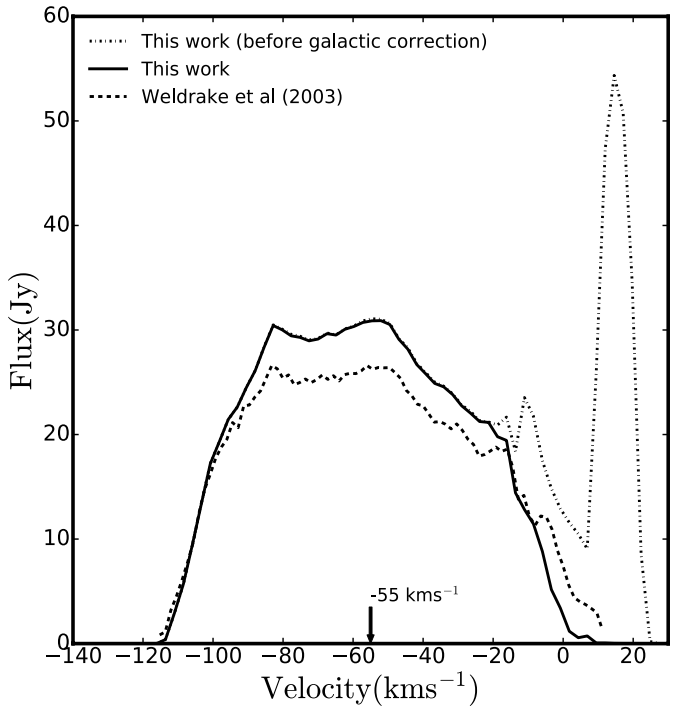
*Derive global parameters such as HI distribution and kinematics.

*Study the environment of low density gas

KAT-7 array

Observations & results

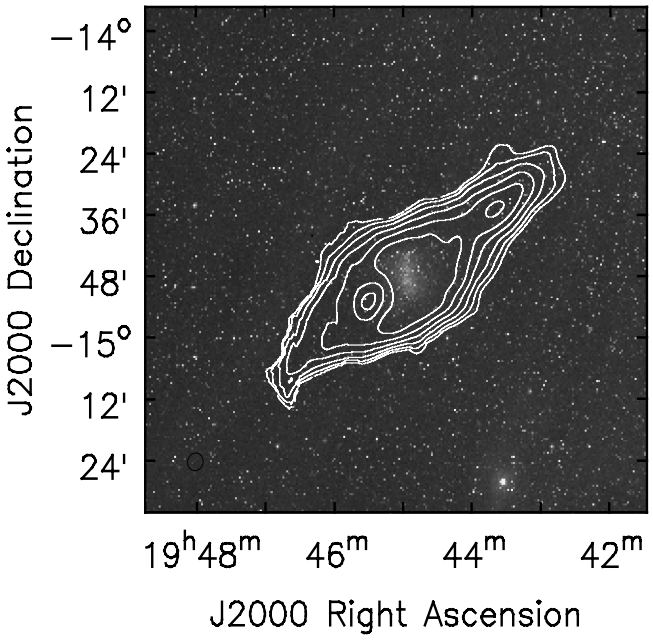
NGC6822 with KAT-7



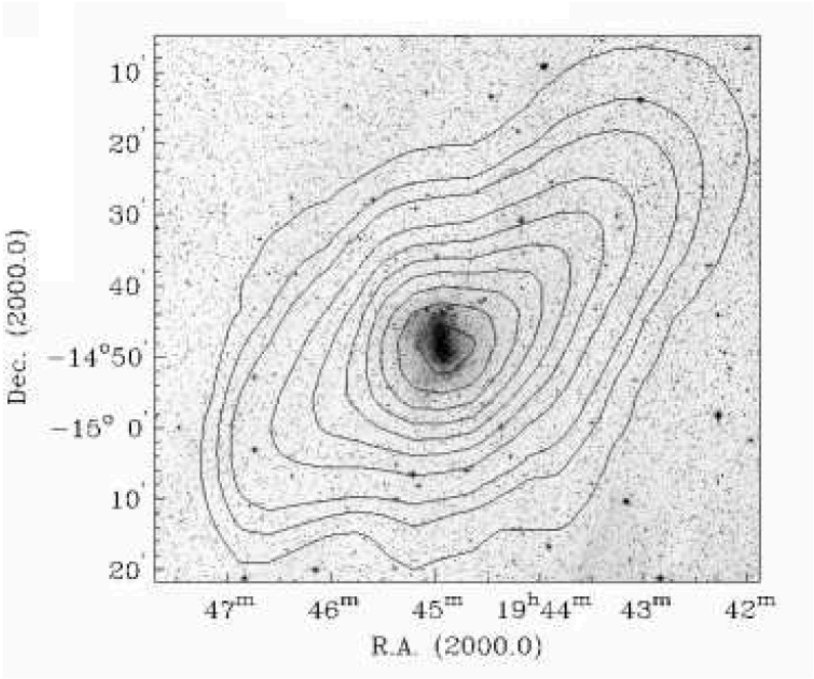
- Three pointing mosaic. ~35 hour per pointing after flagging
- ~3 mJy/beam rms in 2.56 kms^2 channel
- 23 % more flux than ATCA (2440 ±200 Jy.kms^2 ,comparable with single dish)
- HI mass 1.3 x 10^8 M⊙

Observations & results

NGC6822 with KAT-7



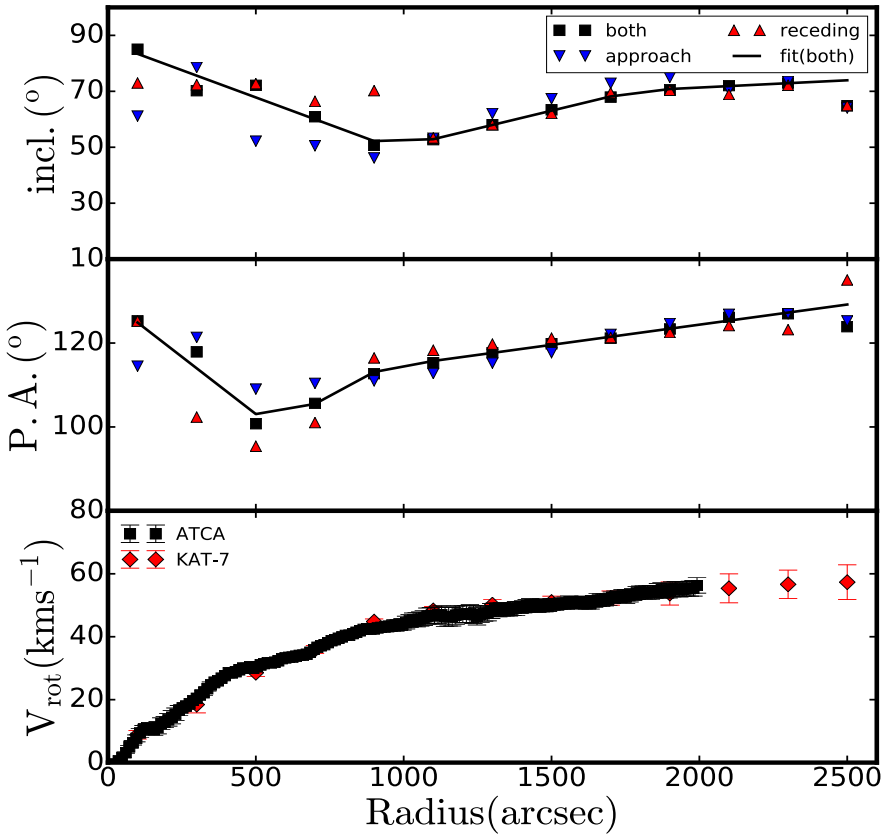
HI column density on DSS image. Lowest contour 1x10e19 cm^2. Order of magnitude than ATCA (10e20 cm^2)



- Single dish NGC6822

Observations & results

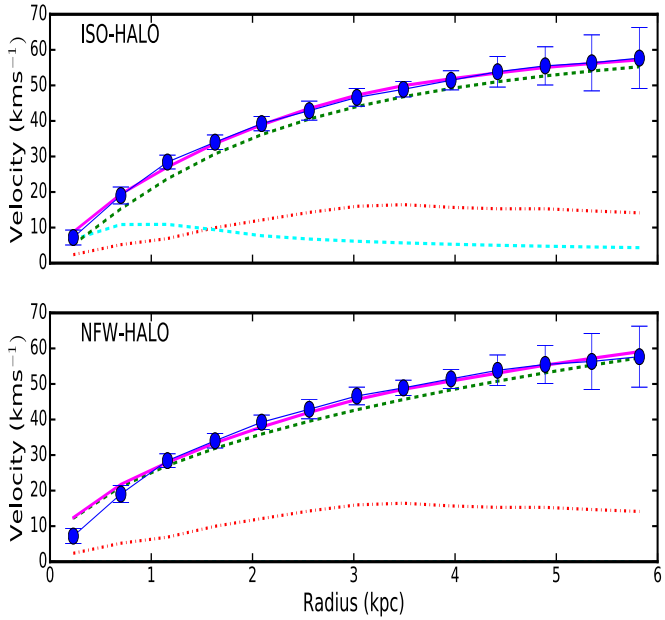
NGC6822 with KAT-7



- RC derived using GIPSY task ROTCUR from velocity field map.
- RC agrees with ATCA data.
- KAT-7 extends 500 arcsec more than ATCA.

Observations & results

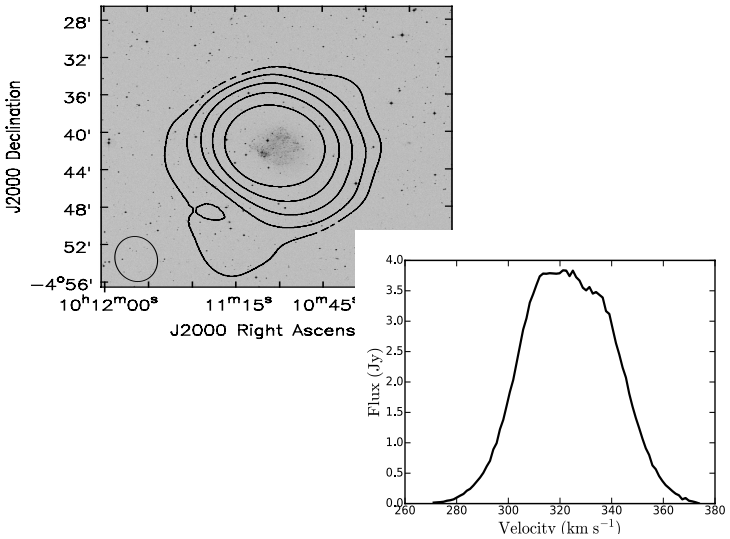
NGC6822 with KAT-7



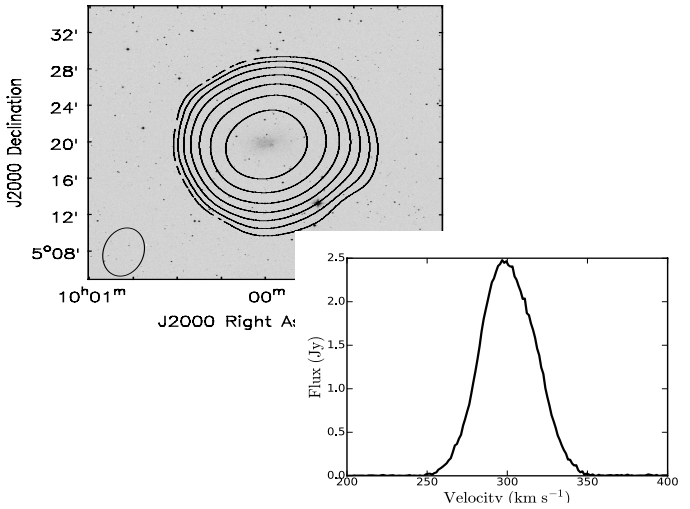
- NGC6822 DM dominated
- DM ISO model produces observed rotation curve with M/L=0.2
- NFW not physical only fits with M/L = 0.
- NGC6822 is cored not cuspy DM halo .

Ongoing work

Sextans A & B –KAT-7



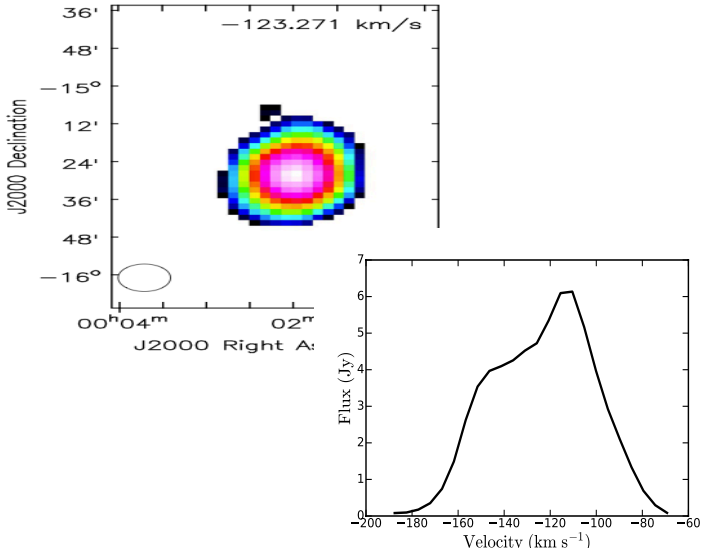
- ~ 60 hours on source
- Synthesized beam 277” x 204 “
- Noise level 3.4 mJy/beam
- Flux 181 Jy.km/s



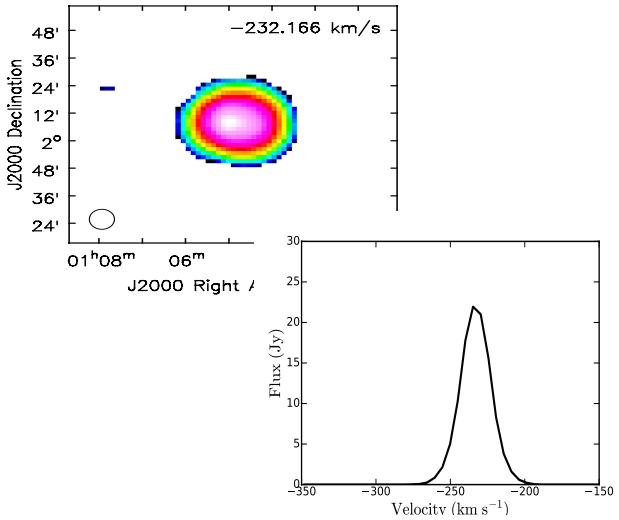
- ~51 hours on source
- synthesized beam 255“x 191”
- noise level 4 mJy/beam
- Flux 105 Jy.km/s

Ongoing work

WLM & IC1613 -GBT



- ~14 hours observation
- noise in line free channel 20 mK
- Integrated flux 333 Jy.km/s



- ~14 hours observation
- noise in line free channels 13mK
- Integrated flux 566 Jy.km/s

Conclusion

- HI studies in dwarf irregulars gives rich information about galaxy kinematics and distribution.
- Capabilities of KAT-7 gives us an opportunity to detect large scale extended HI as we wait for up coming pathfinders
- NGC6822, we detect ~23 % more flux than ATCA with rotation curve going out 500 arcsec more than ATCA.
- GBT sensitivity allows us to detect the presence of low column density regions.