Survey of Southern Local Group Dwarf Galaxies

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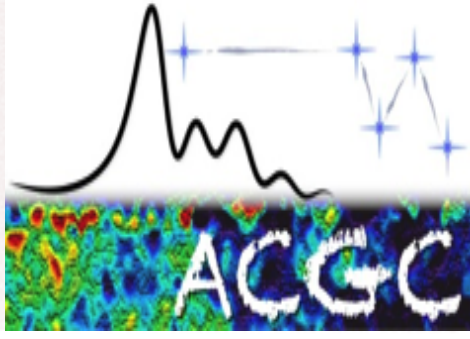


Outline

- Background
- Motivation
- Sample Selection and Observations
- NGC6822 with KAT-7
- Future work

Background

Dwarf galaxies & why they are important

- Small sized (few kpc)

  Low luminosity (10^6-10^10 Lo)

  Low mass(10^7-10^10 Mo)

  low surface brightness.

Sagittarius dwarf irregular as seen by hubble.

Background

Dwarf galaxies & why they are important

Different classes of dwarf galaxies

Late type dwarf galaxies

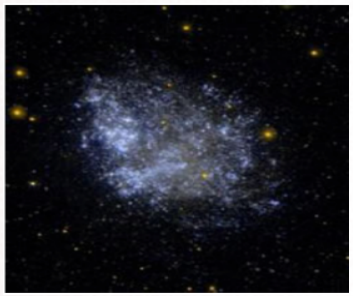
Dwarf Irregular galaxies

Gas rich, star formation, gas kinematics.

Early type dwarf galaxies

Dwarf sphroidals/dwarf ellipticals

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



Dwarf irregular IC1613

Dwarf spheroidal Leo I

Dwarf elliptical NGC 185

Background

Dwarf galaxies & why they are important

- Understanding the neutral hydrogen content in local group dwarf irregulars is particularly important for a number of reasons:

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2) Low level of evolution, low metallicity and high gas content, makes these systems the most similar to primeval galaxies and, therefore, the most useful to infer the primordial galaxy conditions.

3) Relatively simple structure, without dominant bulges, spiral arms makes it less difficult to unfold various physical processes occurring in galaxies.

Background

previous HI studies on dwarf irregulars

- Extended HI in dwarf irregulars- extending upto 3~7 optical disk. Superb tool for probing large scale kinematics e.g (Huncheimer, W. K et al observed extended HI upto 5.8 times galaxy optical disk at column denisties 10^19 atoms cm^2 in Sextan A using the Effelsberg 100m telescope.)

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- Obtain the rotation curves to much greater radii e.g. (Carignan et al, 1998, where able to combine VLA data with the DRAO array which enabled them to derive rotation curves up to 33 percent in radii.

Motivation

Why this project?

- To determine the full extent of the extended HI in dwarf irregulars by taking advantage of KAT-7 compact baselines and low receiver temperature.

Unique array in southern hemisphere, KAT-7 baselines (26 to 185 m) with low receiver temperature (Tsys ~26K)enables us to detect large scale extended HI.

Motivation

Why this project?

- To determine the full extent of the extended HI in dwarf irregulars by taking advantage of KAT-7 compact baselines and low receiver temperature.

- 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.

Unique array in southern hemisphere, KAT-7 baselines (26 to 185 m) with low receiver temperature (Tsys ~26K)enables us to detect large scale extended HI.

Sample selection & observations

- 7 dwarf irregulars from the literature
- Observable with KAT-7
- Sources include :

	NGC6822	WLM	IC1613	Sextan A	Sextan B	SagDIG	DD0 210
RA(J2000)	19:44:56	00:01:57	01:04:47	10:11:00	10:00:00	19:00:01	20:46:51
DEC(J2000)	-14:47:51	-15:27:50	02:07:04	-04:41:34	05:19:56	-30:30:00	-12:50:53
Distance	0.5 Mpc	1Mpc	0.7 Mpc	1.42 Mpc	1.44 Mpc	1.1 Mpc	0.9 Mpc
M_v	-15.2	-14.3	-14.6	-14.2	-14.2	-12.5	-10.9

NGC 6822 with KAT-7

- Observing parameters

Source	Bandpas/ flux calibrator	Phase calibrator	Total observing time	Velocity resolution	Number of pointing	Total bandwidth	Observing frequency
NGC6822	PKS1934-63	PKS1938-155	~150 Hrs	0.644 km/s	3	12.5 MHz	1420.7 MHz

Data reduction method

Calibration carried out using CASA
Flagging
Flux calibration
Bandpass calibration
Gain calibration
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Apply calibration to target source
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- flag out baselines ant4&ant5 for all Observations..

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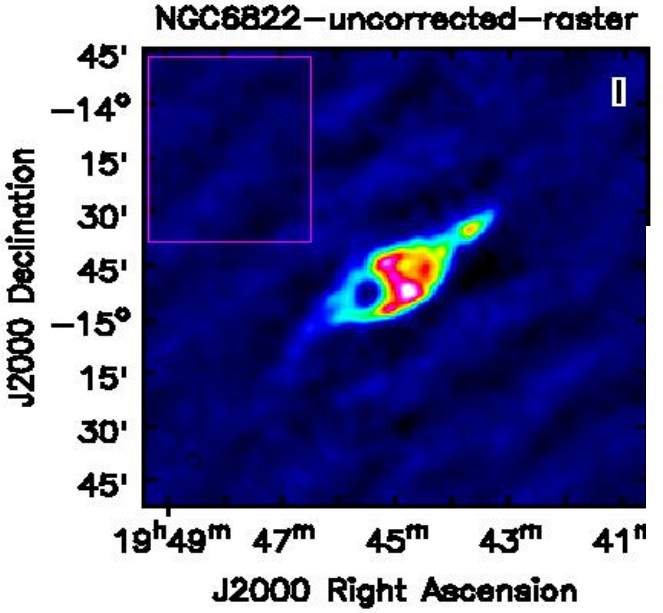

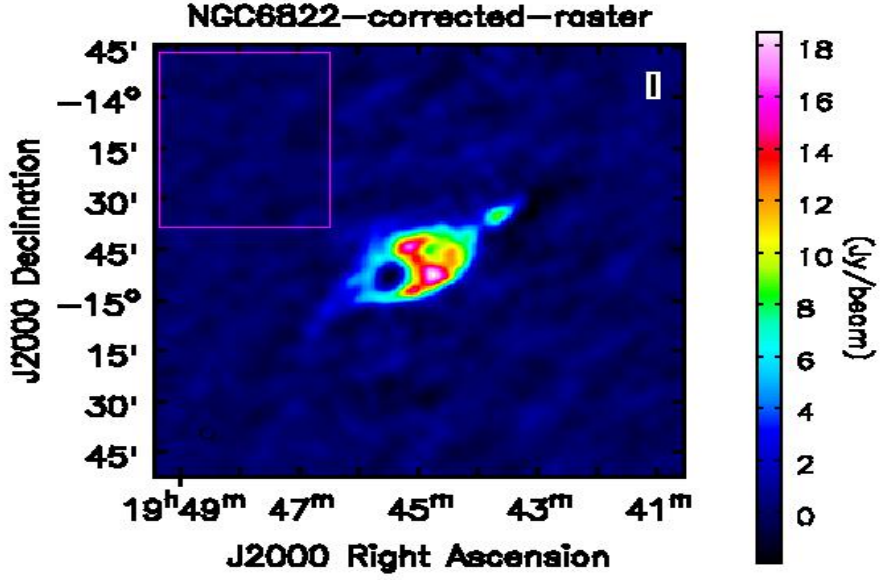

Artifacts in image elevate the noise level :

RMS: uncorrected map 0.4 Jy/beam

RMS: for corrected map 0.2 Jy/beam

NGC 6822 with KAT-7

- The final combined cube with ~80 hours cleaned with robust 0 produces:

1) map 256 by 256 pixels

2) velocity resolution 2.5 km/s

3) Synthesized beam 219'' by 193''

4) noise line free channel 3 mJy/beam

* Due to proximity of NGC6822 we have galactic HI contamination in some channels.

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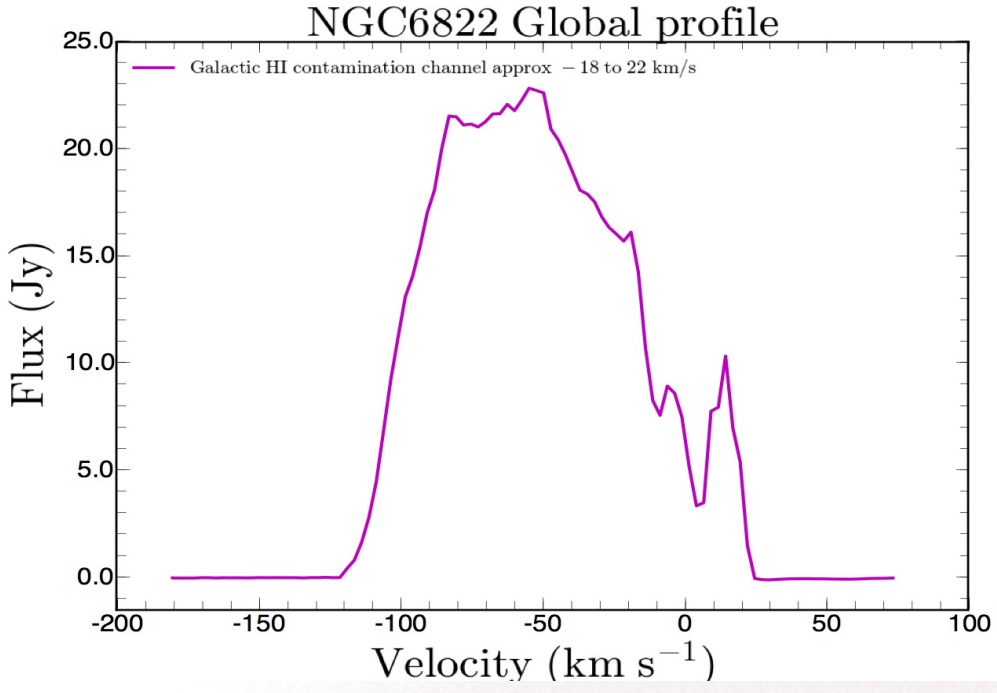
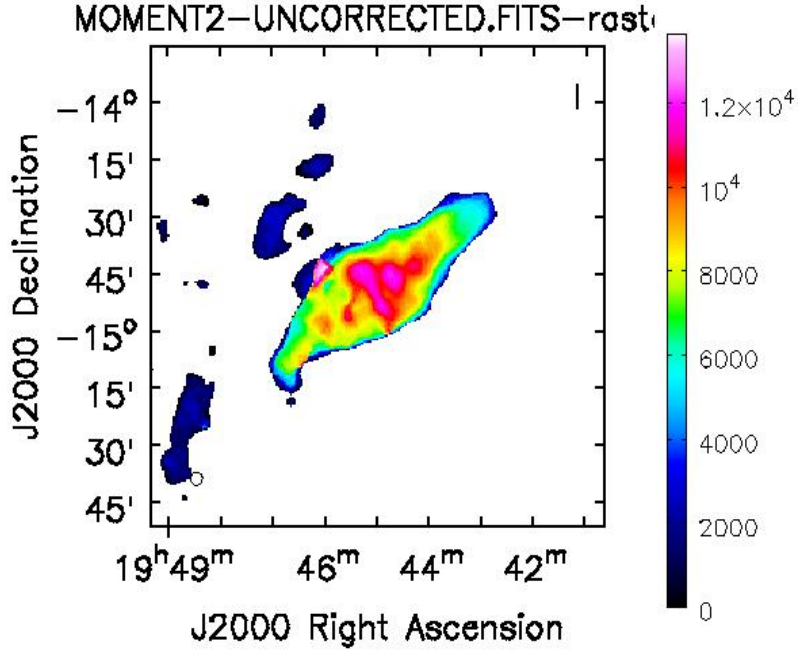
Galactic contamination due to proximity ~-18 to 22 km/s.



NGC 6822 with KAT-7

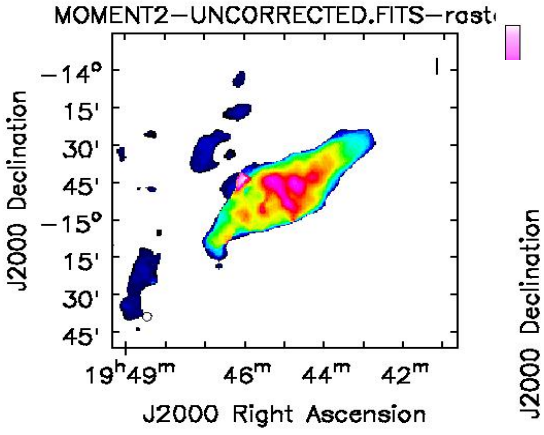
- Much of the galactic HI is separated from the galaxy (The galactic HI is at a much lower velocity dispersion)
- The HI in the galaxy has a wider velocity width (The HI extends across many channels) while that of the galactic HI only spans in few channels (less than 3 channels).
- Mask out galactic HI by excluding flux that does not extend more than 3 channels (in affected channels).

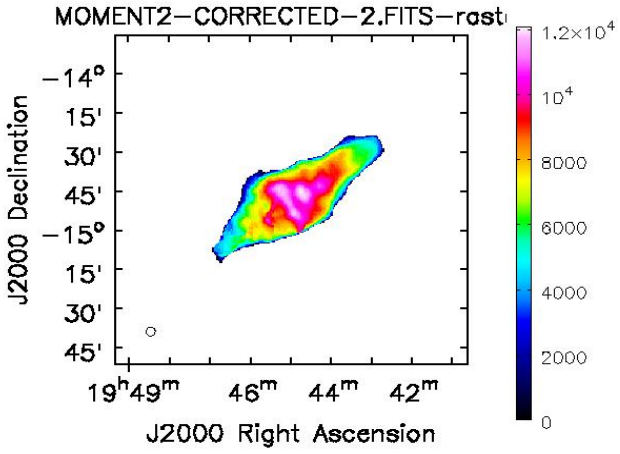


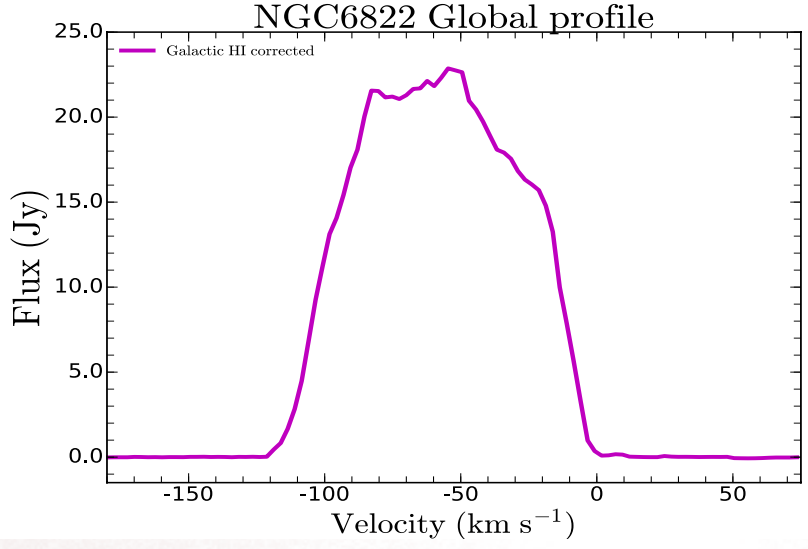
NGC 6822 with KAT-7

Moment 2 map with galactic HI

Spread over the left side





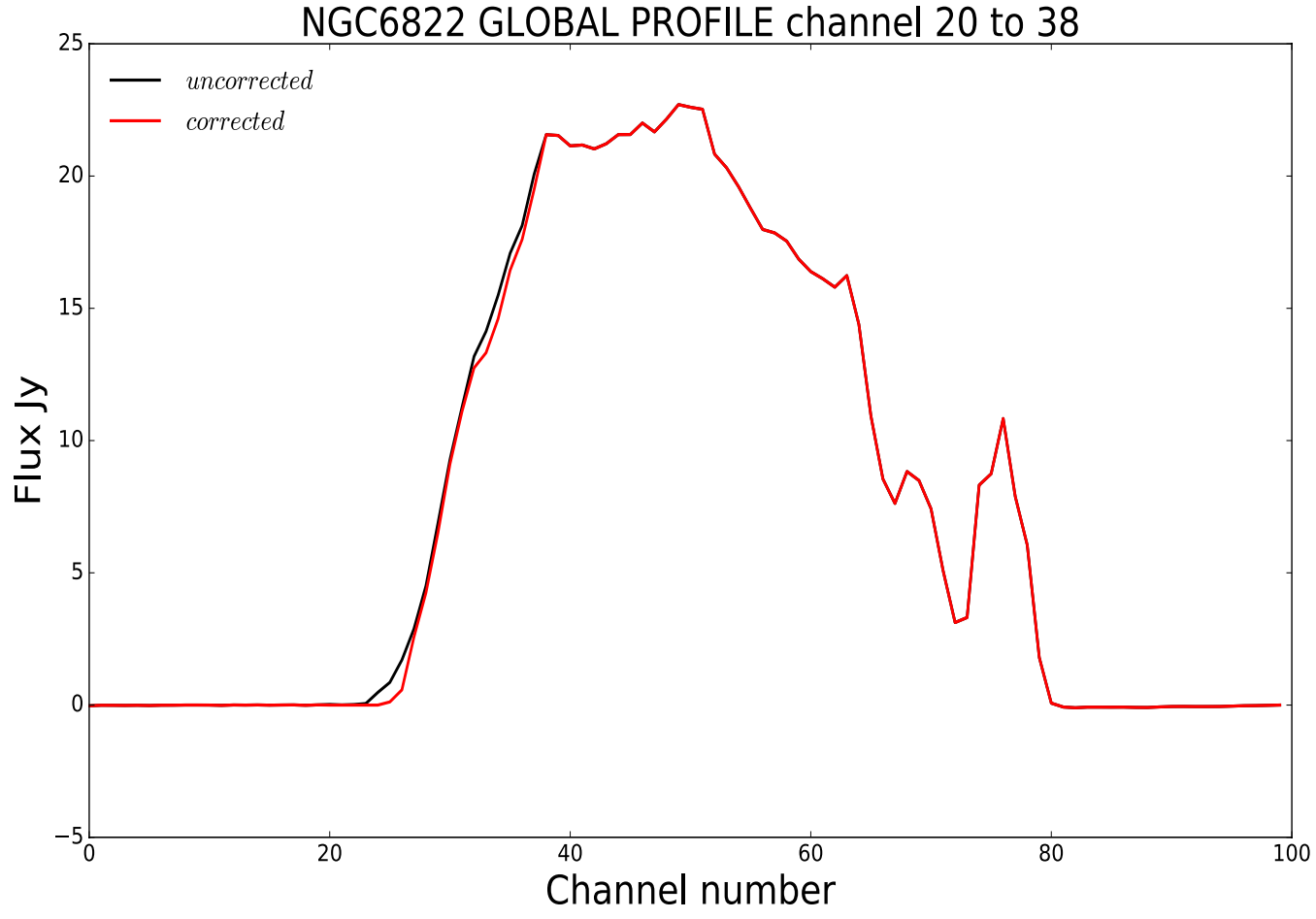


Moment 2 map corrected for galactic HI

Global profile after correcting for galactic HI

NGC 6822 with KAT-7

- Test to see how much galaxy flux is lost (channel 20 to 40)



Future work

- Detailed analysis of NGC6822
- We have data for Sextan A and B which is ready for reduction
- IC1613 and WLM to be observed with the GBT
- Write up