The THINGS HI super profiles

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Introduction

The phase structure of the ISM

- ISM : has different forms (Molecular, Neutral, Ionized)
- Molecular ISM: Giant molecular clouds
- Neutral ISM (focus of this talk) : CNM , WNM
- Ionized ISM: WIM and HIM

Introduction *Star formation and the ISM*

- Star formation is not yet well understood.
- Molecular gas is directly linked to star formation but is diff cult to detect in low metallicity dwarf galaxies.

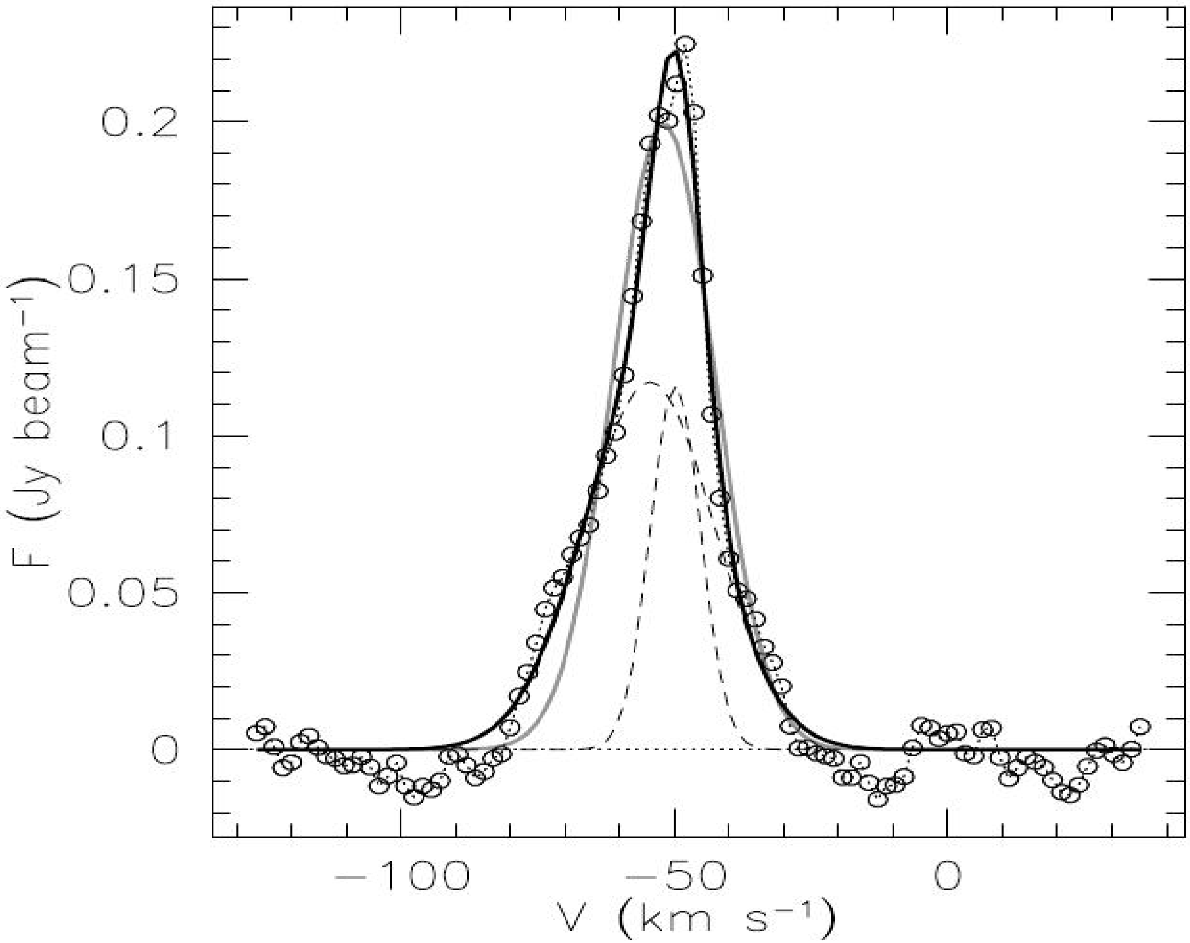
Introduction

Star formation and the ISM

- Previous works have shown that the CNM tend to be associated with star formation.
- CNM properties might be used as alternatives to molecular gas properties to study star formation in dwarfs.

Introduction

Previous work



Attempt to detect the CNM and WNM through HI line emission

de Blok and Walter (2006)

Introduction

Aims

- Study the shapes of the HI velocity profiles of a large sample of galaxies.
- See if we can relate the shapes of the profiles to properties of galaxies and their star formation activity

Introduction

Data used

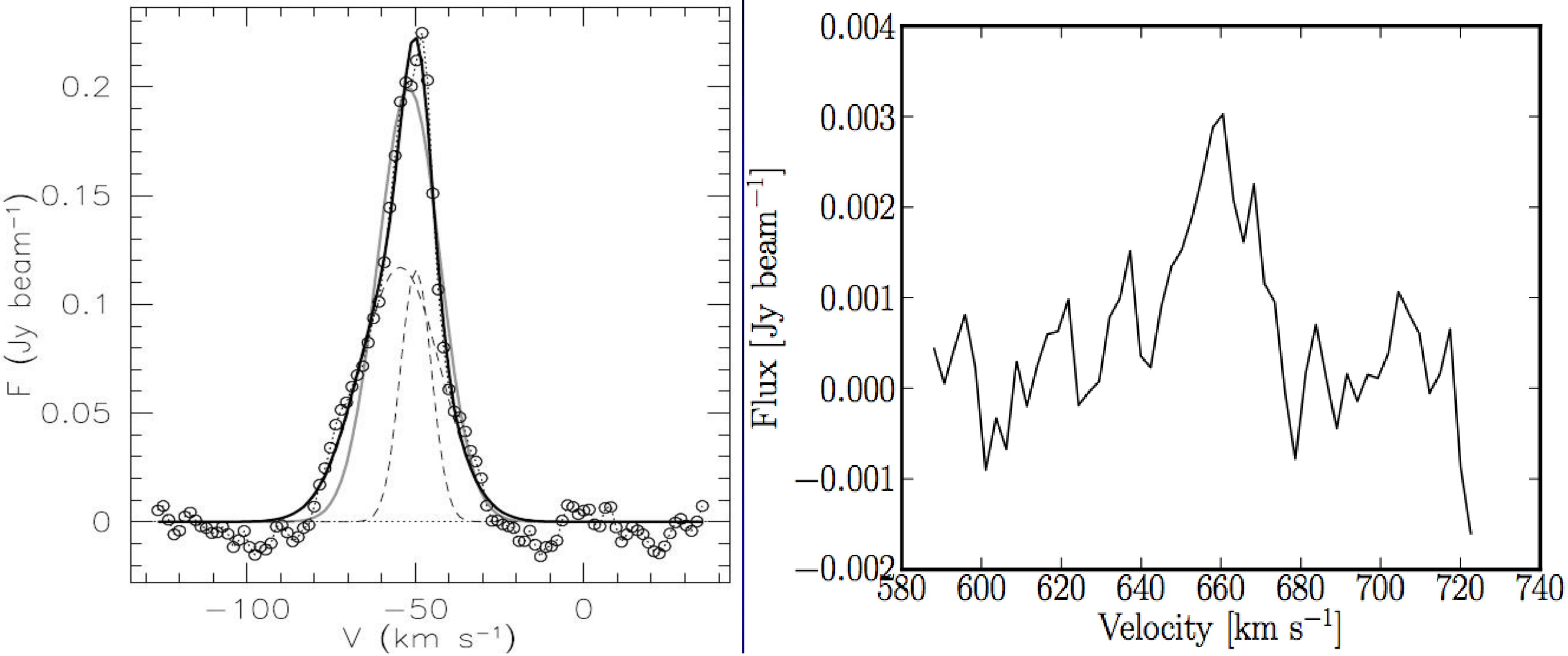
Galaxies:
34 (Spirals and Dwarfs)

Velocity resolution:
< 5.2 km/s

Spatial resolution:
6″(100-300pc)

Method

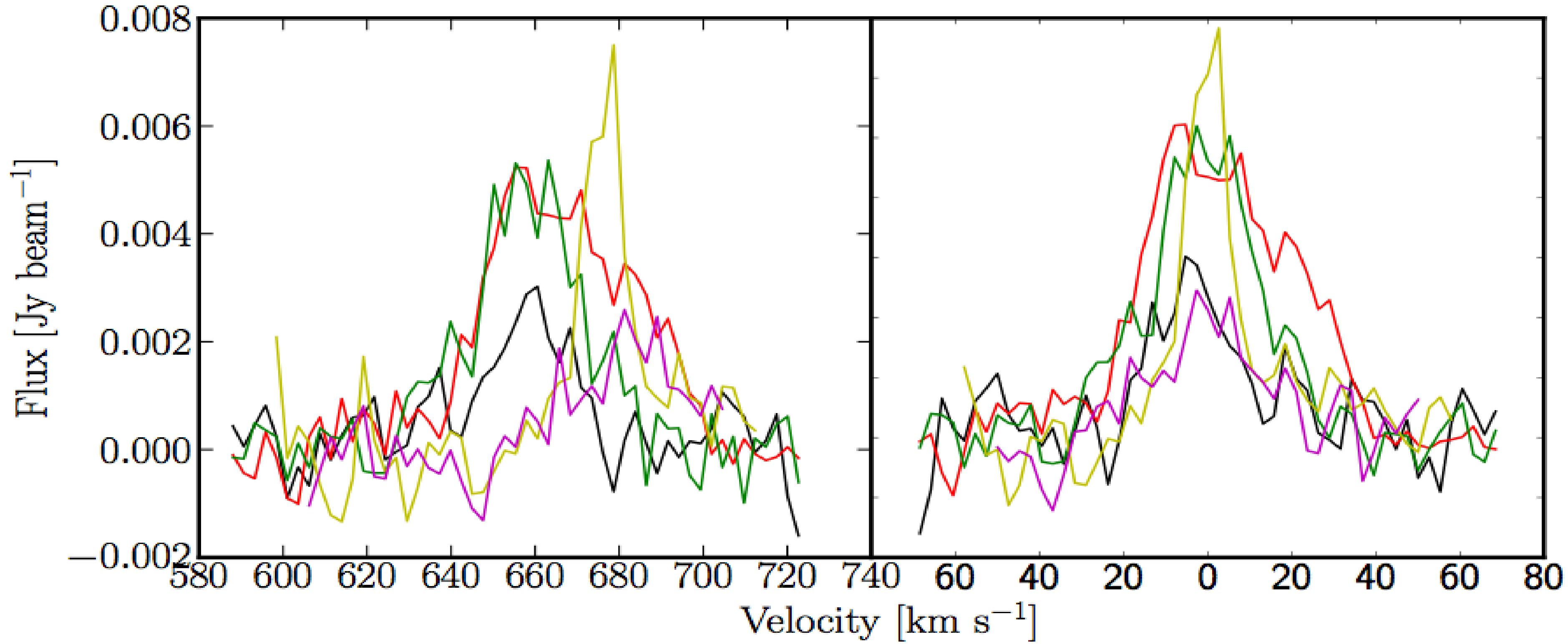
Constructing high S/N profiles



Fitting of individual profiles is only accurate when the S/N is high

Method

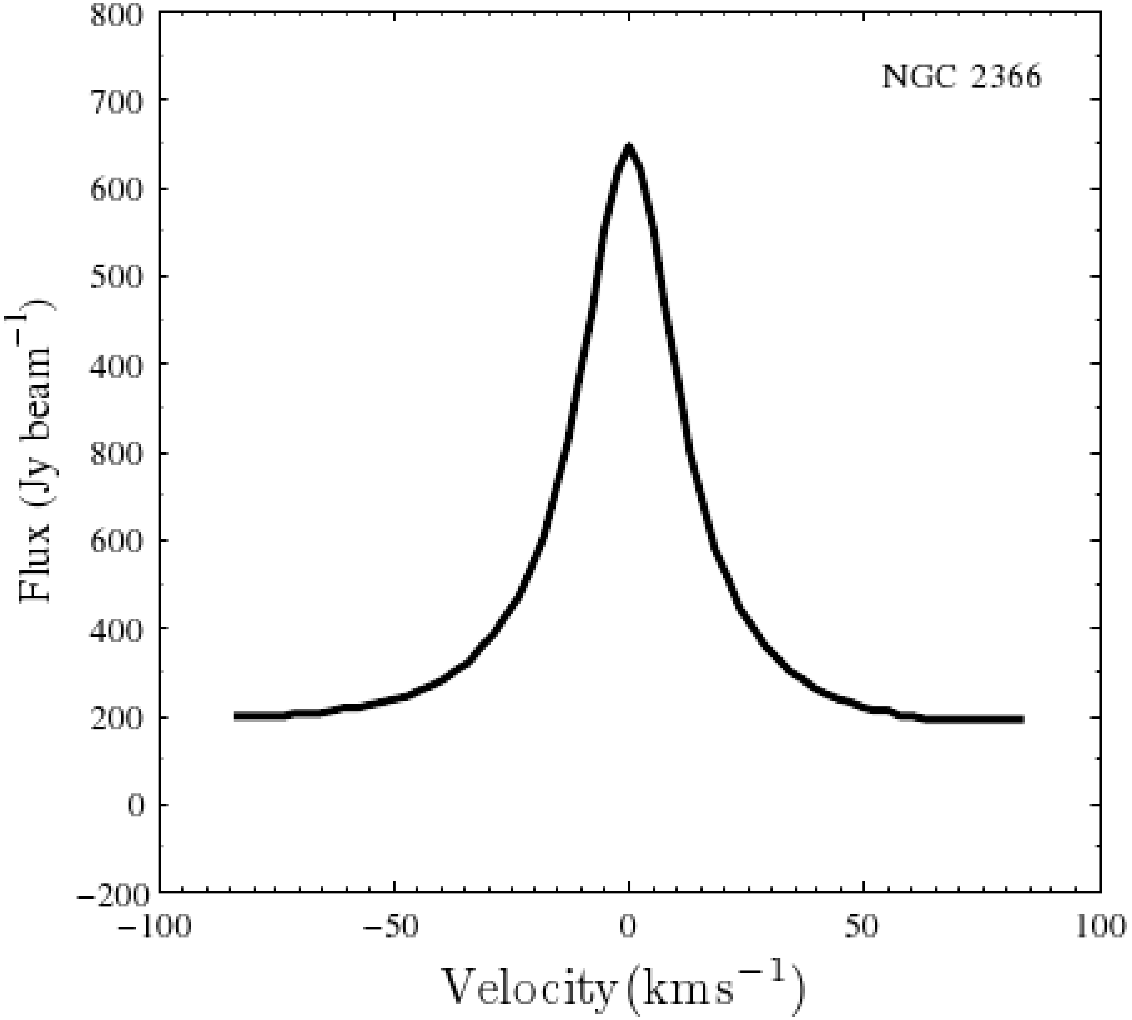
Constructing high S/N profiles



Left panel: individual profiles before shifting them to a common reference velocity

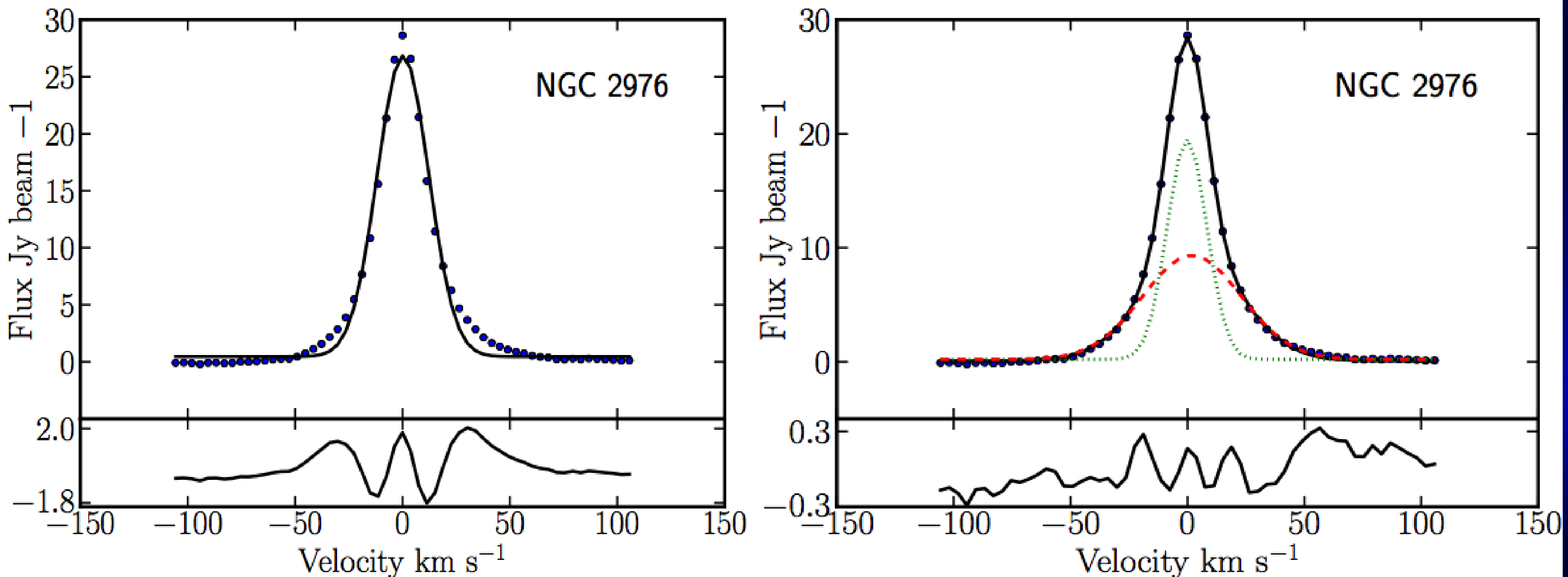
Right panel: individual profiles after shifting them to a common reference velocity

The HI super profiles of the THINGS galaxies



Super profile:
sum of the shifted spectra

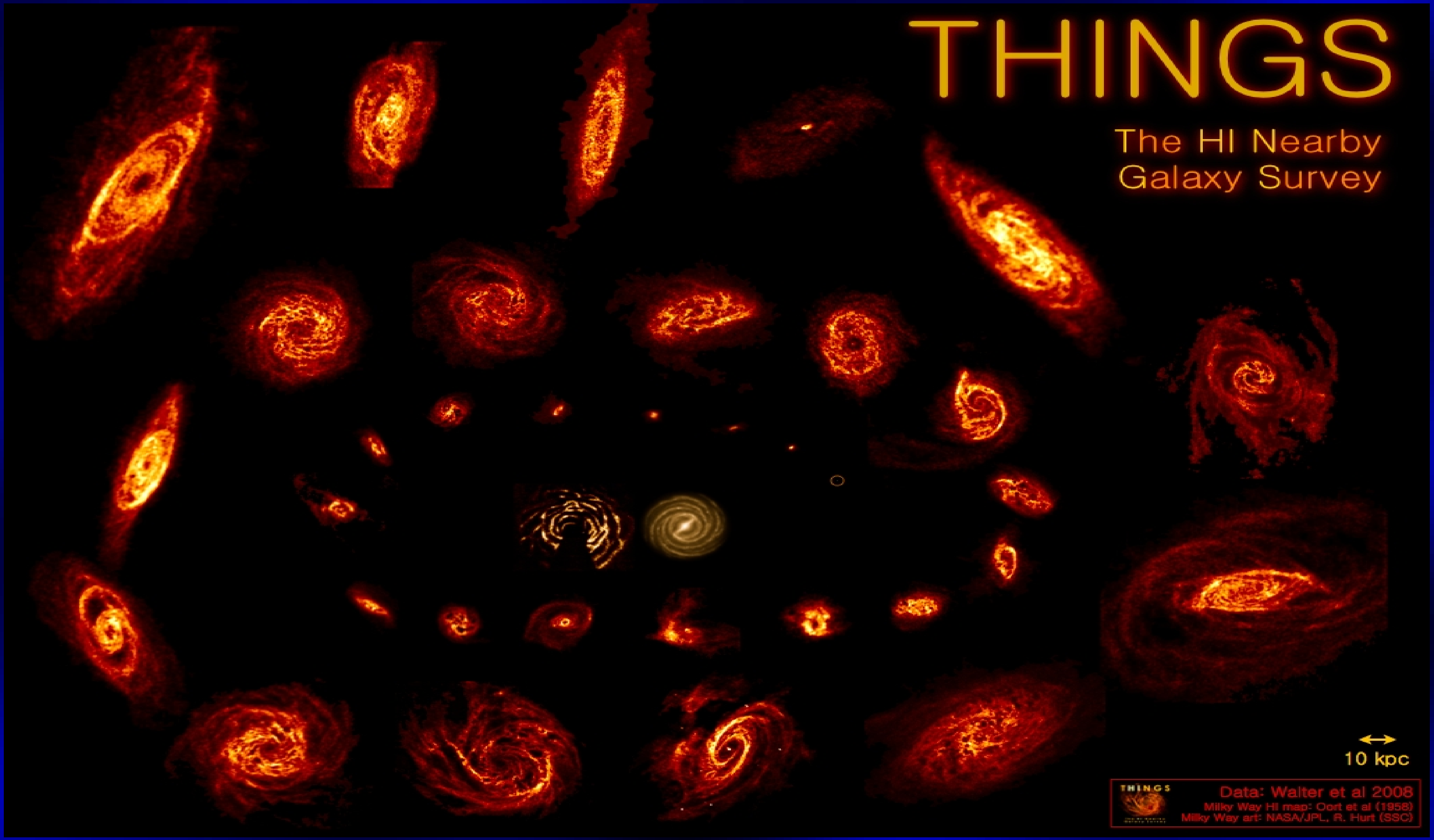
The HI super profiles of the THINGS galaxies



Left panel: super profile fitted with a single Gaussian Component

Right panel : super profile fitted with a double Gaussian component

Making sub samples



Making sub samples

- Sample 1 (our Clean Sample): Non interacting, not dominated by projection effect, counter rotation, thick disk...
- Sample 2: All galaxies that do not fall in the Sample 1 classification

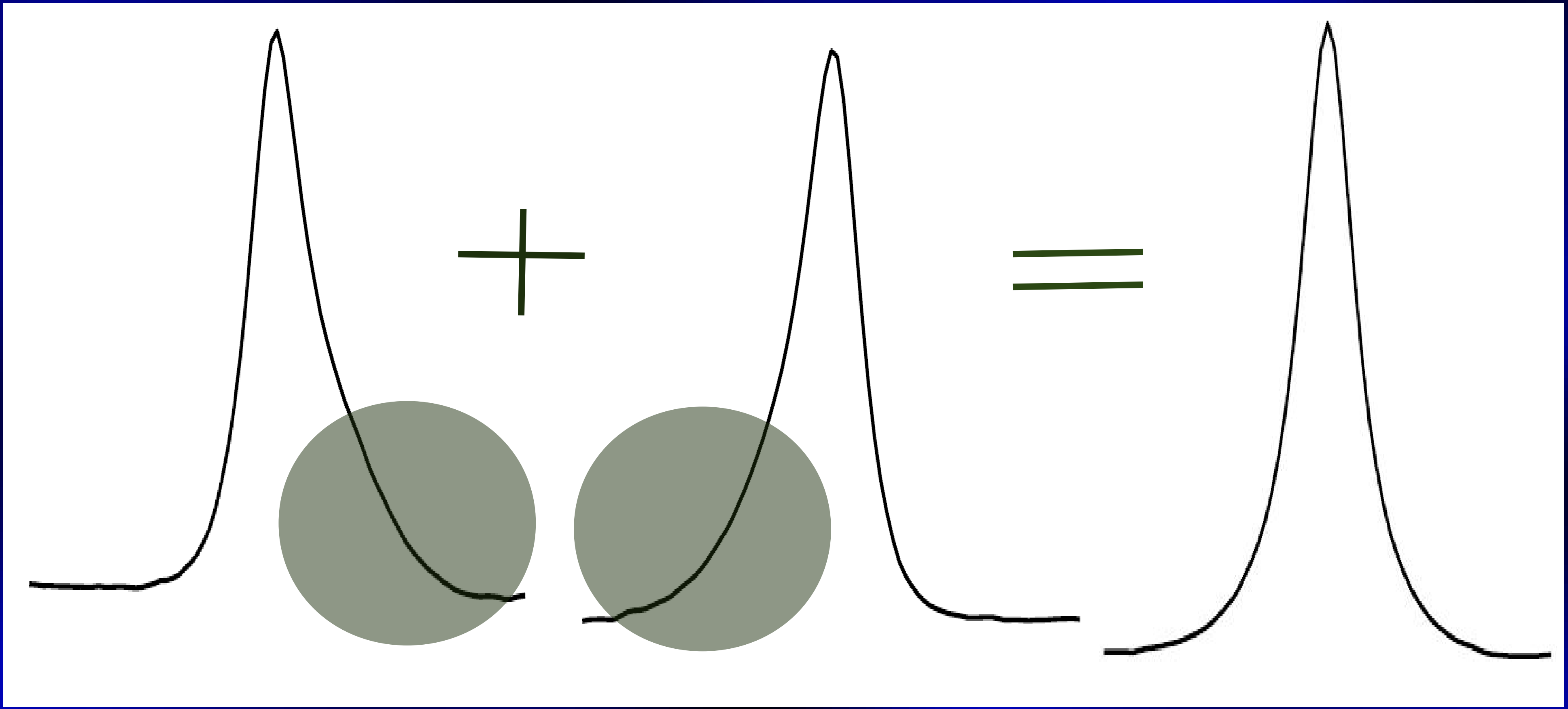
Method's robustness

Uncertainties

- Does small uncertainty values used in shifting individual profiles broaden super profiles?
- How do individual asymmetric input profiles affect the shapes of the resulting super profile?

Method's robustness

Uncertainties



Analysis

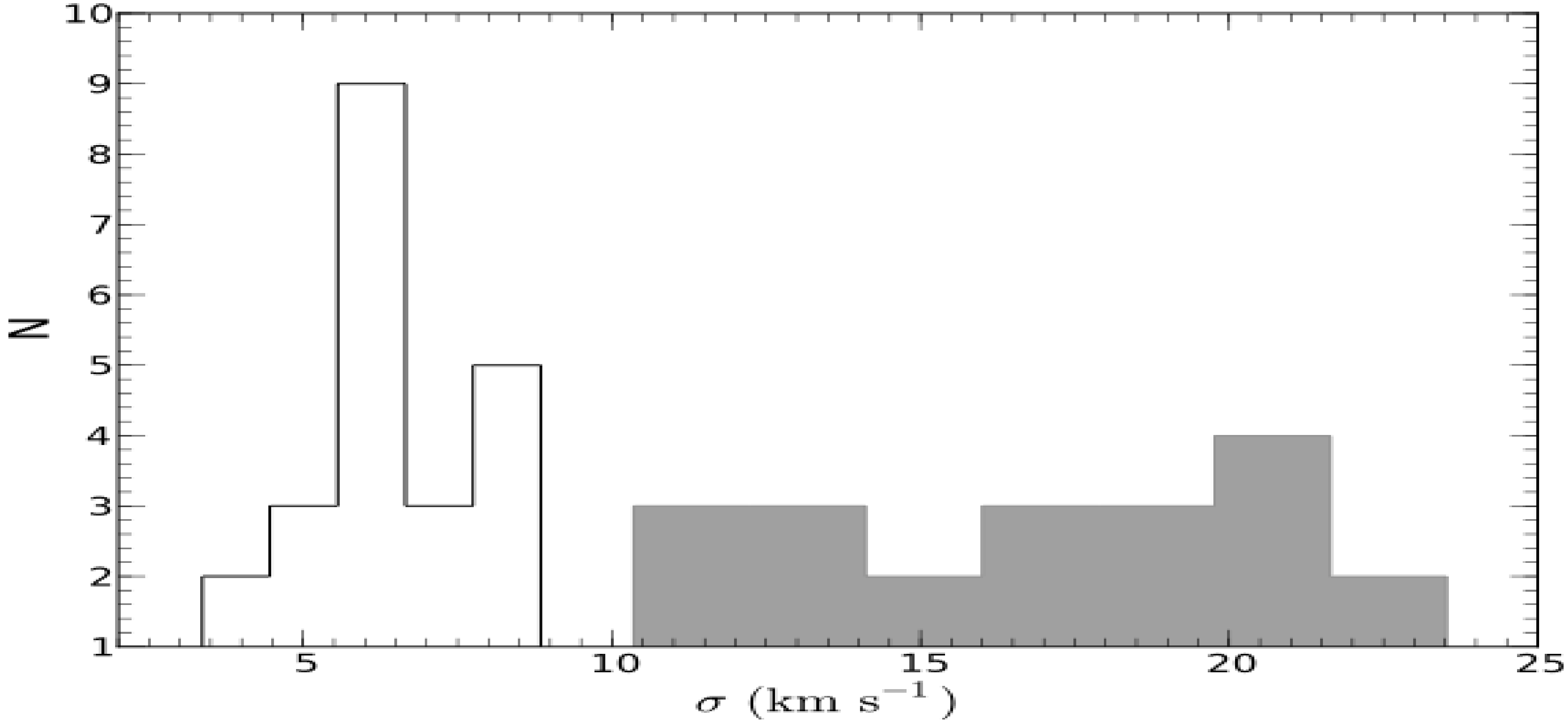
Analyze the shapes of the super profiles of the Clean Sample:

√in different location in a galaxy

√in low, moderate and high SFR regions

Results

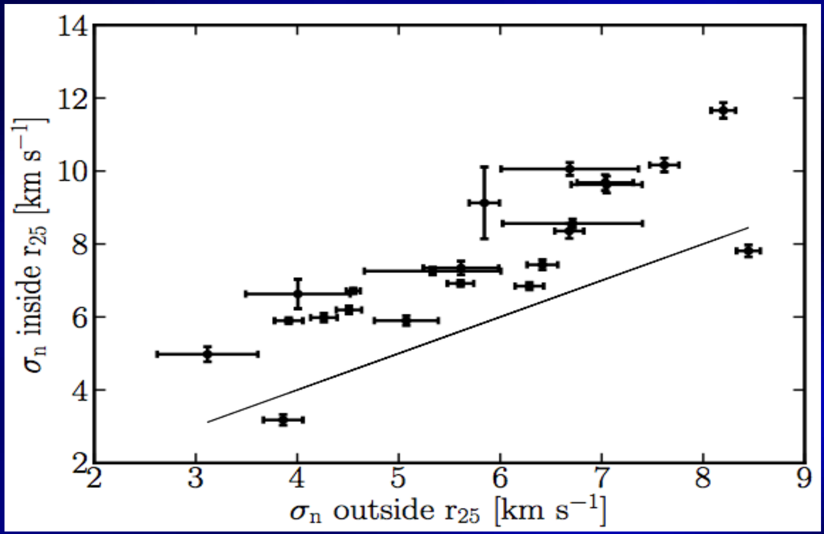
Velocity dispersions

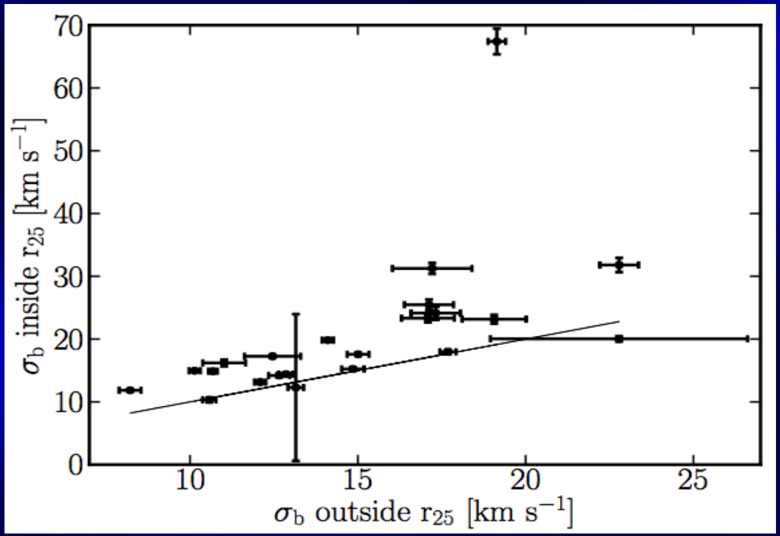


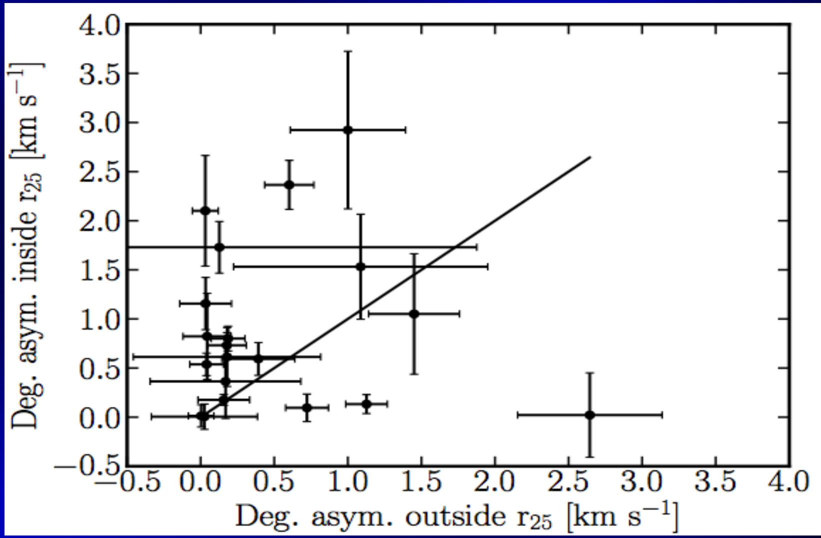
Velocity dispersion of the narrow (solid histogram) and broad (gray histogram) component of the Clean sample

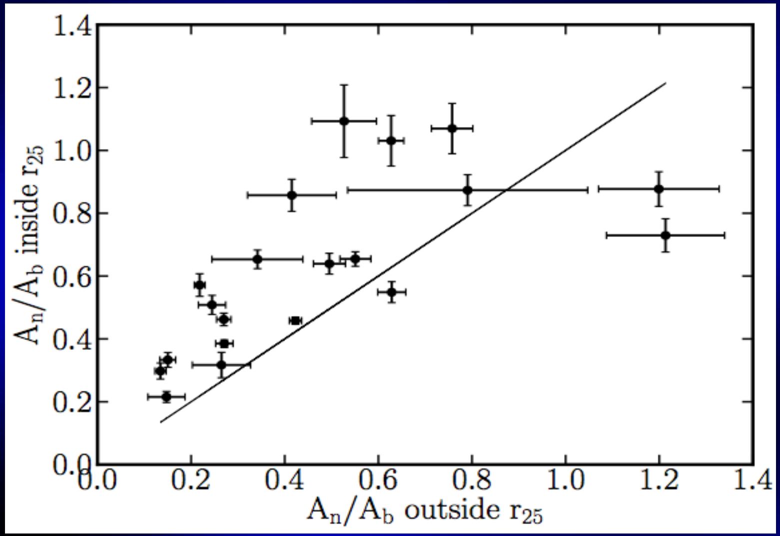
Results

Super profiles and location in galaxies







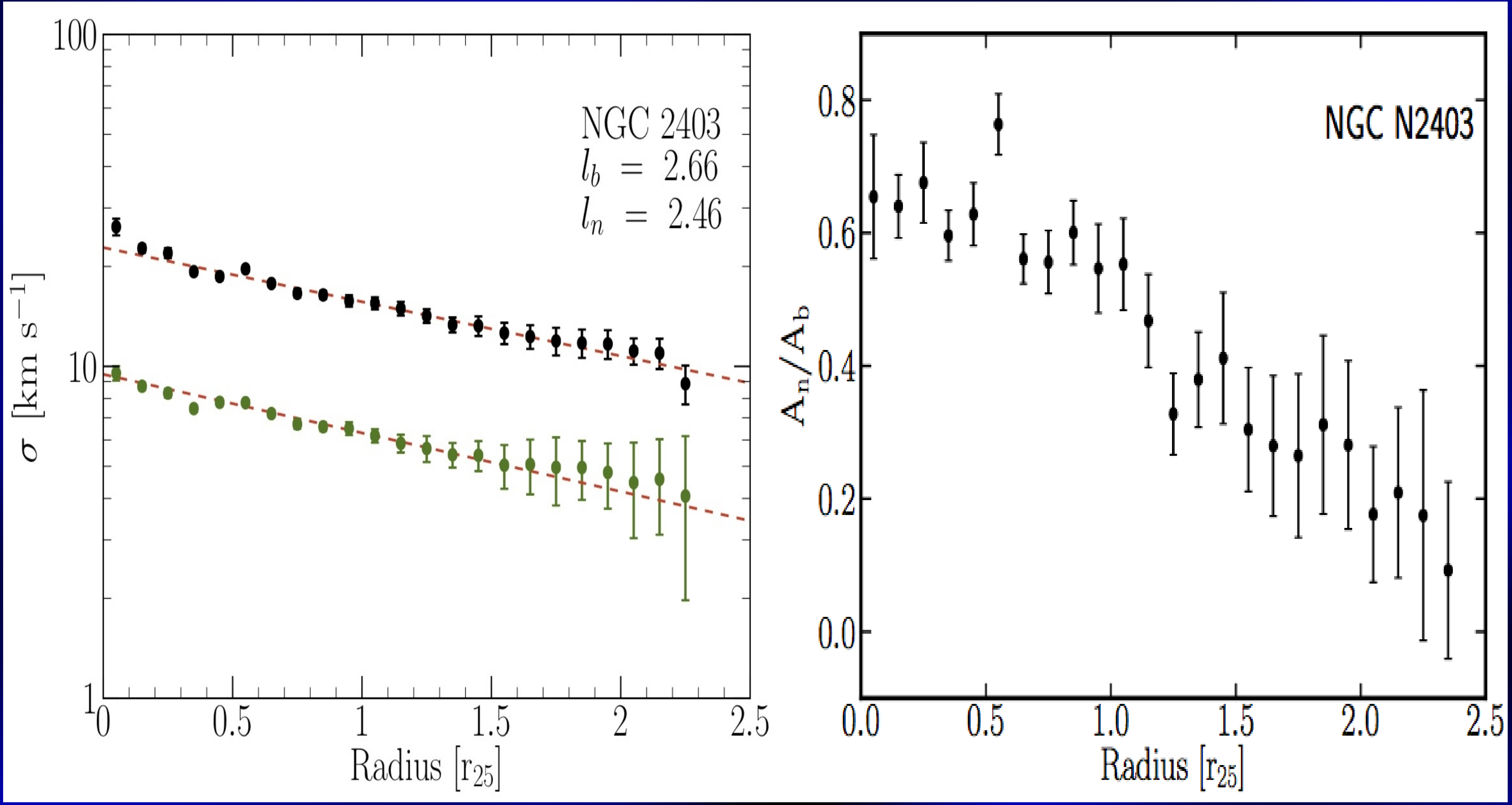


Ϭn/b: Velocity dispersion of the narrow/broad component

An/b: Area of the narrow/broad component; Deg.asym: degree of asymmetry of the super profile

Results

Super profiles and location in galaxies

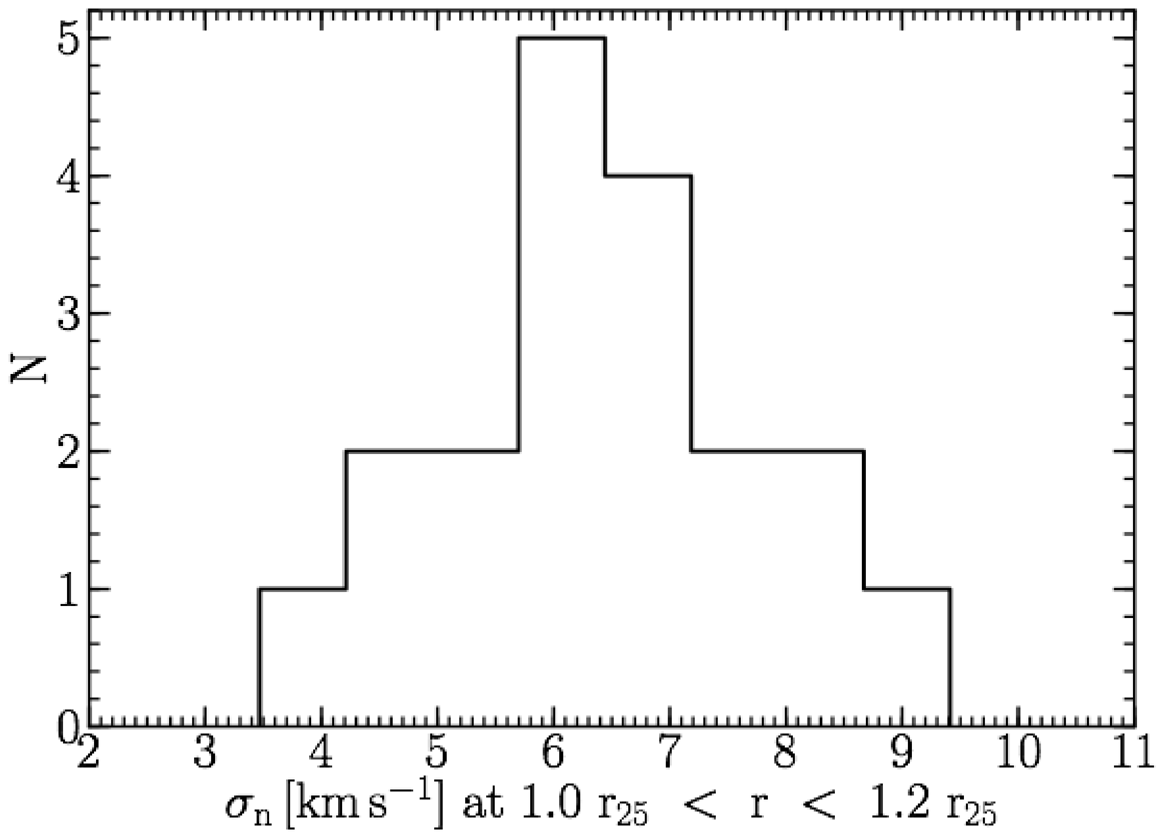


Left panel: velocity dispersion of the narrow and broad component as a function of radius

Right panel: Ratio of the rea of the narrow and broad components as a function of radius

Results

Super profiles and location in galaxies



The narrow component velocity dispersions seem to converge to a fixed value at about r_25.
This value is 6.5±1.4 km/s

Conclusion

We have analyzed the super profiles of the THINGS galaxies.

We have decomposed the profiles into Gaussian components and have found narrow and broad components in all our analyzed galaxies

We associate the narrow and broad components with the CNM and WNM.

We have found some correspondence between the shapes of the super profiles and their location in a galaxy:

√ the profiles tend to be broader and more asymmetric

inside the optical radius r_25

√the narrow component tend to dominate inside r_25

√the velocity dispersion of the narrow and broad components tend

to decrease with increasing radius

Future works

- Investigate wether the narrow components are associated with molecular gas.
- Use the derived narrow component velocity dispersion to constrain star formation laws.