The Dynamical Properties of Virgo Cluster Galaxies

Nathalie N.-Q. Ouellette (Queen's University)

Advisor: Prof. Stéphane Courteau

Collaborators: Prof. Jon Holtzman (NMSU), Prof. Juliane Dalcanton (UWashington), Dr. Michael McDonald (MIT), Yucong Zhu (Harvard)

The Virgo Cluster


Rogelio Bernal Andreo

- 2096 galaxies over 140 deg^2 (VCC: Binggeli et al. 1985)
- Complete down to M_B = -13 (Binggeli et al. 1985)
- Distance of approx. 16.5 Mpc (Mei et al. 2007)
- Dynamically active (Böhringer et al. 2004)
- Contains multiple substructures (de Vaucouleurs 1961)
- Subject of many surveys: ACSVCS (Côté et al. 2004), HeViCS (Davies et al. 2010), GUViCS (Boselli et al. 2011), NGVS (Ferrarese et al. 2012)

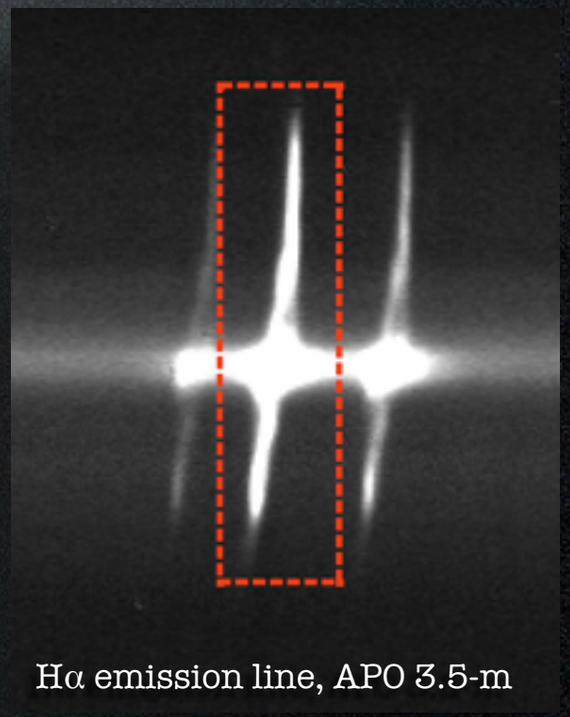
The SHIVir Survey

Spectroscopic and H-band Imaging of Virgo

- *g*-, *r*-, *i*-, *z*- (SDSS DR6) and near-IR *H*-band photometry (CFHT), surface brightness profiles, isophotal magnitudes and radii

- Optical spectroscopy from Palomar, Kitt Peak National and Apache Point Observatories

http://www.astro.queensu.ca/virgo



Hα emission line, APO 3.5-m

Goals

Virgo Cluster Study: Homogeneous photometric and spectroscopic study of Virgo Cluster Galaxies

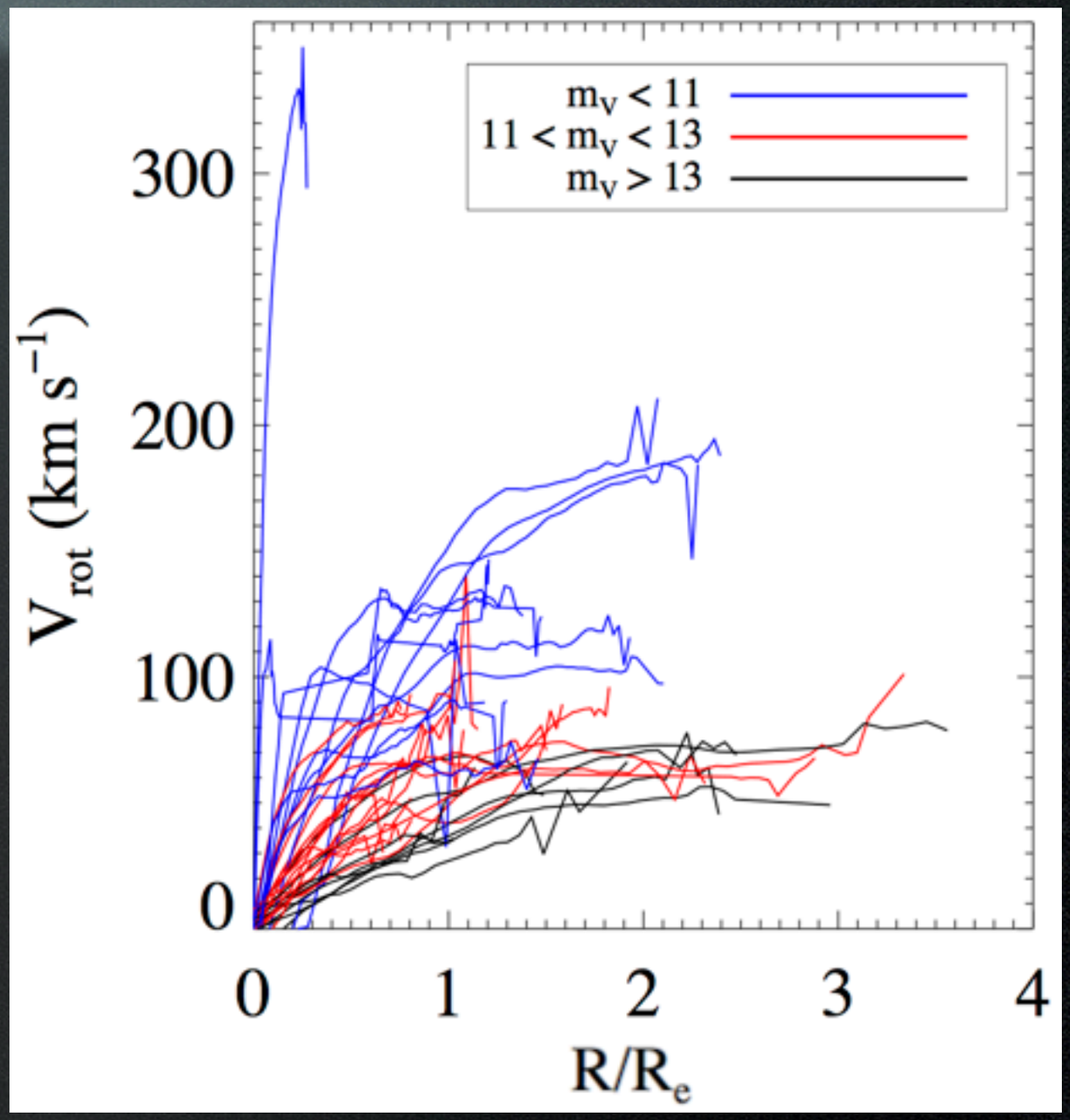
Compilation of Parameters: Compile the most complete collection of galaxy structure parameters in a cluster to date (coupled with stellar populations study by J.Roediger for Ph.D.)

Scaling Relations: Build and study largest Tully-Fisher, Faber-Jackson and Fundamental Plane relations for a cluster to date

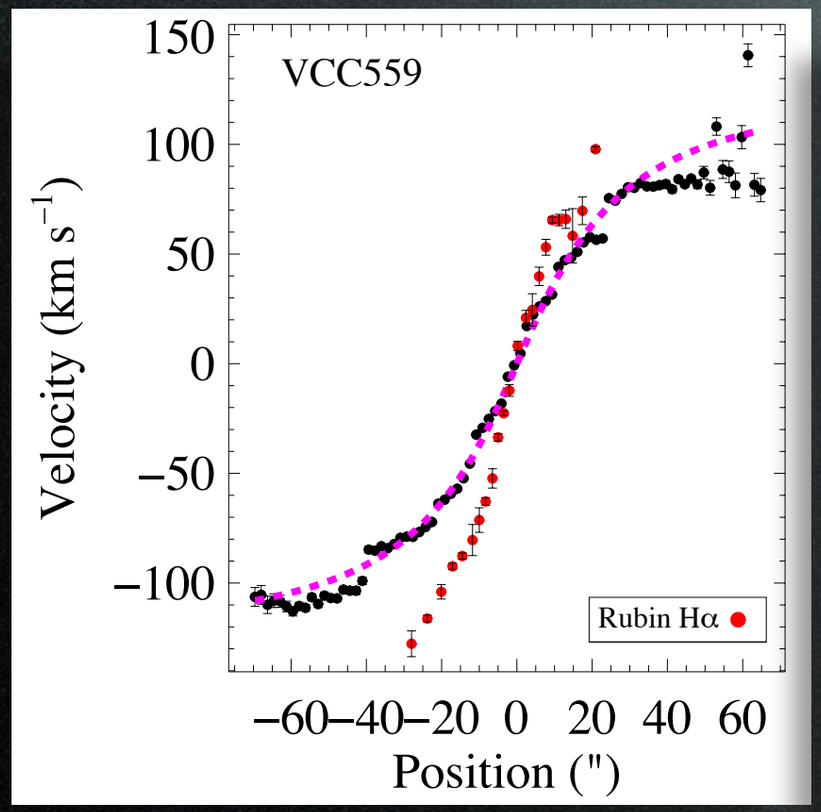
Defining/refining new metrics for V_{rot} and σ: Based on minimisation of scatter in scaling relations

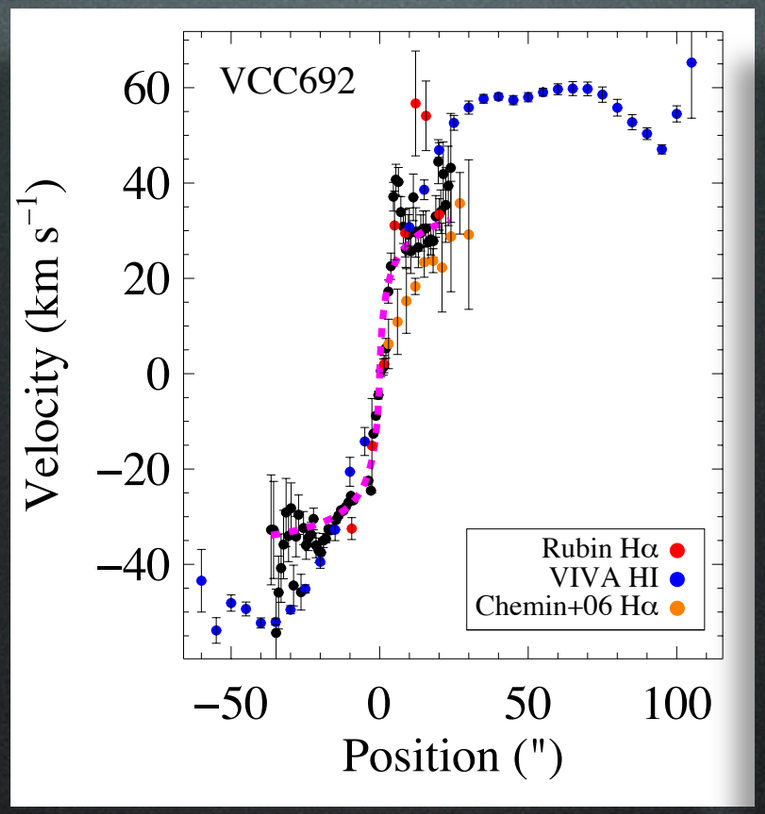
Rotation Curves

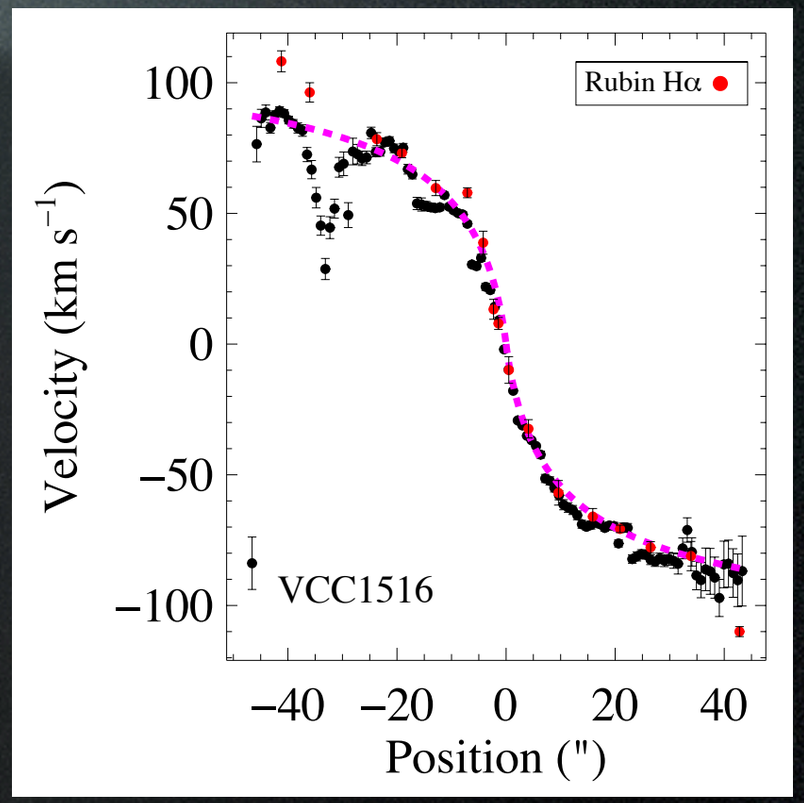
RCs extracted for 34 SHIVir gas-rich galaxies



Rotation Curves





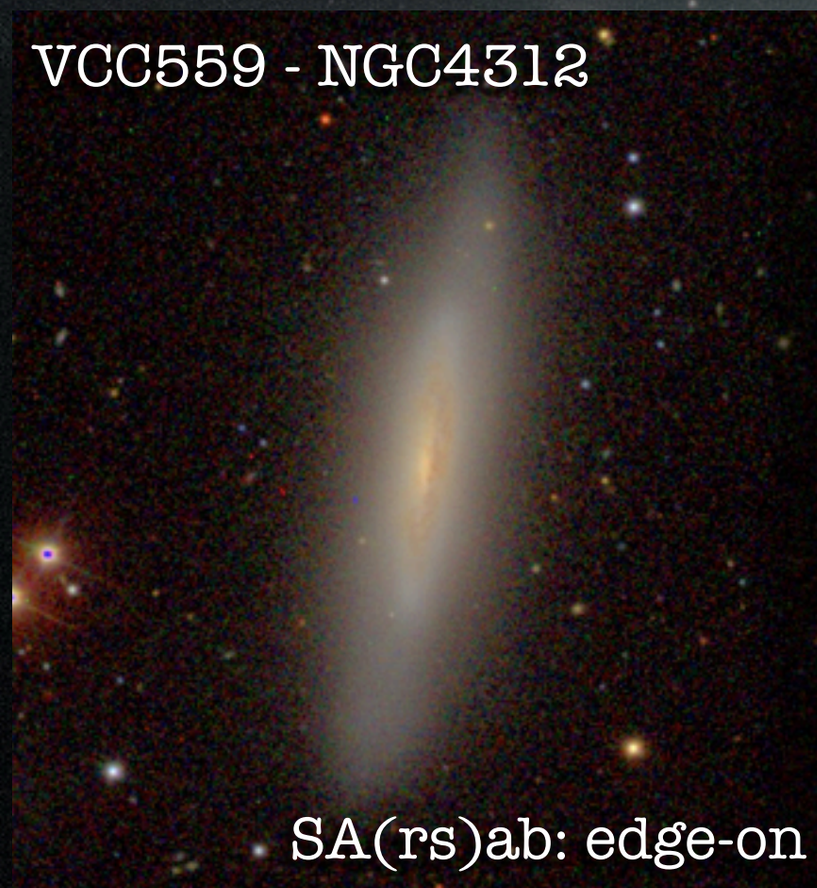


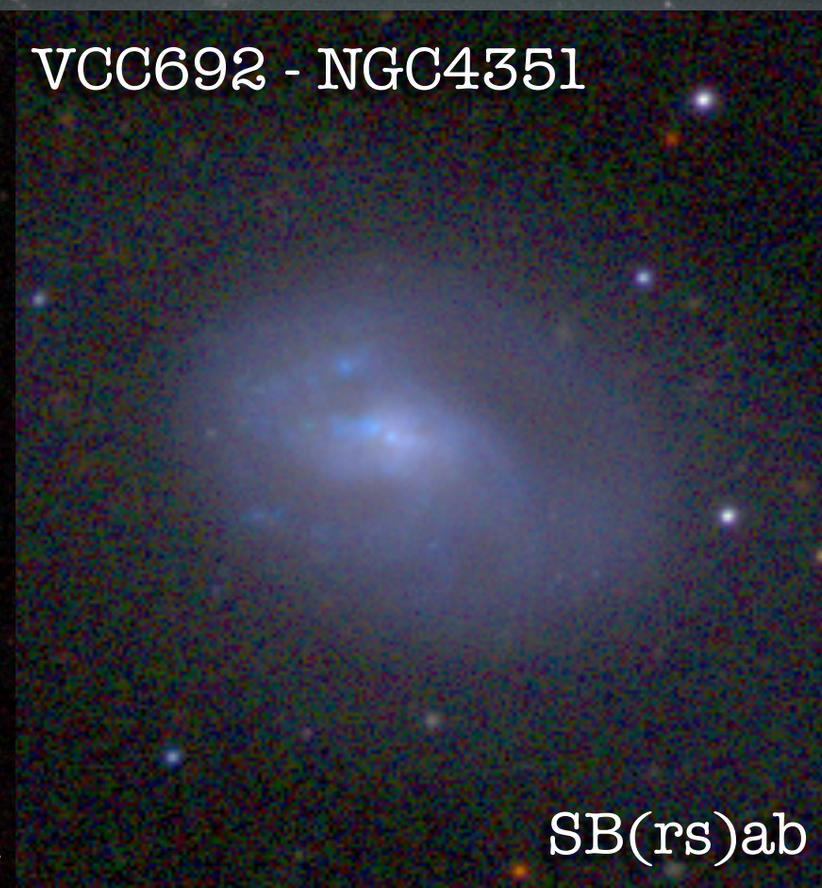
PA differences?

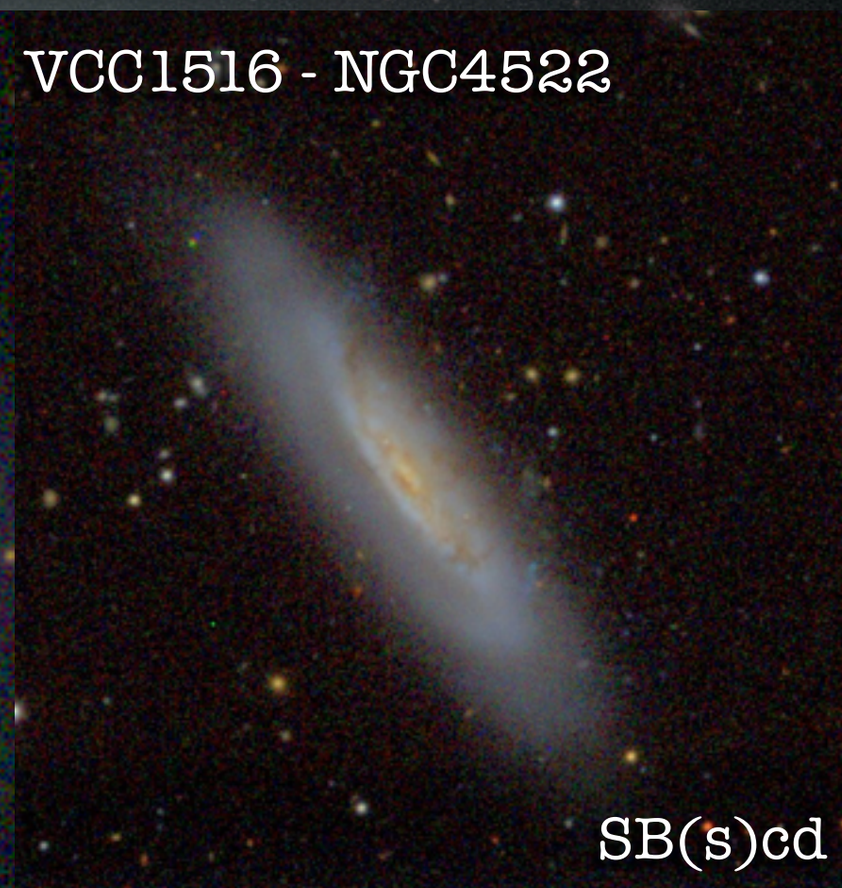
Symmetric warps?

Non-axisymmetric dynamical

Rotation Curves







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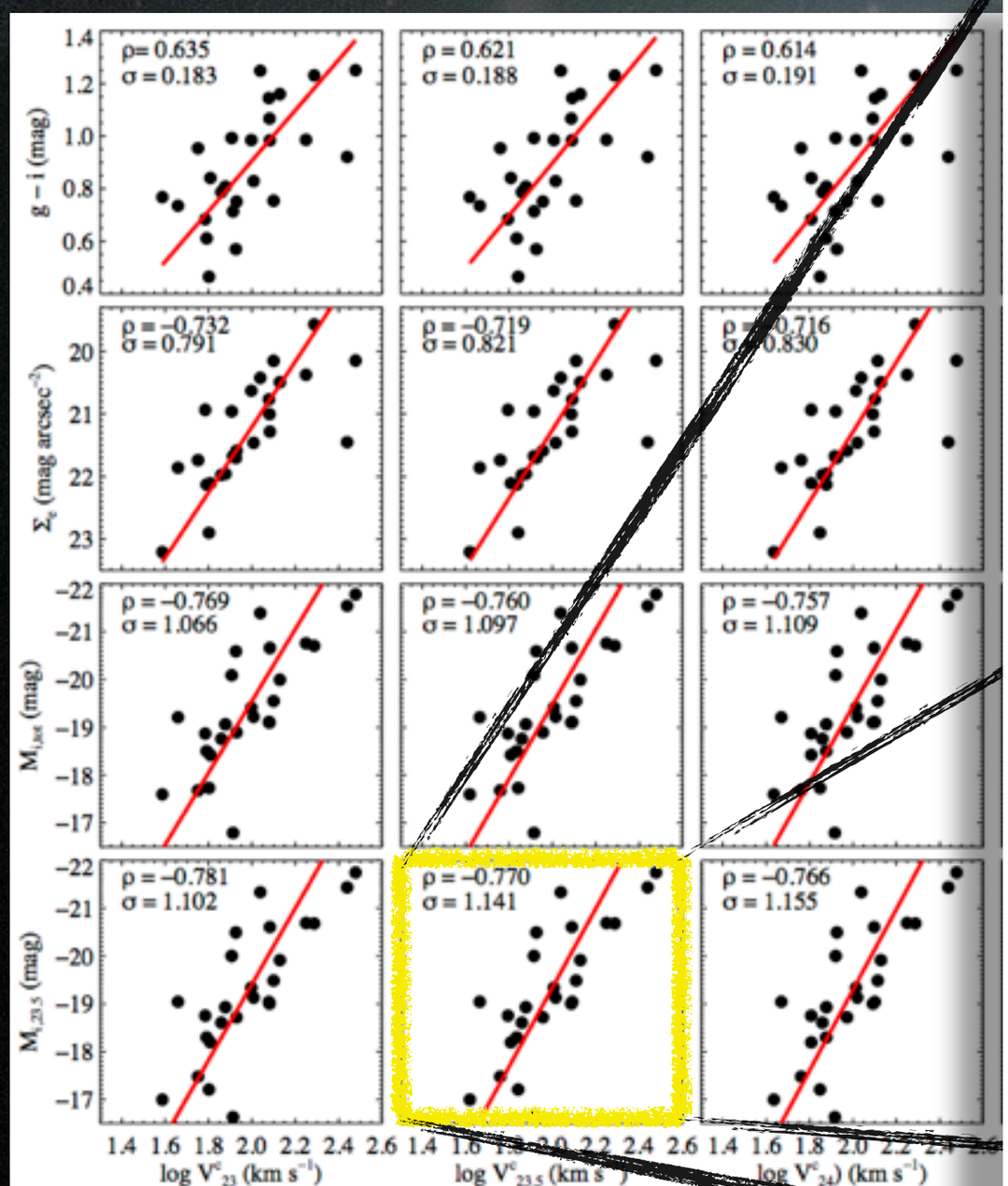
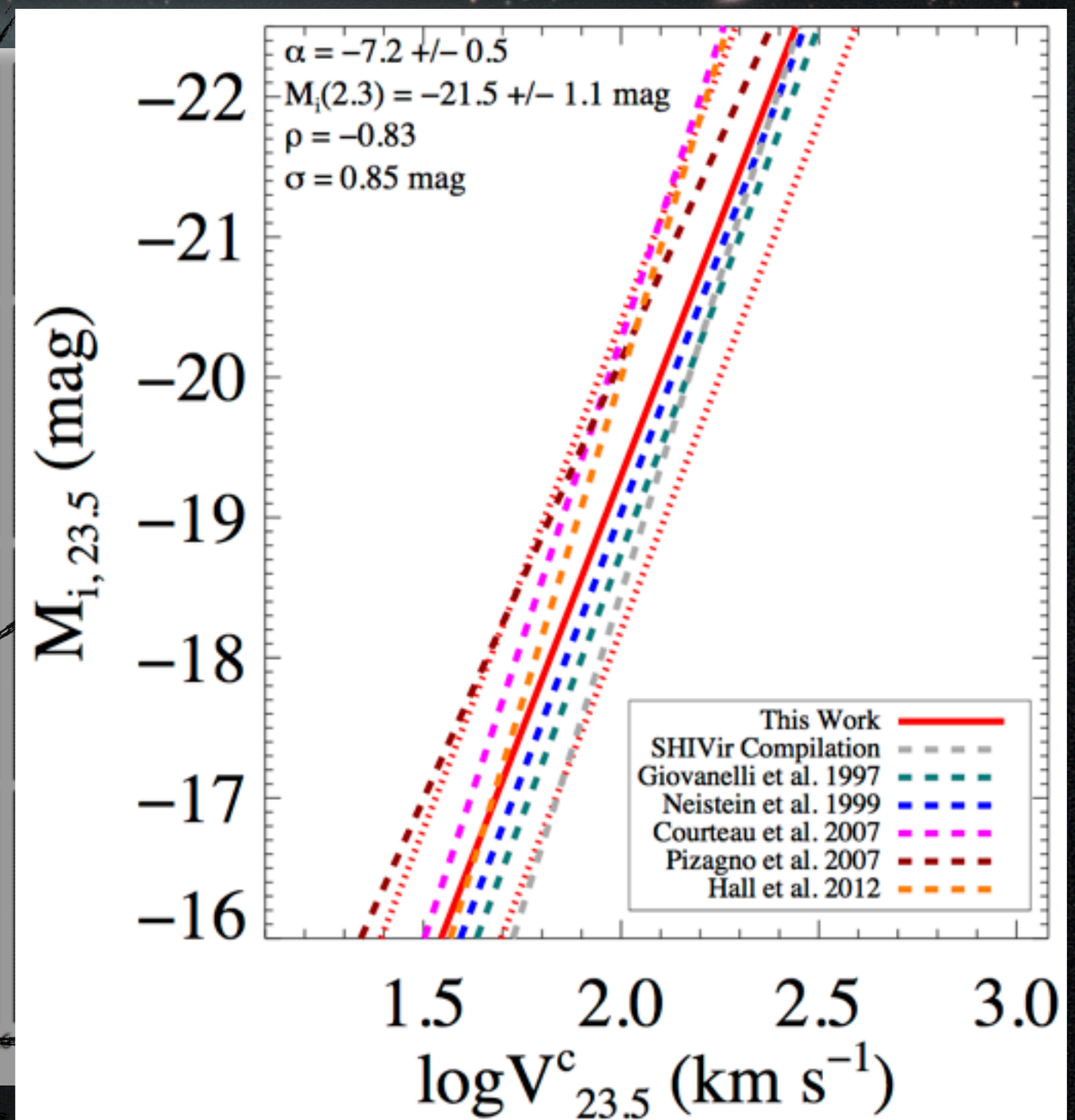
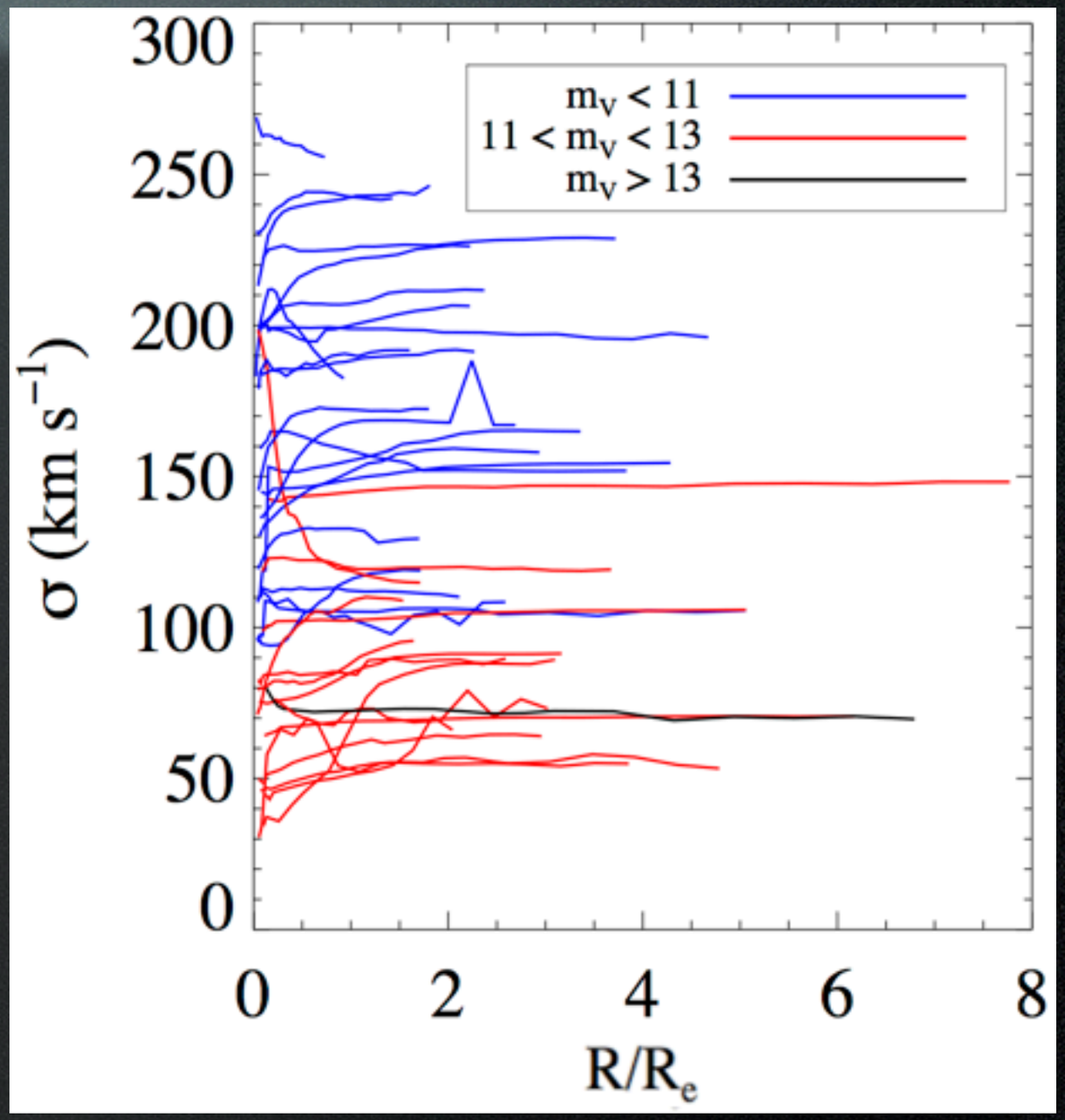
Tully–Fisher Relation





Velocity Dispersion Profiles

Velocity dispersion profiles extracted for 33 SHIVir gas-poor galaxies



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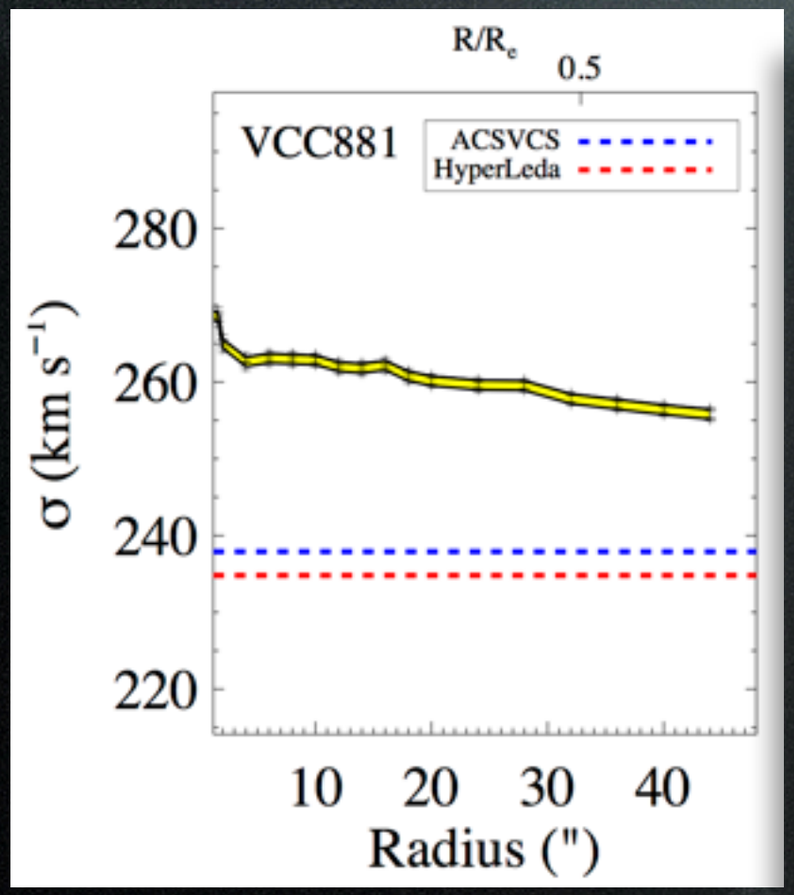
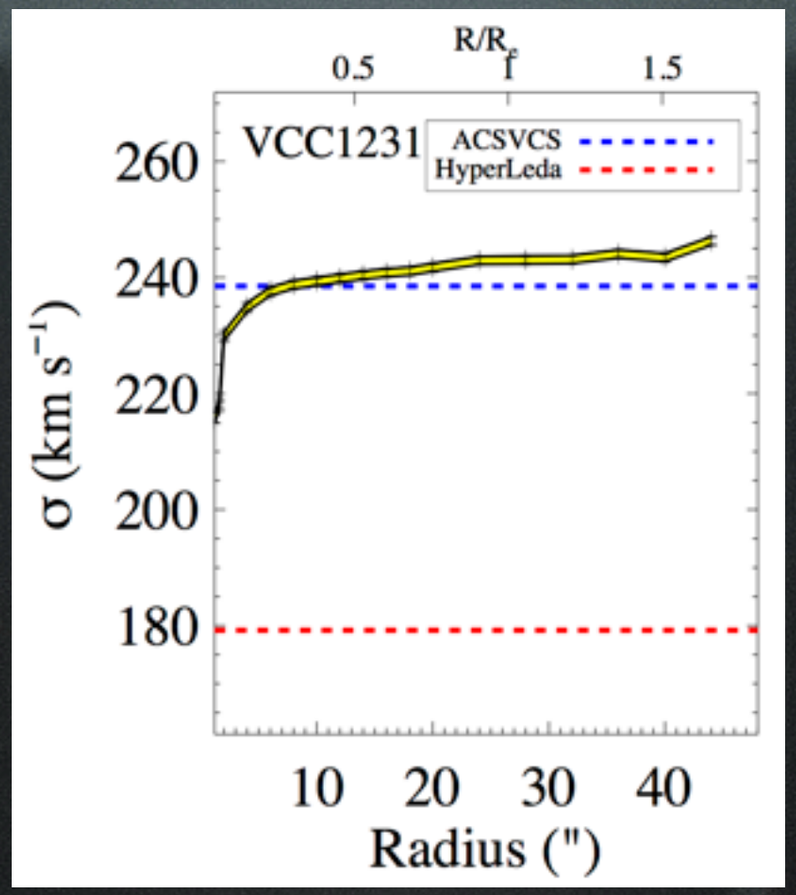
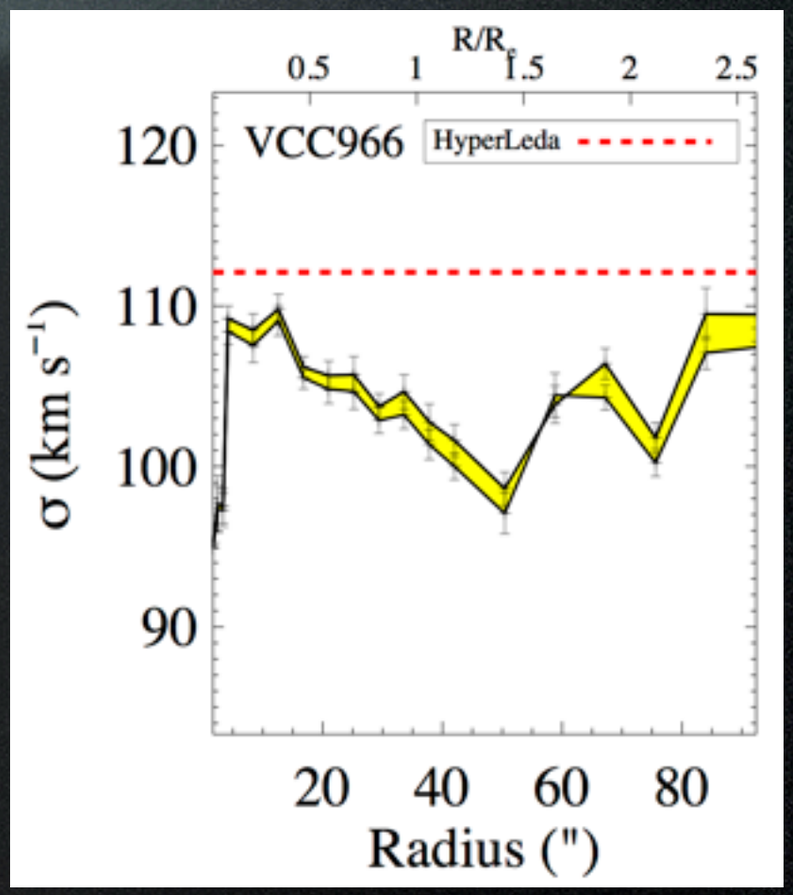
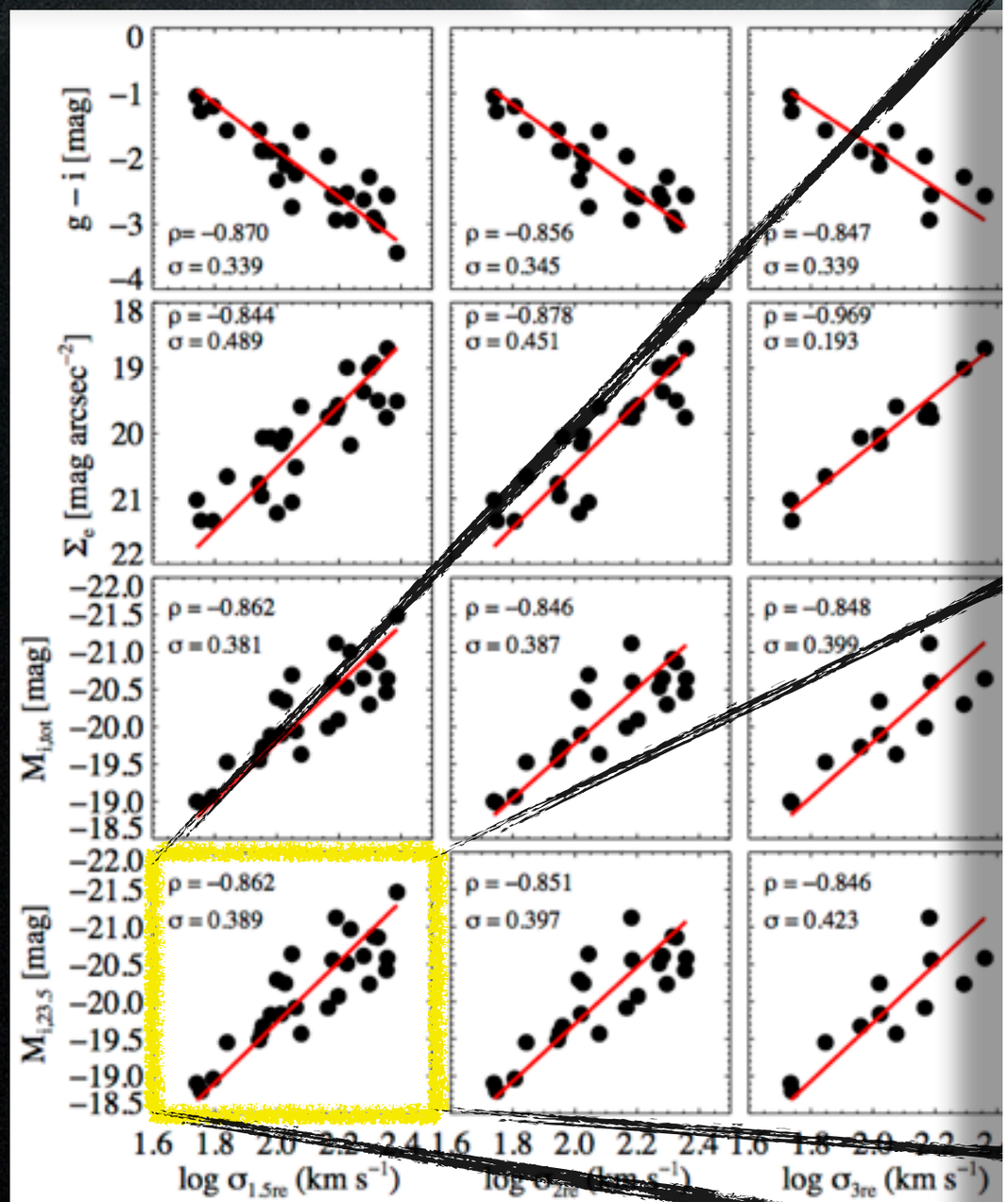


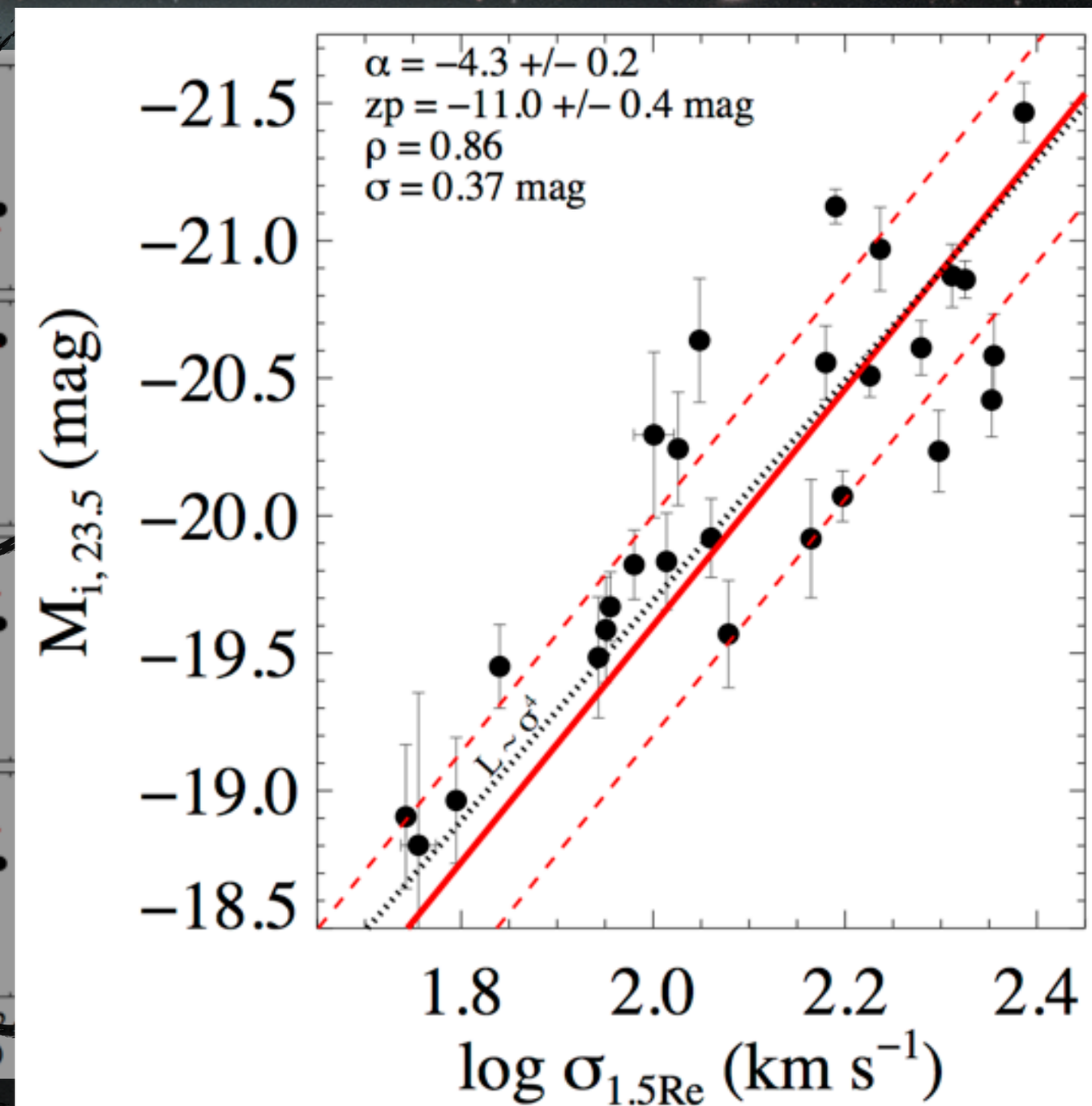




***Uncorrected for rotation**

Faber–Jackson Relation





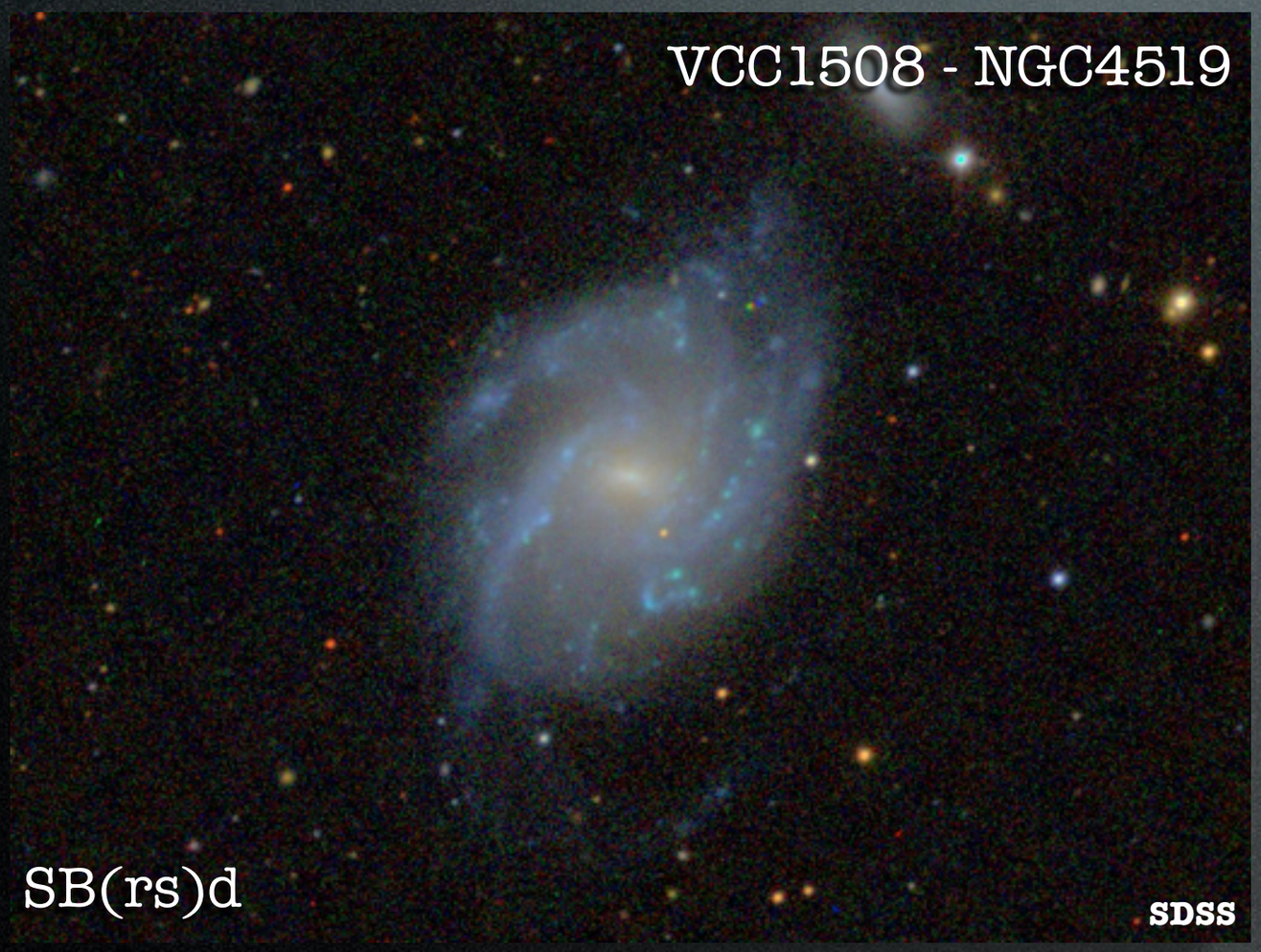
Results Summary

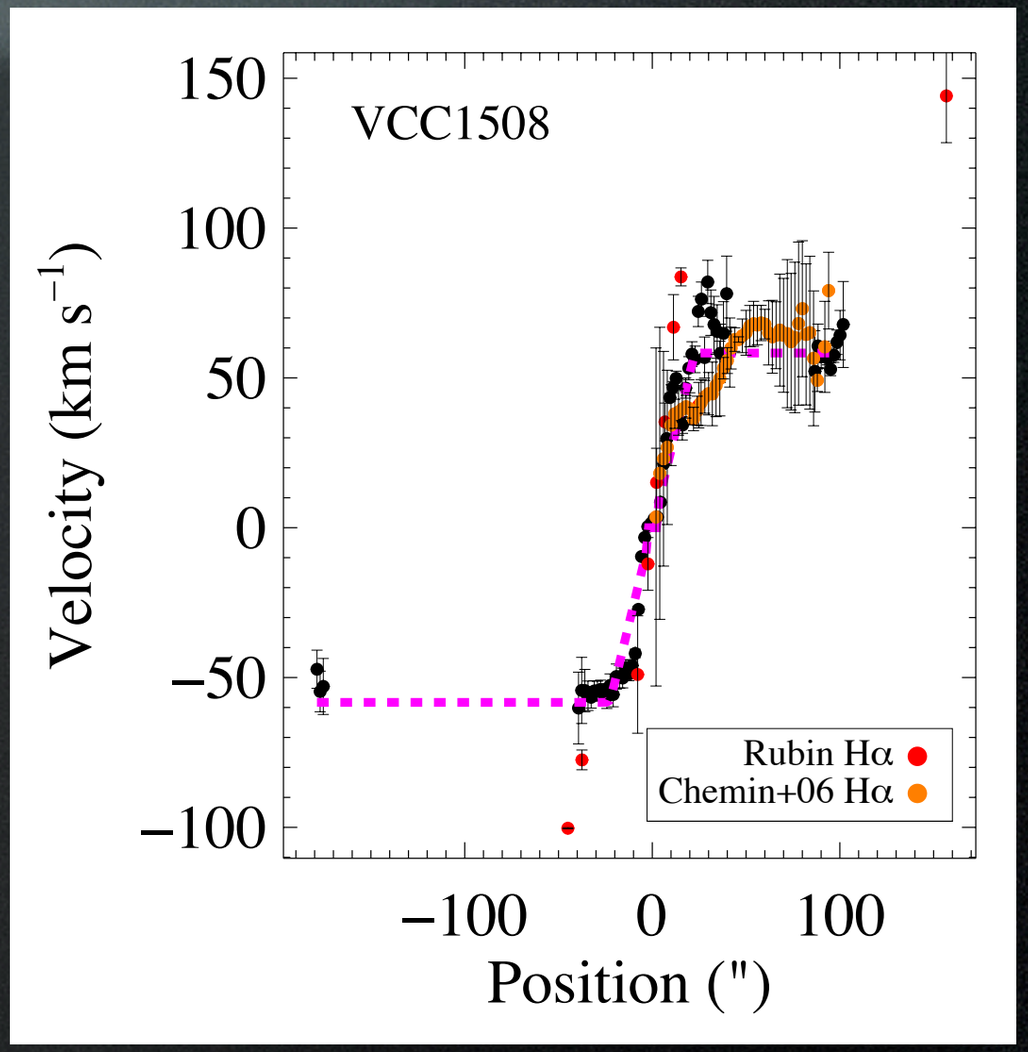
- RCs and VDs were extracted for 34 gas-rich and 33 gas-poor galaxies, respectively
- Both our TFR and FJR agree with previous works
- FJR scatter is reduced when larger fractions of R_e are used (1.5 R_e in this case, coincides with peak of SNR profile)

Future Work

- Correction for rotation for all VD profiles; yields collection of gas-poor galaxies' RCs
- Computation of best VD based on a Fundamental Plane analysis (Sheth & Bernardi 2011)
- New observations at Gemini (proposal to be submitted in the Fall)
- Inclusion of spiral galaxies from other works (Rubin et al. 1999; Chemin et al. 2006; ALFALFA; VIVA; etc.) in our TFR analysis
- Creation of a Virgo velocity/mass function (Dutton et al. 2011; Papastergis et al. 2011; Trujillo-Gomez et al. 2011)

SITELLE's Potential





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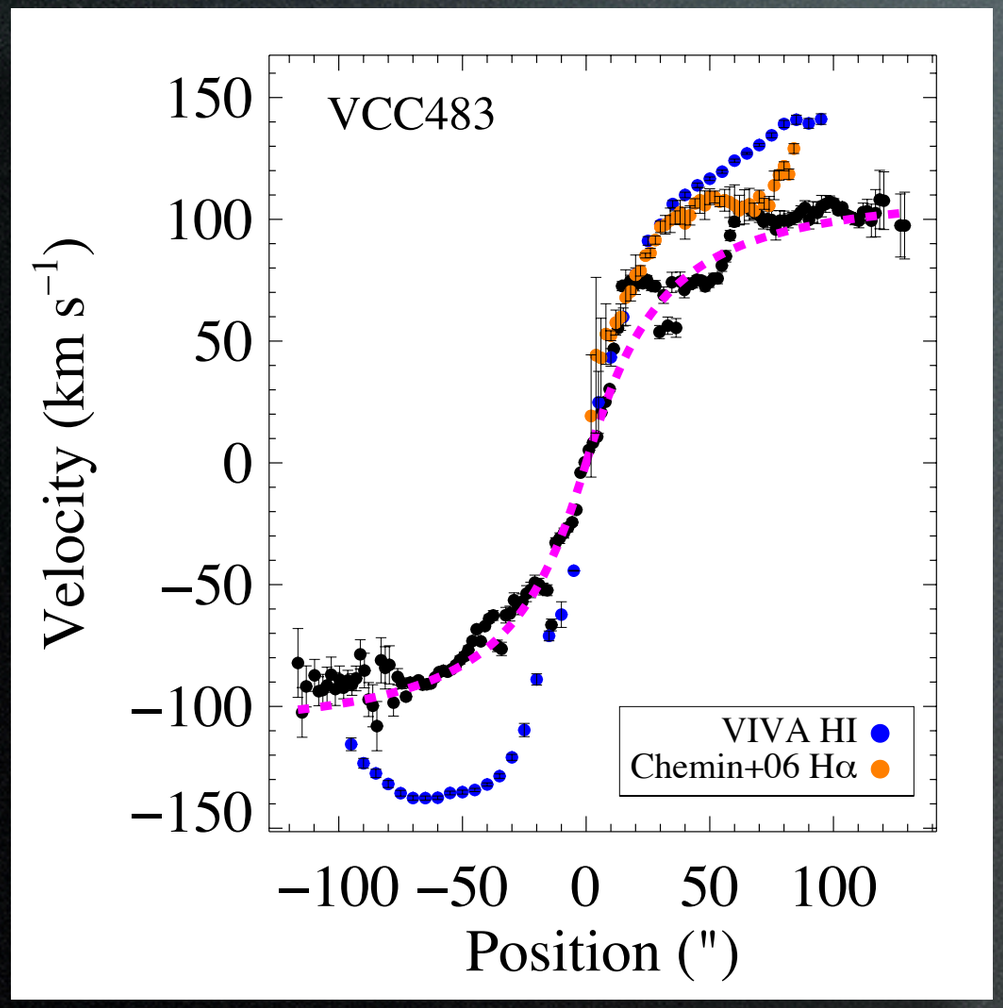

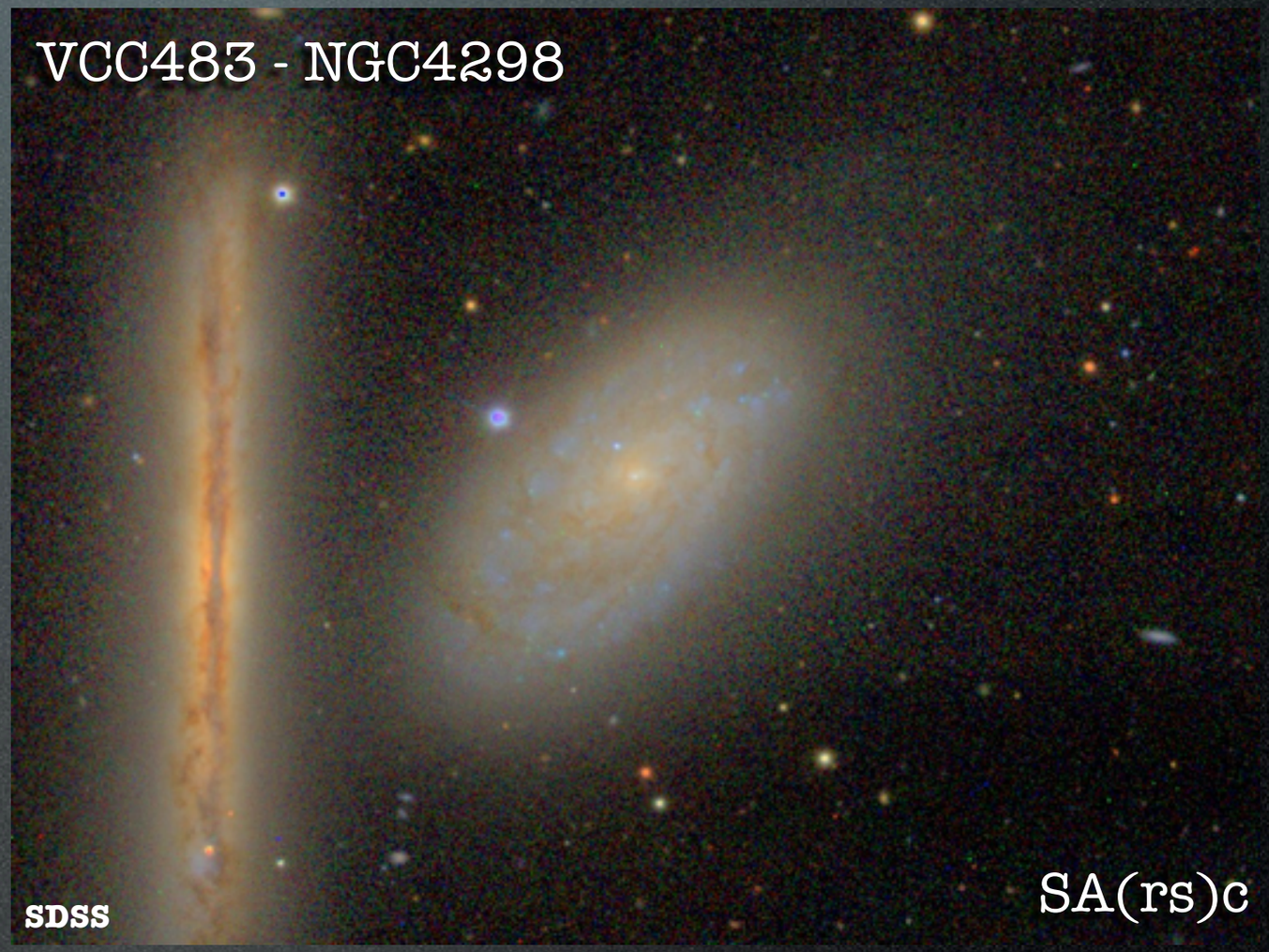

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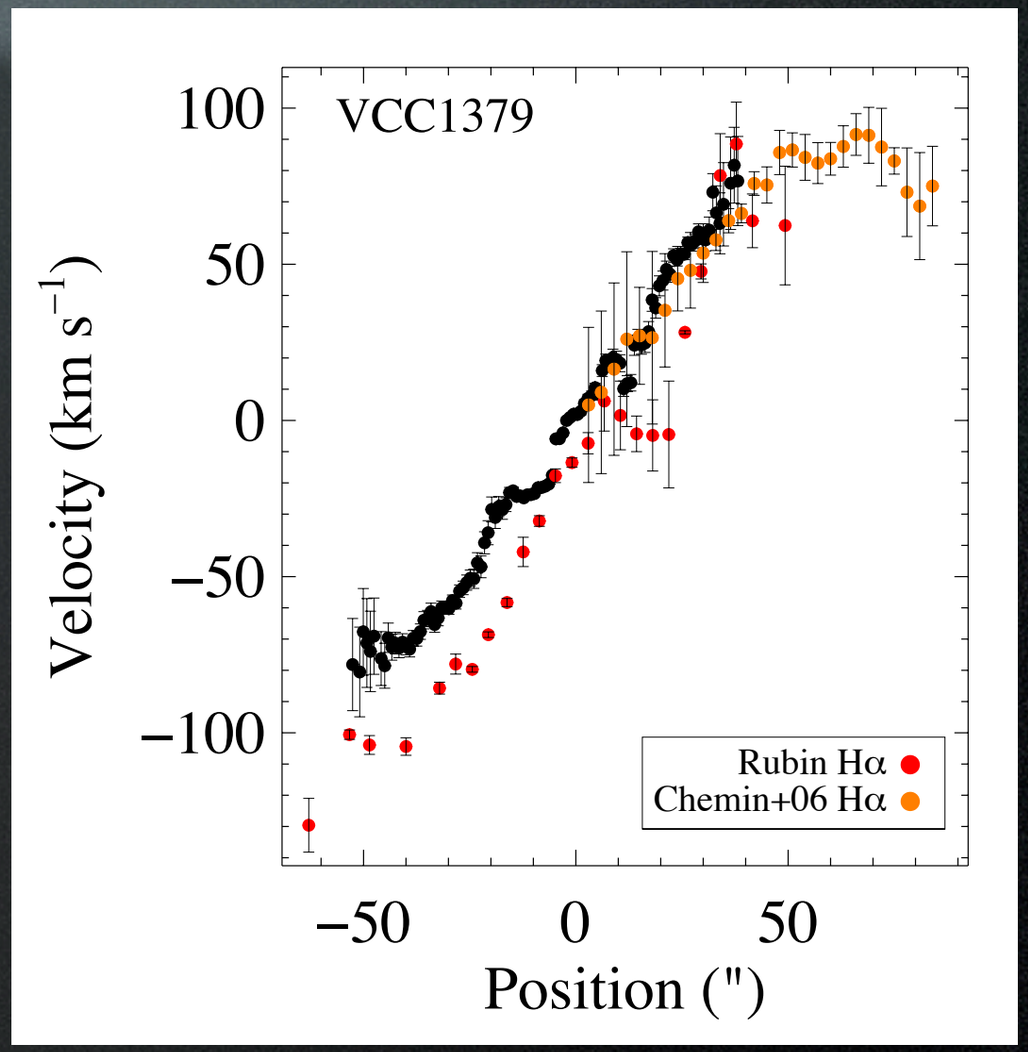

SITELLE's Potential

Specifications:

- Rest frame Hα emission + NII lines (λ = 6563Å)
- Spectral resolution R≅5,000+
- Targets at mγ≅9.5-16

Goals:

- Study non-axisymmetric structures
- Systematically compare 2D HI to Hα velocity maps for Virgo (study non-circular motion in neutral and ionised gas)
- Create 2D dynamical mass maps