GASS: Galex-Arecibo-SDSS Survey

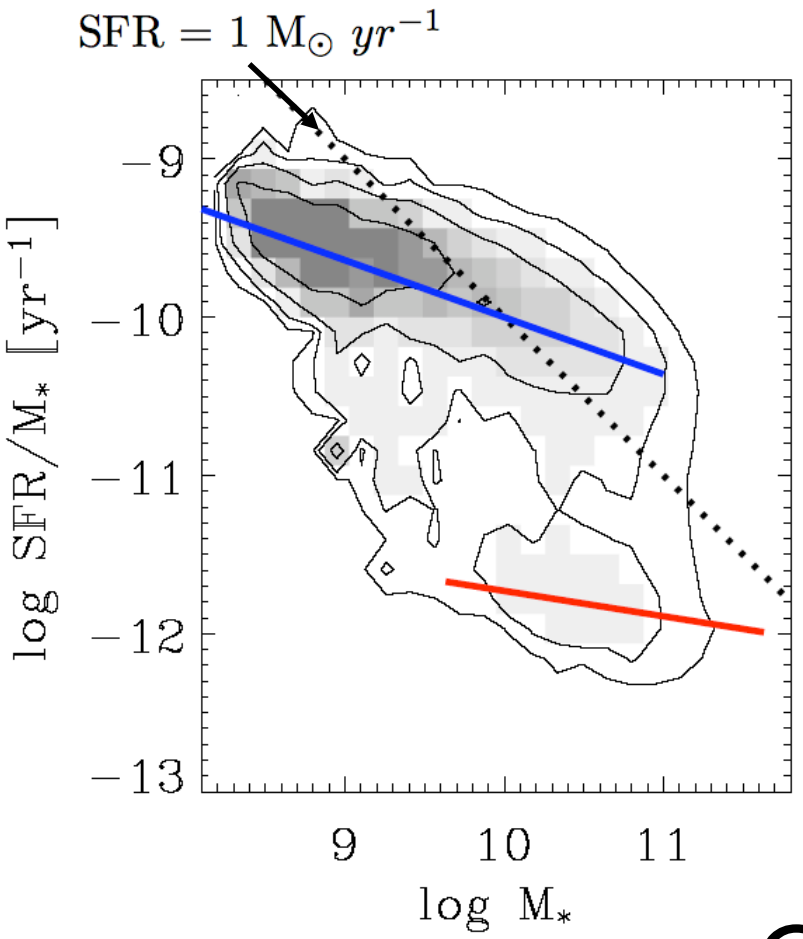
D. Schiminovich (PI) & GASS team

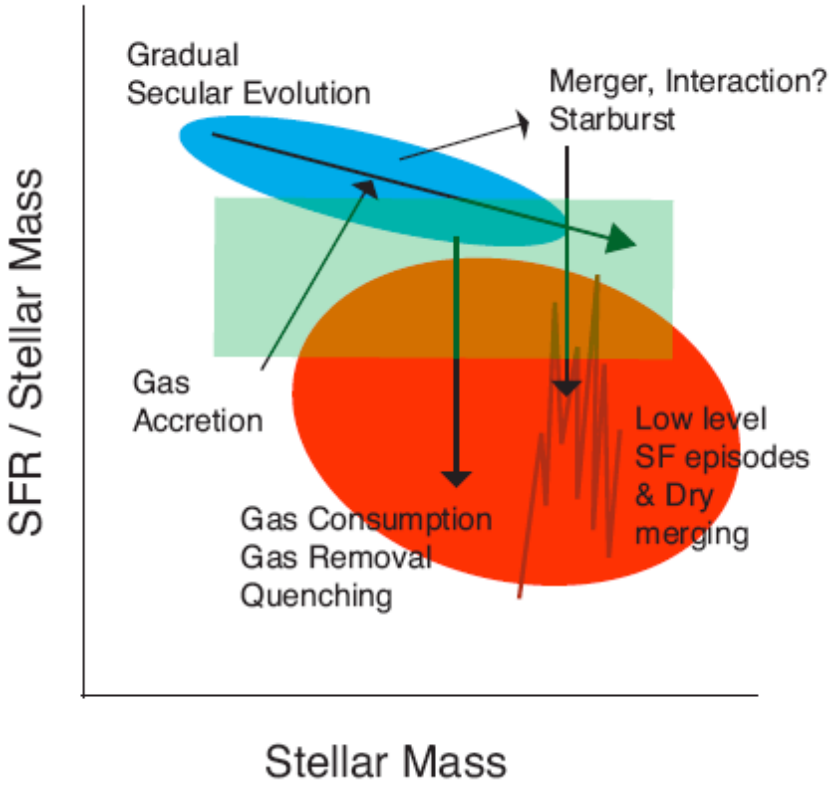
Arecibo Surveys Workshop

GALEX Arecibo SDSS Survey (GASS)

- Targeted HI survey of ~1000 galaxies with log M_*>10, 0.025<z<0.05, selected from within SDSS (sp), GALEX and ALFALFA survey footprints. (L-band wide, position switching)
- Galaxies observed down to constant gas mass fraction limit: f_{gas}~0.02
- Goal: first statistically significant sample of massive "transitional" galaxies with homogeneously measured stellar masses, SFR and gas properties.

GALEX Arecibo SDSS Survey (GASS)





Salim et al. (2007)
Noeske et al. (2007)
Schiminovich et al. (2007)

Goal: Understand SFR/M_* vs. M_* Evolution

GALEX Arecibo SDSS Survey (GASS)

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- Galaxies observed down to constant gas mass fraction limit: f_{gas}~0.02
- Goal: first statistically significant sample of massive "transitional" galaxies with homogeneously measured stellar masses, SFR and gas properties.
- "Sweet spot" in terms of taking full advantage of data from on-going wide field surveys (e.g. SDSS, GALEX, WISE?)
- Complementary to Arecibo blind, large area surveys (ALFALFA, AGES) and future EVLA deep surveys
- Arecibo large program, initial observations began March 2008. Catinella et al. (2009) for details of first data release (~20-25% of survey). On astro-ph today!

The GALEX Arecibo SDSS Survey. I. Gas Fraction Scaling Relations of Massive Galaxies and First Data Release

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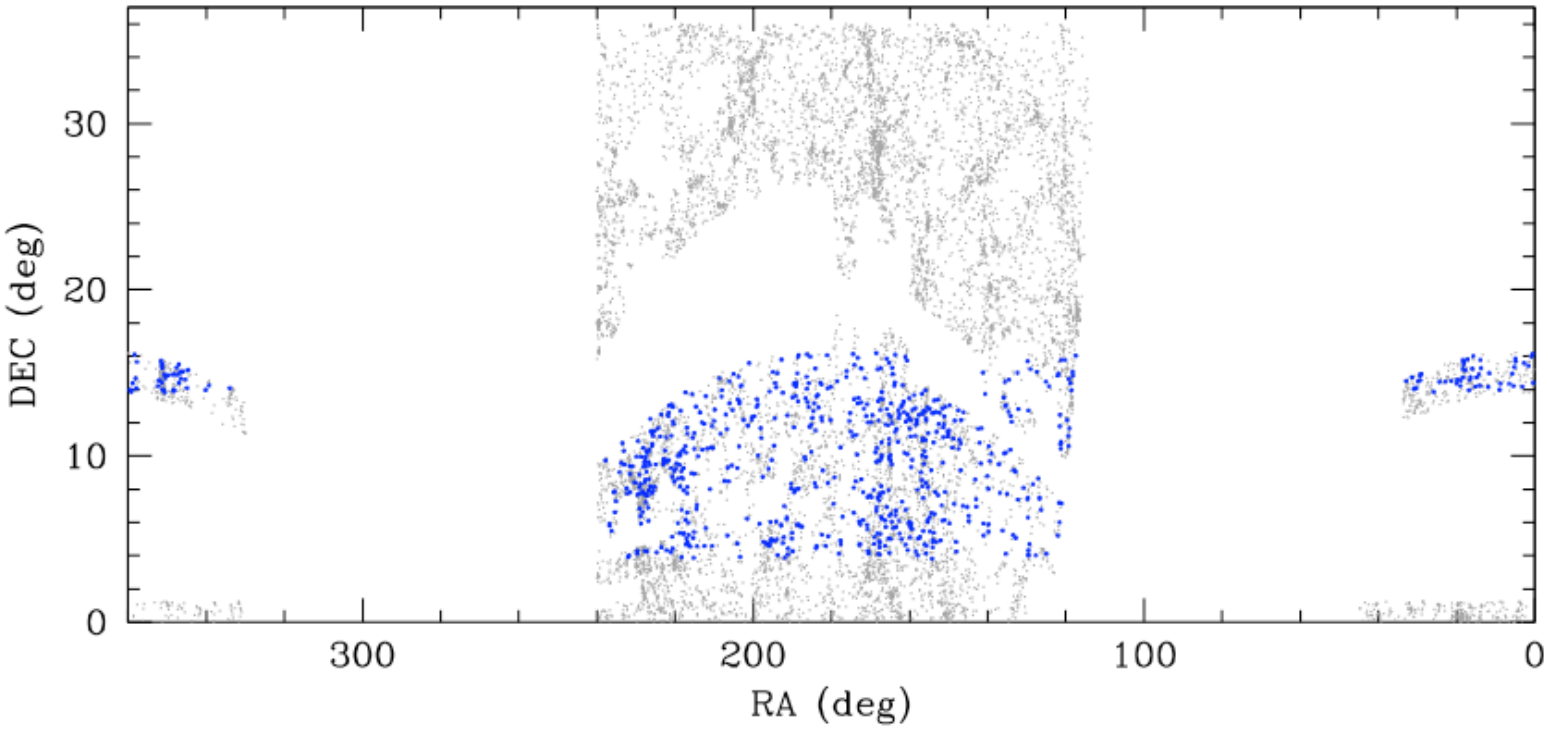
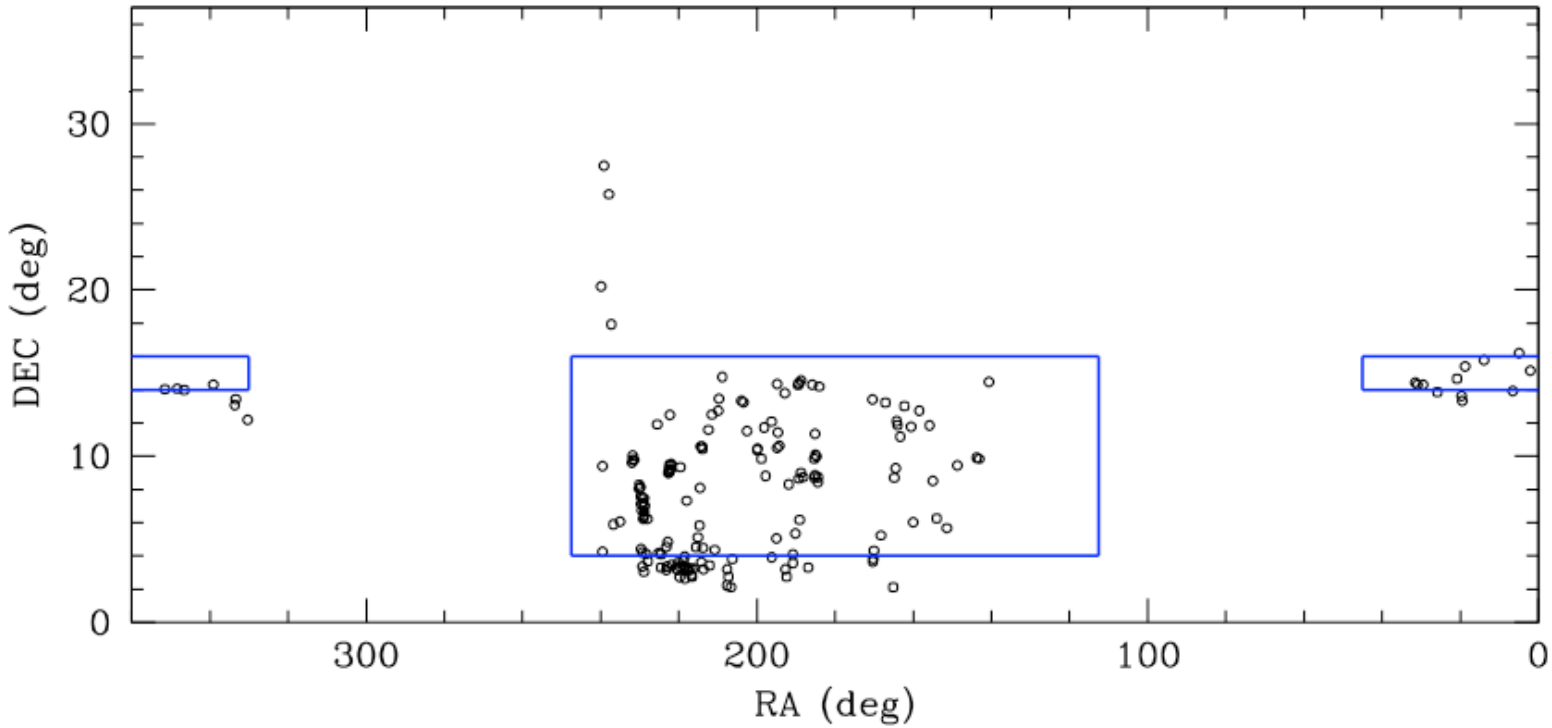
GASS Footprint



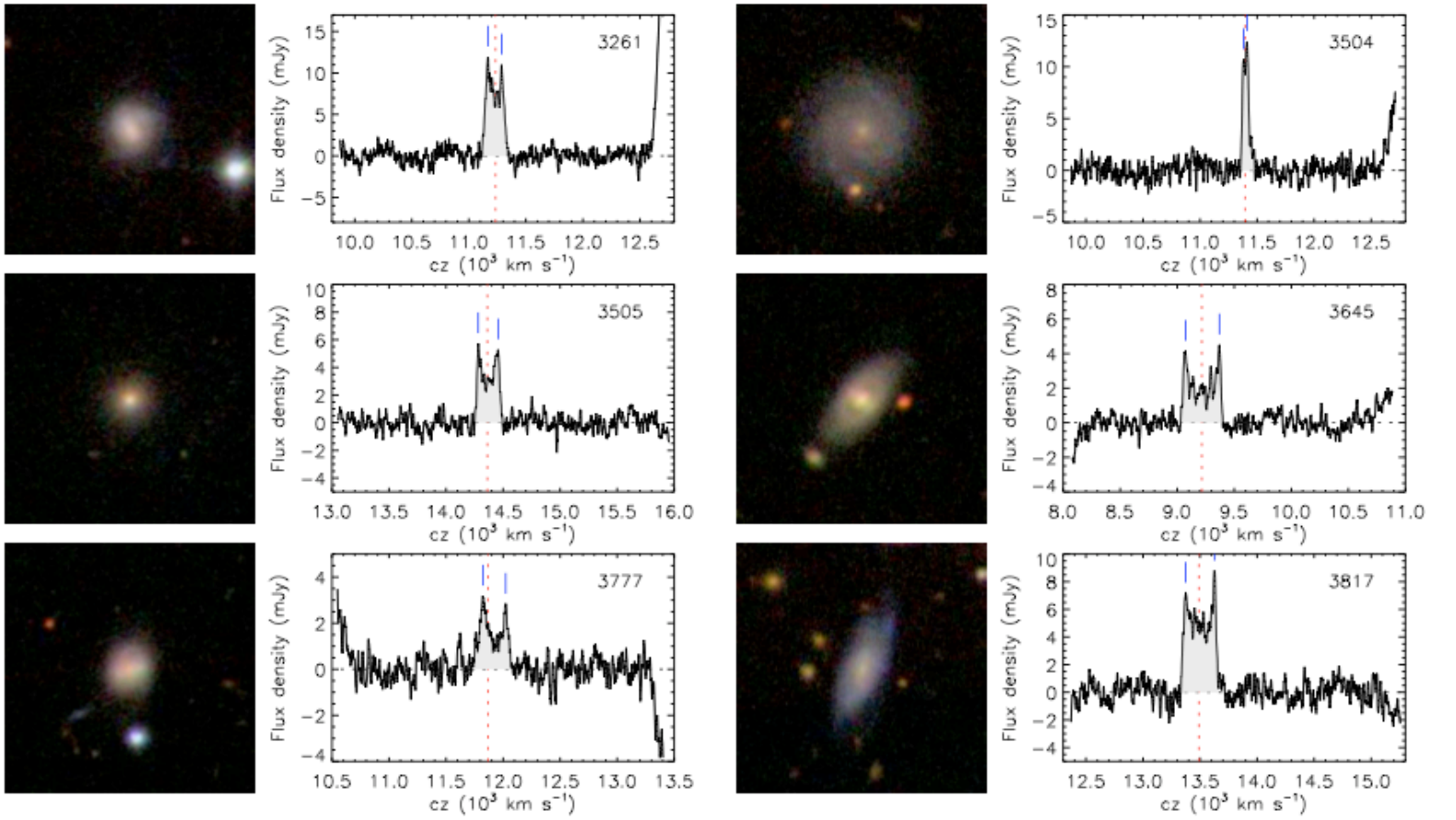
SDSS (DR6) + ALFALFA + GALEX

GASS DR1 (20% complete)



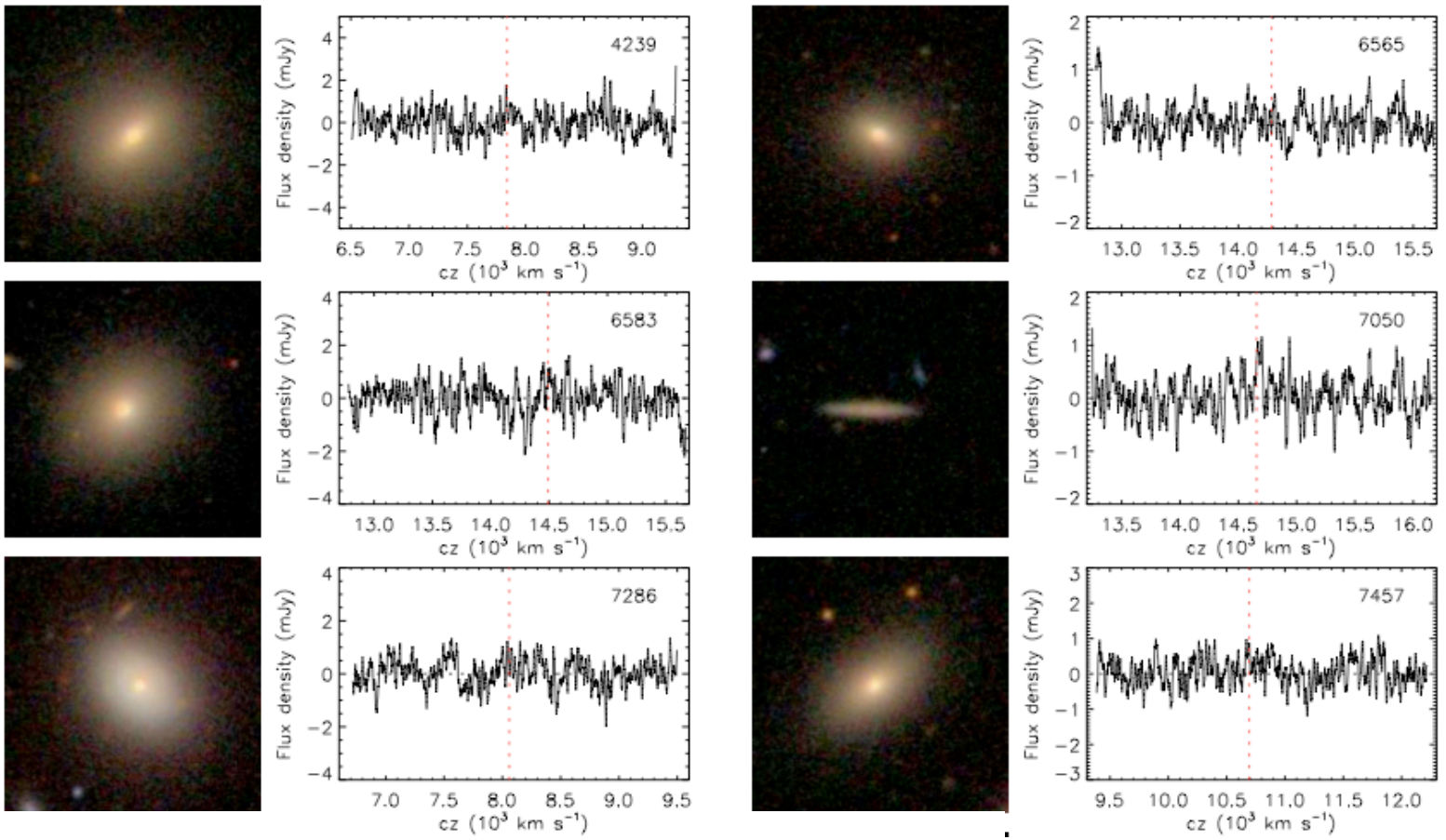
176 GASS observations + ~25 previously HI-detected, from ALFALFA or HI archive (random selection/combined statistically)

GASS DR1 detections



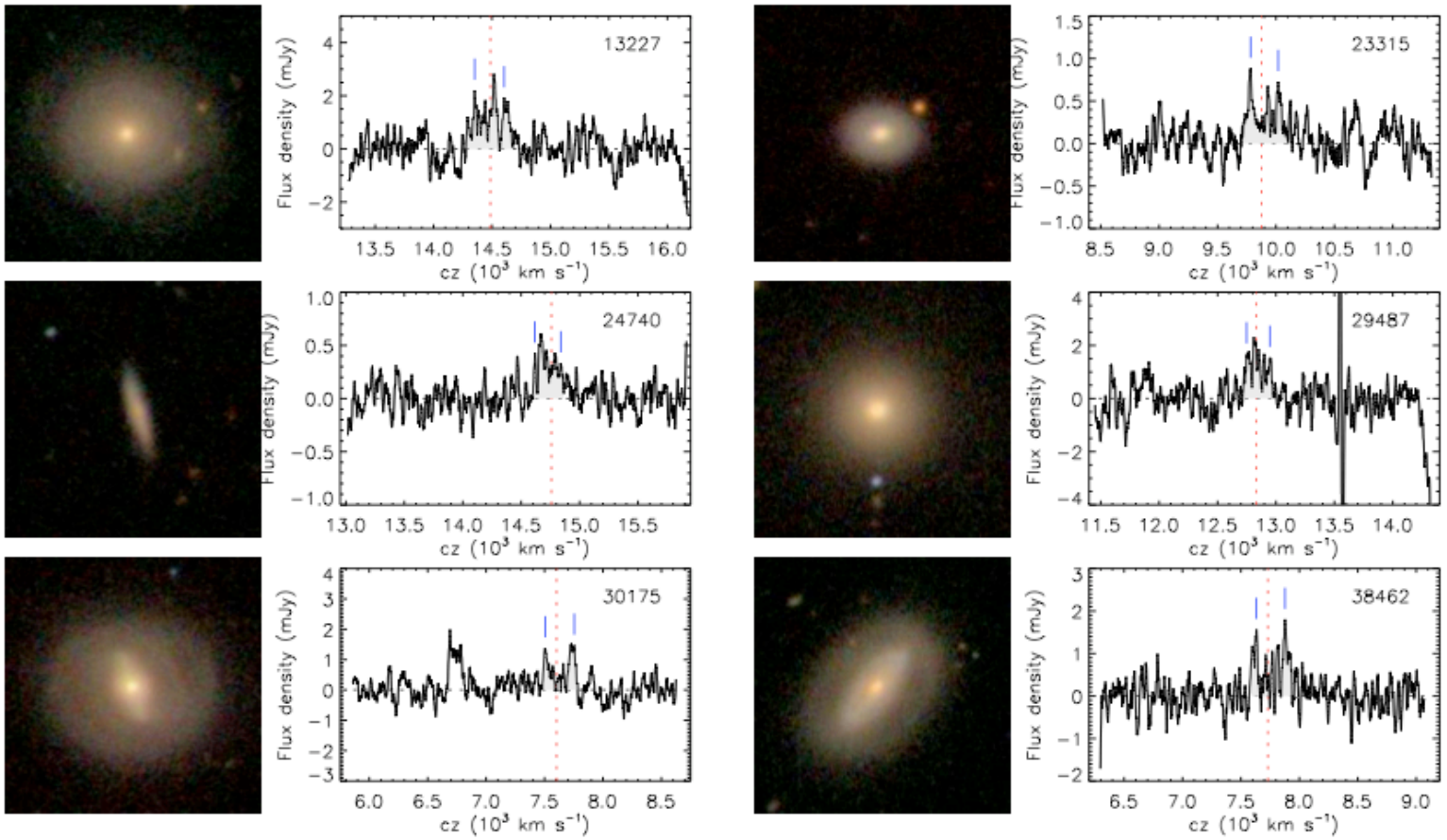
Catinella et al. MNRAS (astro-ph/0912.1610)

GASS DR1 non-detections



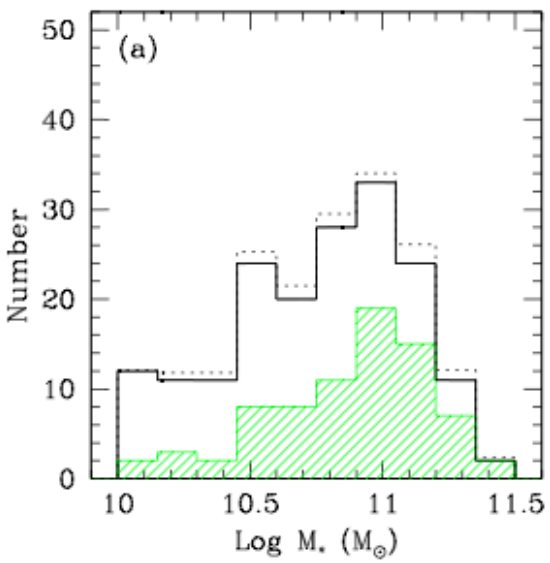
Catinella et al. MNRAS (astro-ph/0912.1610)

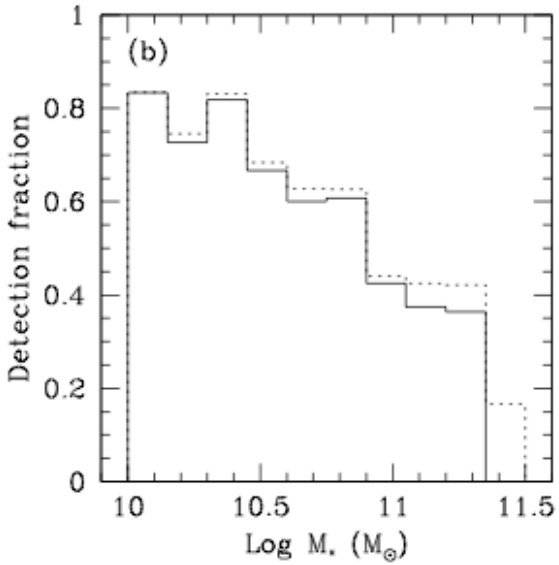
GASS DR1 “marginal”



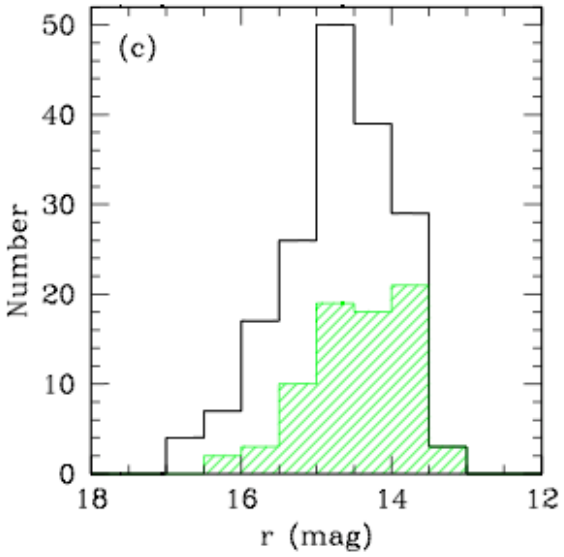
Catinella et al. MNRAS (astro-ph/0912.1610)

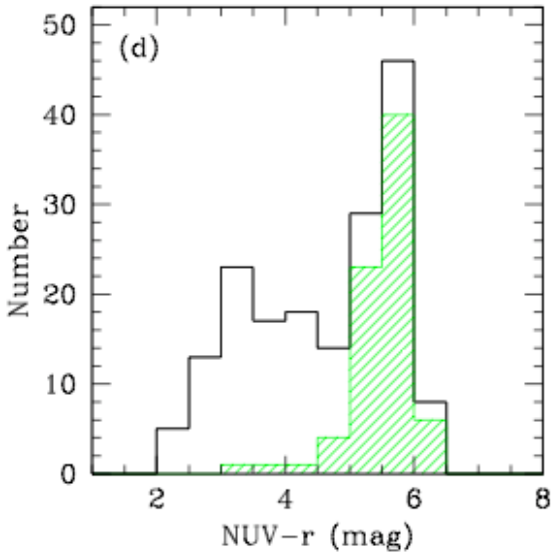
GASS Full Sample/Non-Detections





Detection fraction decreases vs. stellar mass, but remains significant up to the highest stellar mass bins!

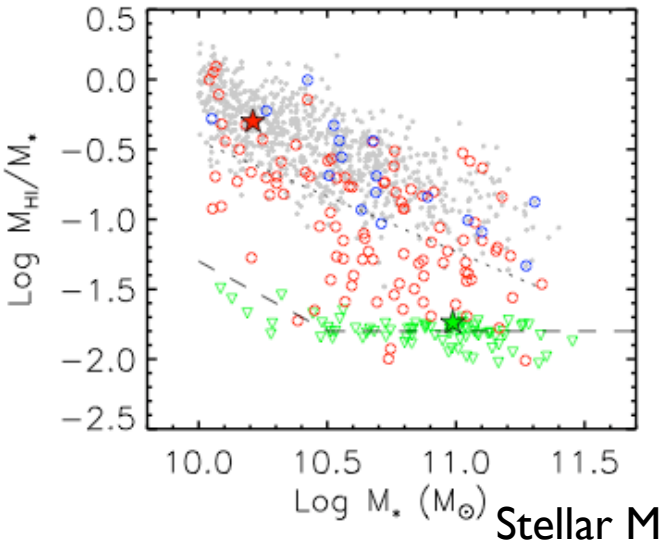




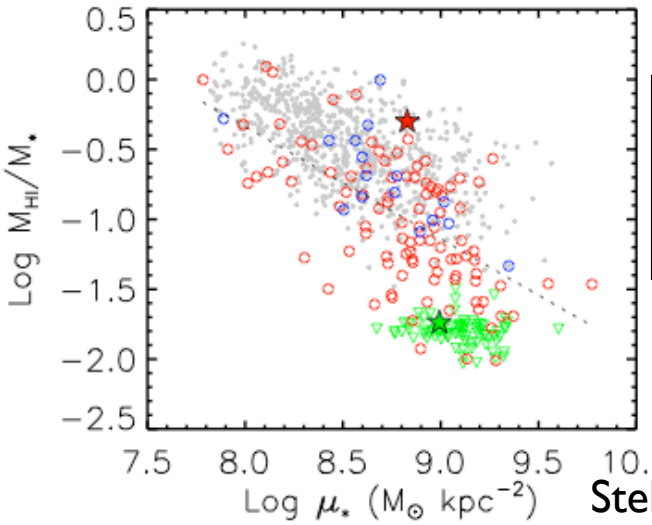
Red galaxies are least likely to be detected

Catinella et al. MNRAS (astro-ph/0912.1610)

GASS - HI Fraction Distribution



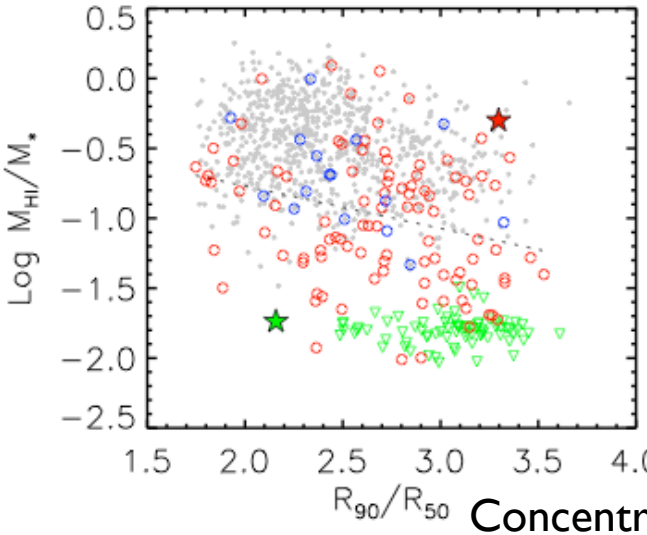
Stellar Mass



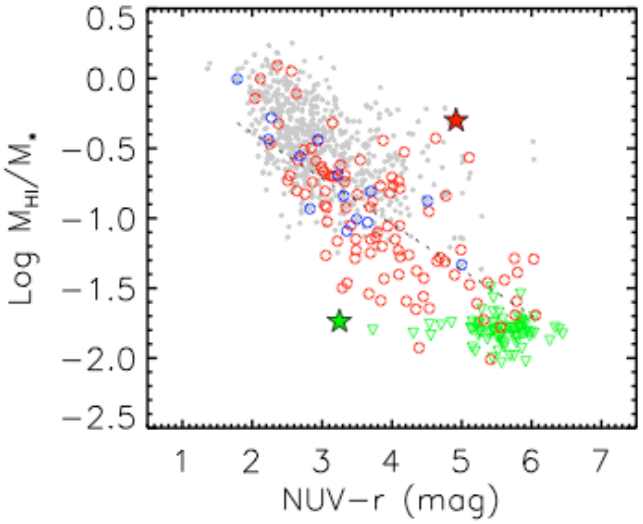
Stellar Mass Surface Density

Green - non-detect

Blue - random from ALFALFA/HI-arch



Concentration



Color

Small grey points: ALFALFA

Gas-rich red (transition?) galaxy w/ 'residual' SF

GASS 3505

Red - No emission lines

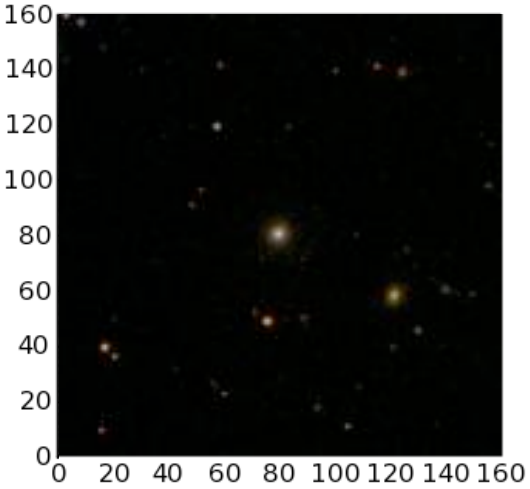
NUV-r ~ 5.5

z=0.048

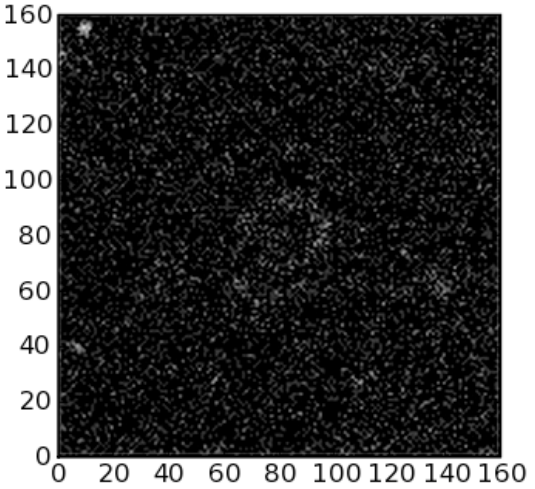
log M_* = 10.3

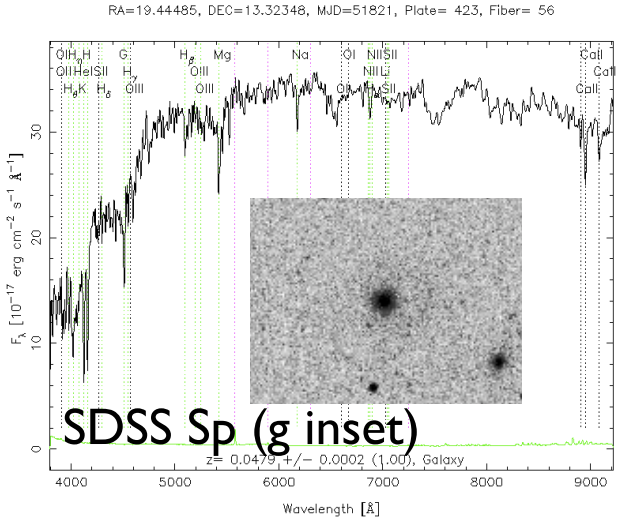
M_{HI}/M_* = 0.3

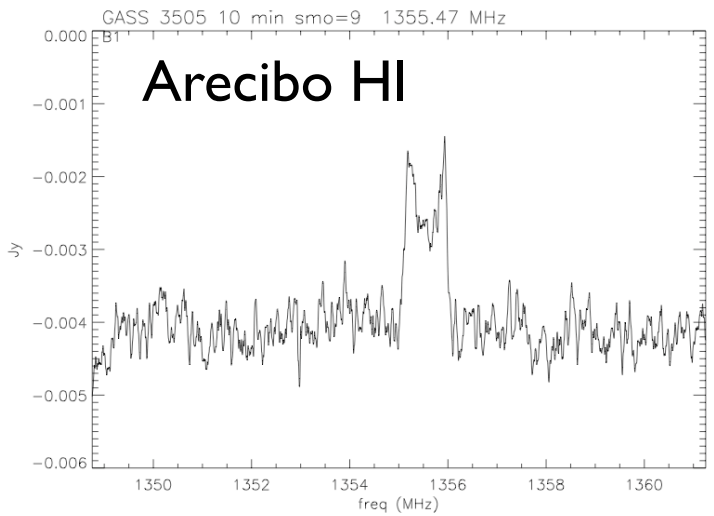
SDSS



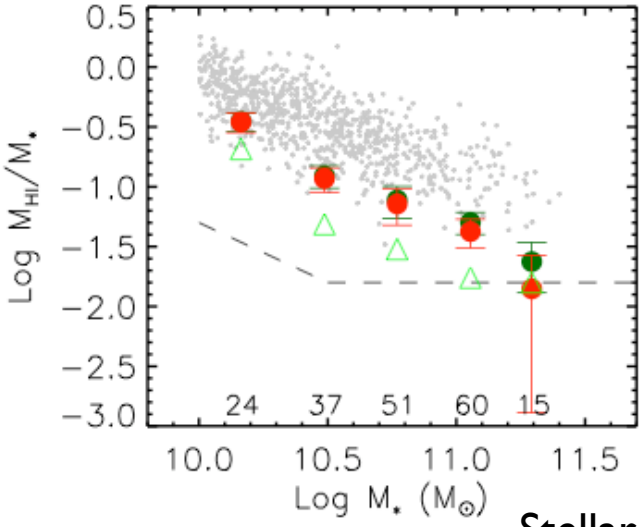
GALEX



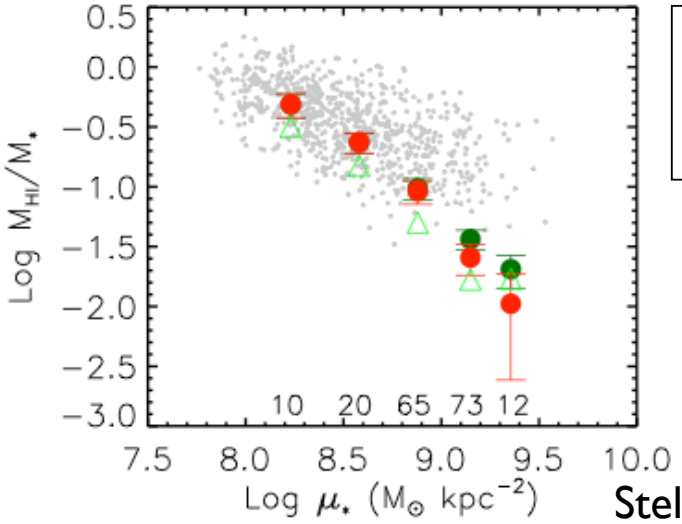




GASS Gas Fraction Scaling Relations



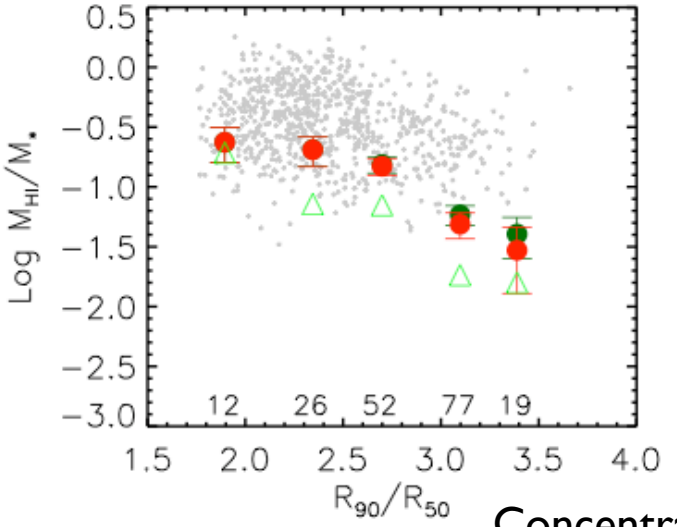
Stellar Mass



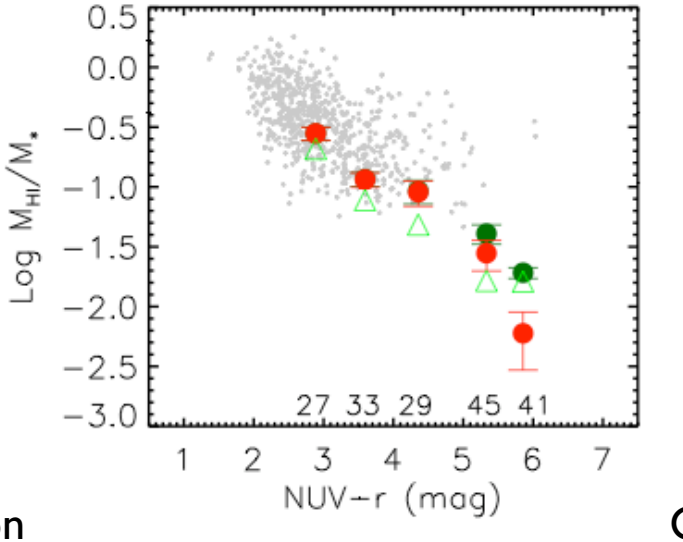
Stellar Mass Surface Density

Circles - Mean
Triangles - Median

Grey points from ALFALFA

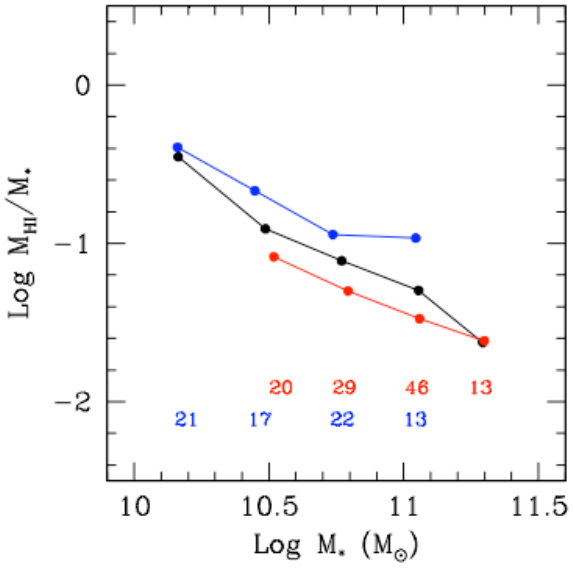


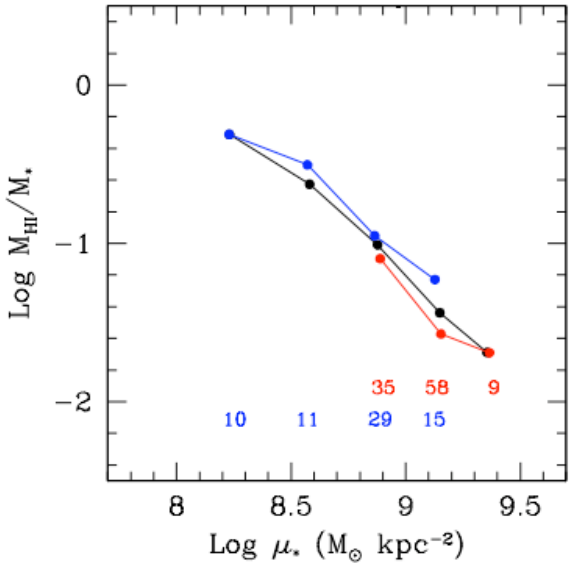
Concentration

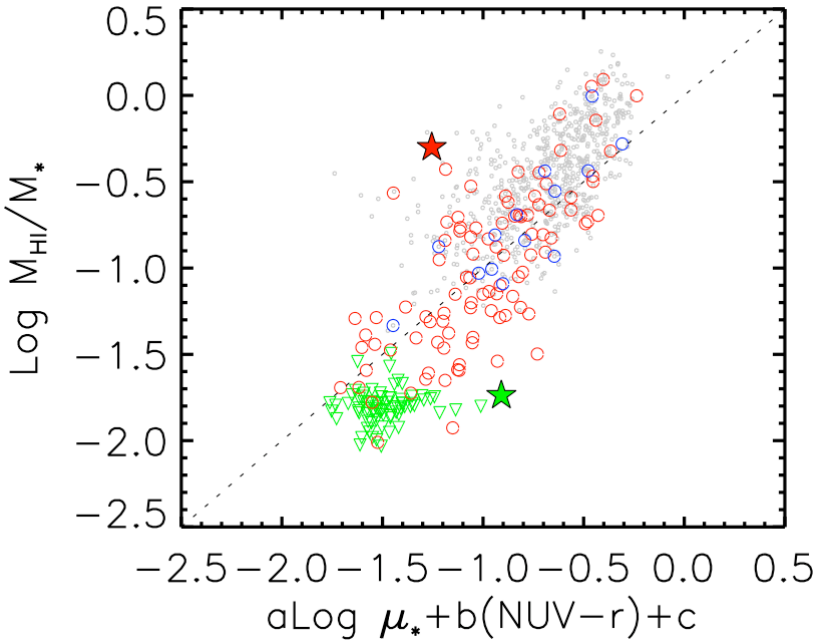


Color

GASS Gas Fraction Scaling Relations







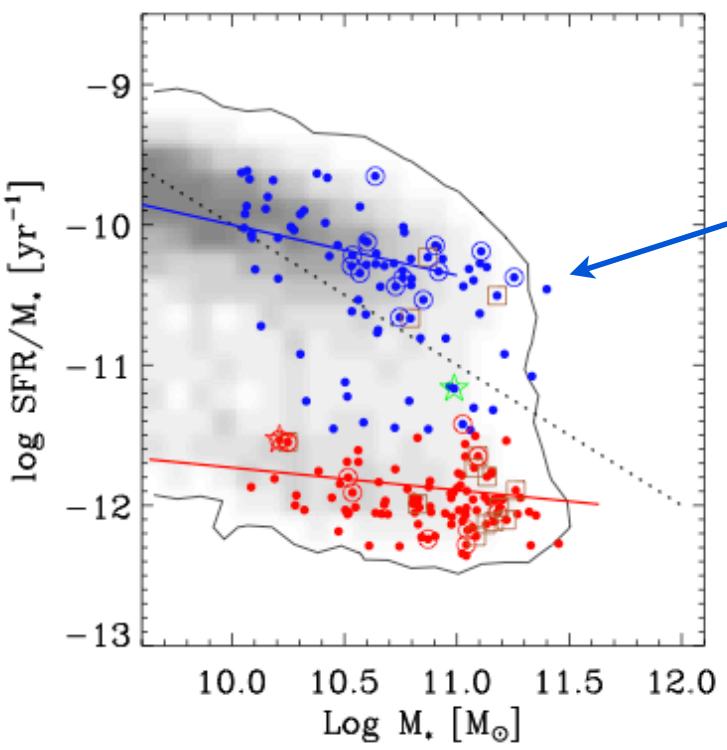
Investigating 'fundamental correlations' between physical properties.

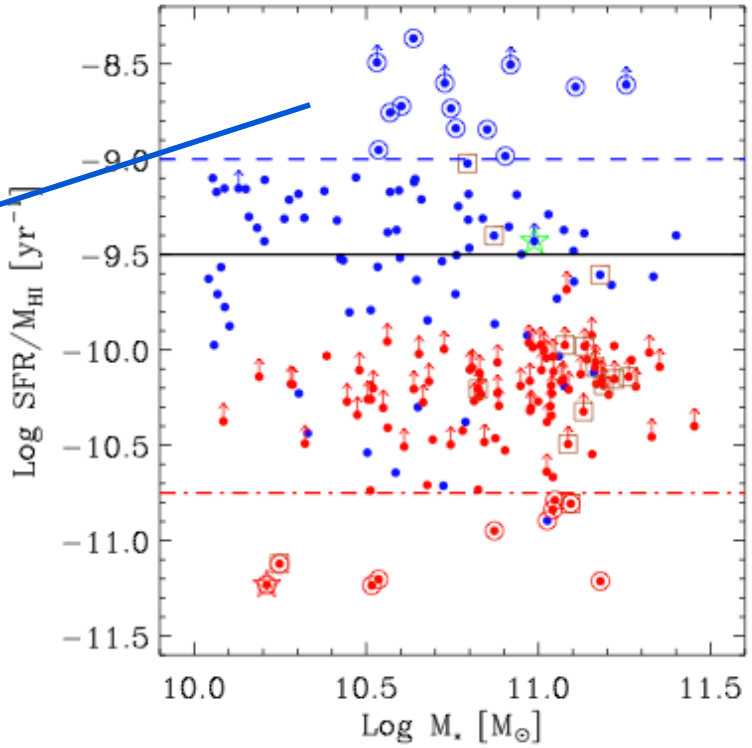
HI fraction closely linked to stellar mass surface density (local potential?)

Still hard to do with small sample

Catinella et al. MNRAS (astro-ph/0912.1610)

GASS - Specific Star Formation Rates and Star Formation Efficiencies



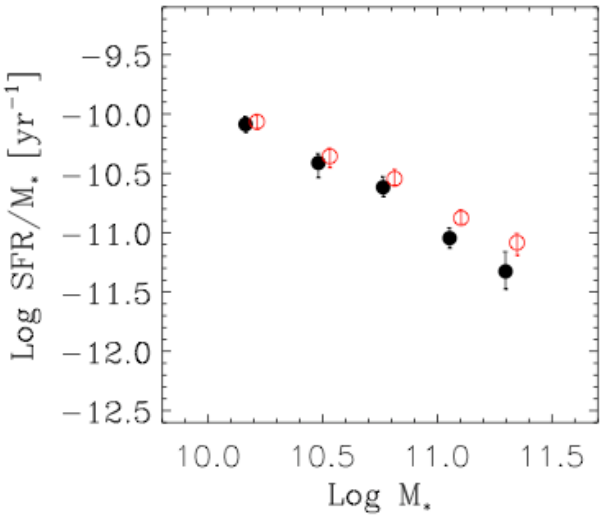


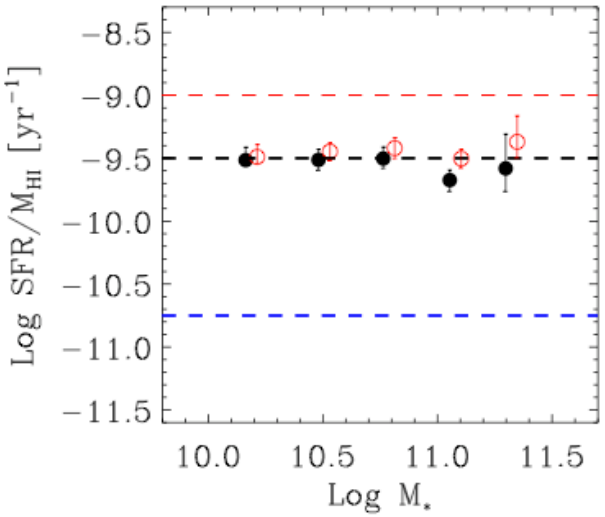
High Efficiency

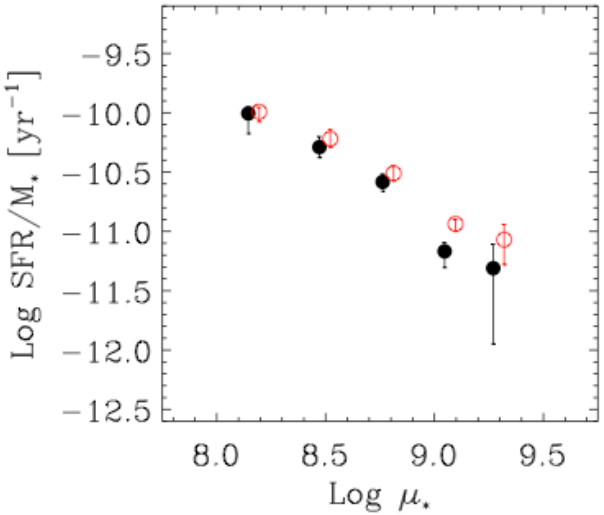
Low Efficiency

DS et al. in prep

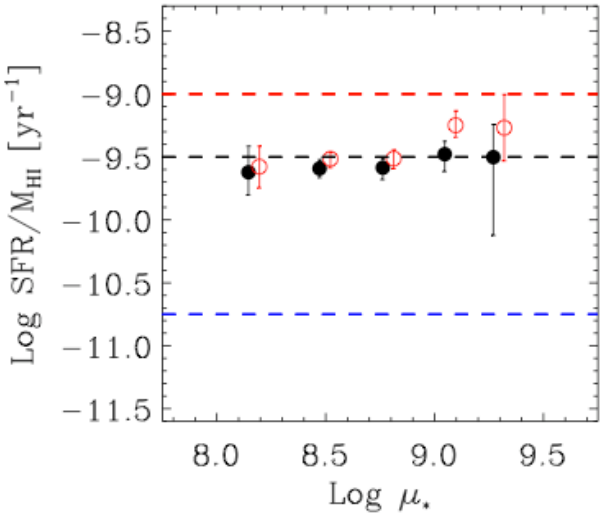
GASS - Specific Star Formation Rates and Star Formation Efficiencies







Specific Star Formation decreases vs. stellar mass, stellar mass surface density



Star Formation Efficiency remains constant

DS et al. in prep

GASS Status

- Survey on-going, 25-30% complete
- First public data release DR1/paper 1 with value-added catalogs.
- Observers trained at multiple institutions: MPA/Garching, Columbia, JHU. Remote observing has been successful
- Graduate students (5), Undergrads (2). Presentations at meetings/AAS
- Corollary programs under way (in addition to GALEX Arecibo-footprint prioritization)
  - COLDGASS - 300 hour large program at IRAM 30m to obtain CO measurements. Observations began last week.
  - Long-slit spectroscopy/IFU, w/ APO and MMT
- Two additional papers nearing completion, other projects in works including first HI+CO paper) Expect ~7-10 GASS-related papers in 2010. We're very enthusiastic about the data obtained thus far and looking forward to completing the survey!

GALEX Arecibo SDSS Survey (GASS)
Organization

- Management: Columbia (Schiminovich), MPA/Garching (Catinella, Kauffmann). Team of ~25 multi-institution
- Observing scripts, first-look analysis routines standardized and documented
- Weekly phone meetings: Observational strategy, analysis, papers
- Face-to-face meetings organized: ~2/year.
- Public and Internal Web Site - Up to date!
- Excellent synergy w/ ALFALFA team, science (e.g. stacking project w/ Fabello)
- All data releases will include value-added quantities from SDSS, GALEX and additional analyses by GASS team

GASS Challenges

- Anticipated Challenges
  - Scheduled in many short observing blocks
  - Unbalanced allocation over sky
- Unanticipated Challenges
  - RFI w/ dependence on receiver set-up. Problems early in a 'run' of observing blocks, fixed for latter part of run.
  - Uncertainty in time allocation with respect to staffing/planning
  - Uncertainty in timing/feedback from skeptical review

The GASS team thanks Arecibo!