GASS Spectroscopy: Metallicity Gradients and Gas Content

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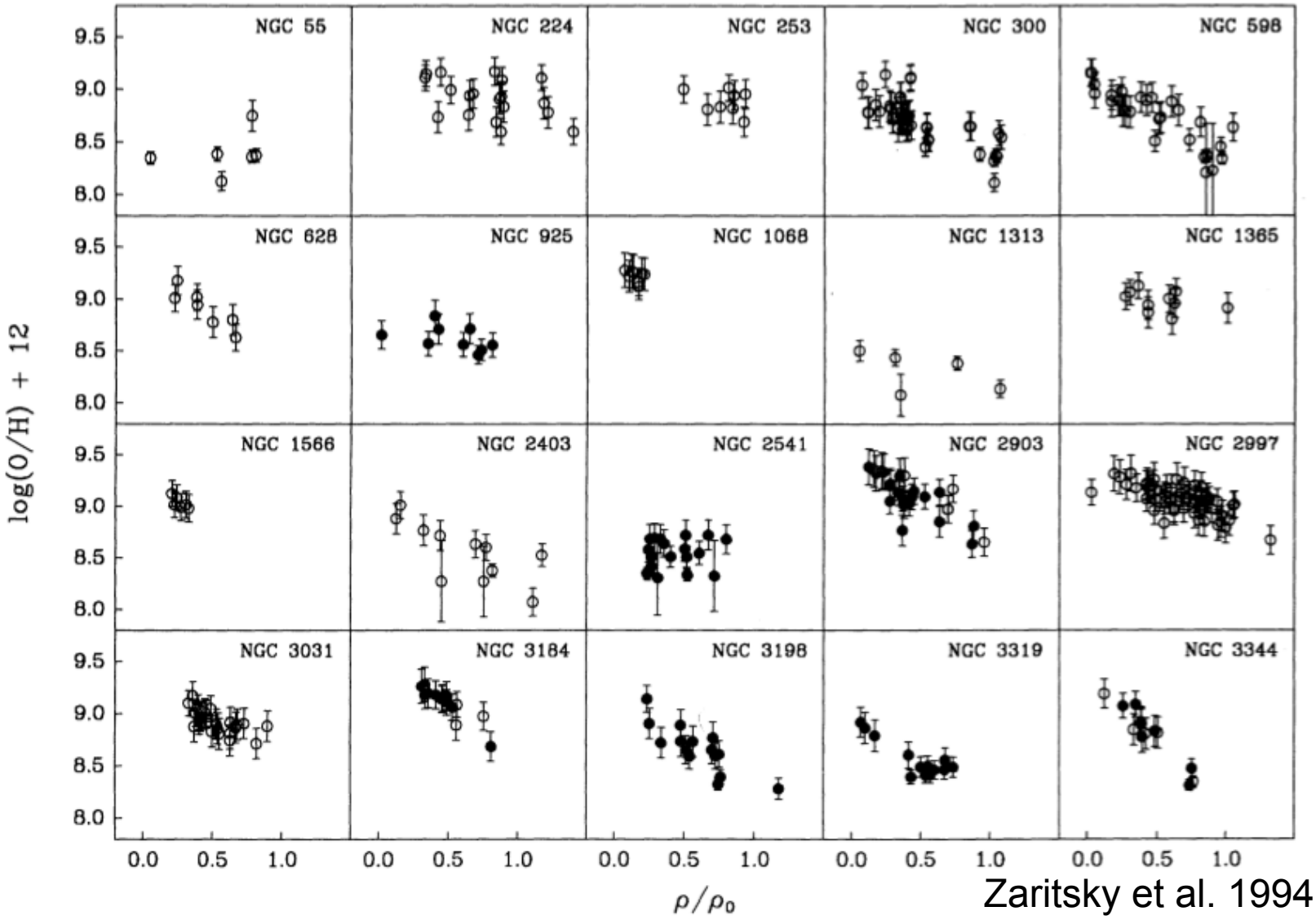
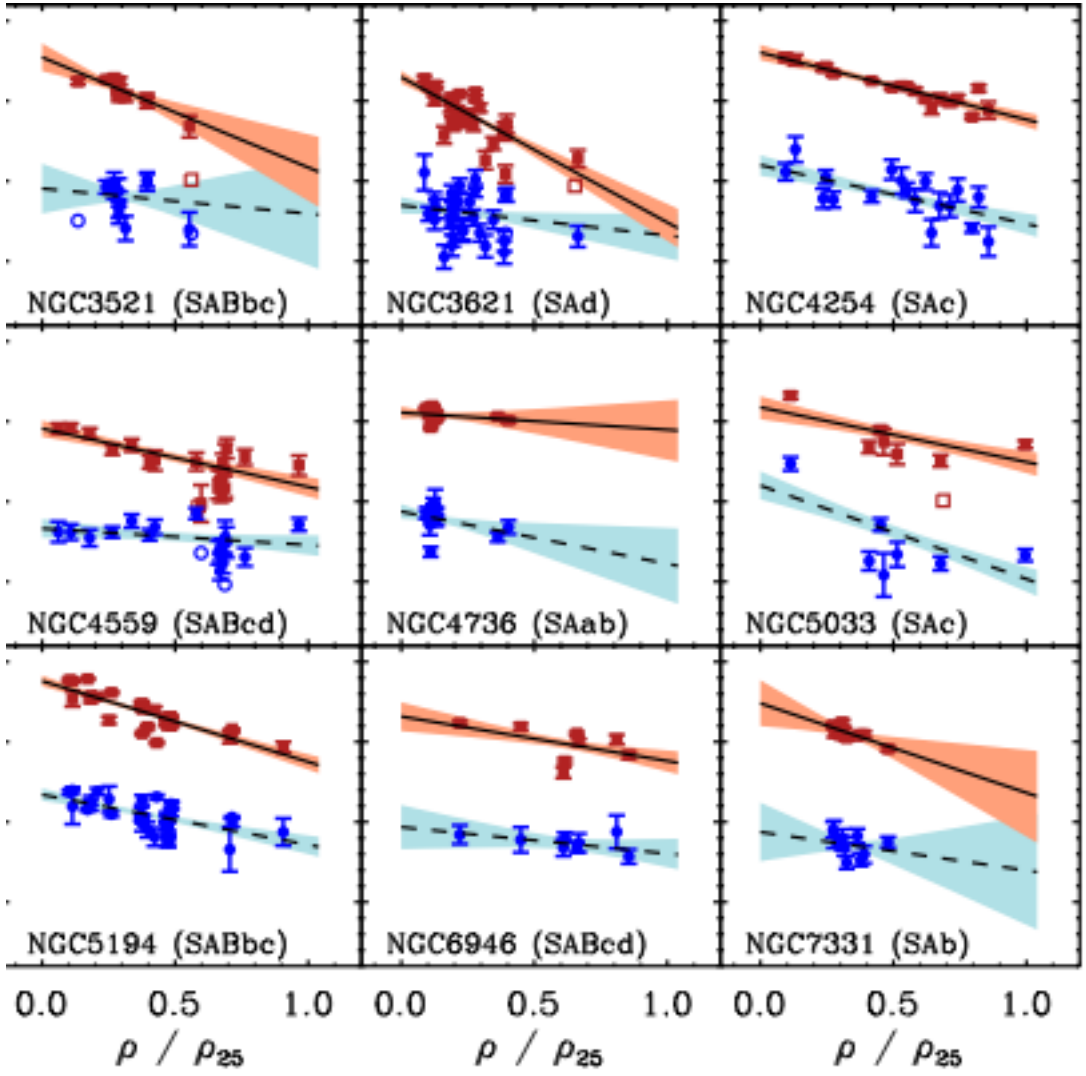
& The GASS Team

Metallicity Gradients

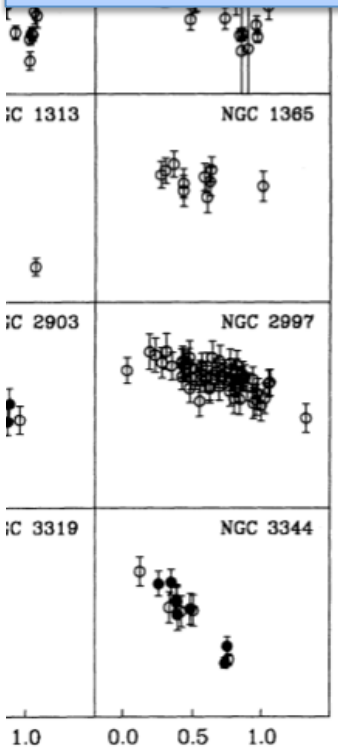


Zaritsky et al. 1994

Metallicity Gradients

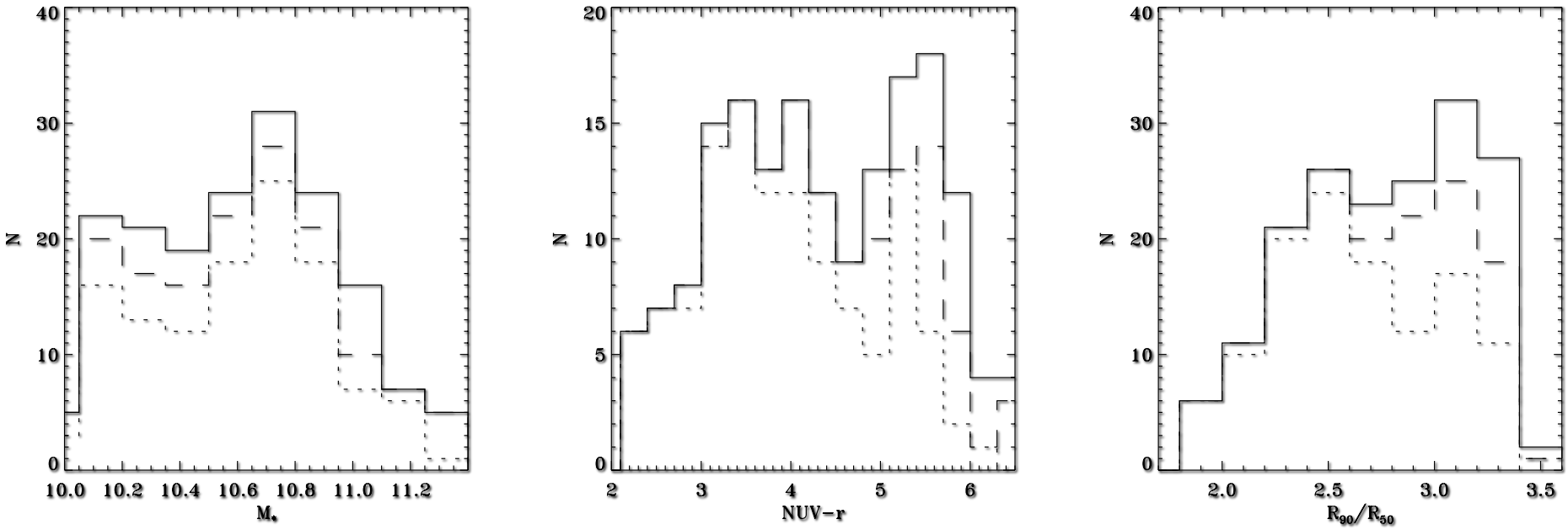


- Small numbers
- Very local, heterogeneous samples

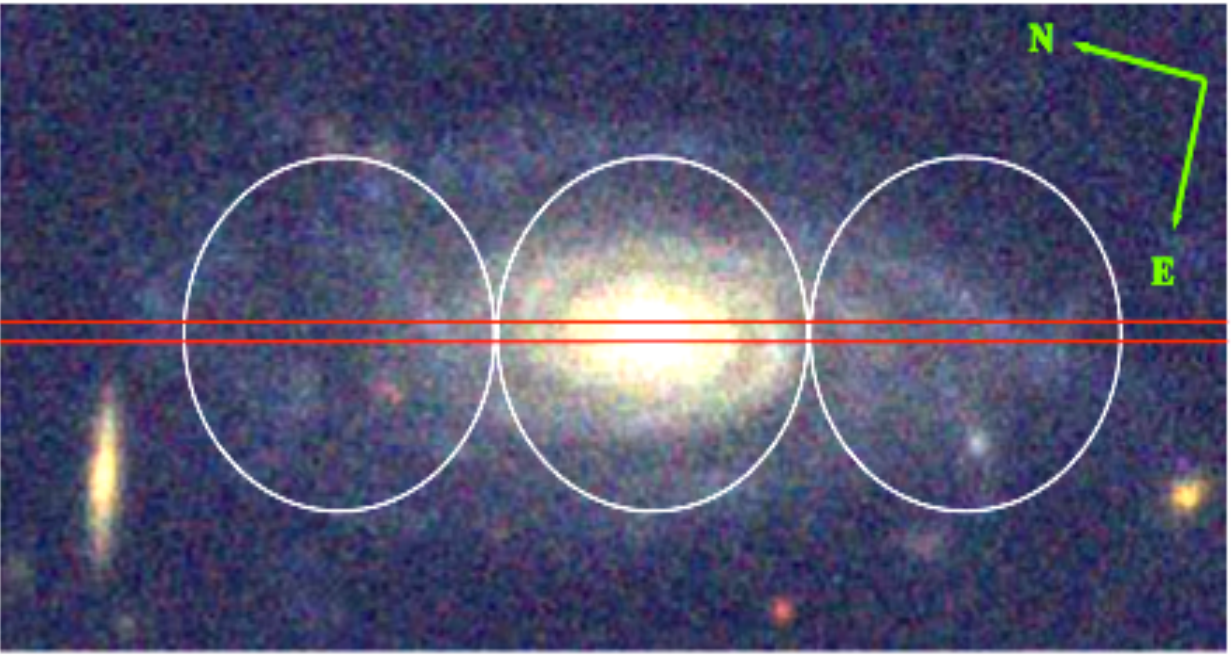


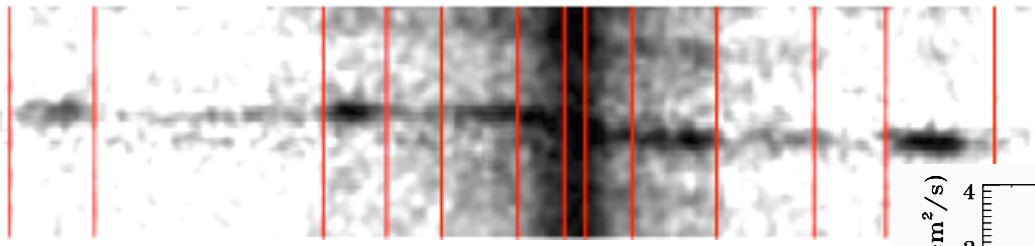
Moustakas et al 2010
SINGS Galaxies

GASS: Uniform, Mass-limited Sample



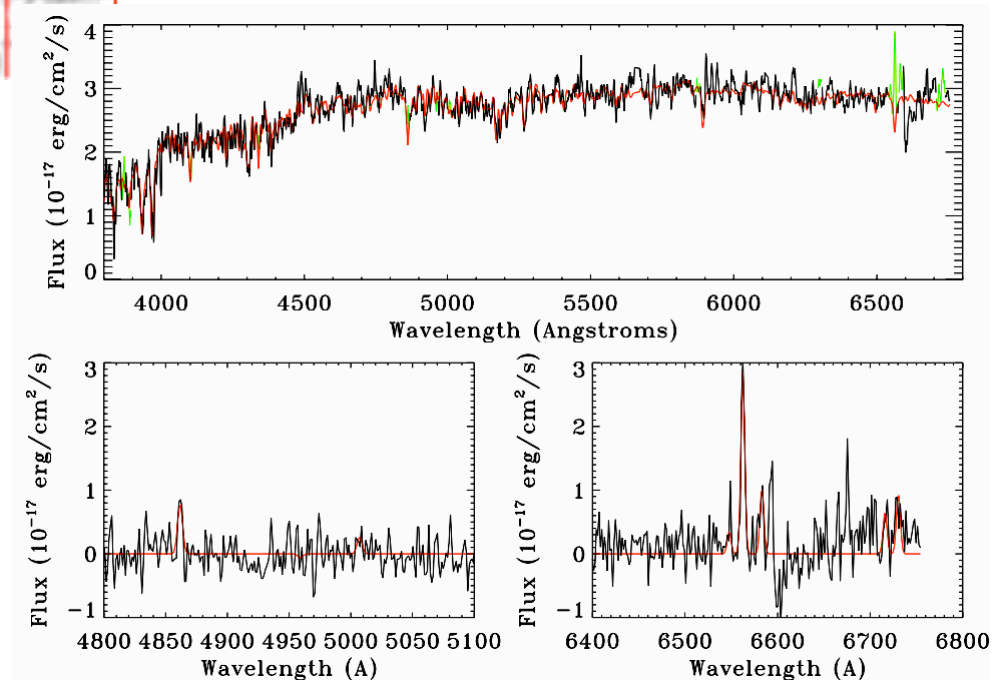
- Long slit spectroscopy campaign covering 250 GASS galaxies (175 here)
- Measured metallicities for 1500 spatial locations w/ SF across 150 galaxies





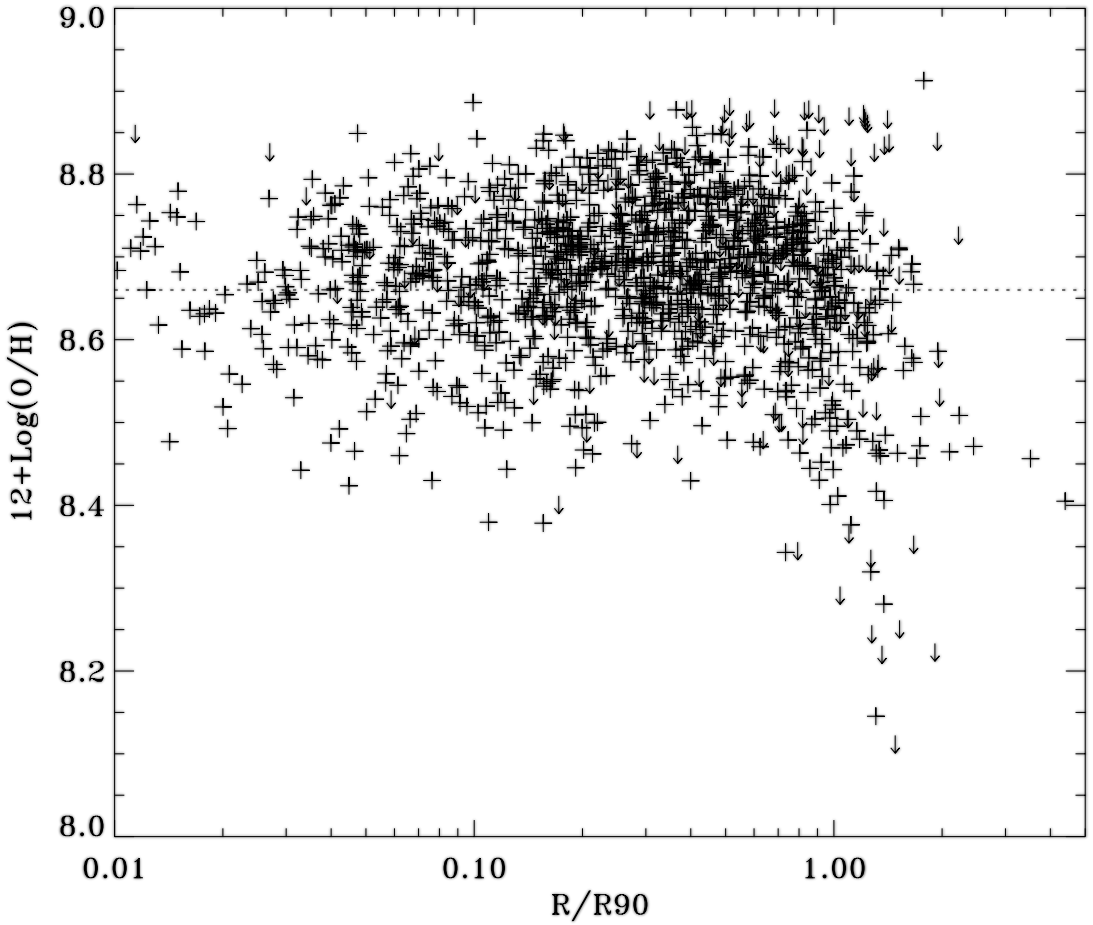
- Radial cuts along major axis
- Adaptive binning on ~kpc scales
- Detect SF to R90 in most

Moran et al. 2010



- Continuum subtracted, line fluxes measured following SDSS method
- Gas phase metallicities calculated on:
  - -Pettini & Pagel (2004) O3N2 index
  - -Tremonti et al. (2004) system

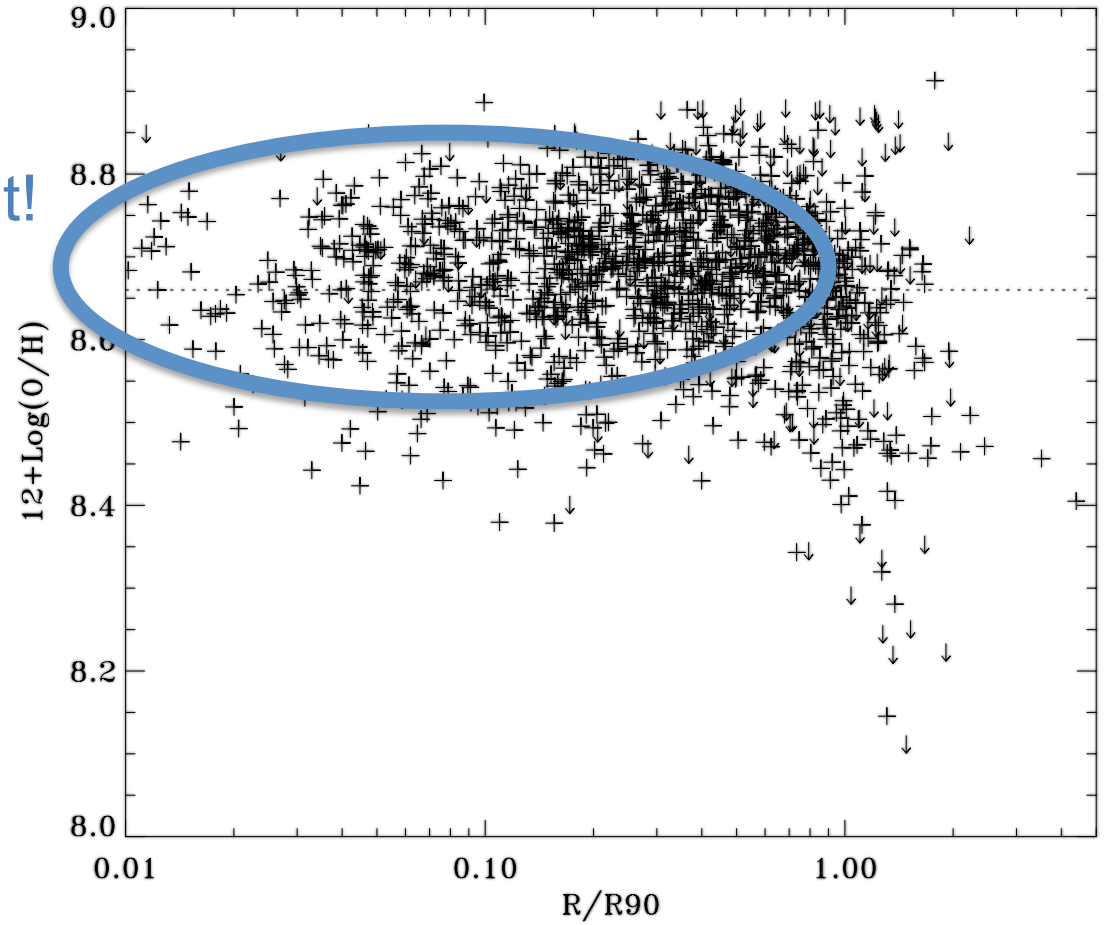
GASS Metallicities



Pettini & Pagel (2004) O3N2 indicator

GASS Metallicities

Mostly flat!



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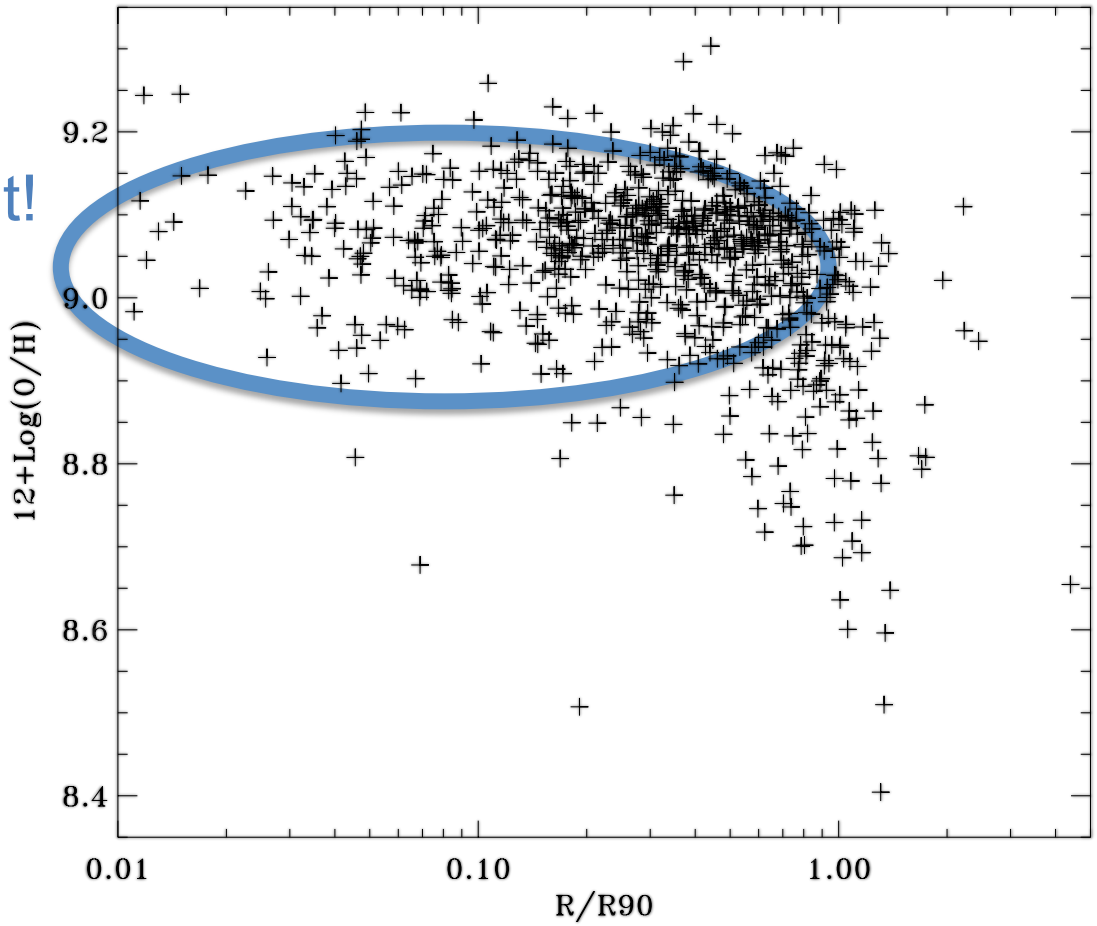
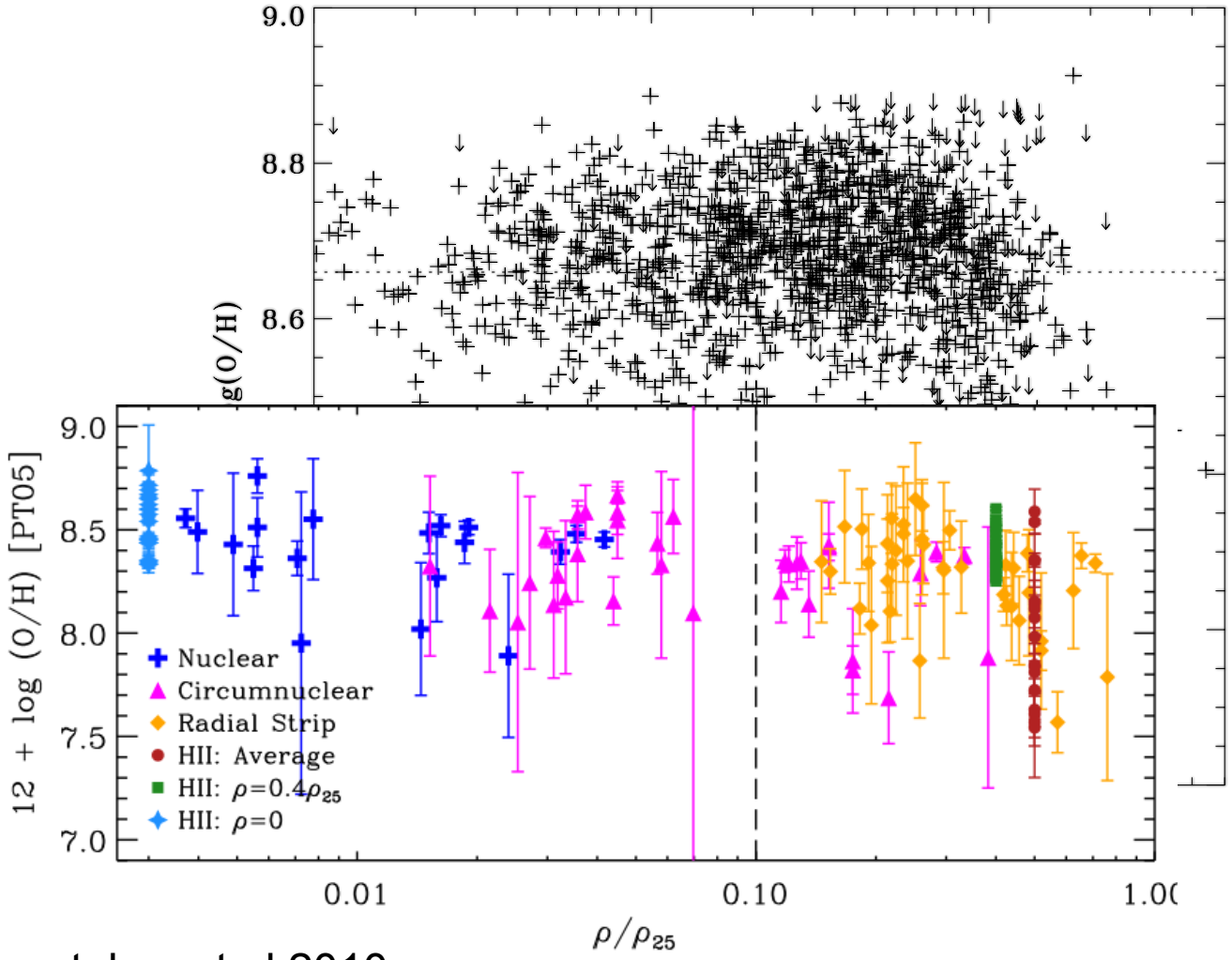


Tremonti et al (2004) method

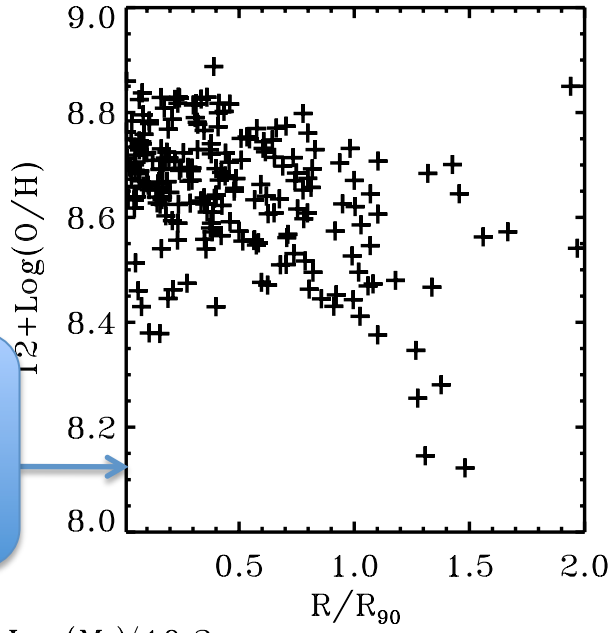
GASS Metallicities



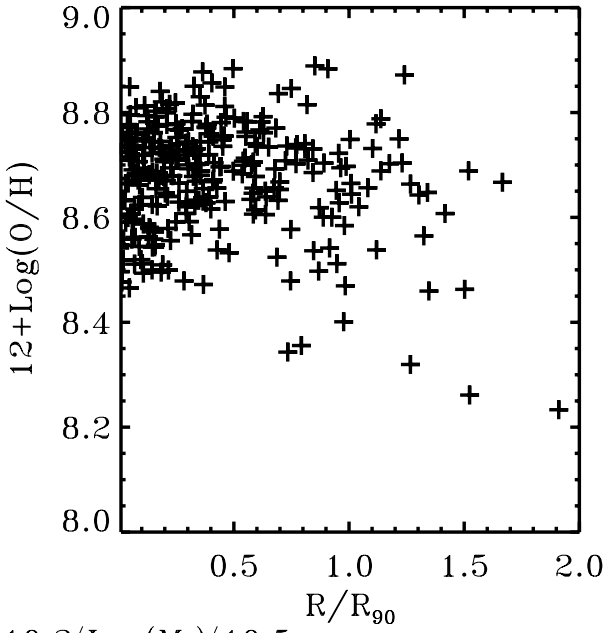
Moustakas et al 2010

Also:
Werk et al 2011, 2010
Long flat gradients in individual galaxies

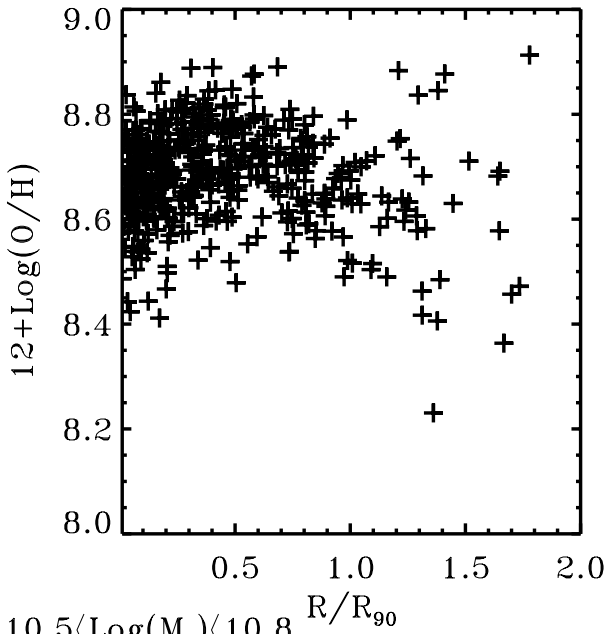
Sings galaxies w/ gradients



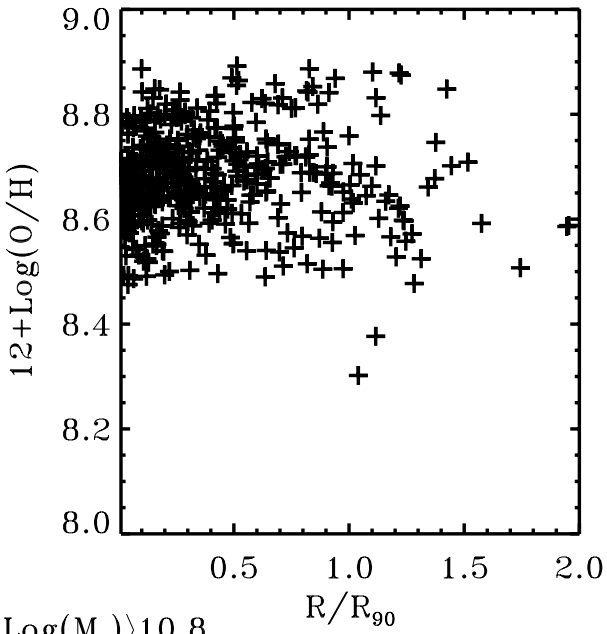
Log(M*)⟨10.2



10.2⟨Log(M*)⟨10.5

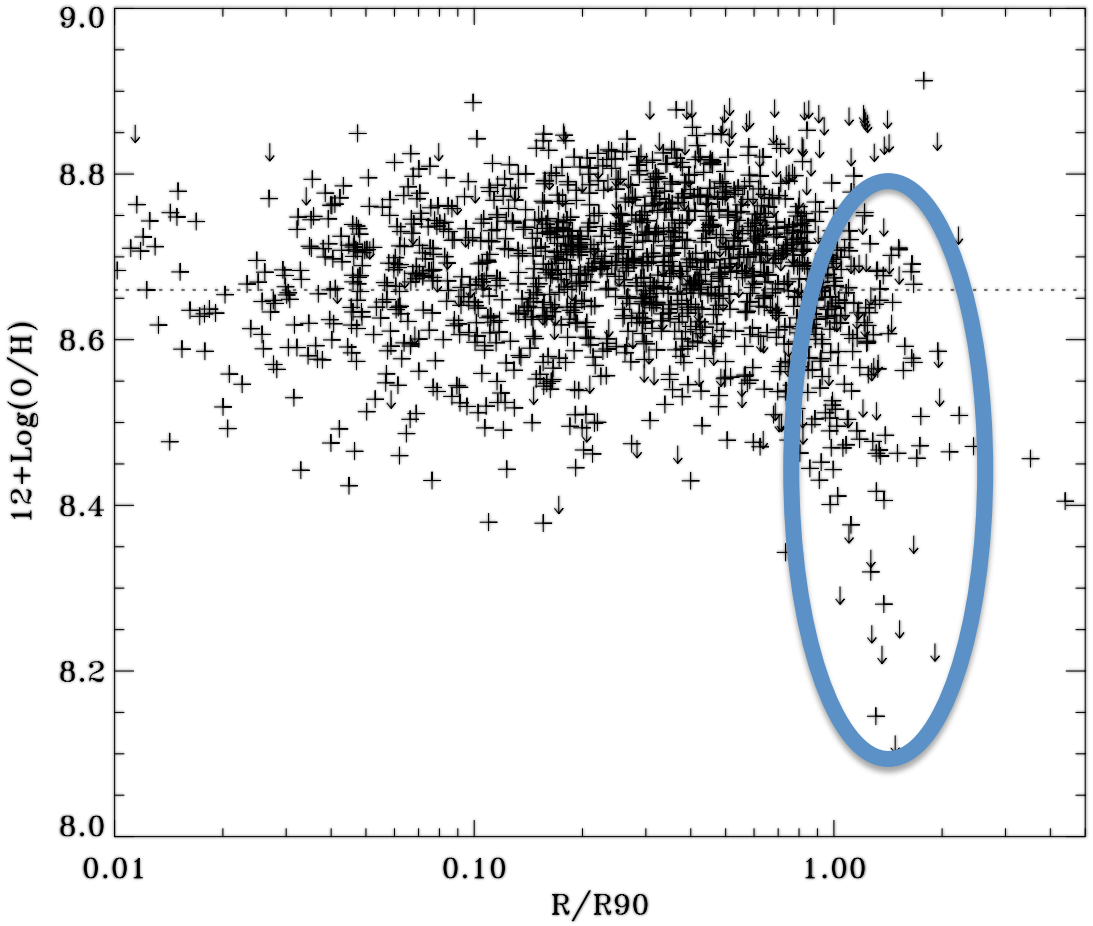


10.5⟨Log(M*)⟨10.8



Log(M*)⟩10.8

GASS Metallicities



Steep drops!

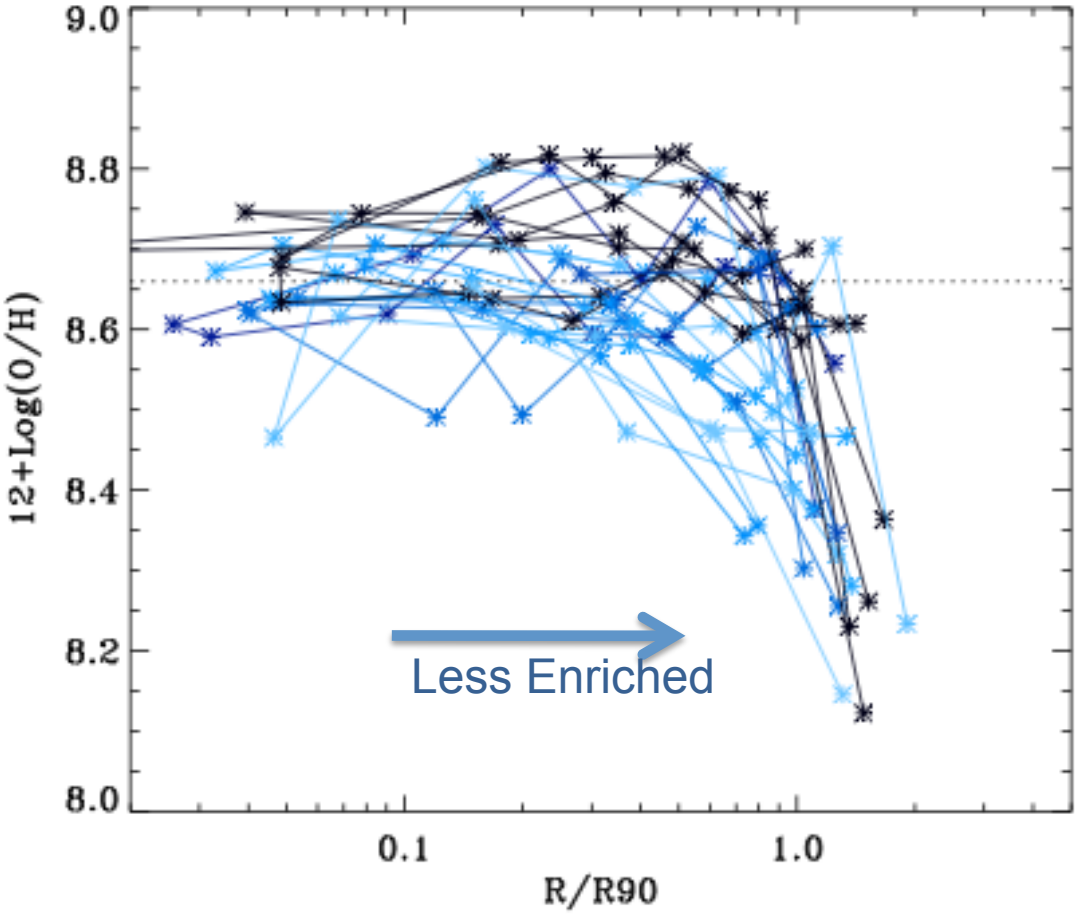
~12 galaxies w/ very big drops similar to UGC8802

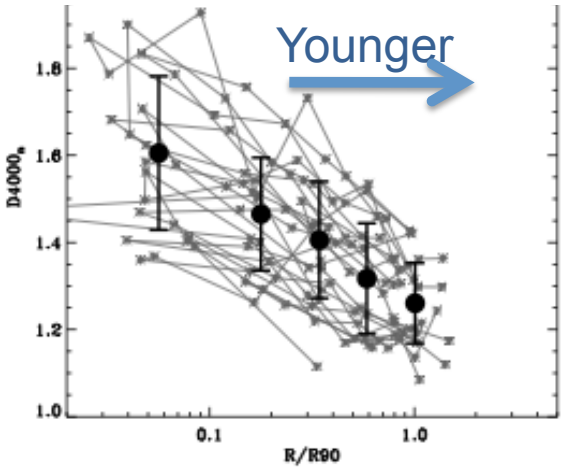
~10% of sample

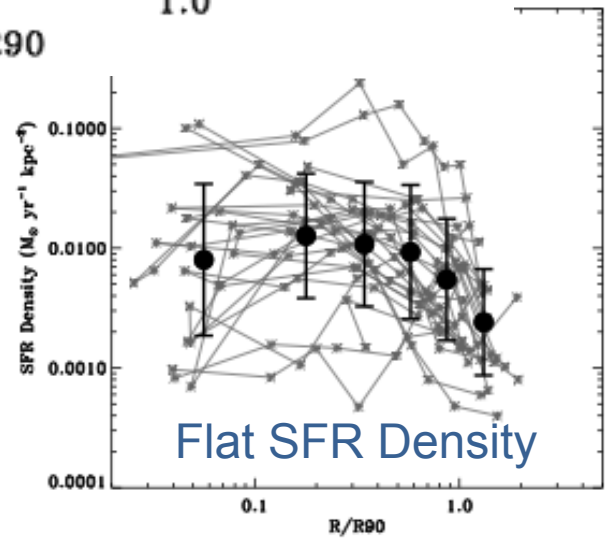
All have high HI content (>30%)

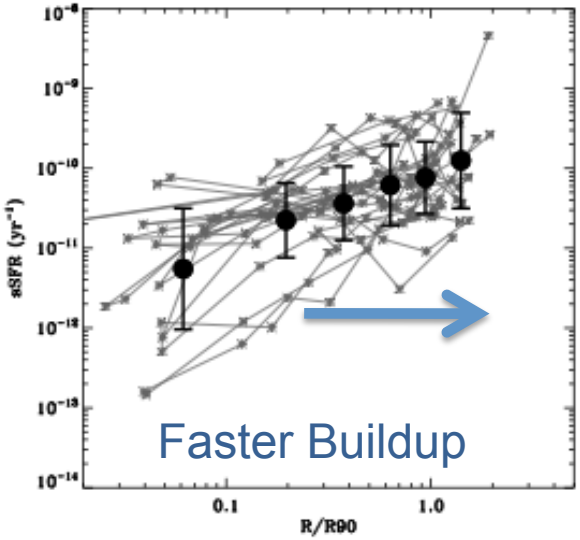
UGC8802 hypothesis: infall of new gas driving disk buildup

Radial profiles for individual big-drop galaxies

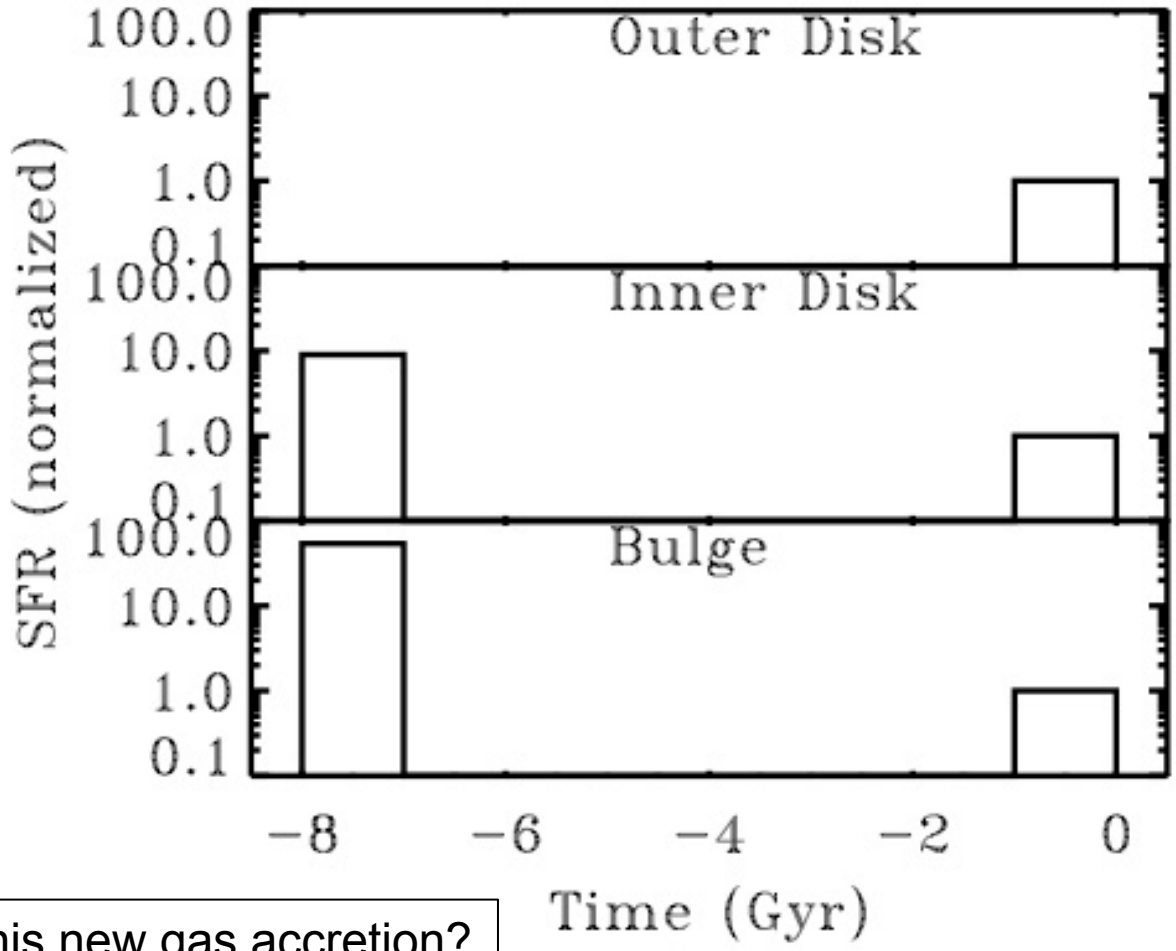






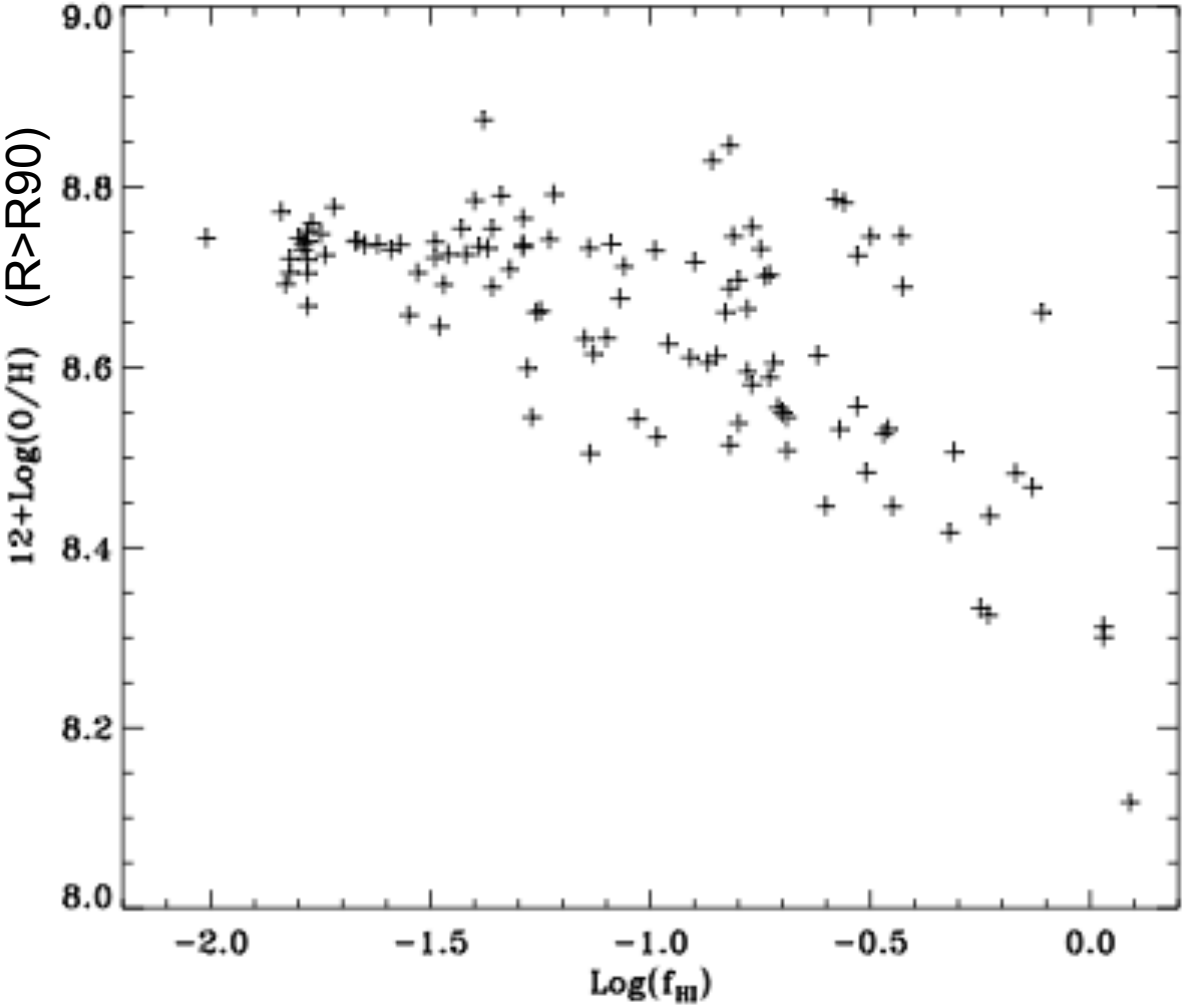


A simple model of SFH: UGC8802 toy model valid for all?



But is this new gas accretion?

Outer Metallicity Drop→ High HI



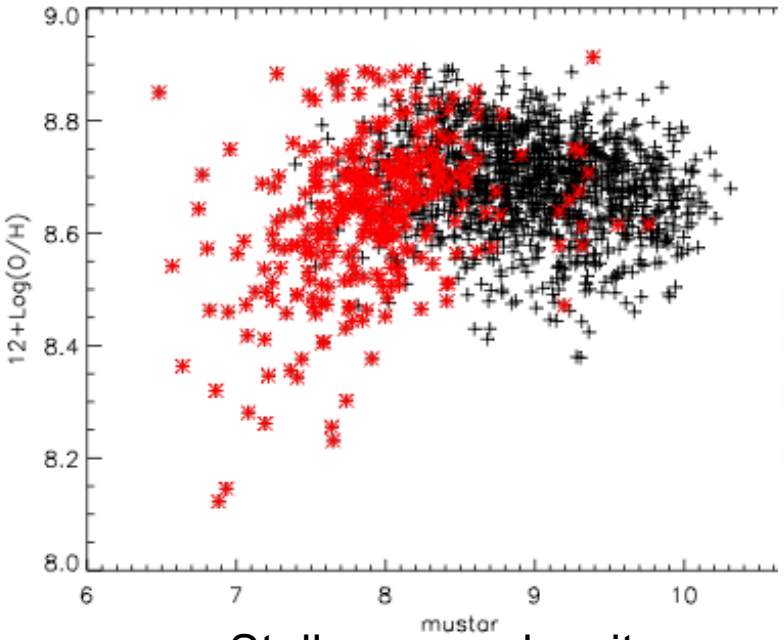
Correlation is *stronger* than that of any other global quantity vs metallicity

A measuring stick for new gas infall?

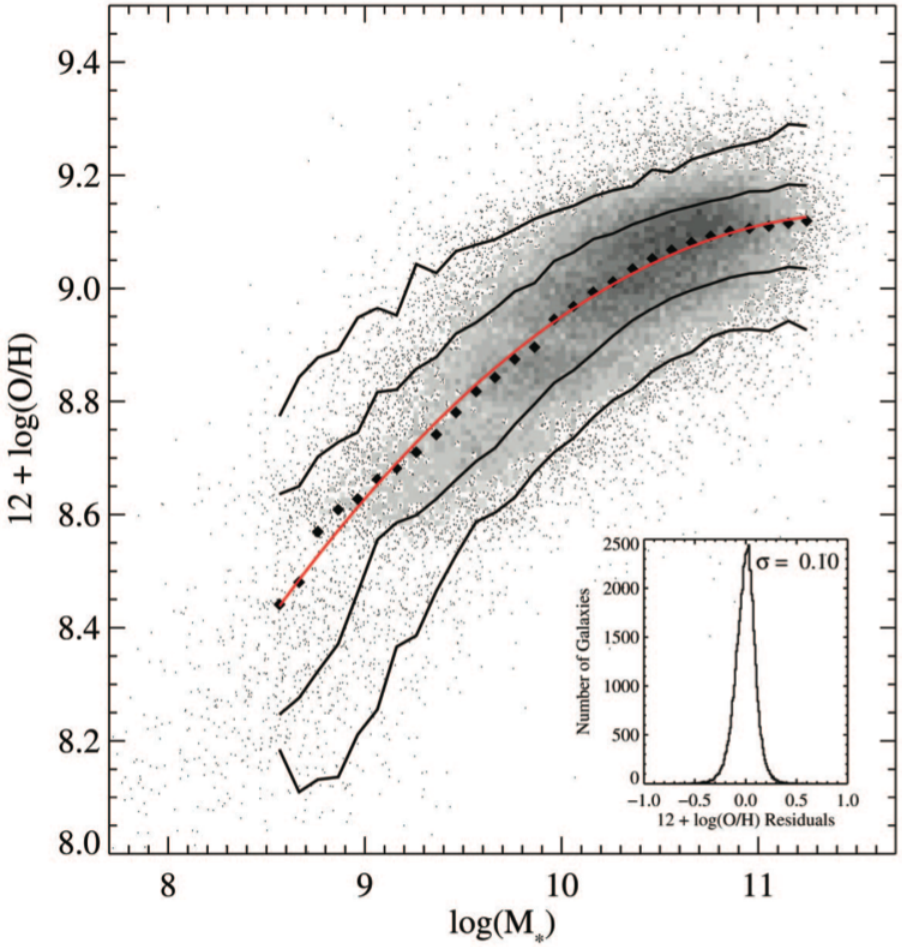
Conclusions

- GASS galaxies exhibit largely flat metallicity gradients (but M_* dependant!)
- ~10% show sharp drops at/near R90
- Outer drop correlates most strongly with total HI content
    - Seems to indicate metal dilution by new accretion
- Outer metallicity depends on stellar mass density and SFR

A Local Mass-Metallicity Relation



Stellar mass density



Tremonti et al. 2004