Metallicity Gradients in Galaxy Discs

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Chemical abundances store information relevant to undertand how galaxies formed and evolved.

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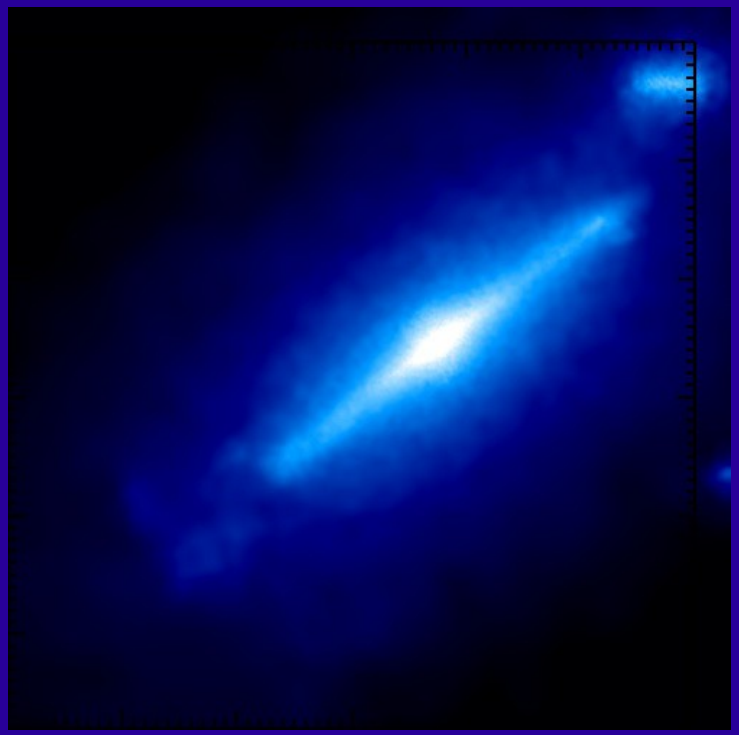
They provide constrains for the sub-grid physics.

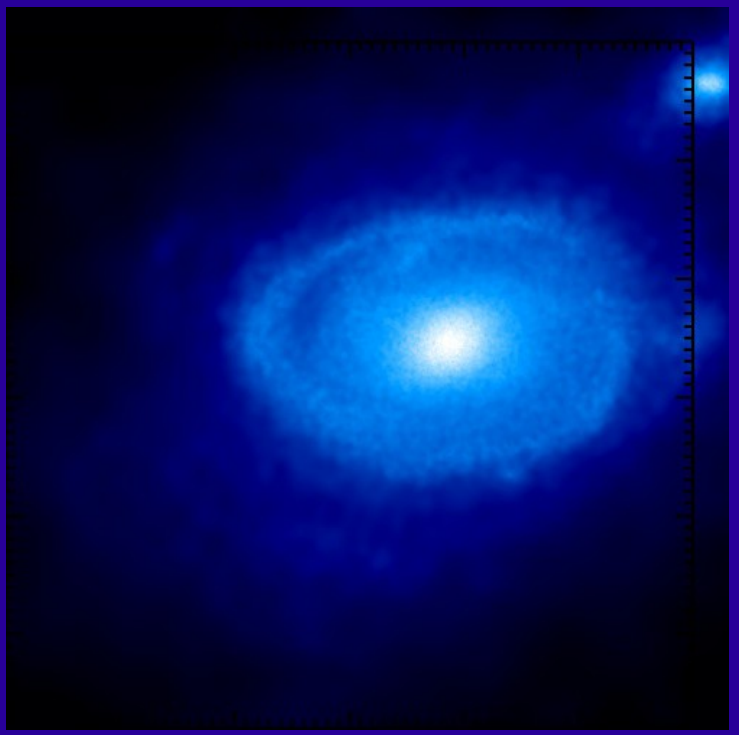
Metallicity gradients in discs are affected by diferent mechanisms in a cosmological context:

+ Can we reproduce metallicity gradients in the gas and SPs in the discs?
+ How do they change with the age of the SPs?
+ How do they evolve?

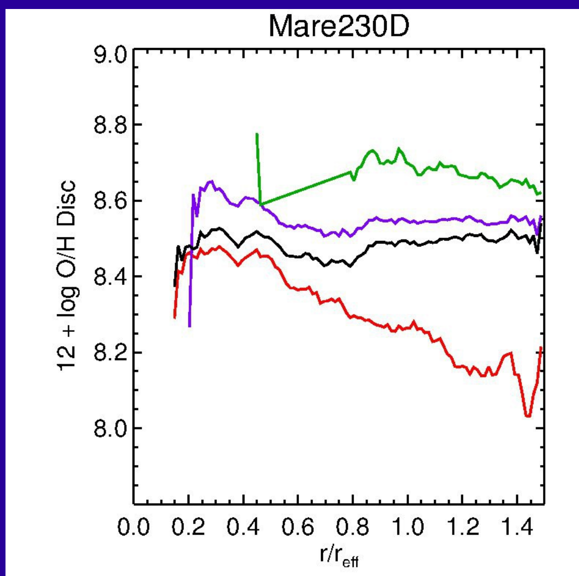
Our version of P-Gadget3:

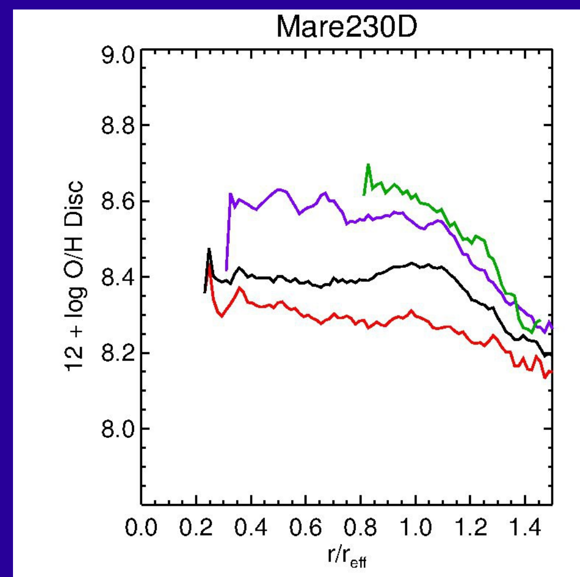
+ Multiphase interestellar medium
+ Stochastic star formation
+ Metal cooling
+ Chemical enrichment by SNII and SNIa: O, C, Si, Fe,...
+ SN feedback (Scannapieco et al. 2006)

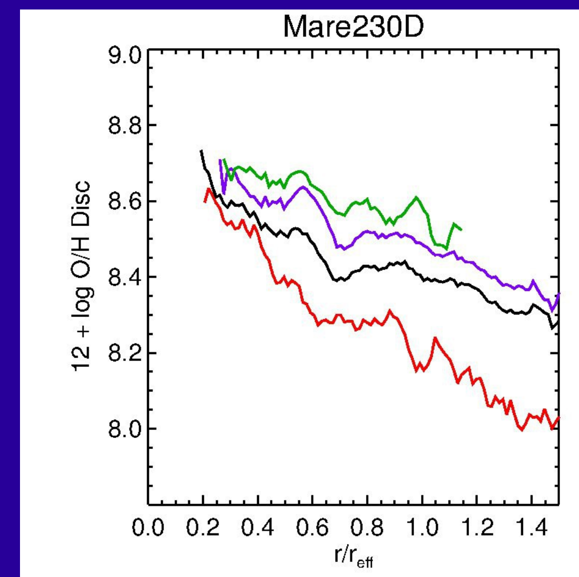




Metallicity profile according to the age of the stellar populations

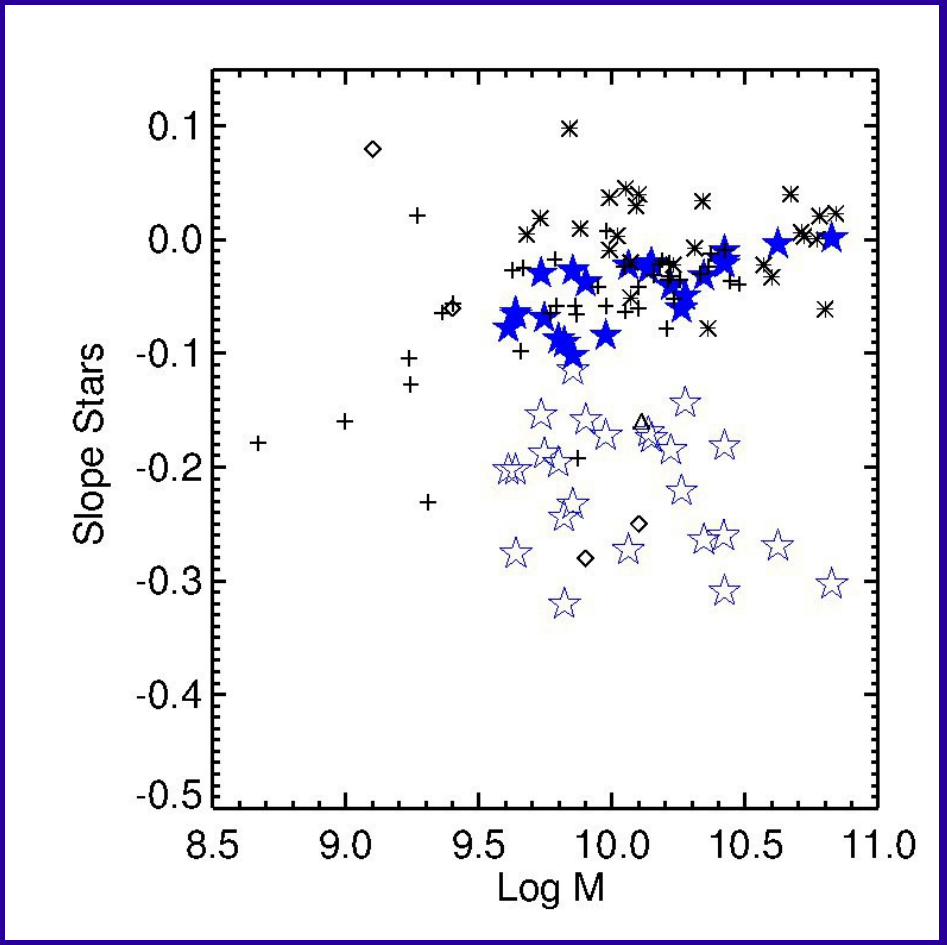


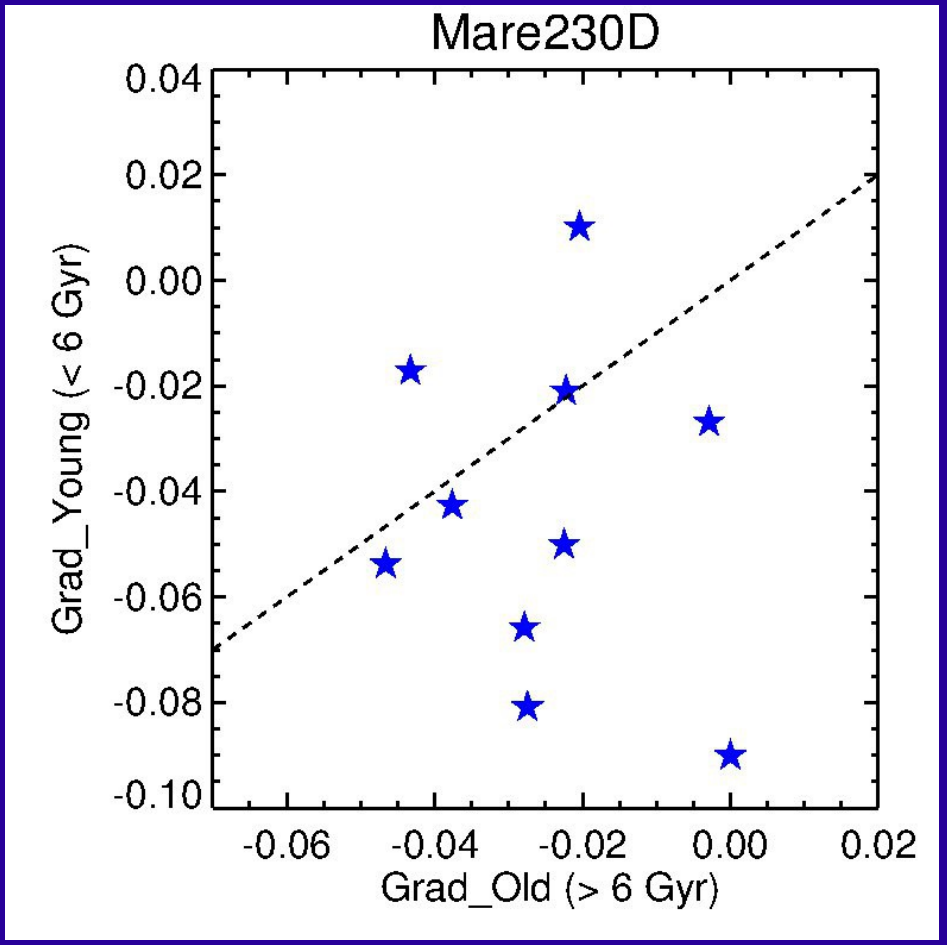




Green: SP < 2 Gyrs
Violet: SP < 6 Gyrs

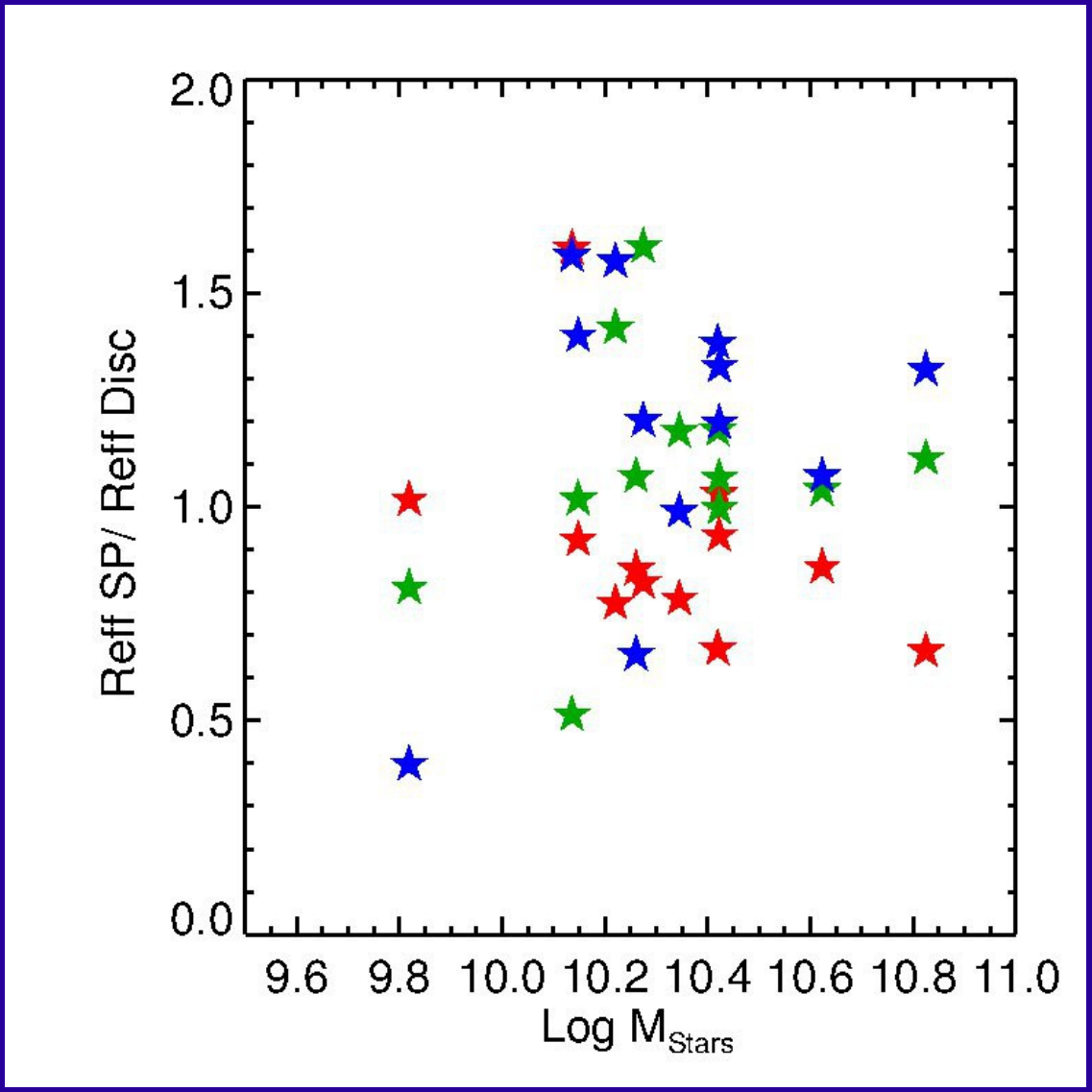
Red: SP > 6 Gyrs
Black: All SPs





Mean Slope ~-0.03 dex/kpc

Mean Slope Old SPs ~ - 0.06 dex/kpc
Mean Slope Young SPs ~ - 0.02 dex/kpc

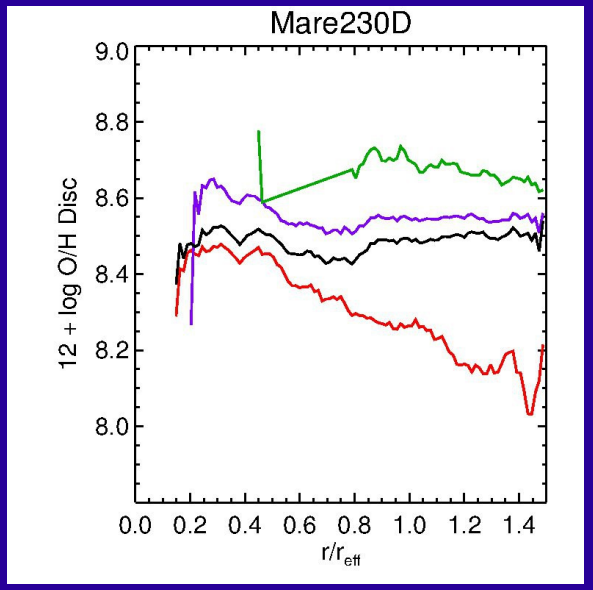


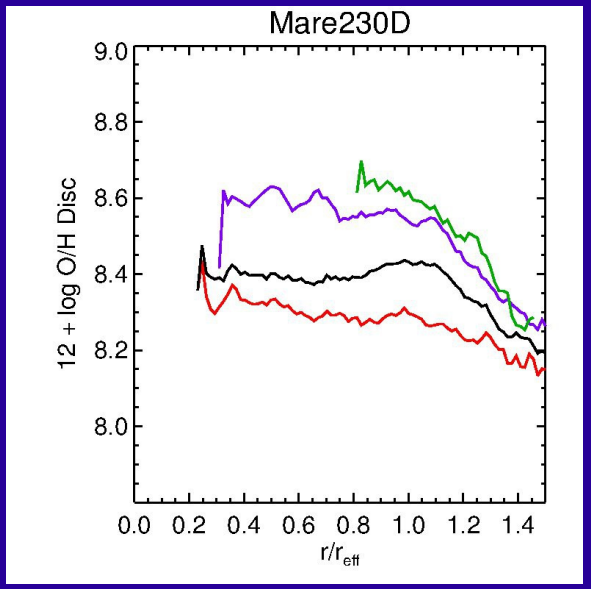
Older stars (> 6 Gyr) are more concentrated than young stars (< (2) 6 Gyrs)

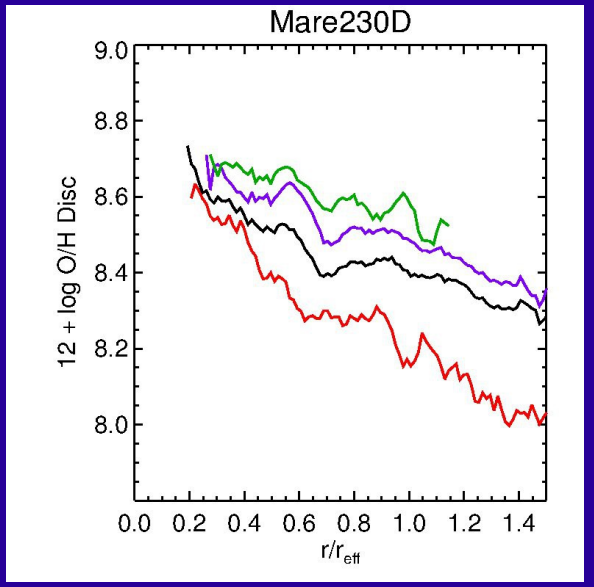
Inside out formation

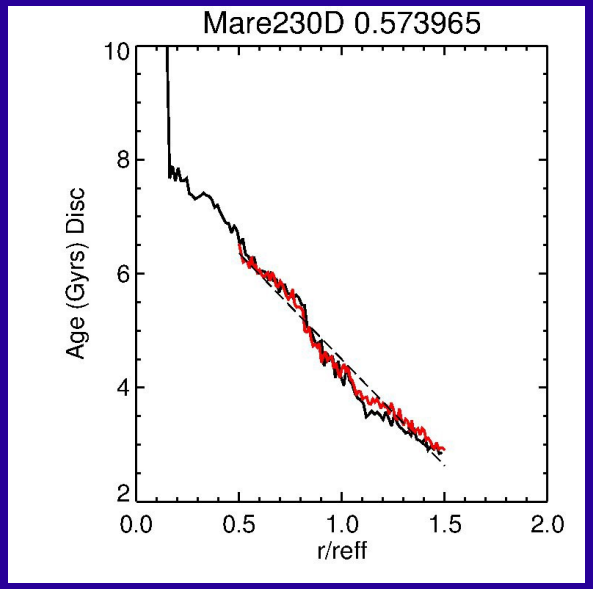
Green: SP < 2 Gyrs
Blue: SP < 6 Gyrs
Red: SP > 6 Gyrs

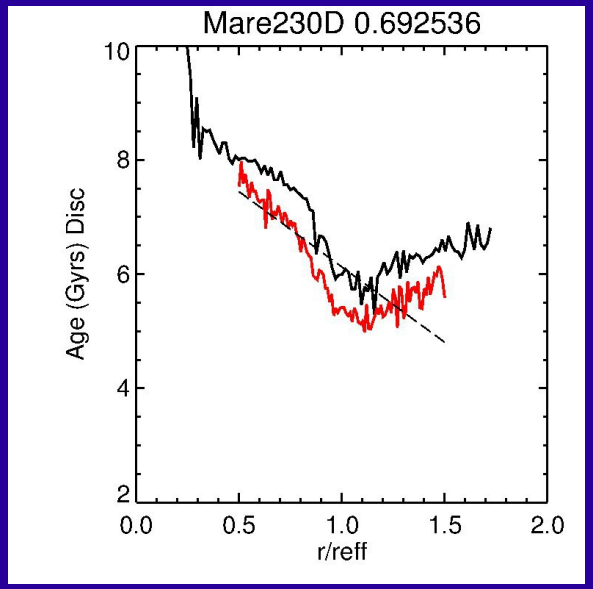
Metallicity profile according to the age of the stellar populations

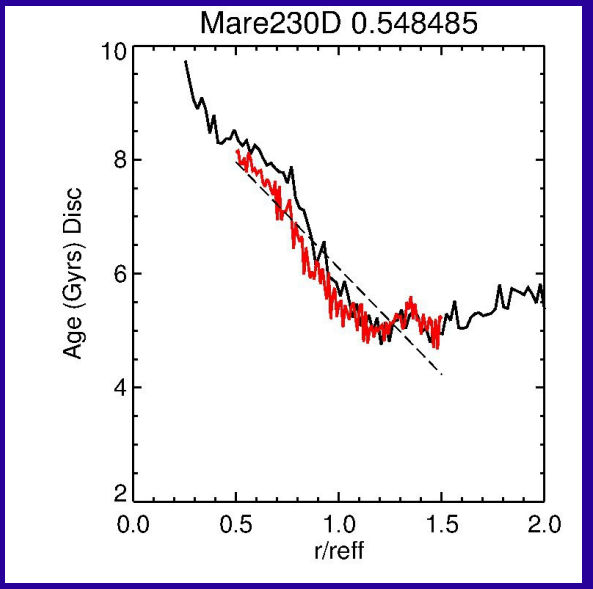












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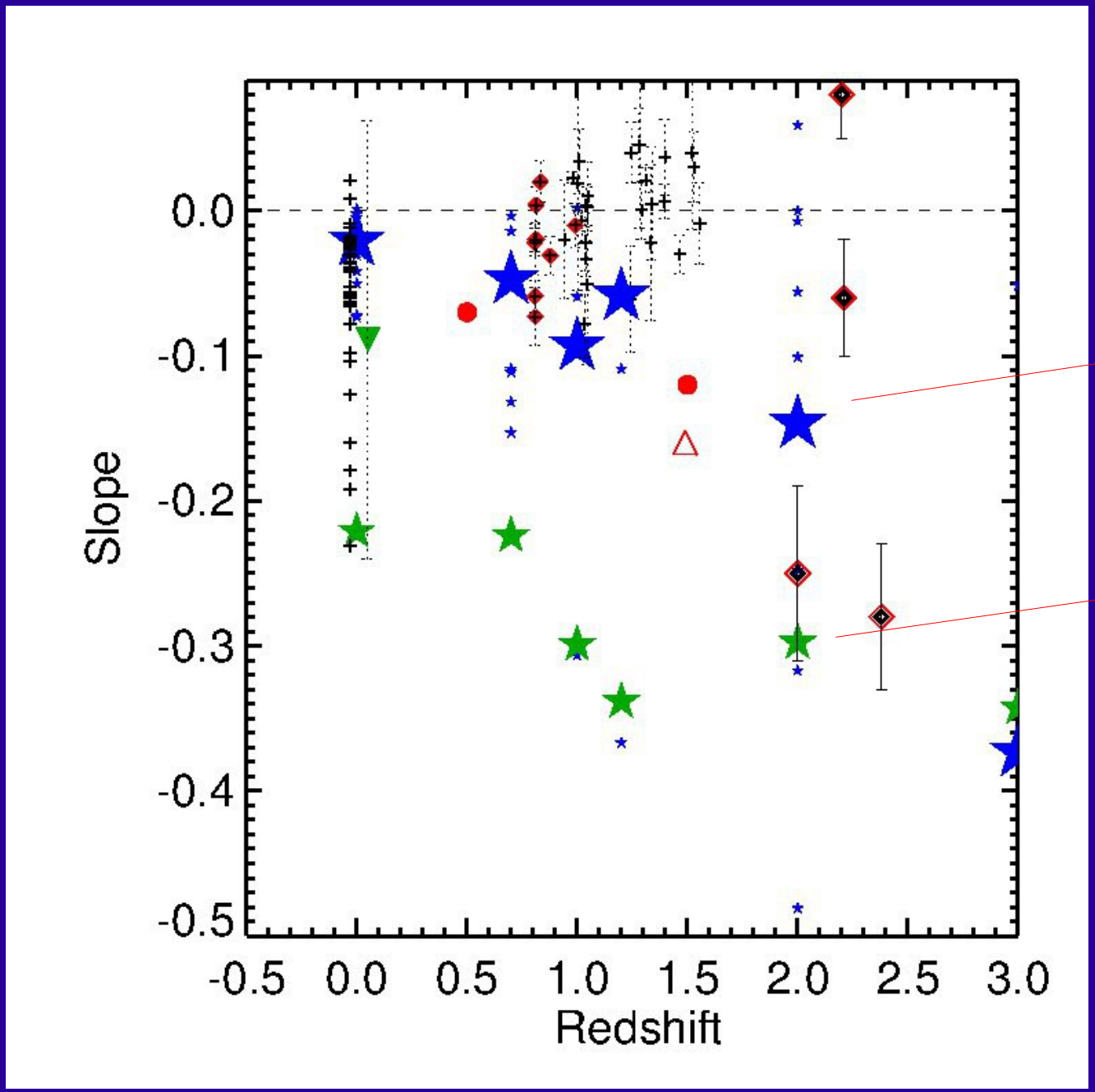
Evolution of the Metallicity Gradients with redshift for the SPs

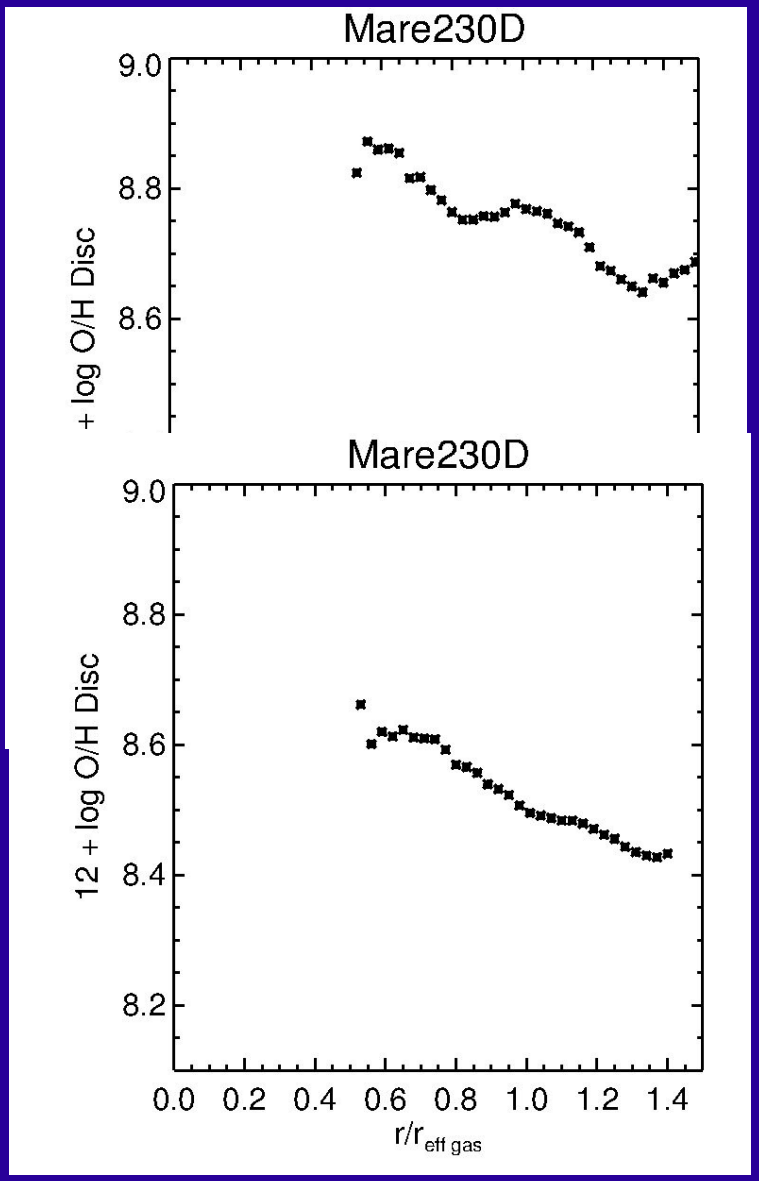


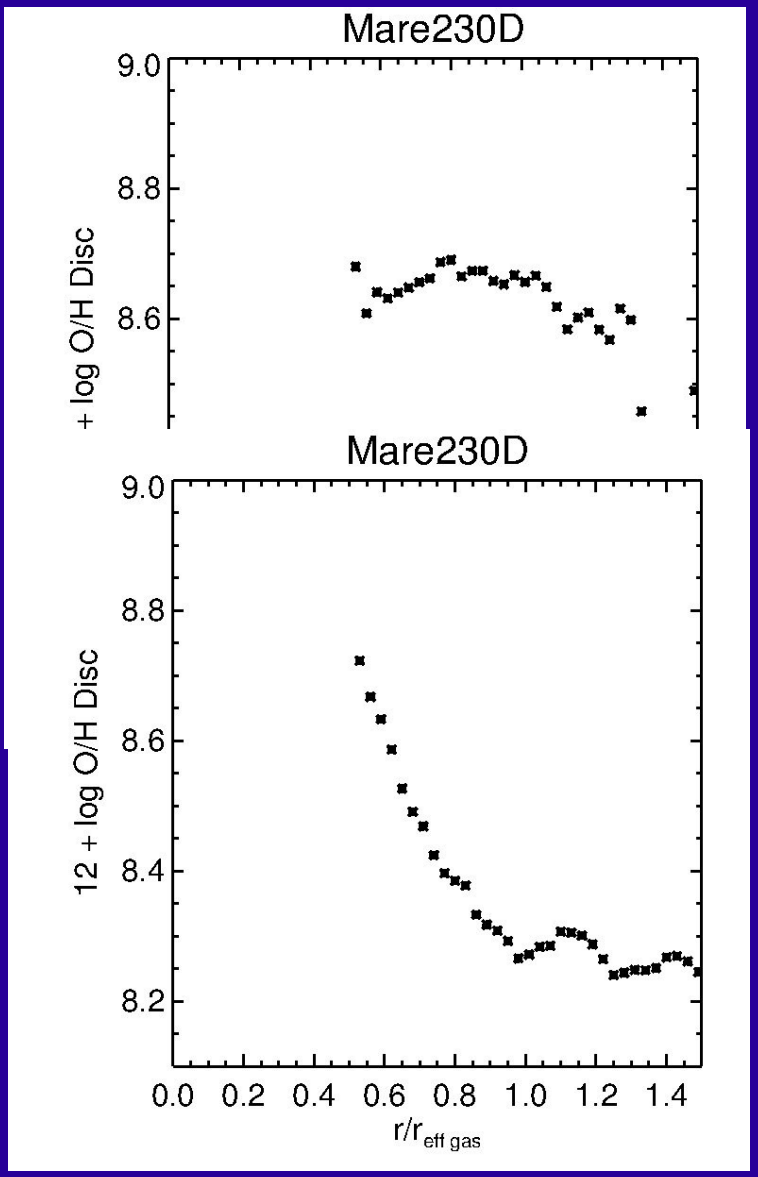
Mean simulated slopes

Mean simulated slopes normalized by half-mass radius.

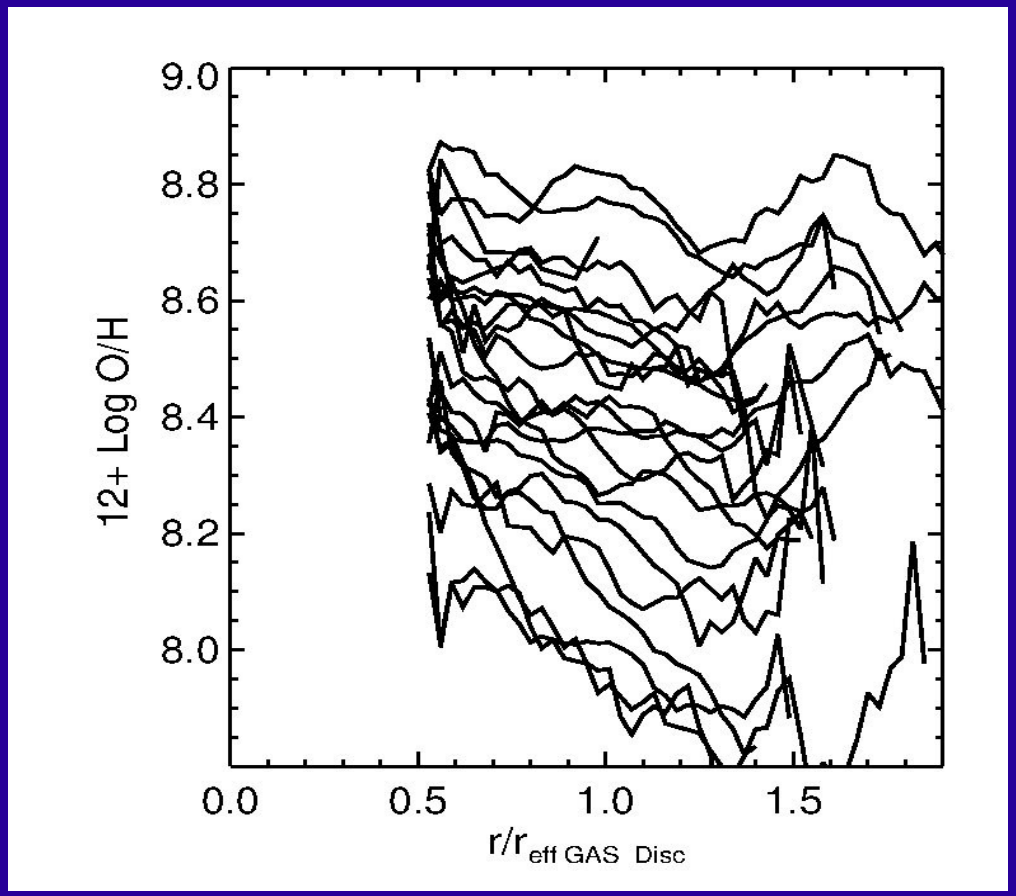
Black symbols: Zartisky et al; Jones et al. 2012,Yuan et al. 2013, Queryrel et al. 2013, Stott et al. 2014

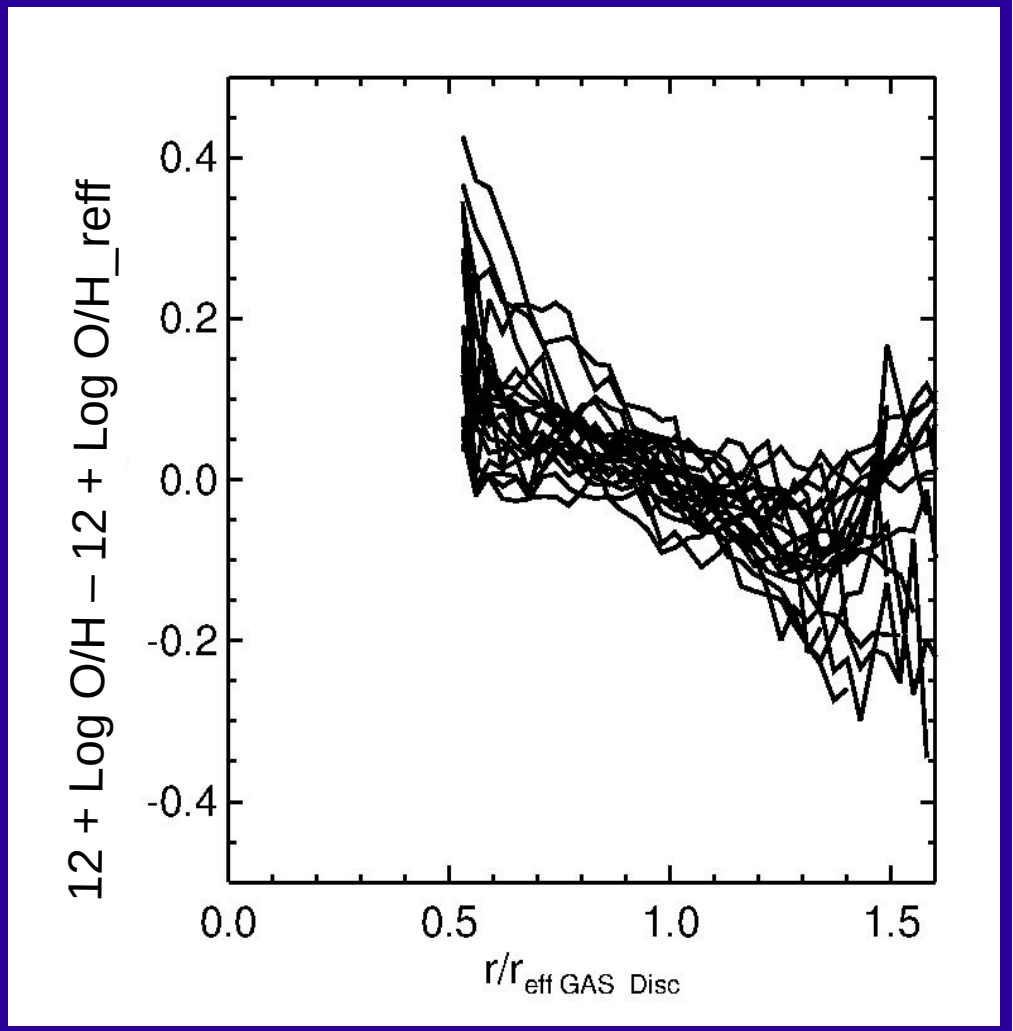
Metallicity Gradients of the Disc Gas Components





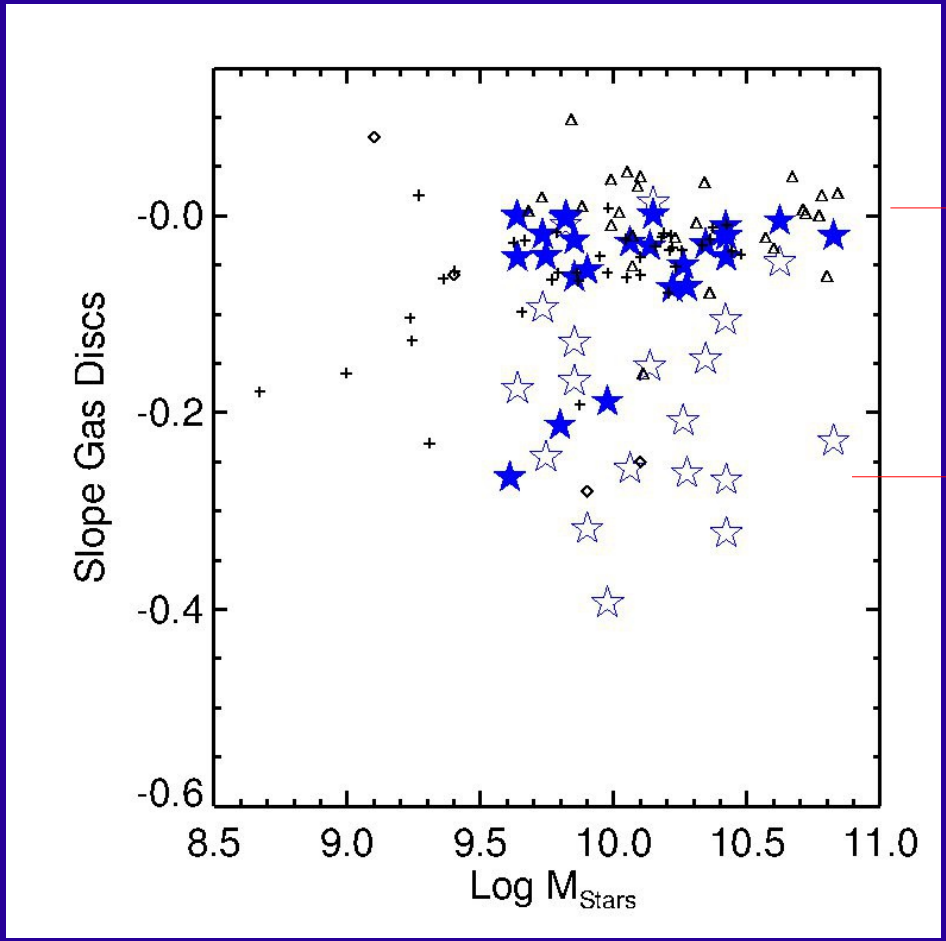
Renormalized Gas Density Profiles





Mean -0.23 dex/(r/reff)

Gradients of the Gaseous Discs

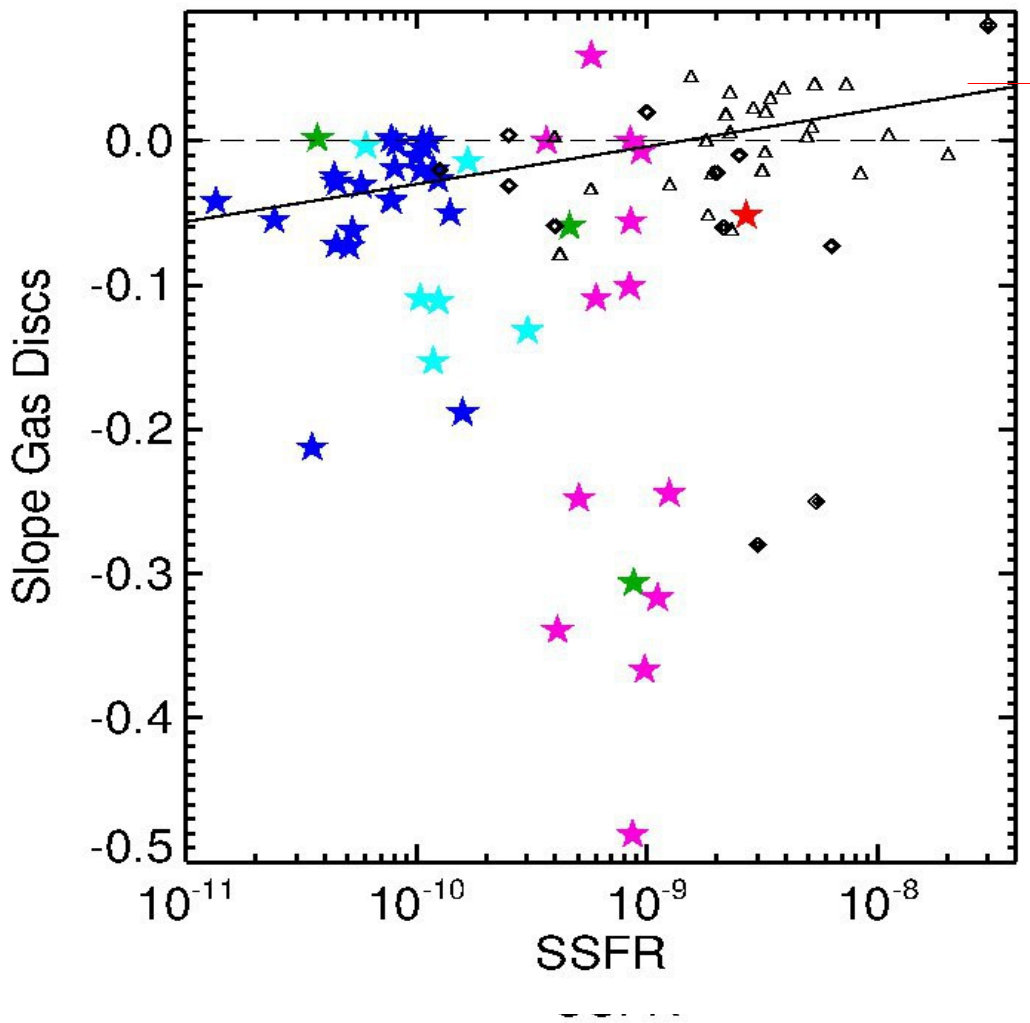


Simulated gas slopes

Simulated slopes normalized by half mass radius.

Black Symbols:
Stott et al. 2014
Jones et al. 2013
Queyrel et al. 2012
Zaritisky et al.1996

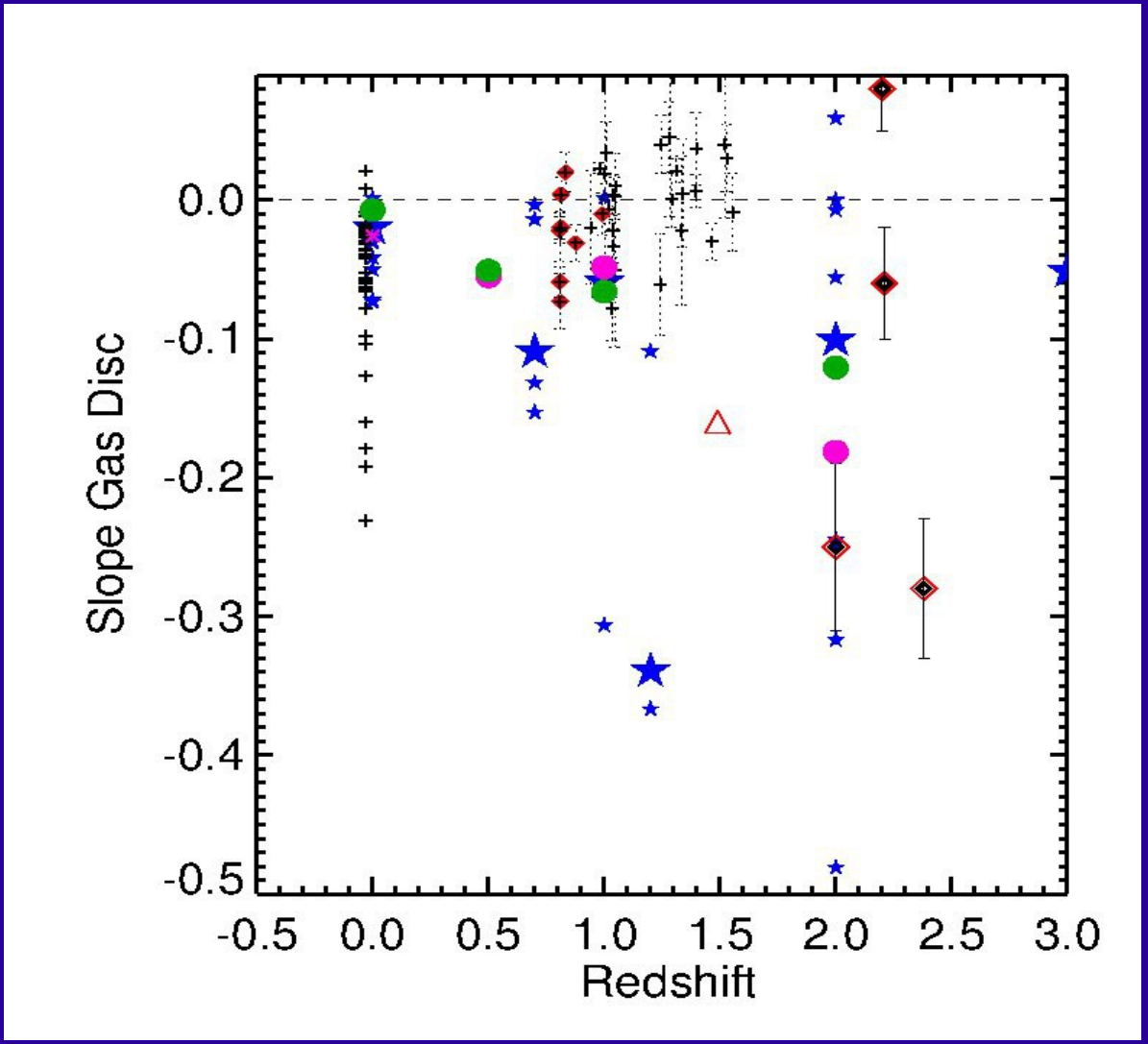
Gradientx and the SSFR relation?



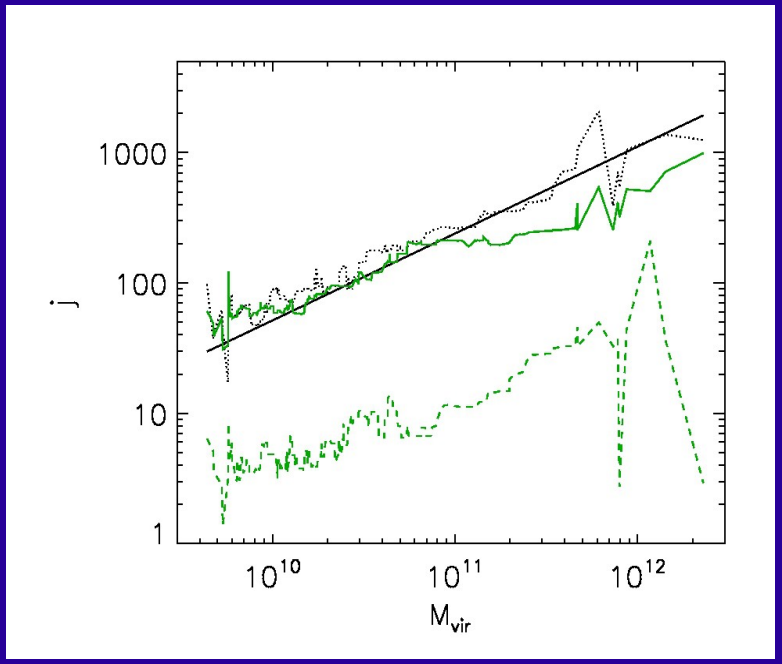
Stott et al. 2014

Black Symbols:
Stott et al. 2014
Jones et al. 2013
Queyrel et al. 2012

Evolution of the Gas Gradients with Redshift

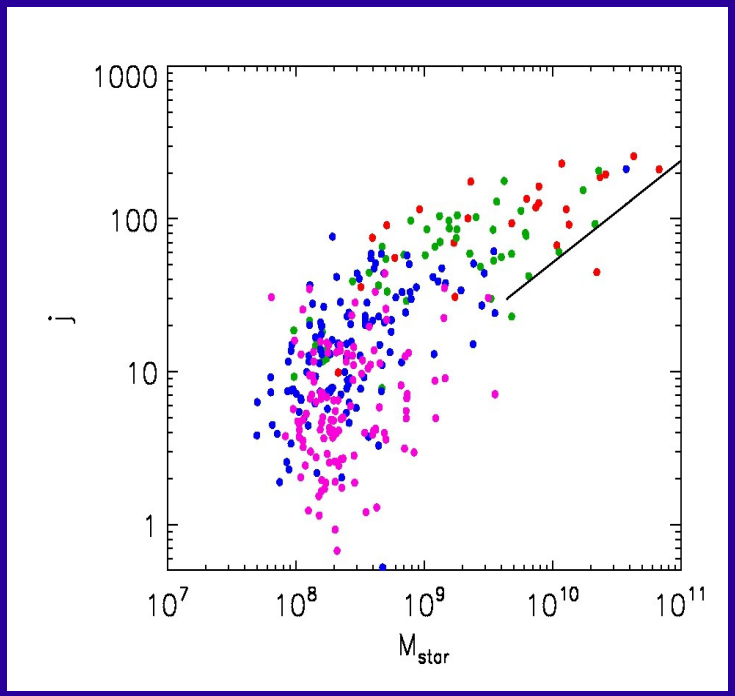


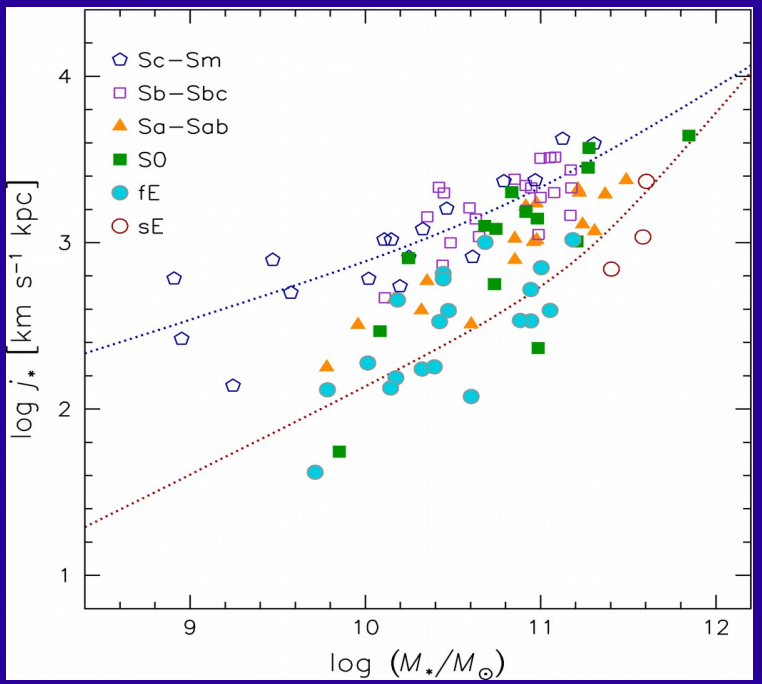
Observations: Zartistky et al. 1996;Yuan et al.. 2012, Queyrel et al. 2012, Jones et al. 2012, Stott et al. 2014,



Angular Momentum Evolution of Discs and Spheroids

Pedrosa & Tissera in prep.





Fall et al. 2014

Summary:

+ Simulated discs have metallicity gradients determined by a combination of stellar populations:

-Old SPs have steeper gradients than young SPs, in general
-Gradients show a correlation with stellar mass which is lost when they are renormalized.
-There a variety of stellar age profiles.

+Gas density profiles:
-Gradients are in global agreement with outliers which show steeper slopes.
-There gradients evolved with time.
-There is a trend between the gas slopes and the SSFR .

Next step

+ Density profiles (and correlate them with the age and metallicity profiles)
+ [Alfa/Fe] trends
+ Search for the events which determine the characteristics.

In collaboration with E. Sillero, S. Pedrosa, De Rossi, Snaith