CHEMICAL EVOLUTION OF DWARF GALAXIES: Parametrical limits

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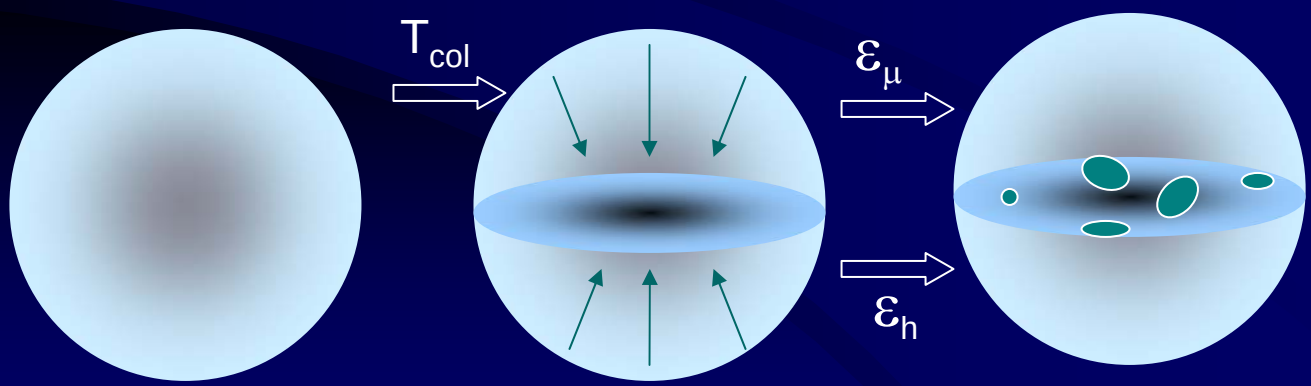
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THE MODEL

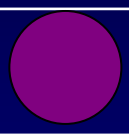
Based on the MULTIPHASE CHEMICAL EVOLUTION MODEL (Ferrini et al 92): The Galaxy is considered as a two-zone system: halo and disk, sliced into cylindrical concentric regions

LIM stars yields: Buell (1998)

Massive stars yields: Woosley & Weaver (1995)



THE GALAXIES and THE PARAMETERS

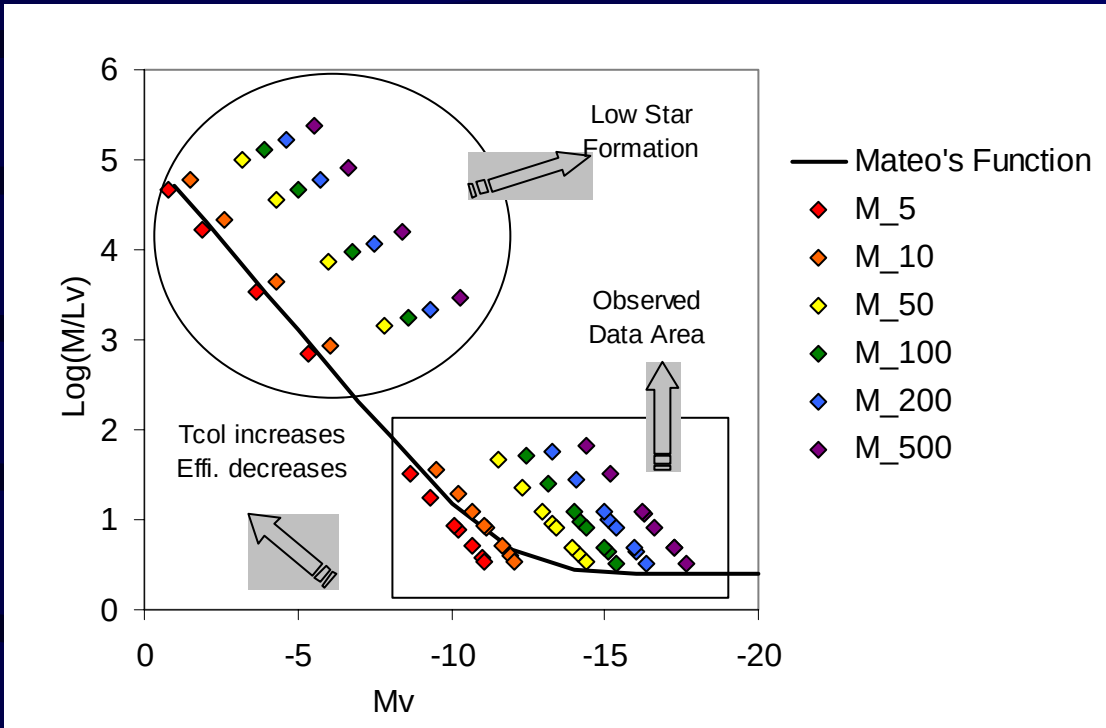
Galaxy	Mass (10^6 $M_\odot$)	Optical Radius (pc)
	8	300
	20	400
	150	900
	390	1300
	1000	1800
	3000	3000

Collapse Time (Gyr)	Star Formation Efficiency
8	Very Low
20	Low
40	Intermediate
60	High

RESULTS

- ✓ Mass - Luminosity relation
- ✓ Gas fraction vs metallicity
- ✓ Gas mass-to-light ratio
- ✓ Star Formation Rate

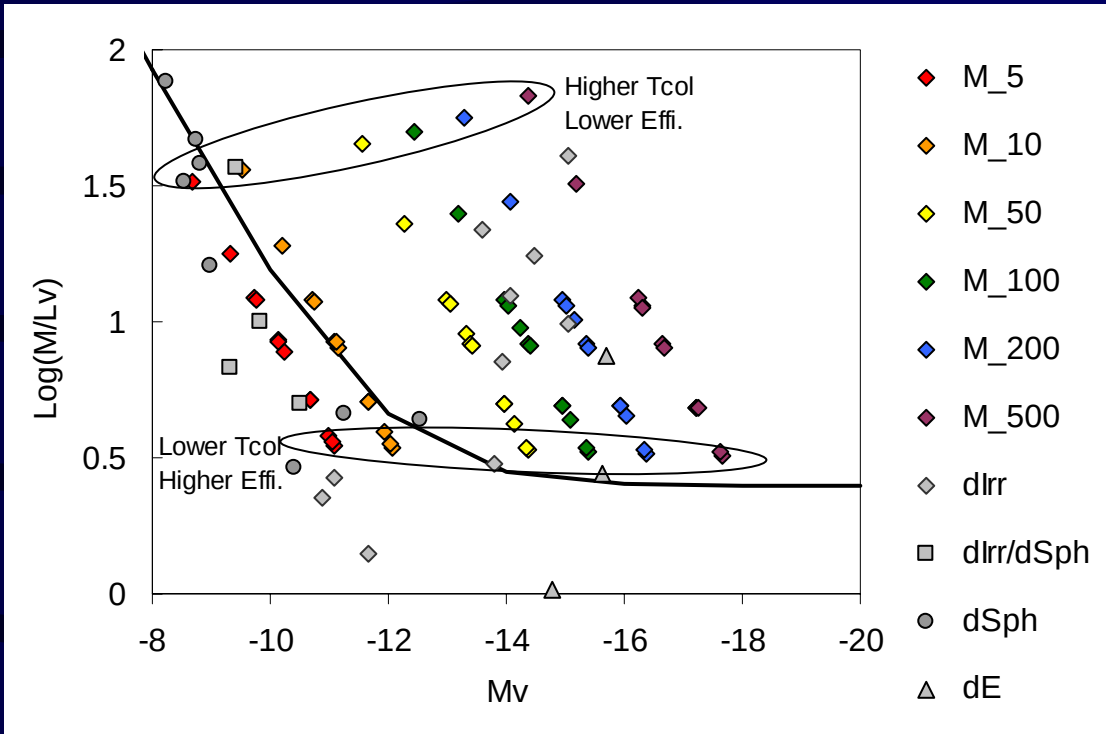
Mass-Luminosity relation



- The Mateo's function has been calculated for the Local Group dwarf galaxies

- Very low efficiency star formation models seem to be out of the data area

Mass-Luminosity relation



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Gas fraction

Some authors define gas fraction as the fraction between gas and baryonic mass:

$$\mu_{bar} = \frac{\text{Mass of gas}}{\text{Mass of gas} + \text{Mass of stars}}$$

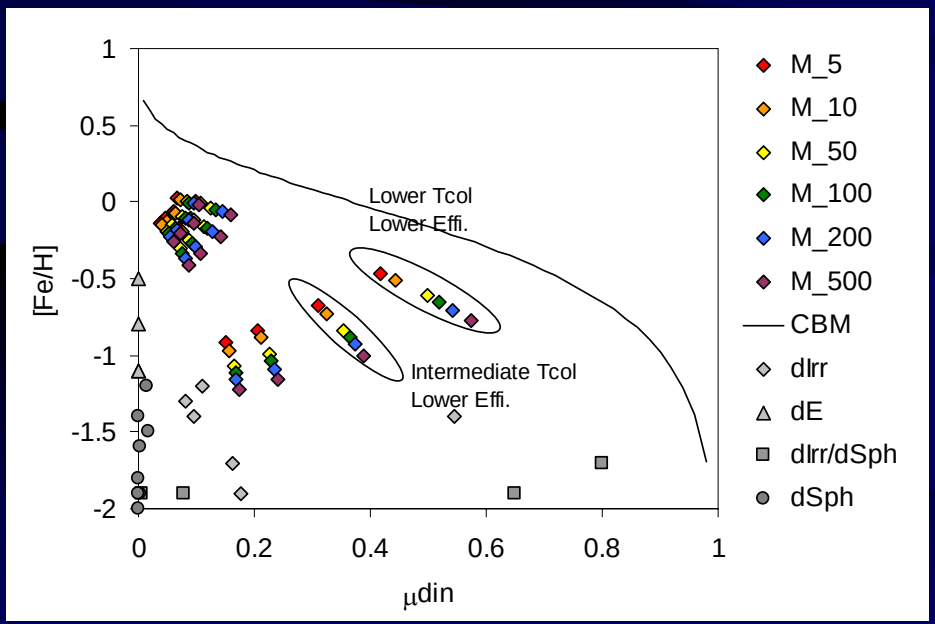
But when this is not possible, dynamical mass is used instead of baryonic mass:

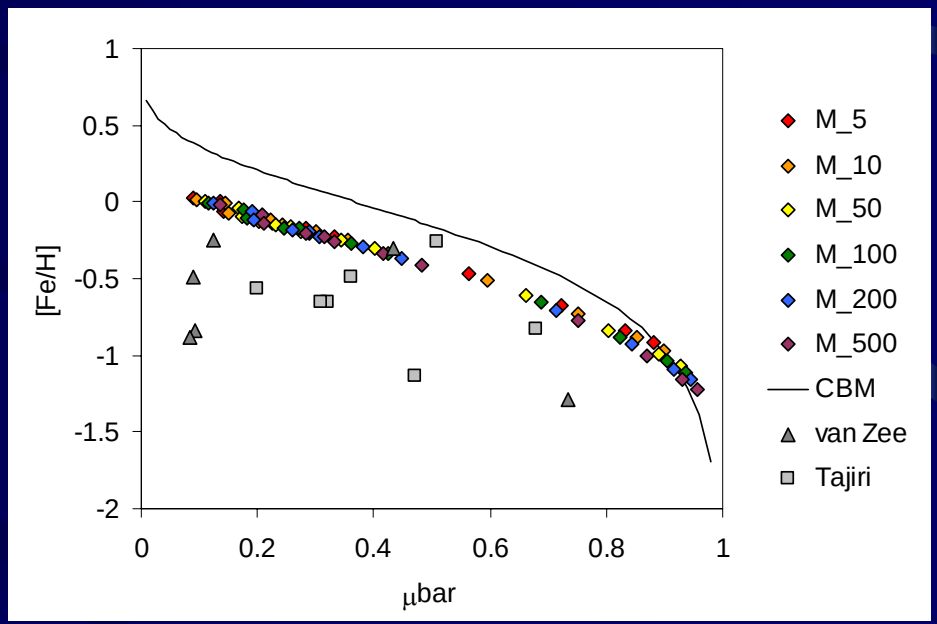
$$\mu_{dyn} = \frac{\text{Mass of gas}}{\text{Dynamical mass}}$$

Dark matter, dust, remnants,… make the results to be quite different.

Metallicity vs gas fraction I

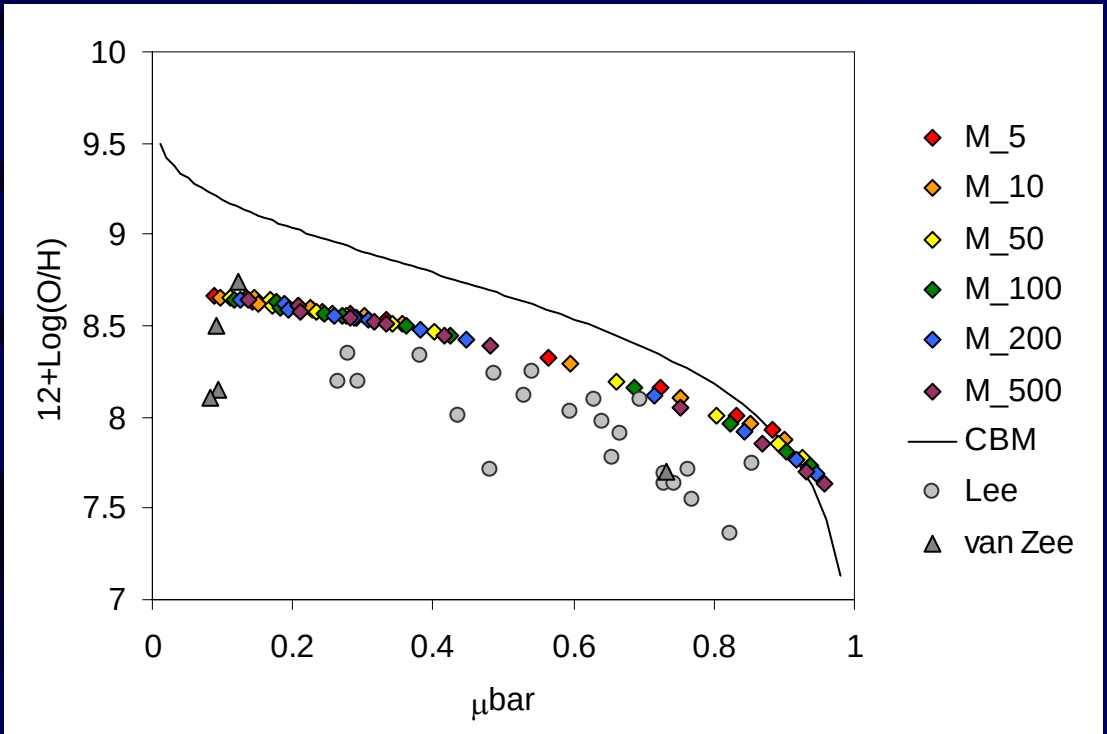
If we work with dynamical mass, all of the models of the same galaxy will be compared with the same value of the mass (total galaxy mass), while if baryonic mass is used, each model will have it’s own mass in stellar form.





Metallicity vs gas fraction II

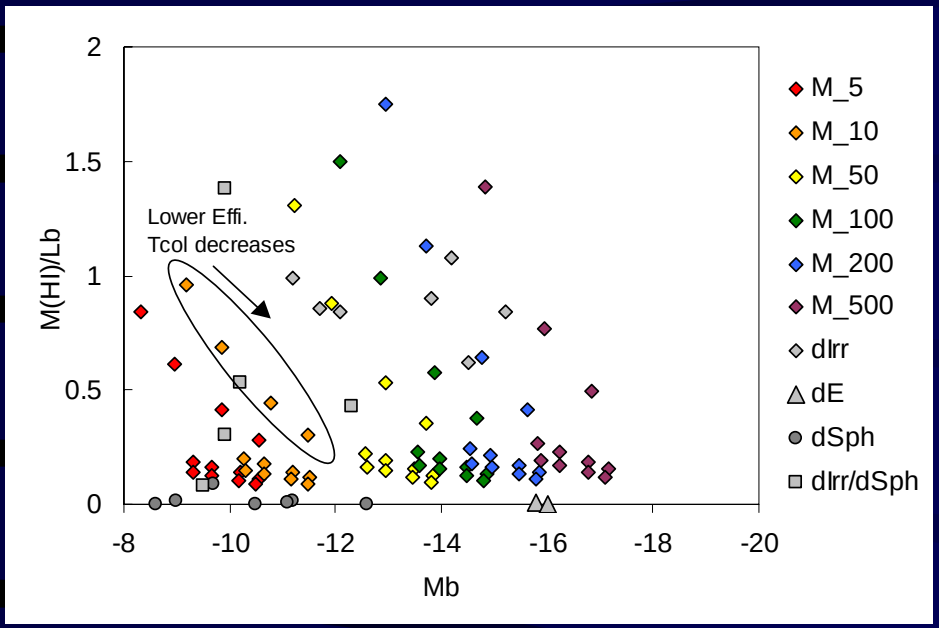
In some cases the metallicity is better estimated through the oxygen abundance, because it has been directly observed. (Lee et al 2003)



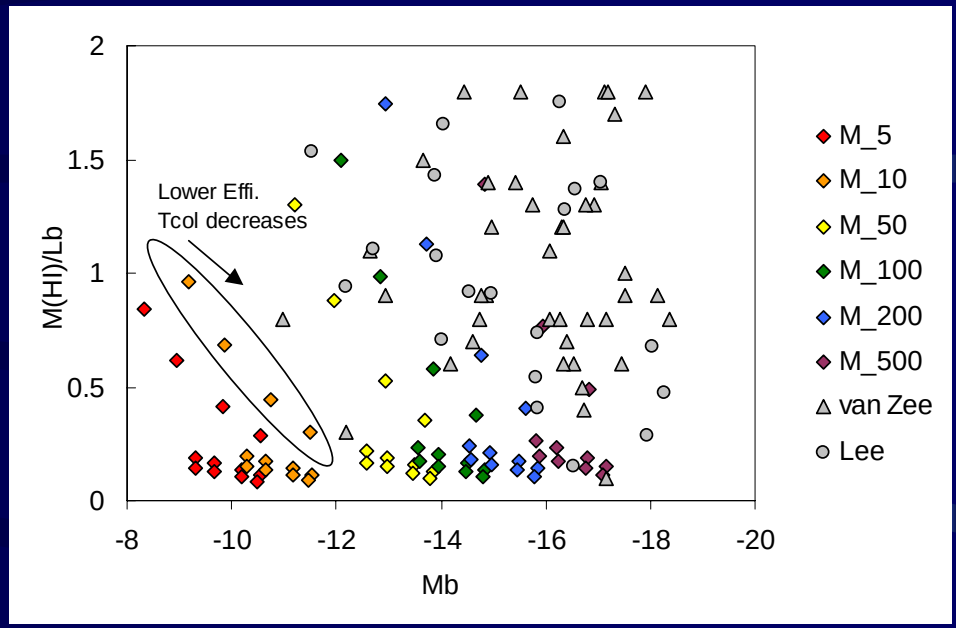
Halo influence?

Gas mass-to-light ratio

Local Group Data



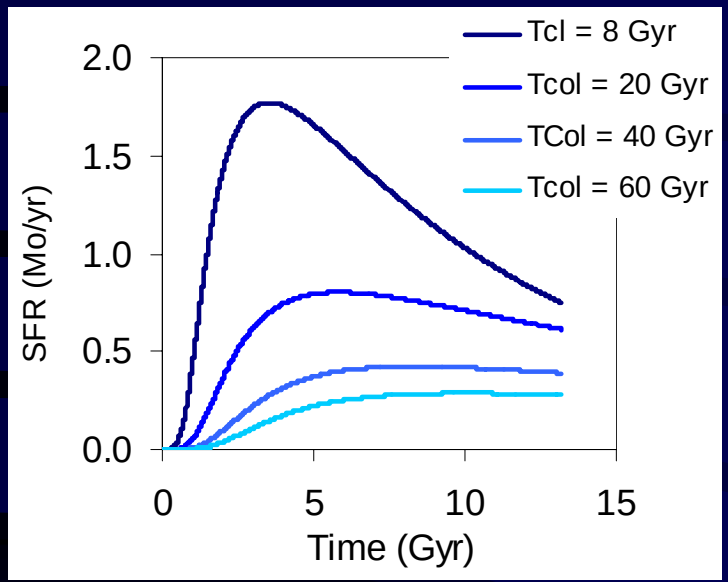
Isolated Dwarfs Data

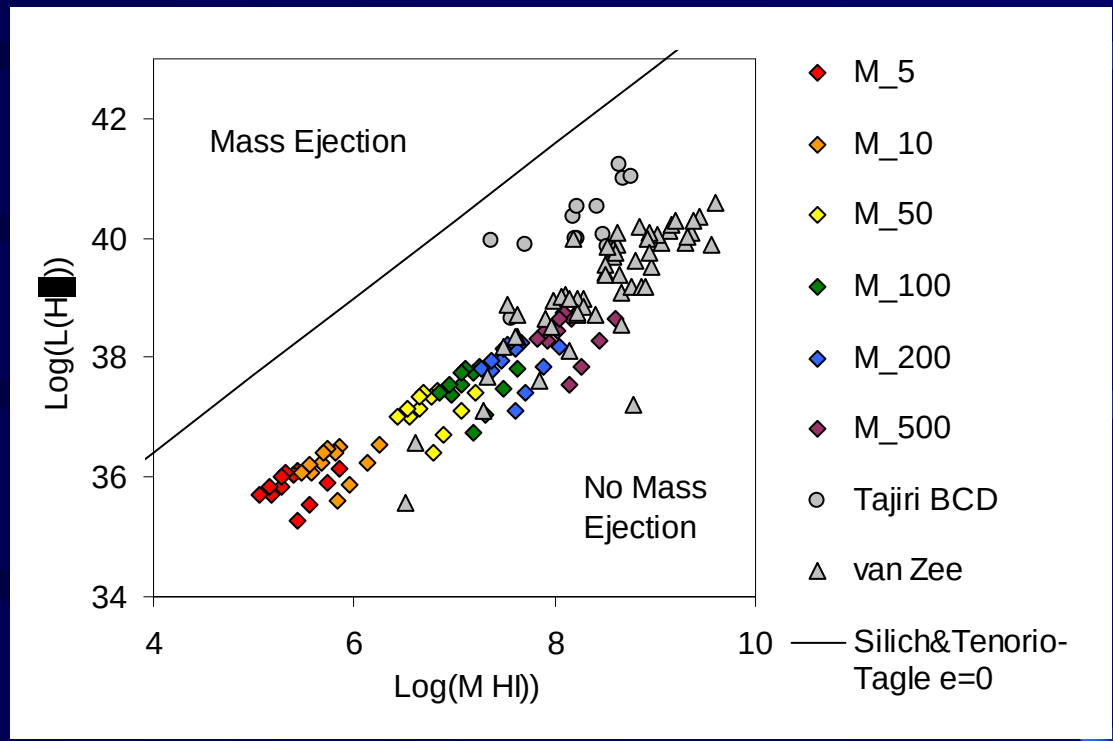


- ✓LG galaxies have <u>less gas content</u> for similar Mb values than isolated dwarfs galaxies. Enviromental effects? Spatial distribution?
- ✓The <u>gas content</u> in LG dSph and dE is <u>too low</u> to be reproduced by our models.
- ✓Most of the LG dIrr and the field dIrr can be modelized with <u>no winds</u>
- ✓The dIrr in the field are better reproduced by the <u>bigger galaxies</u> models.

Star Formation Rate

Relation between SFR and L(Hα) from Legrand et al 2001





In our models SF has no burst.

All of the field galaxies are in the "*No Mass Ejection*" area. No winds are needed.

Once again, bigger galaxies models fit better the da

CONCLUSIONS

1.- There are important differences between LG Dwarfs and Fields Dwarfs, even if both belong to the same class .

2.- It is not necessary to add galactic winds to the model if we want to reproduce isolated irregular dwarfs.

3.-A soft but efficient SF along time can explain a great amount of observations.

4.- SF in the halo can be overestimated in the models.