Chemical Evolution of Stellar Systems in the Local Group of Galaxies

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The Local Group

The Local Group presents an unique opportunity to study the properties of galaxies in a small distance scale.

Disks

Bulge

Irregulars

Prescriptions of the Chemical Evolution Models

Infall of primordial gas with and exponential profile

Schmidt-Kennicutt law for SFR

Single slope IMF

Efficiency in the star formation

Threshold

Yields of Woosley and Weaver (1995) with the corrections suggested by François et al. (2004) for massive stars, Nomoto et al. (1997) for SNIa and Van den Hoek and Groenewegen (1997) for intermediate mass stars.

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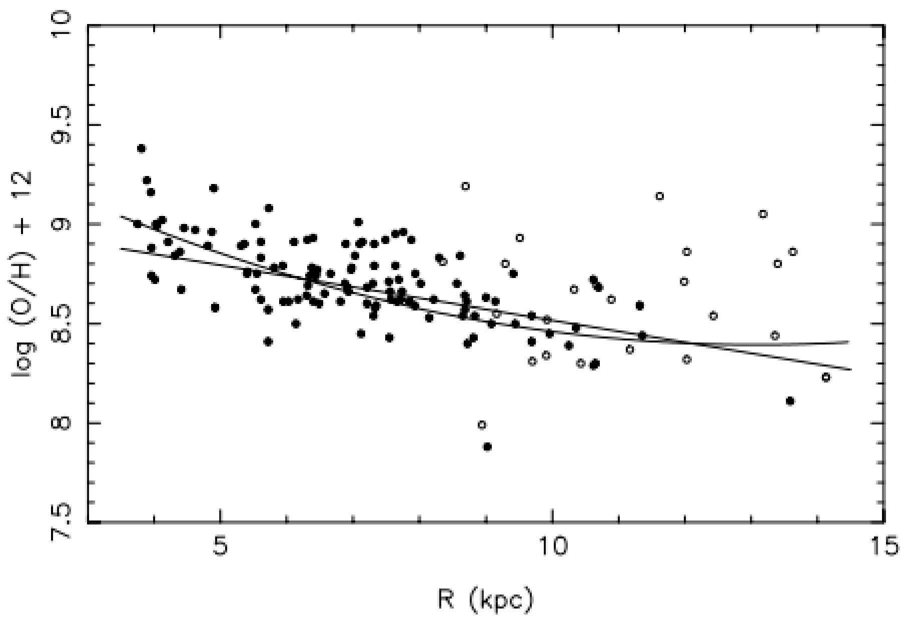
Disks

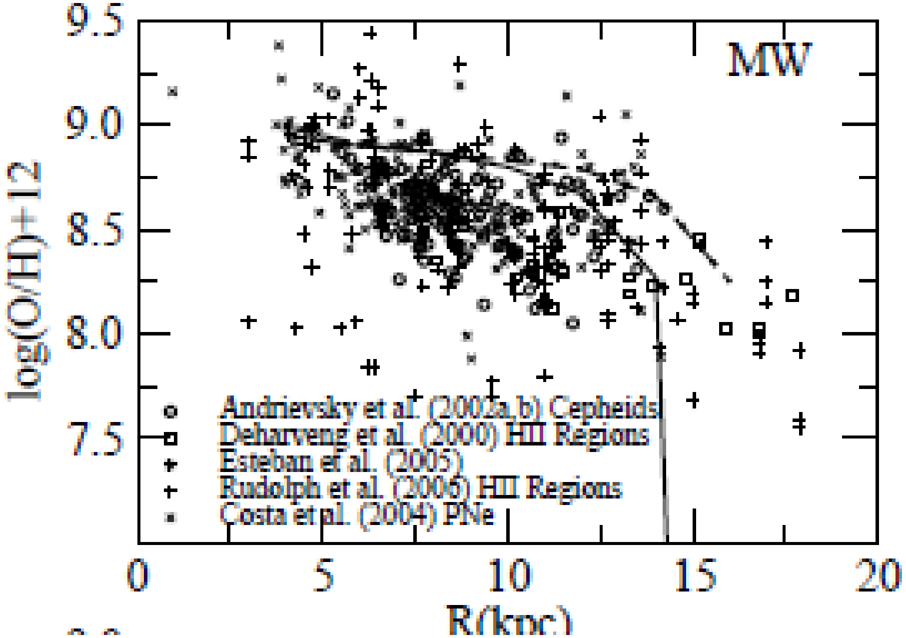
Inside-out formation

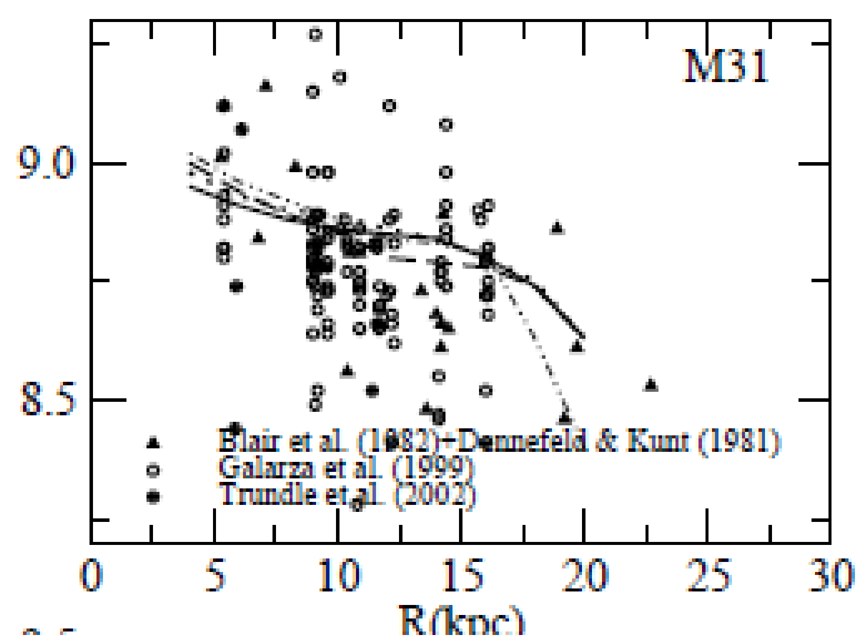
Spacial and time evolution of the abundance gradient



Costa et al. (2004)

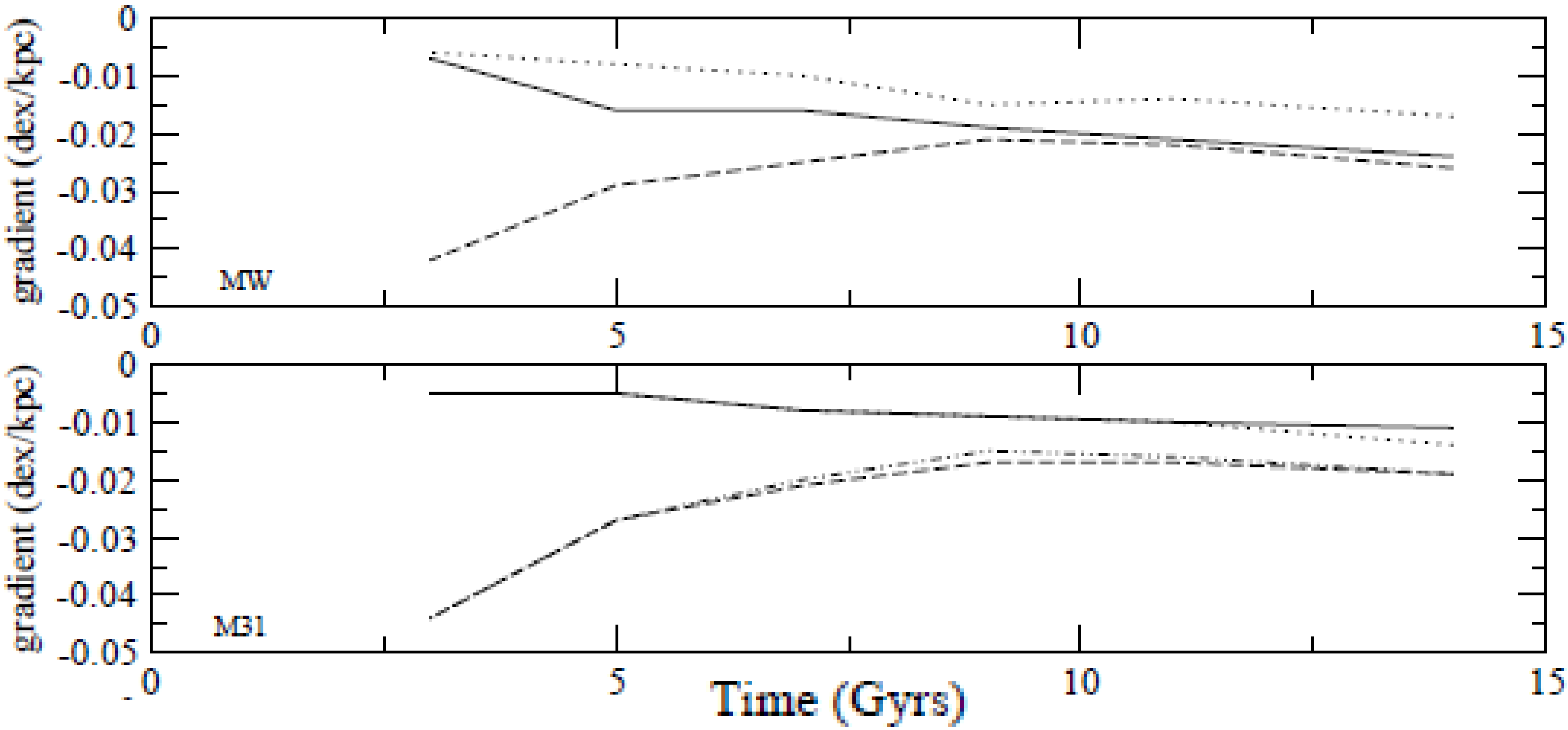
Disks - Abundance Gradients





Marcon-Uchida et al. 2010

Time evolution of the abundance gradient



Solid lines MW v= 1 Gyr $^{-1}$, threshold = 4$M_{\odot}pc^{-2}$ M31 v=1 Gyr $^{-1}$, threshold=5$M_{\odot}pc^{-2}$(Braun et al. 2009)

Dotted lines MW v = 1 Gyr $^{-1}$, threshold = 7$M_{\odot}pc^{-2}$ M31 v=2 Gyr $^{-1}$, threshold=5$M_{\odot}pc^{-2}$

Dashed lines MW v(R), threshold 4$M_{\odot}pc^{-2}$ M31 v(R), threshold=5$M_{\odot}pc^{-2}$

M31 Bulge

Classical bulge with no evidence of two stellar populations.

Single zone model

Should have passed through a very intense star formation, at a maximum rate, during a short timescale.

Fast gas collapse (less than 1 Gyr)

Very efficient star formation rate ($\nu \sim 20\ Gyr^{-1}$)

IMF flatter than Salpeter

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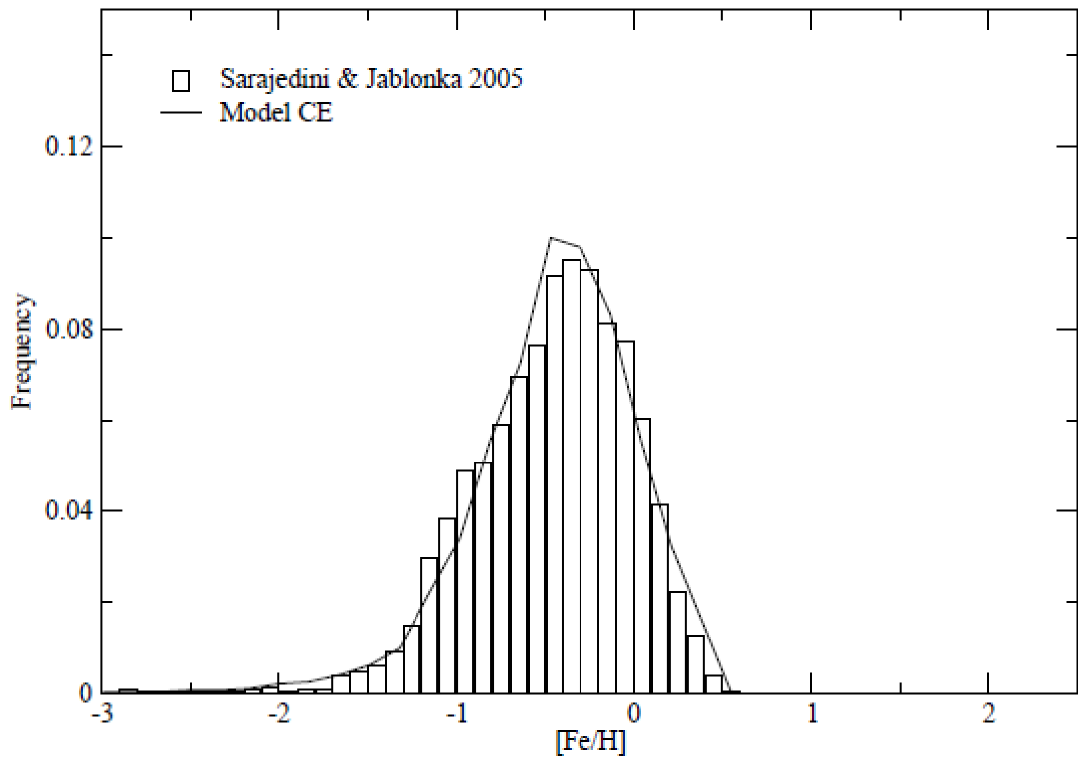
M31 MDF

Fit using statistical method

Single-zone

$\nu = 19\ Gyr^{-1}$

$\tau = 0.2$ Gyrs



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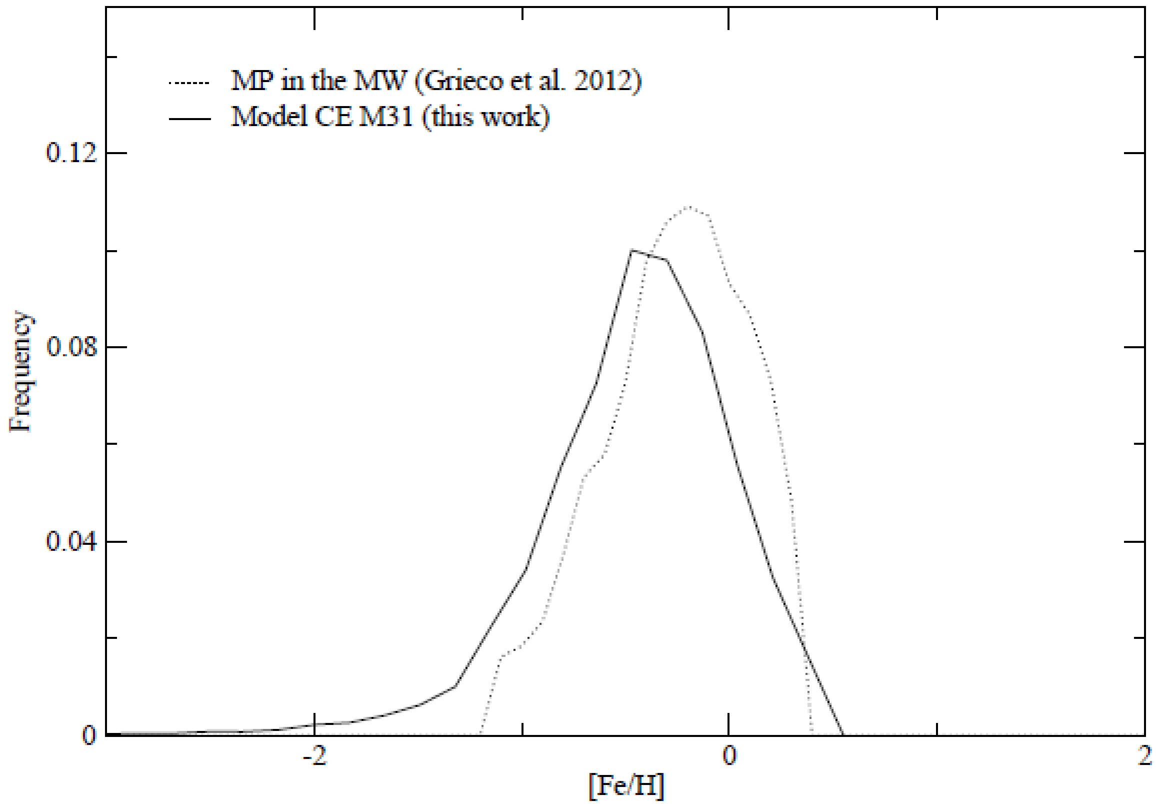
MDF – M31 and MW MP stars



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LMC (preliminary results)

Single-zone model

Salpeter IMF

η_{SNIa} = 0.50 η_{SNII} = 0.03 ηw = 0.03

Wind efficiency: - 0.25

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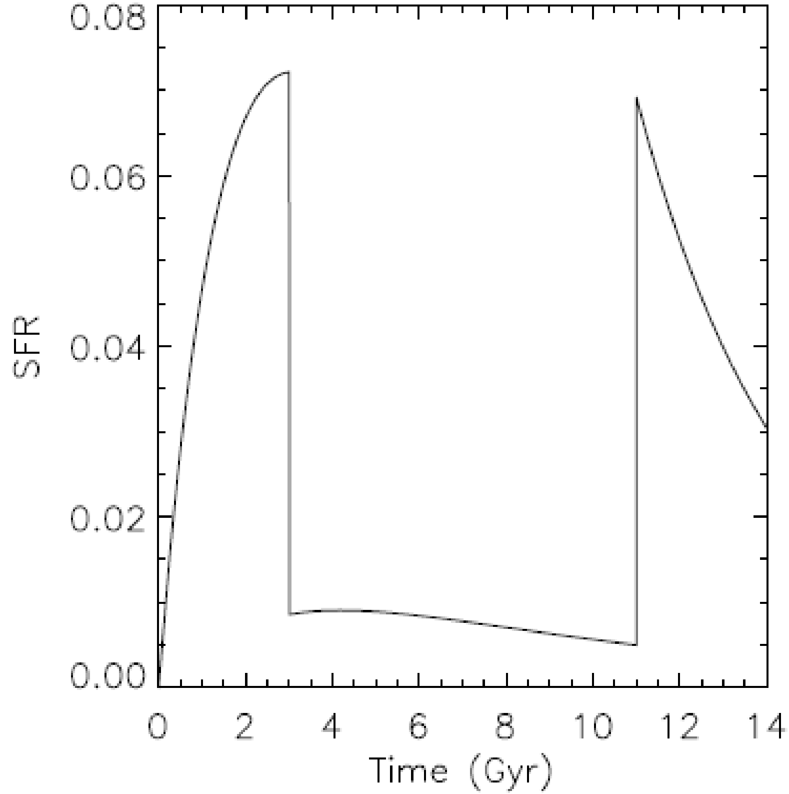
SFR - LMC

$$\begin{cases} \Delta t_1 = 0 - 3\ Gyrs & v_1 = 0.143\ Gyr^{-1} \\ \Delta t_2 = 3 - 11\ Gyrs & v_2 = 0.020\ Gyr^{-1} \\ \Delta t_3 = 11 - 14\ Gyrs & v_3 = 0.244 Gyr^{-1} \end{cases}$$



Carrera et al. 2008 and Harris & Zaritsky 2009

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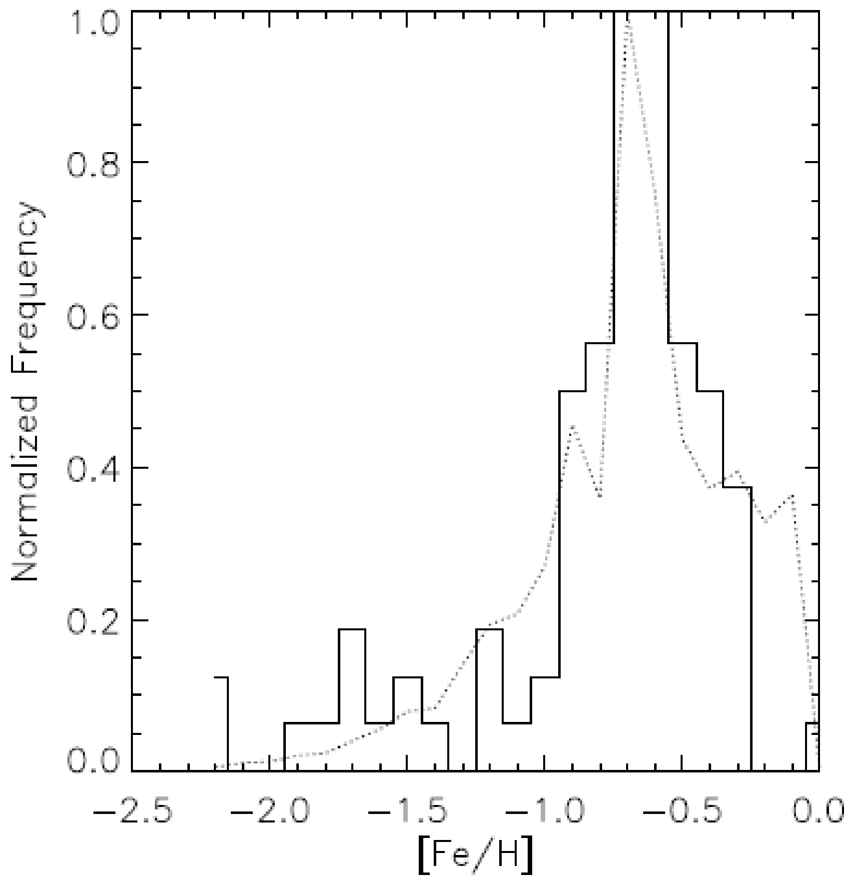
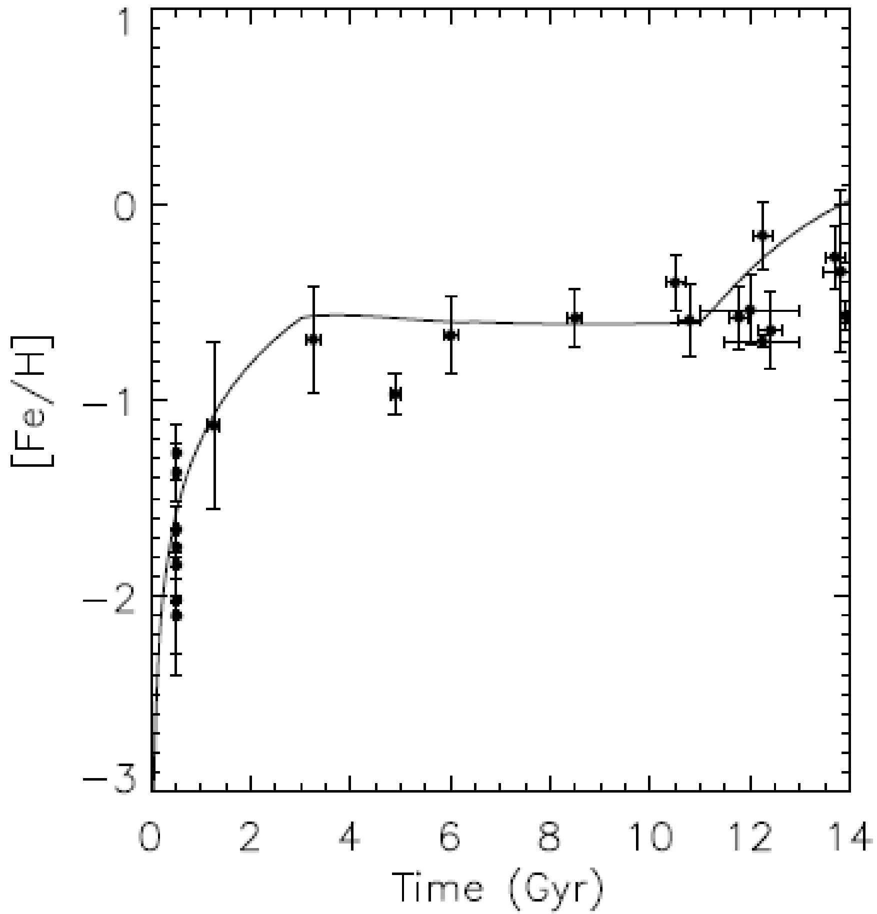
MDF - LMC



Pompeia et al. (2008), Mucciraretti et al. (2010), Hill et al. (2000), Colucci et al. (2012)

Age-metallicity relation



Carrera et al. (2008) and Harris & Zaritsky (2009)

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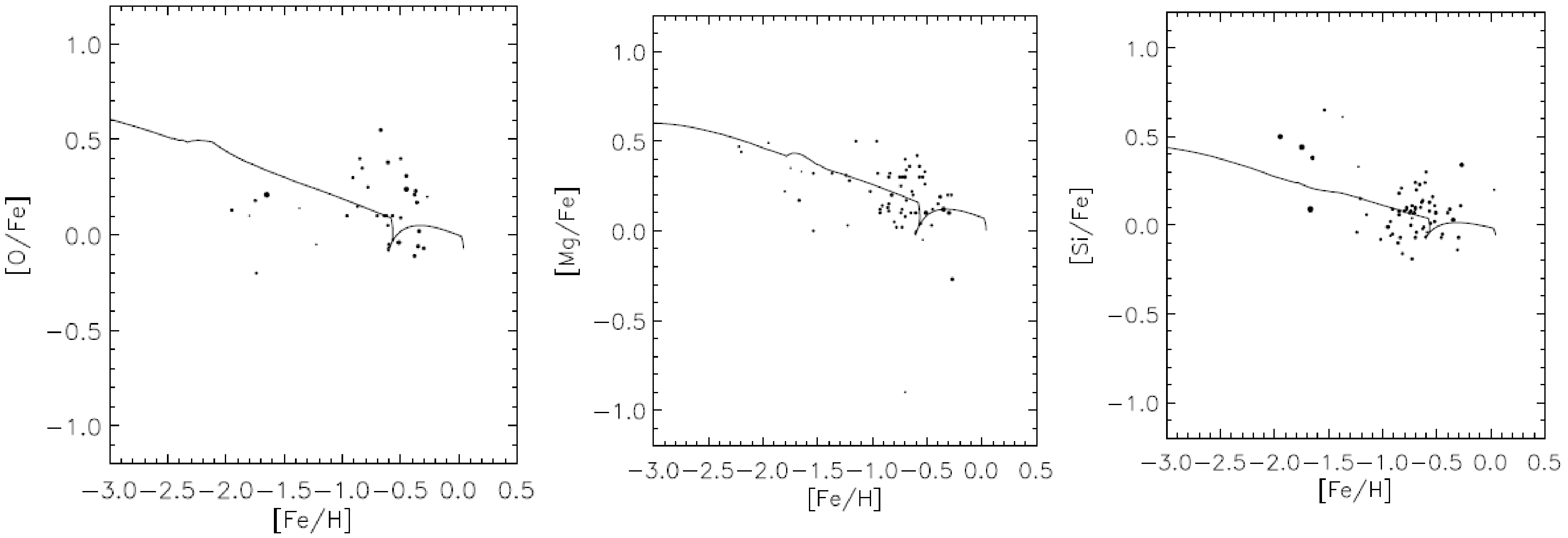
Abundances



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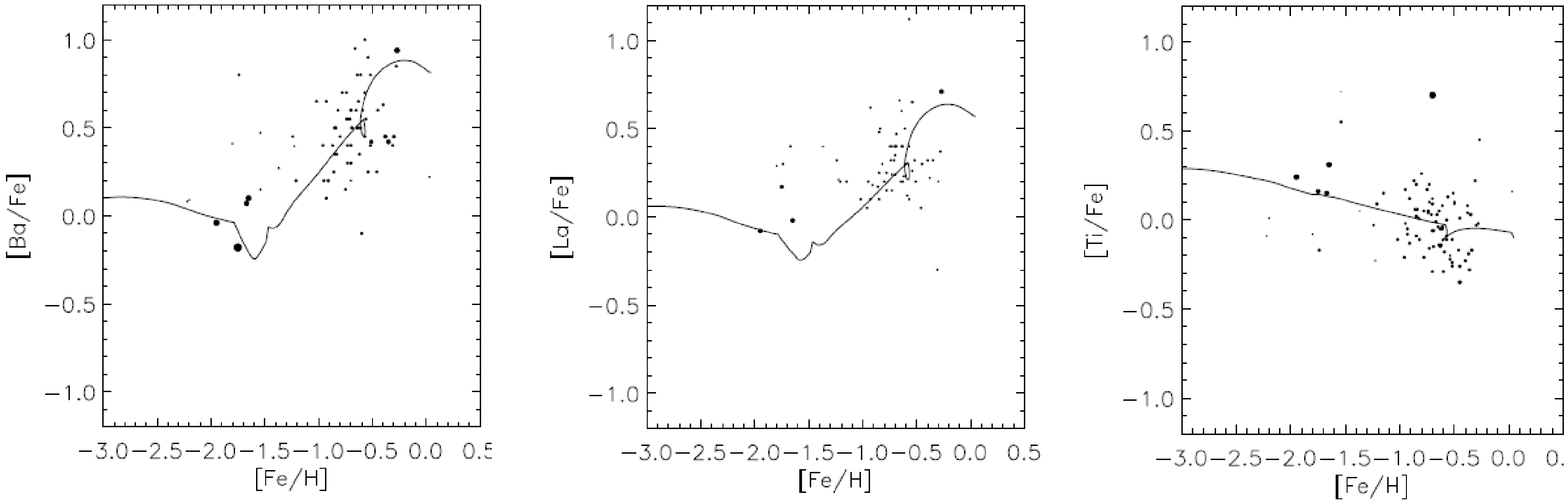
Abundances



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Summary & Perspectives

Disks:

Threshold is responsible for the spatial variation

Efficiency in the SFR can make the abundance gradient flatten or steepen along the chemical evolution of the galaxy.

M31 Bulge:

Formed very fast way with high efficiency (ν = 19.00 *Gyr*$^{-1}$) and small timescales for the infall of gas (0.21 *Gyrs)*

Magellanic Clouds:

First results are promising, work to do about yields to reproduce heavy elements.

Modelling the SMC

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