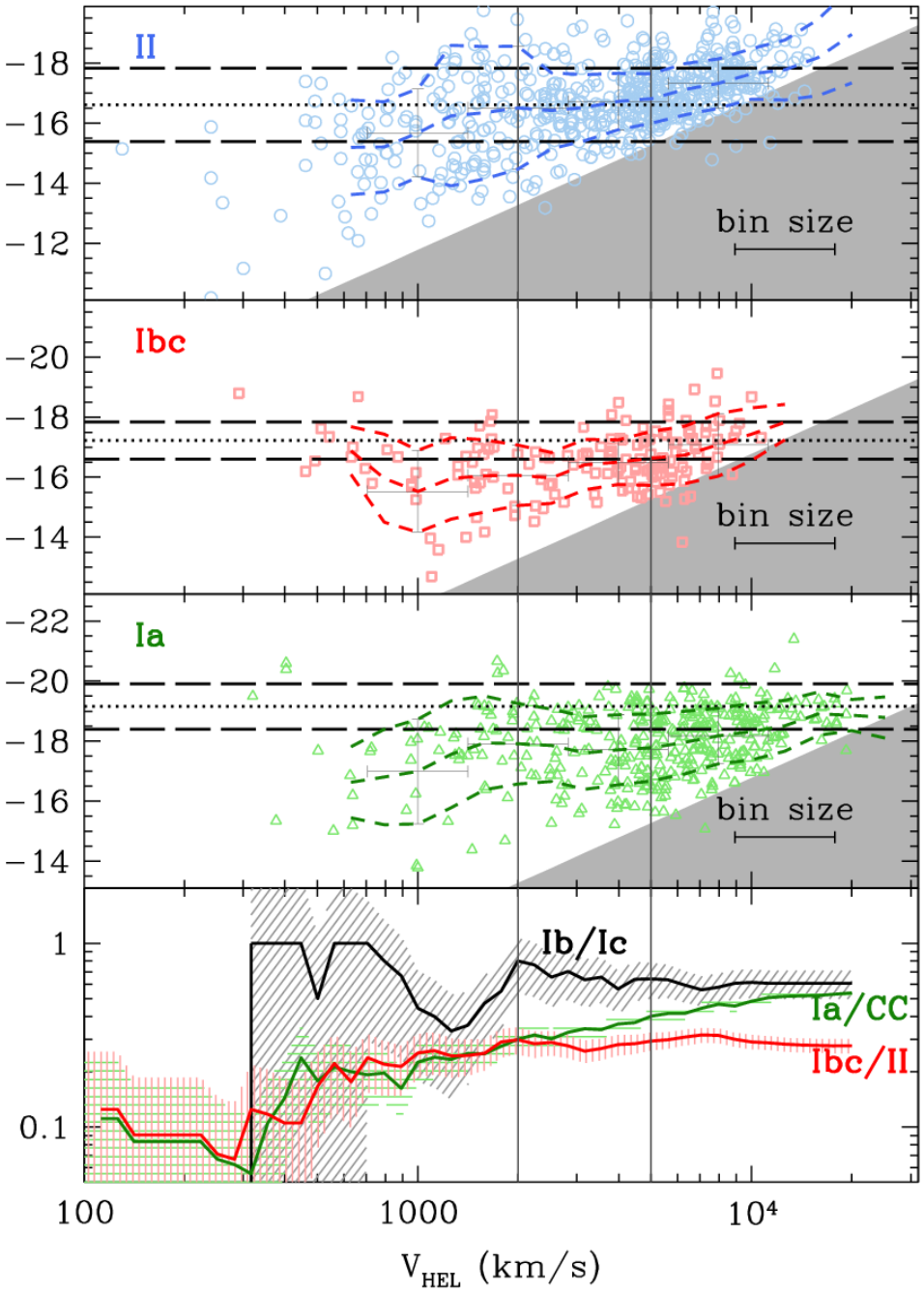
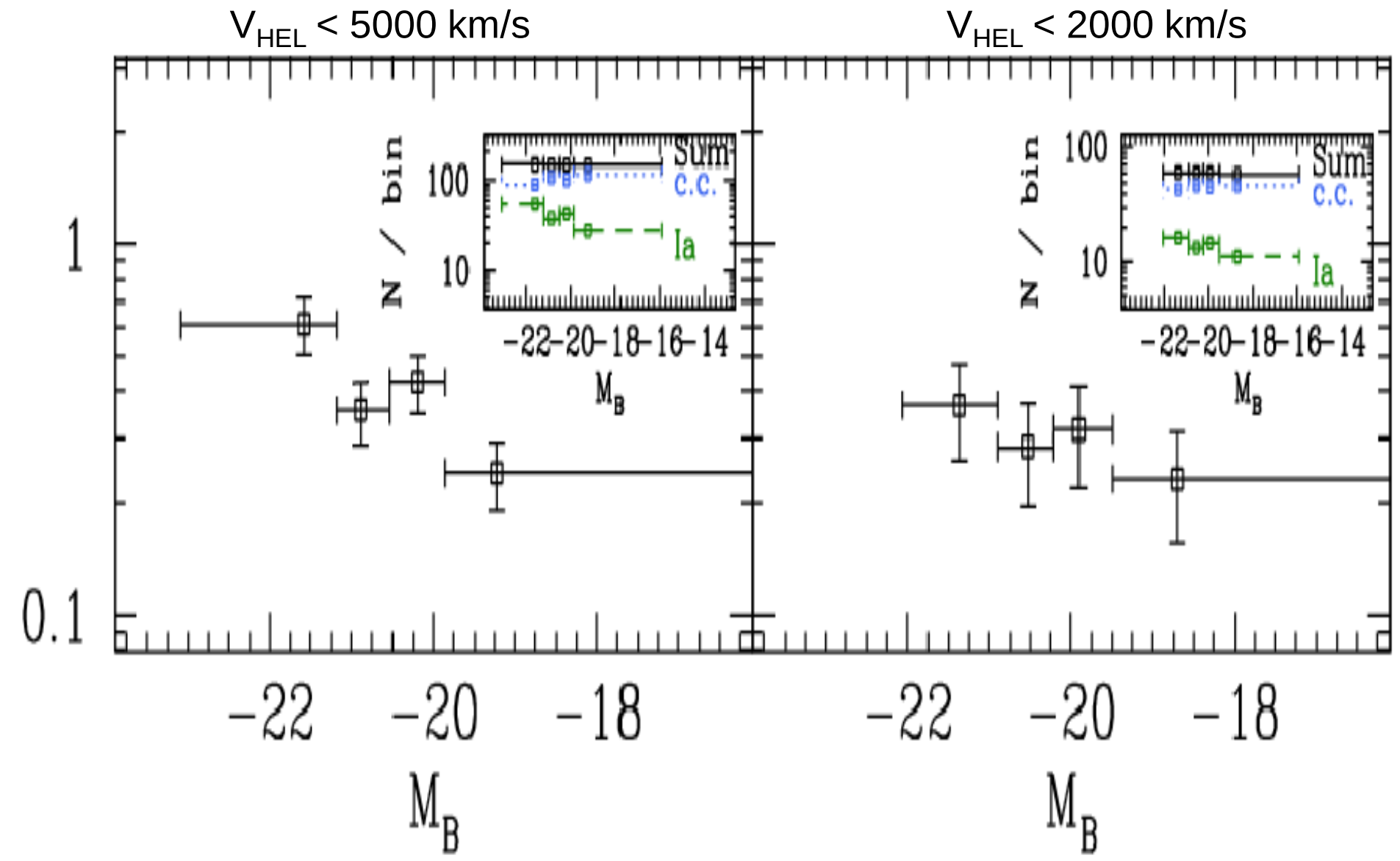
The SNIa/CCSN ratio as a function of metallicity

Boissier and Prantzos (2009)

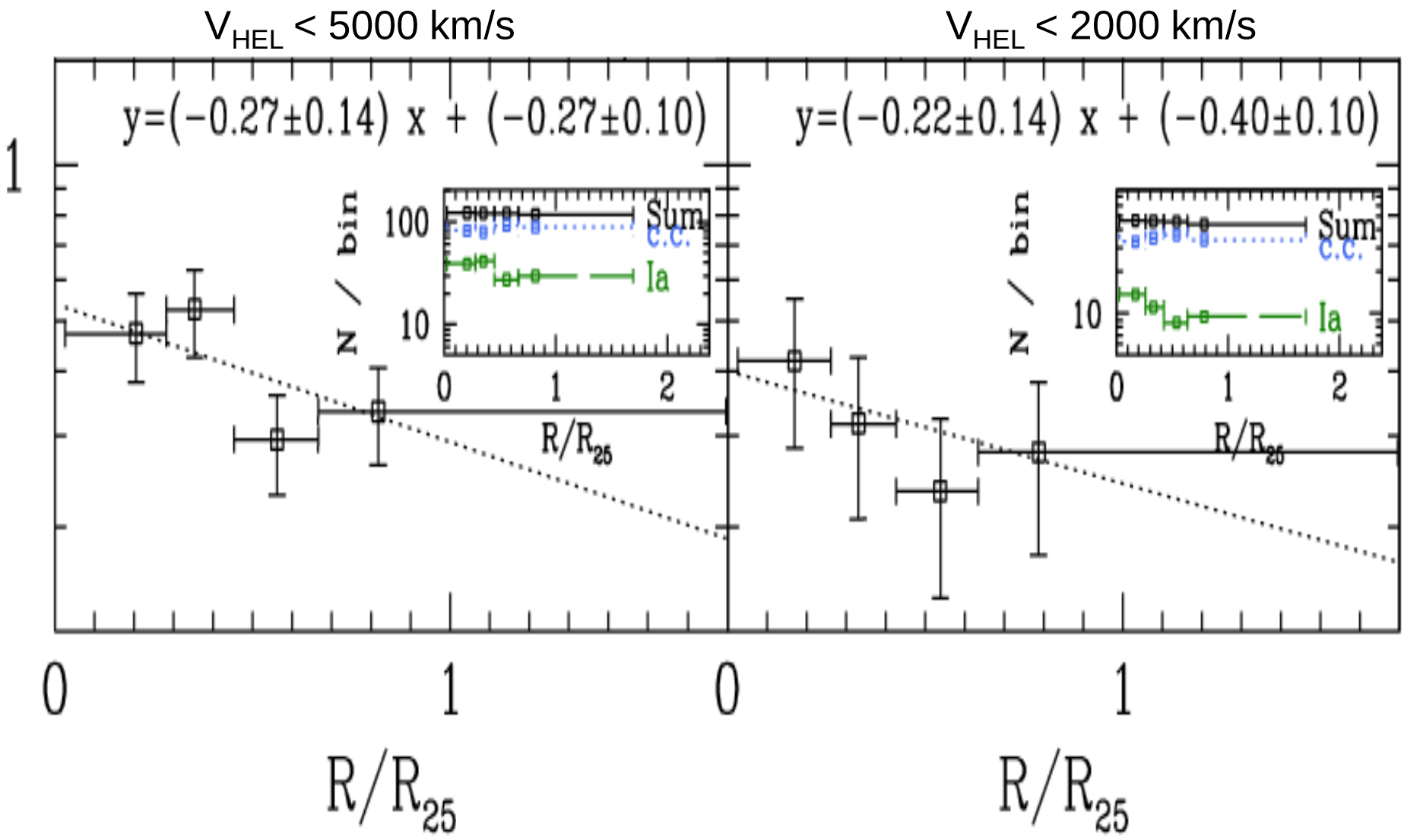


SN Type	Larger statistics $V_{HEL} < 5000$ km/s	Conservative $V_{HEL} < 2000$ km/s
Ic	49 (41)	18 (15)
Ib	32 (25)	15 (12)
Ibc	98 (79)	43 (36)
II	318 (239)	142 (96)
Ia	166 (132)	56 (42)
$N(Ibc)/N(II)$	0.31 ± 0.04	0.30 ± 0.05
$N(Ic)/N(Ib)$	1.53 ± 0.35	1.20 ± 0.42
$N(Ia)/N(CC)$	0.40 ± 0.04	0.30 ± 0.05

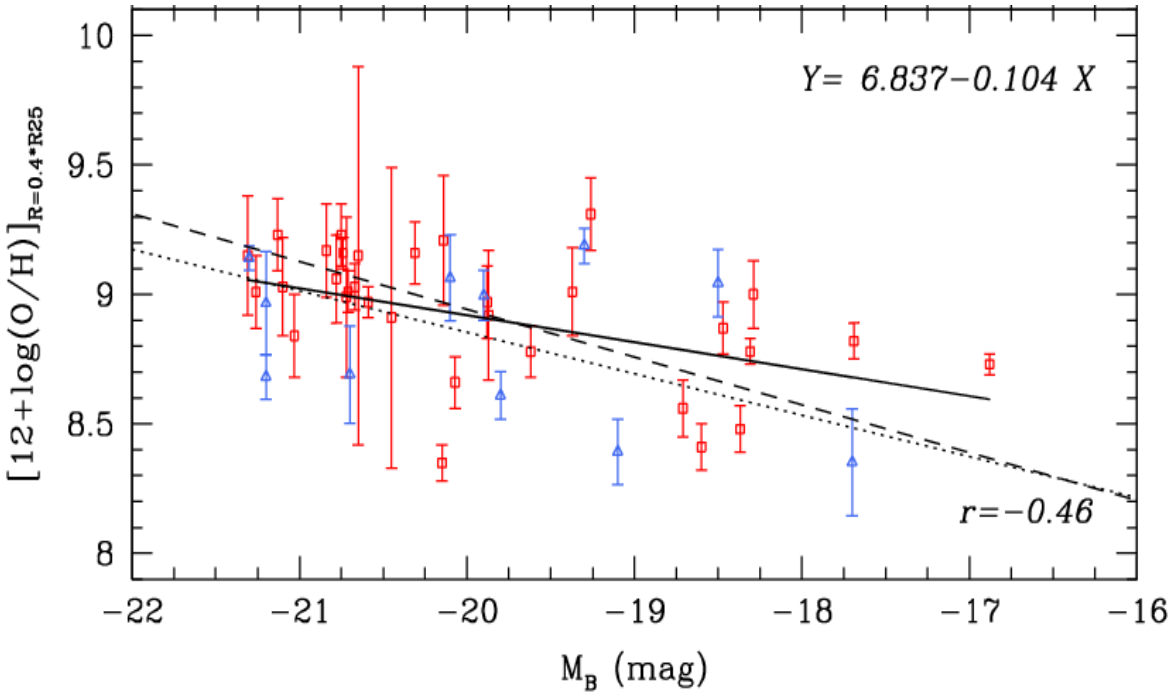
A correlation of SNIa/CCSN ratio with host galaxy magnitude



A correlation of SNIa/CCSN ratio with radial position in host galaxy

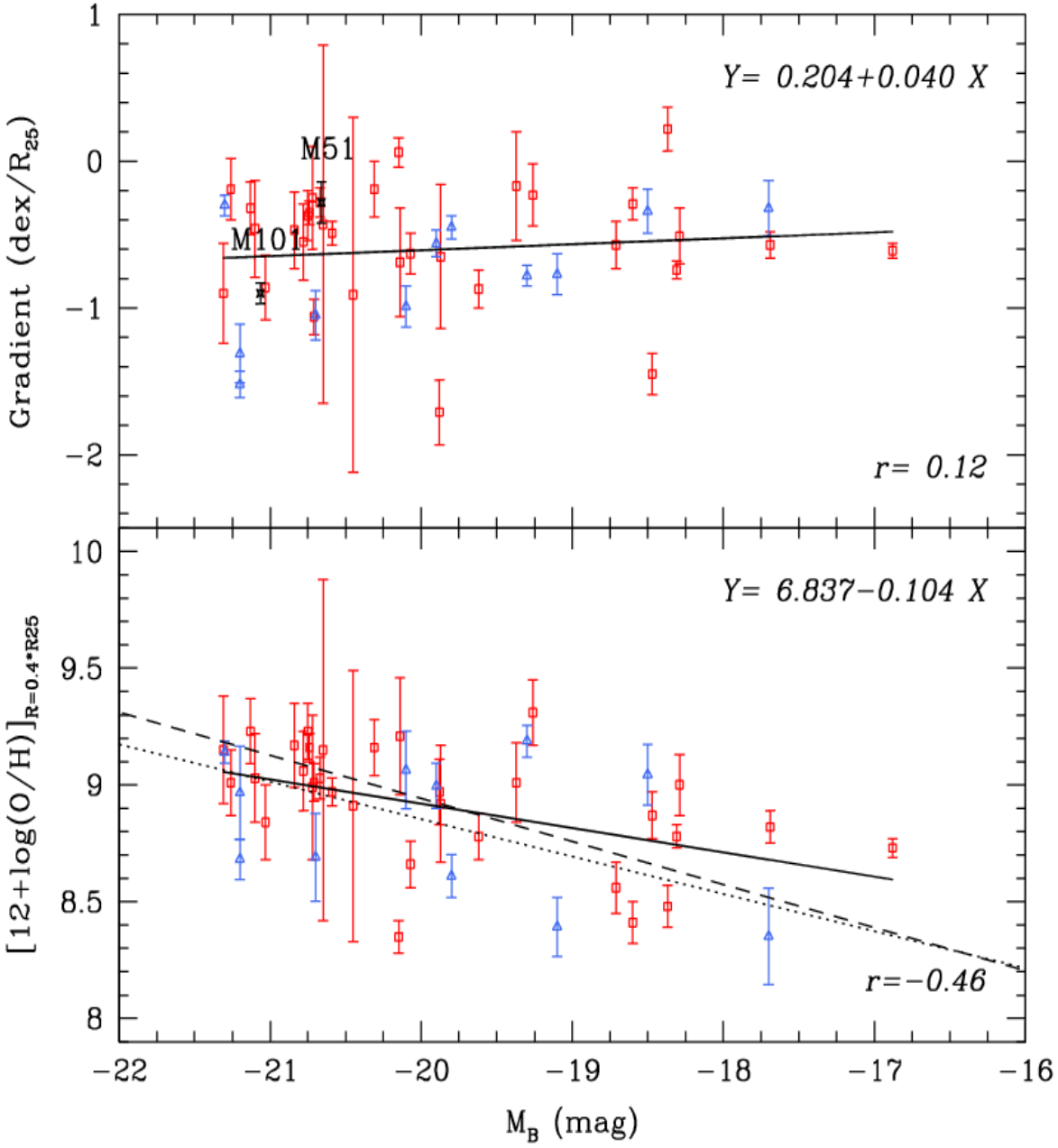


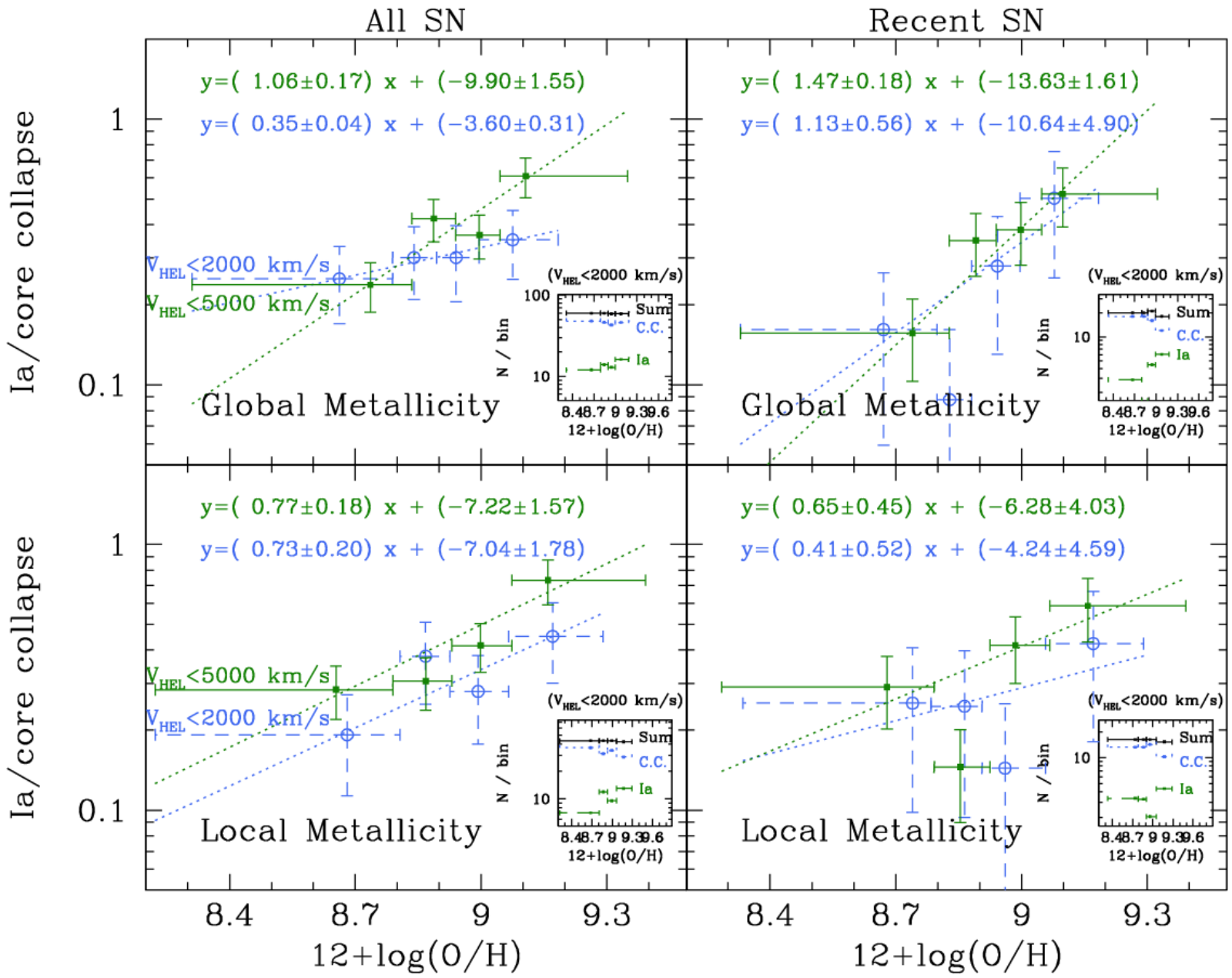
By using the
metallicity vs luminosity
relation (*bottom*)
one may correlate the
SNIa/CCSN ratio to the
global galaxian metallicity
(Prantzos and Boissier 2003)



By using the
metallicity gradient vs luminosity
relation (*top*)
one may correlate the
SNIa/CCSN ratio to the
local galaxian metallicity
(Boissier and Prantzos 2009)

By using the
metallicity vs luminosity
relation (*bottom*)
one may correlate the
SNIa/CCSN ratio to the
global galaxian metallicity
(Prantzos and Boissier 2003)





A correlation of SNIa/CCSN ratio with host galaxy metallicity, global and local

A correlation of SNIa/CCSN ratio with metallicity

NOT a causal relation : *metallicity does NOT affect the SNIa/CCSN ratio*

Both metallicity and SNIa/CCSN are high

in regions which have undergone

substantial processing (star formation)

and now have

small *gas fraction* and

low *specific star formation rate* (SFR/M_{stars})

$$R(CC) = \kappa \ \Psi$$

Ψ = Star formation rate

$$R(Ia) = \alpha\Psi + \beta \mathrm{M}_*$$

Scannapieco and Bildsten 2005

$$\frac{R(Ia)}{R(CC)} = A + B \ \frac{\mathrm{M}_*}{\Psi}$$

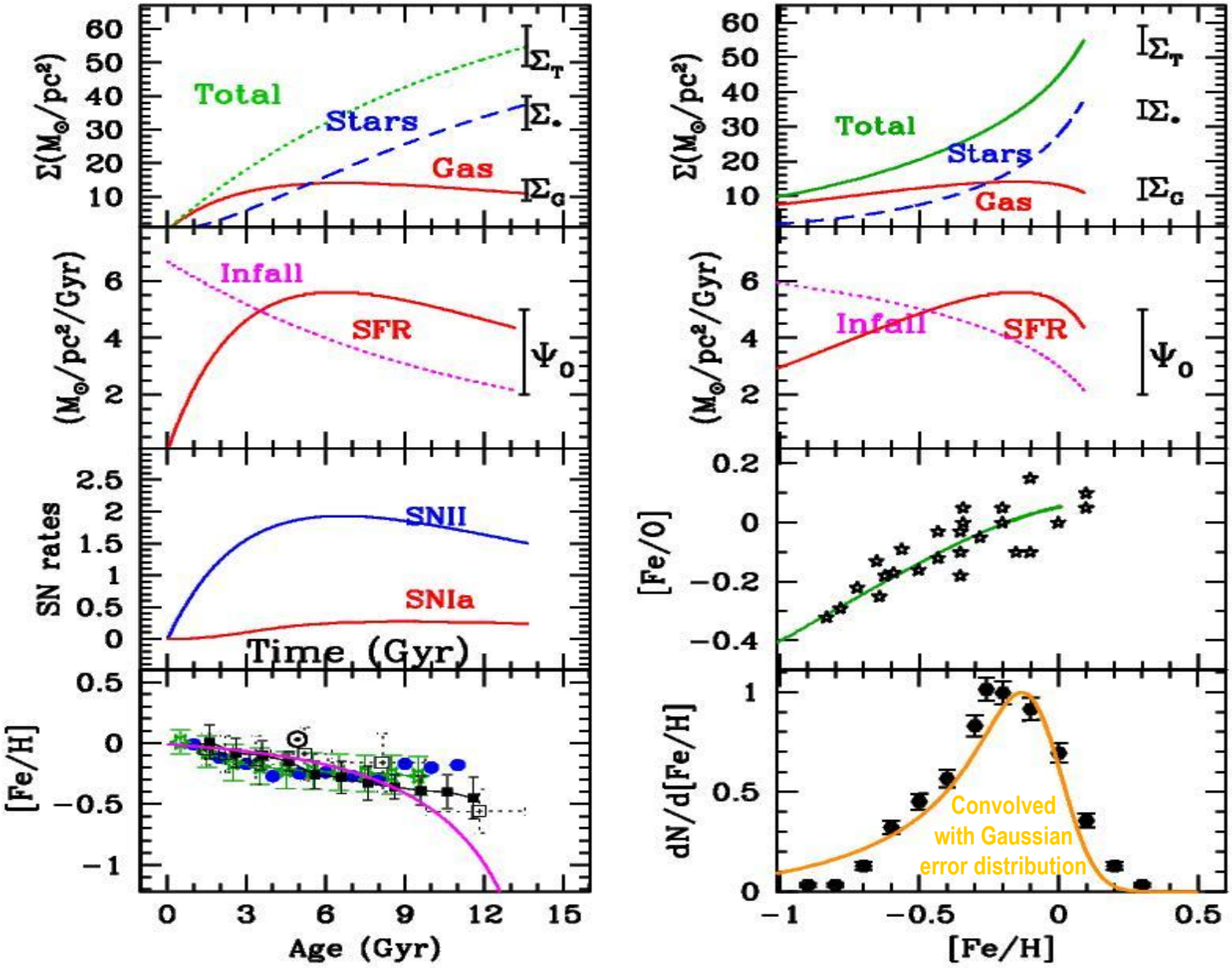
The more massive a galaxy, the lower is its gas fraction $g=M_g/(M_g+M_*)$ and the lower its Specific star formation rate Ψ / M_*

More massive galaxies have then

- higher metallicities $Z=y\ ln(1/g)$ (because their gas is more processed)

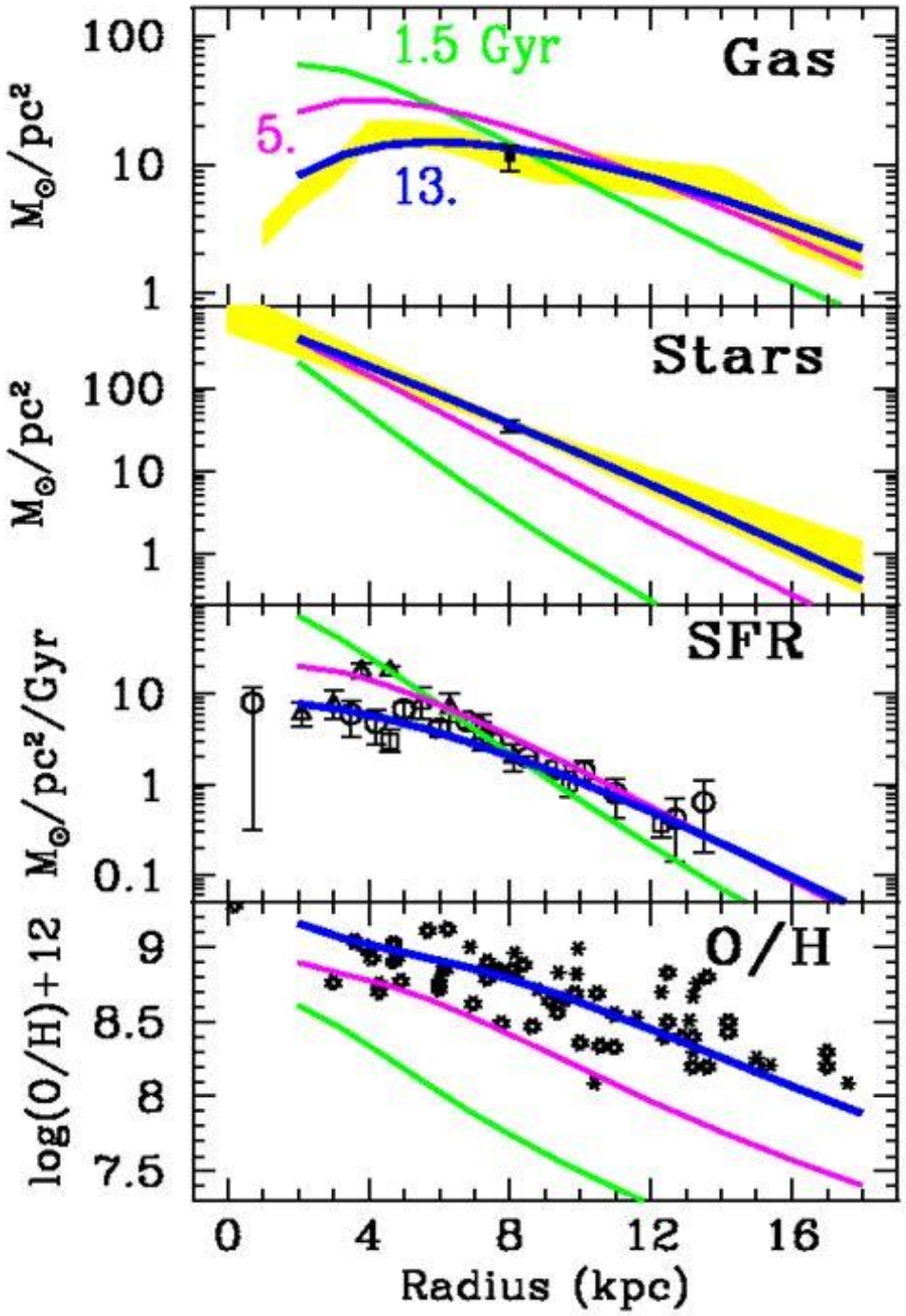
- and higher $R(Ia)/R(CC)$ ratios (for the same reason)

The Solar Neighborhood

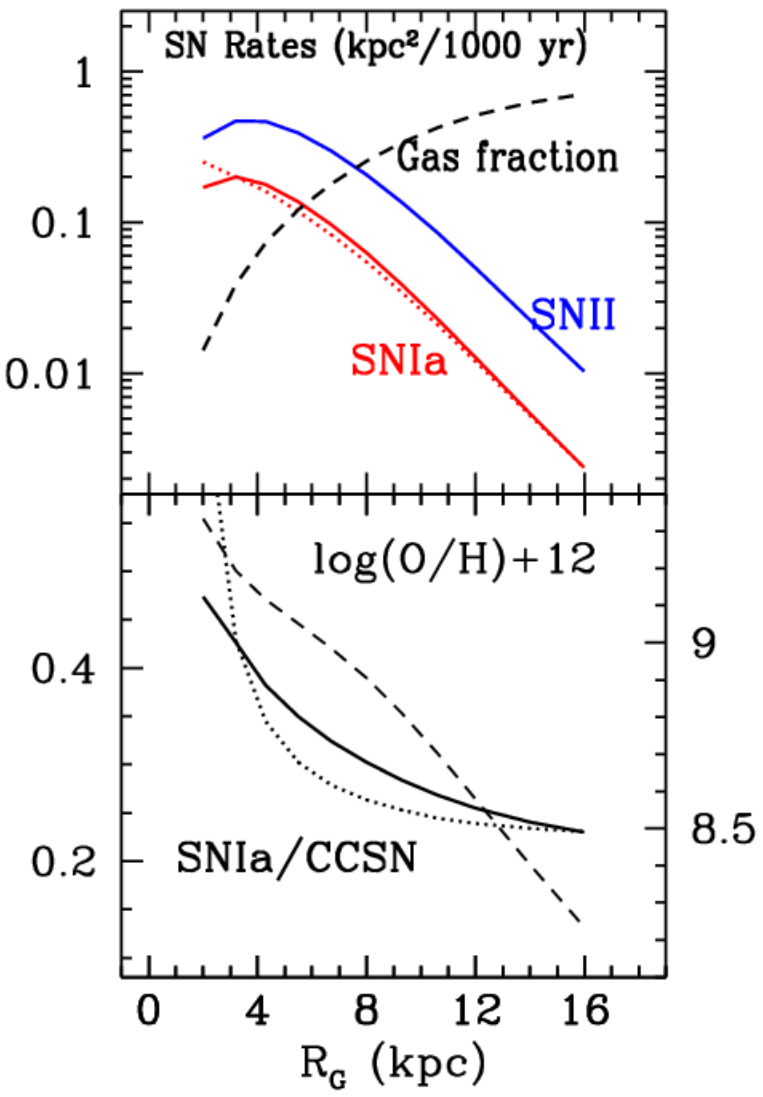


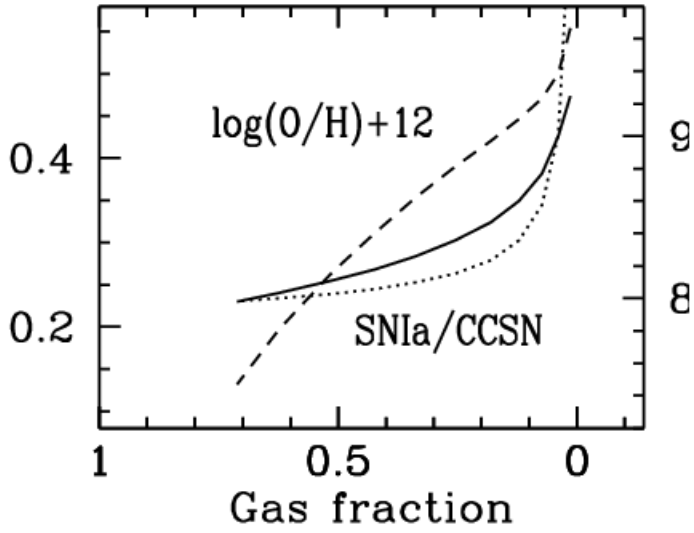
SLOW INFALL (τ = 7-8 Gyr) to fix G- (or M- or K-) dwarf problem *(metallicity distribution)*
and SNIa to account for [Fe/O] evolution

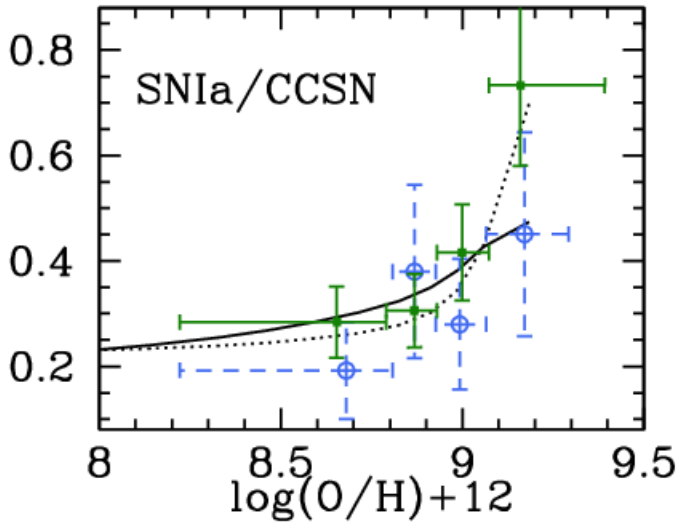
Chemical evolution of the Milky Way disk



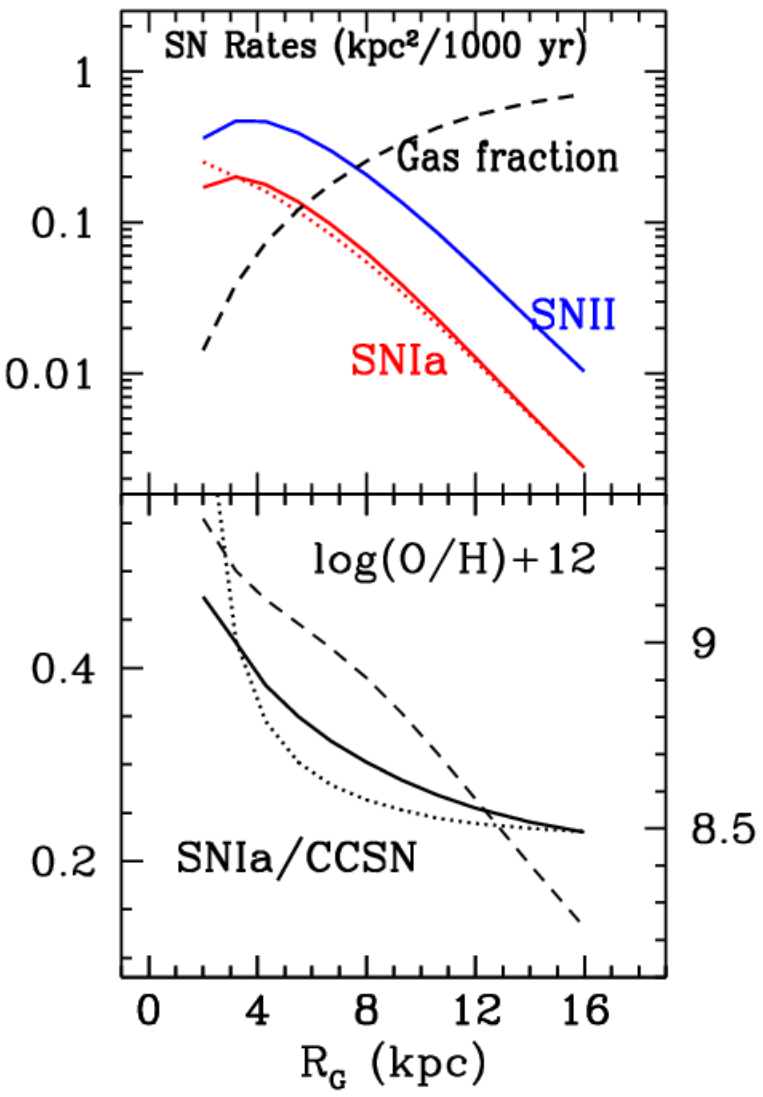
The SNIa/CCSN ratio and the metallicity are higher in regions of lower gas fraction (which are more chemically processed)

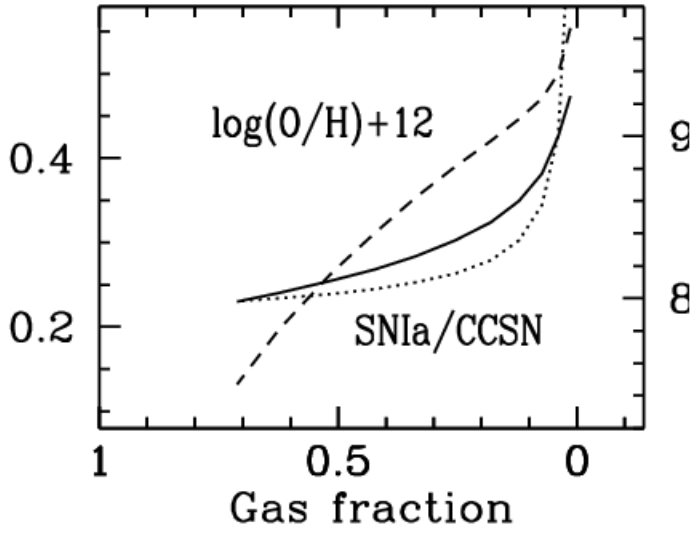


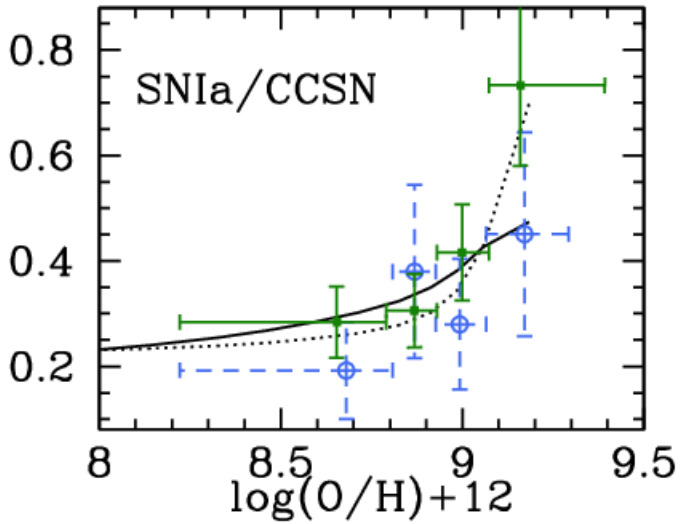




The SNIa/CCSN ratio and the metallicity are higher in regions of lower gas fraction (which are more chemically processed)







This leads to a correlation between SNIa/CCSN and metallicity, as observed in external galaxies (*Boissier and Prantzos 2009)*