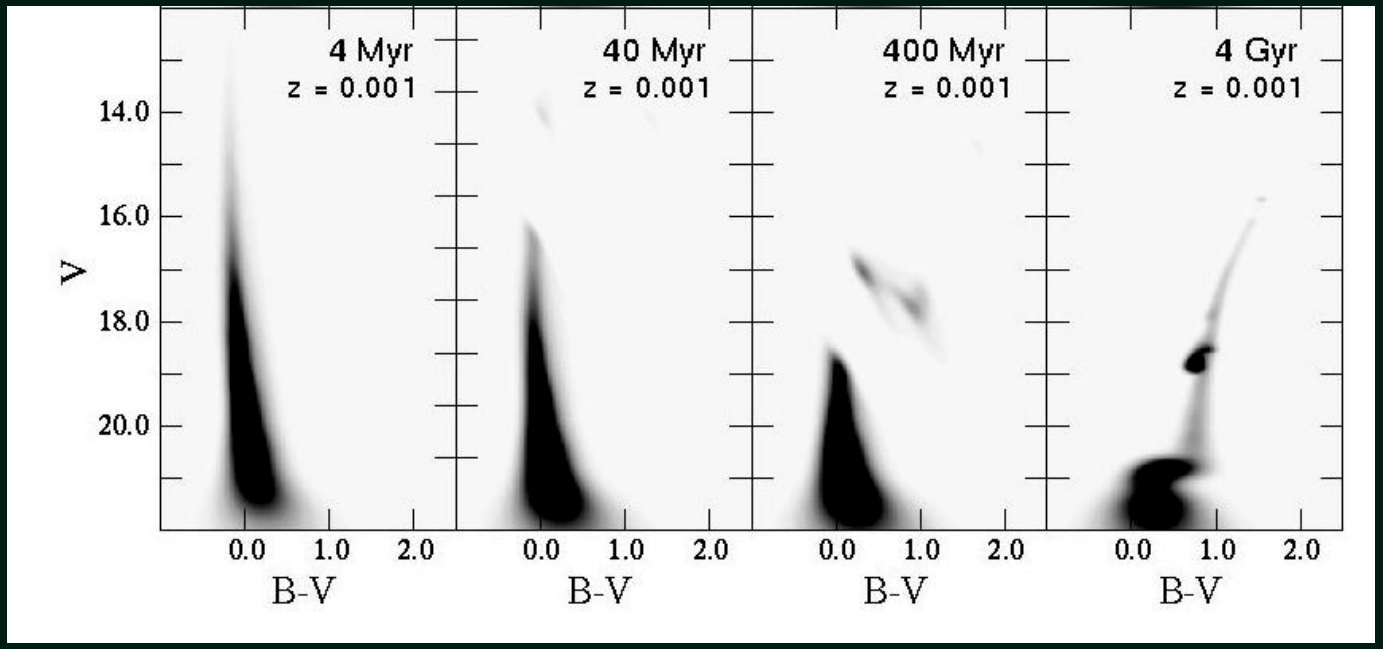
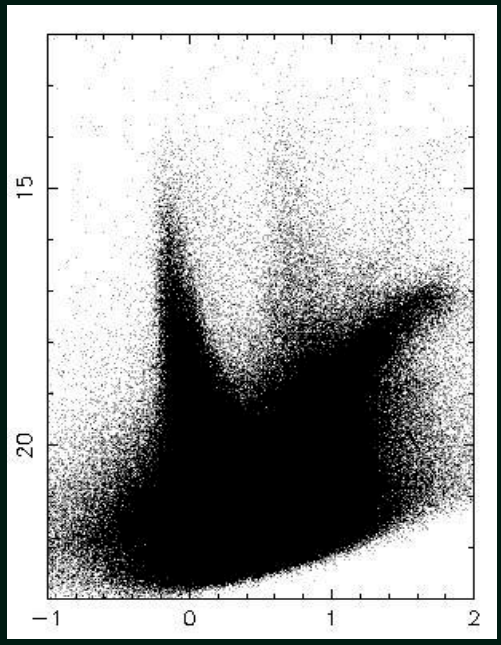
Galaxy evolution in a locally dense environment: the samall Magellanic cloud

Galaxy Evolution in a Locally Dense Environment: The Small Magellanic Cloud

Does local environment play a role?
Can we quantify its effect?

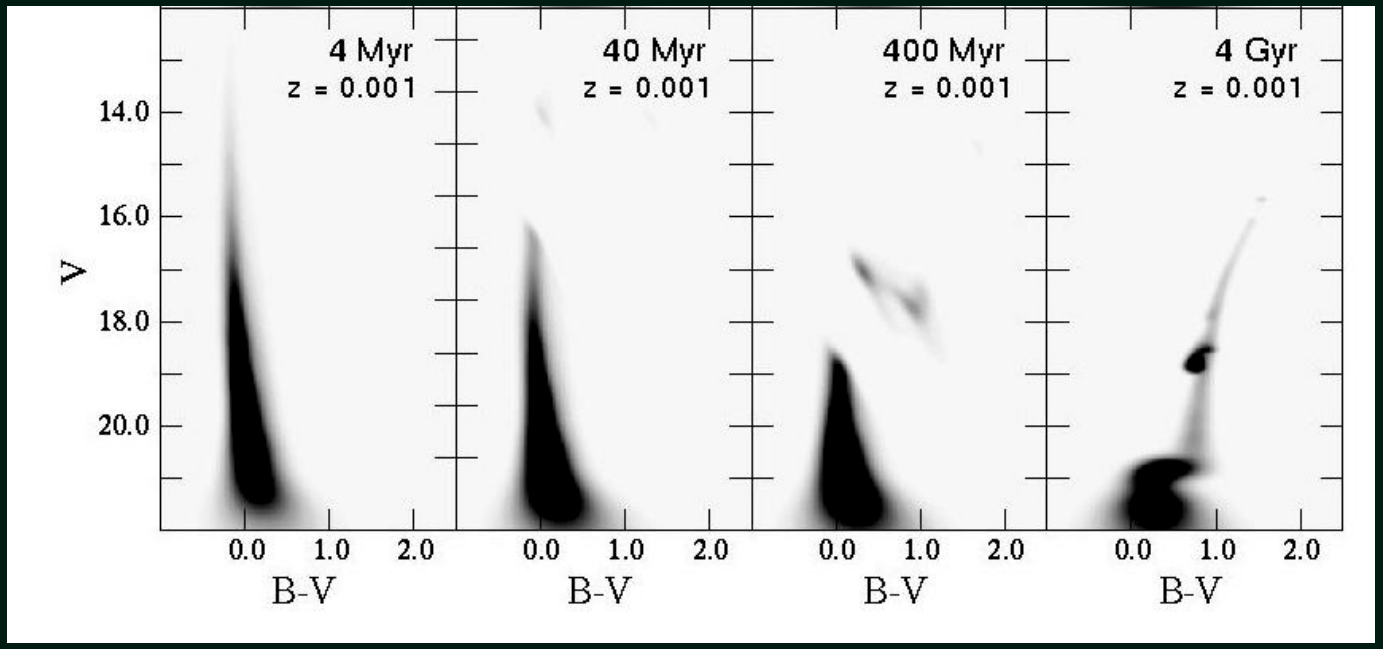
in collaboration with Jason Harris

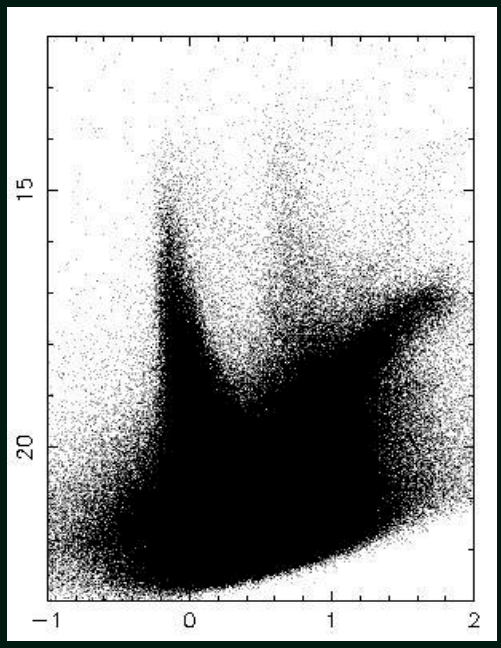




A(CMD1) + B(CMD2) + C(CMD3) + ... = observed

where A, B, C, ... are the star formation history





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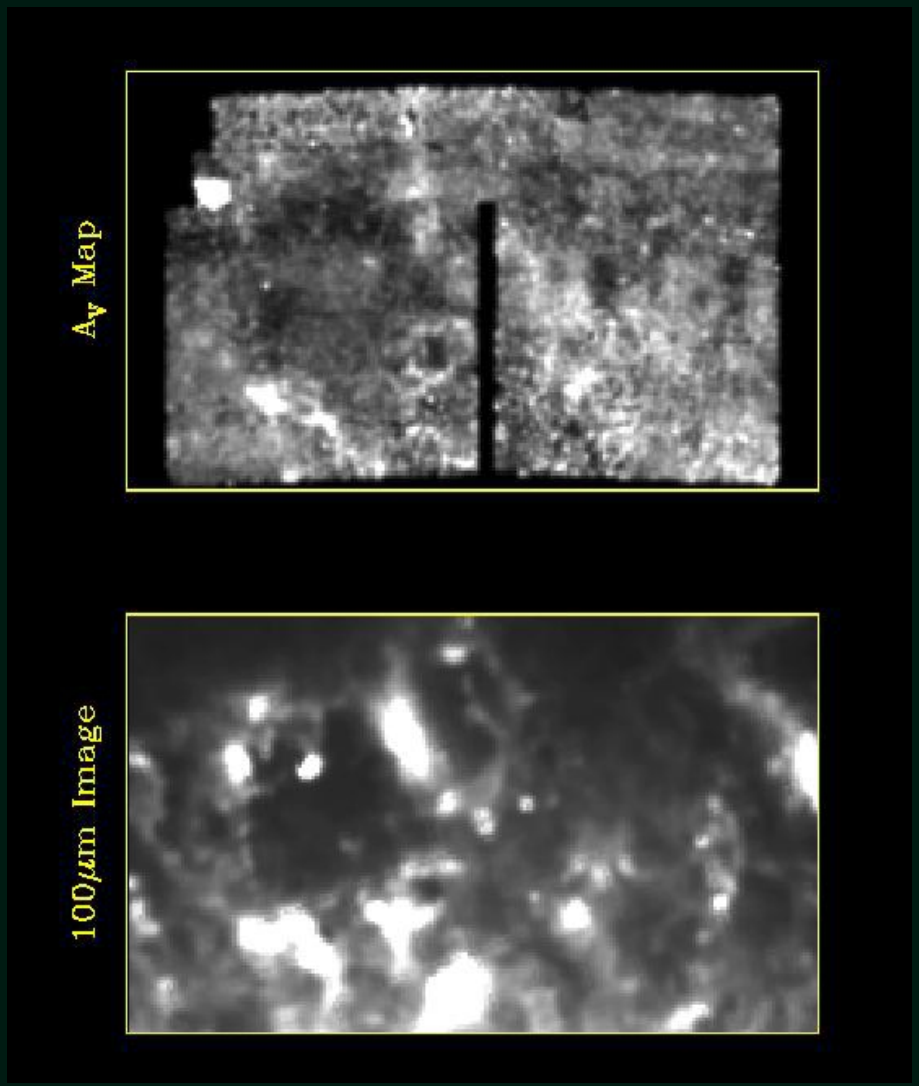
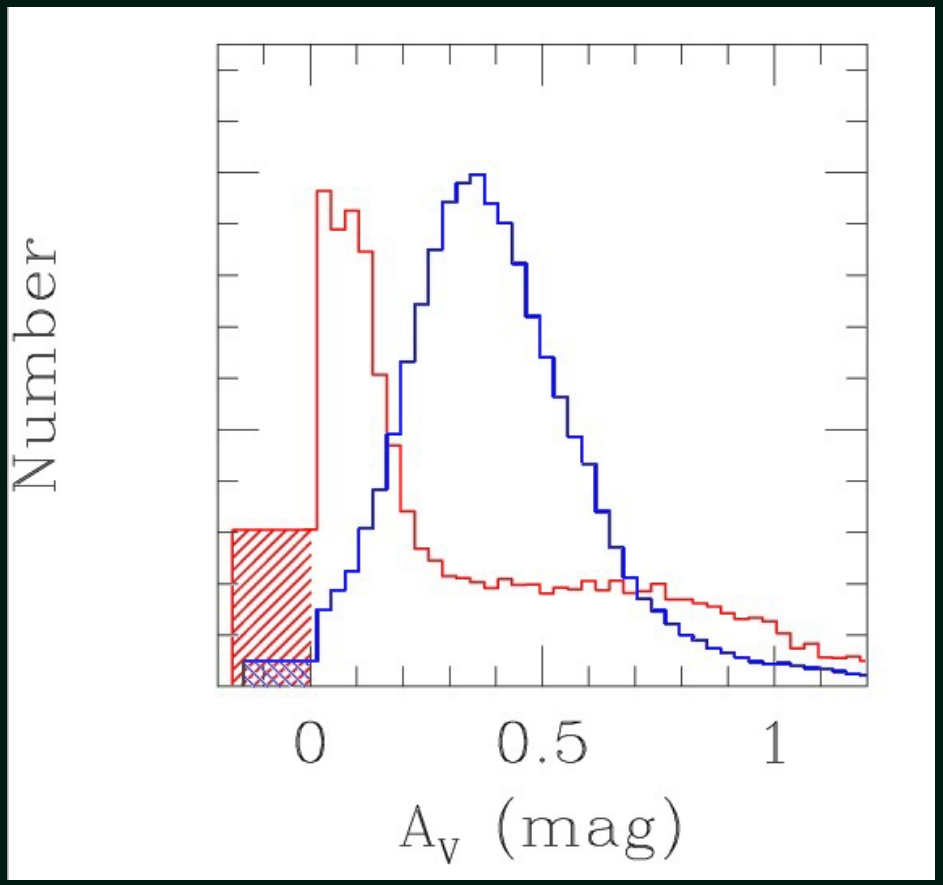
where A, B, C, ... are the star formation history

photometric uncertainties, completeness, crowding, extinction, binarity, model libraries, line-of-sight depth, distance, dynamical mixing, foreground, IMF

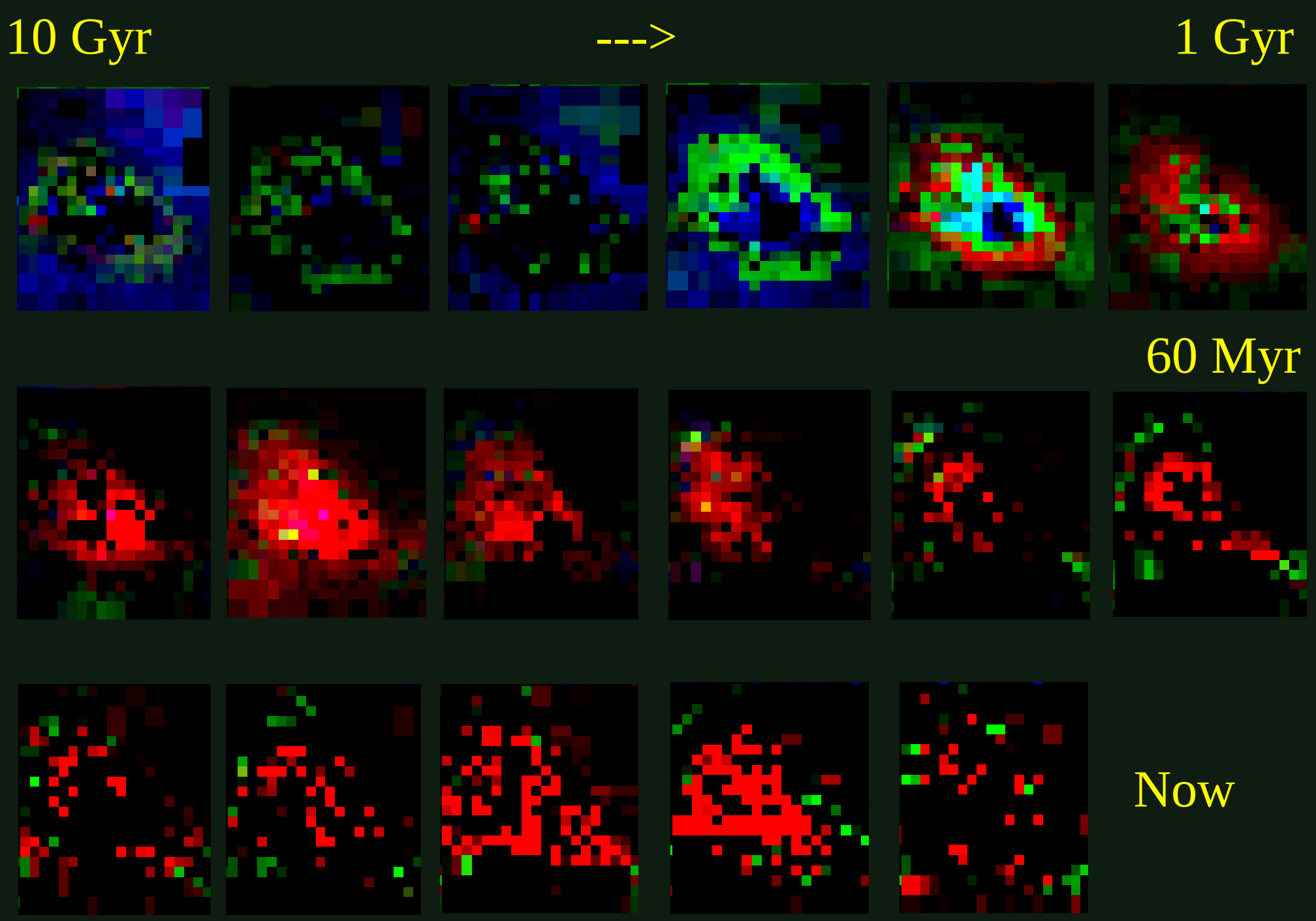
Extinction is ...

spatially variable

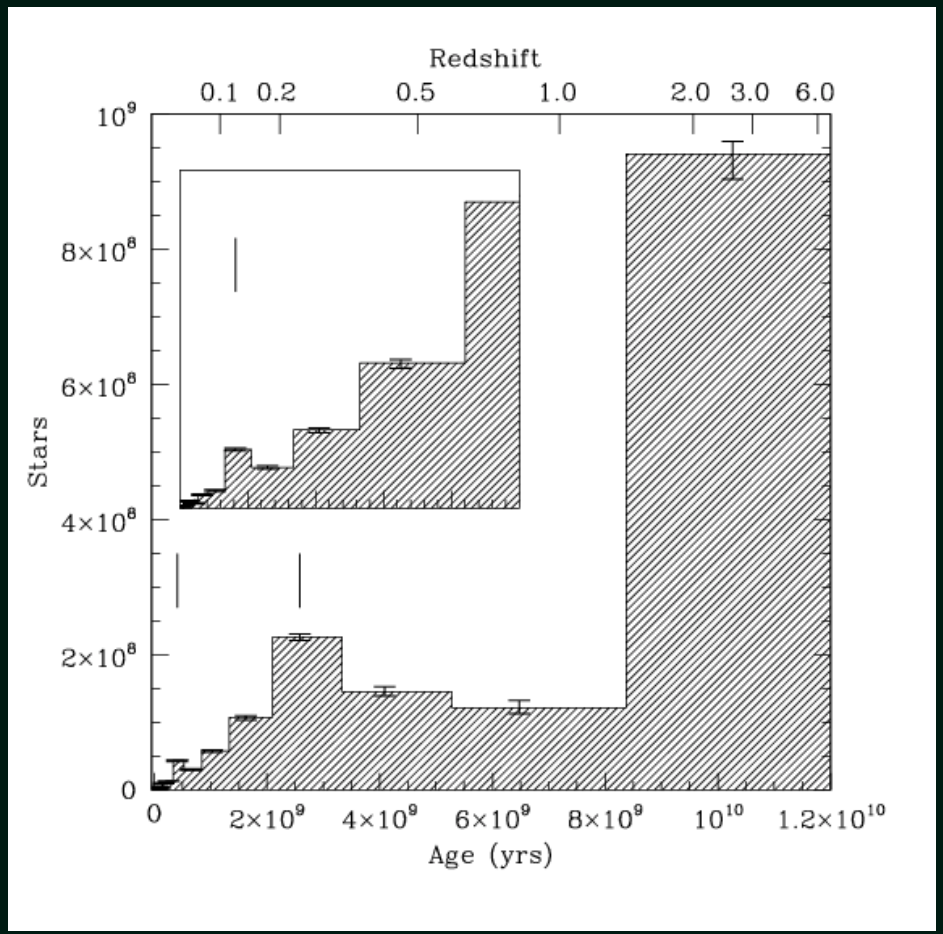


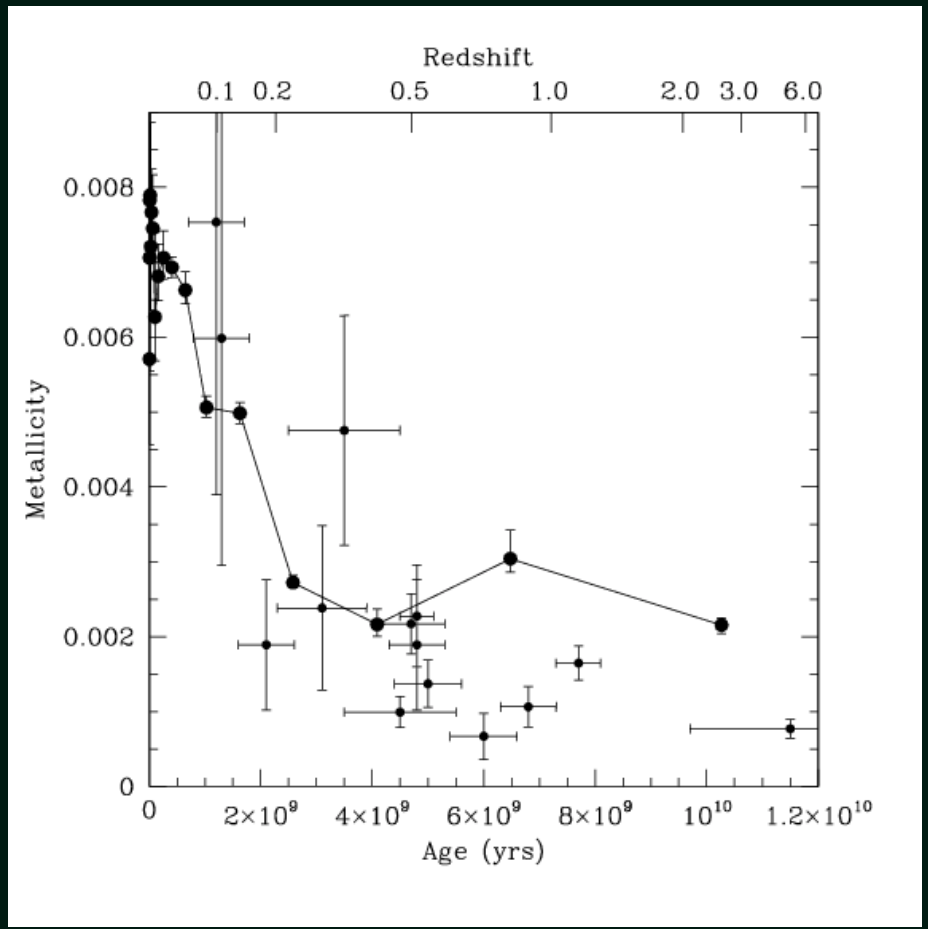


population dependent


10 Gyr
--->
1 Gyr
60 Myr
Now

The SMC star formation and...





chemical enrichment history

Begin with simple model

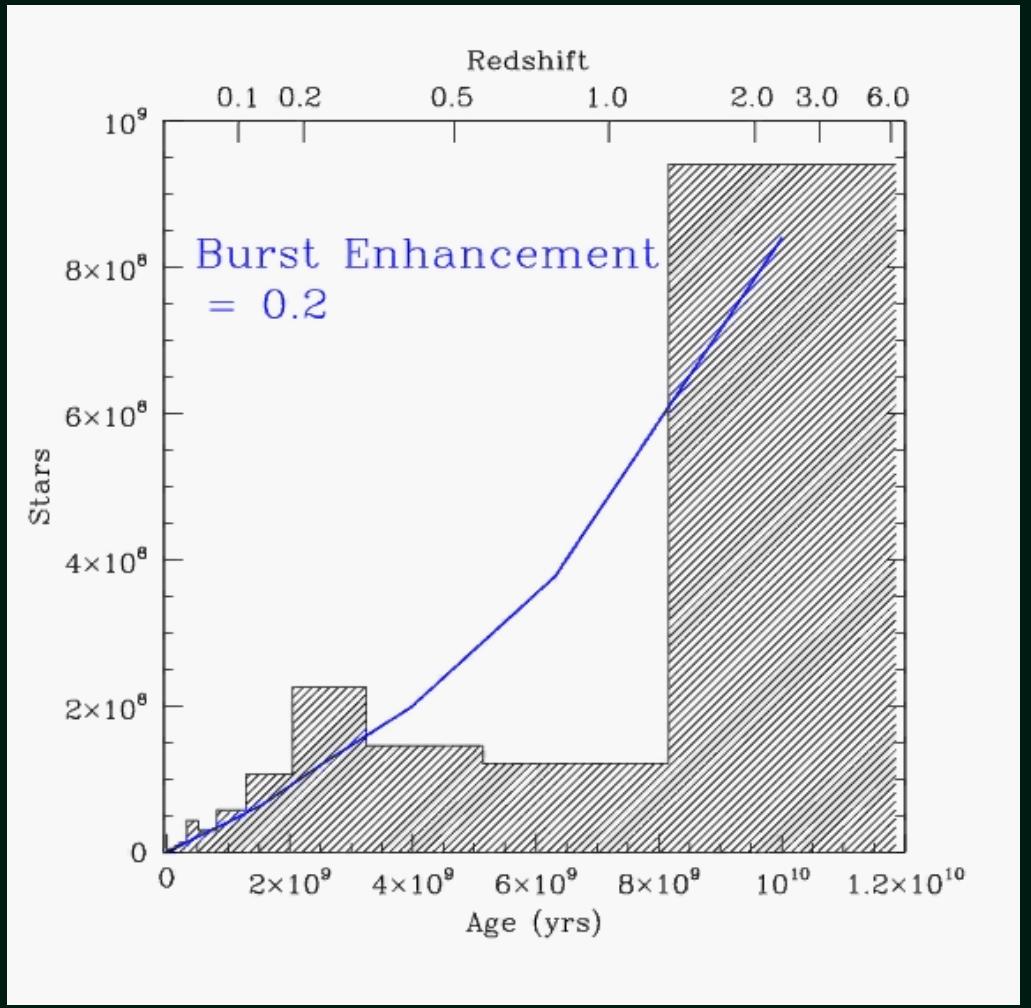
closed-box, instantaneous recycling

enhancement of SFR α $1/r^n$

orbit given by proper motion

(Lin, Klemola, & Jones 1995)

must match stellar mass and remaining gas



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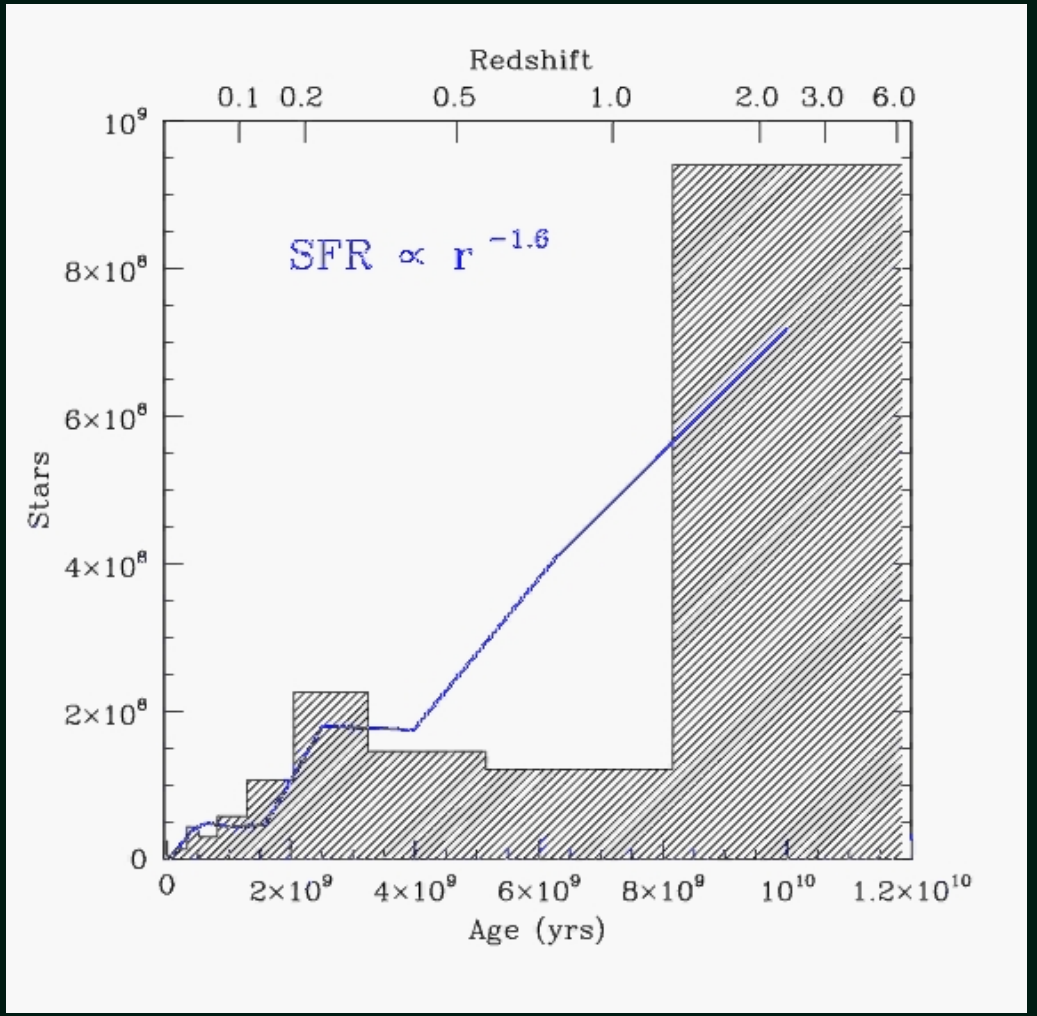
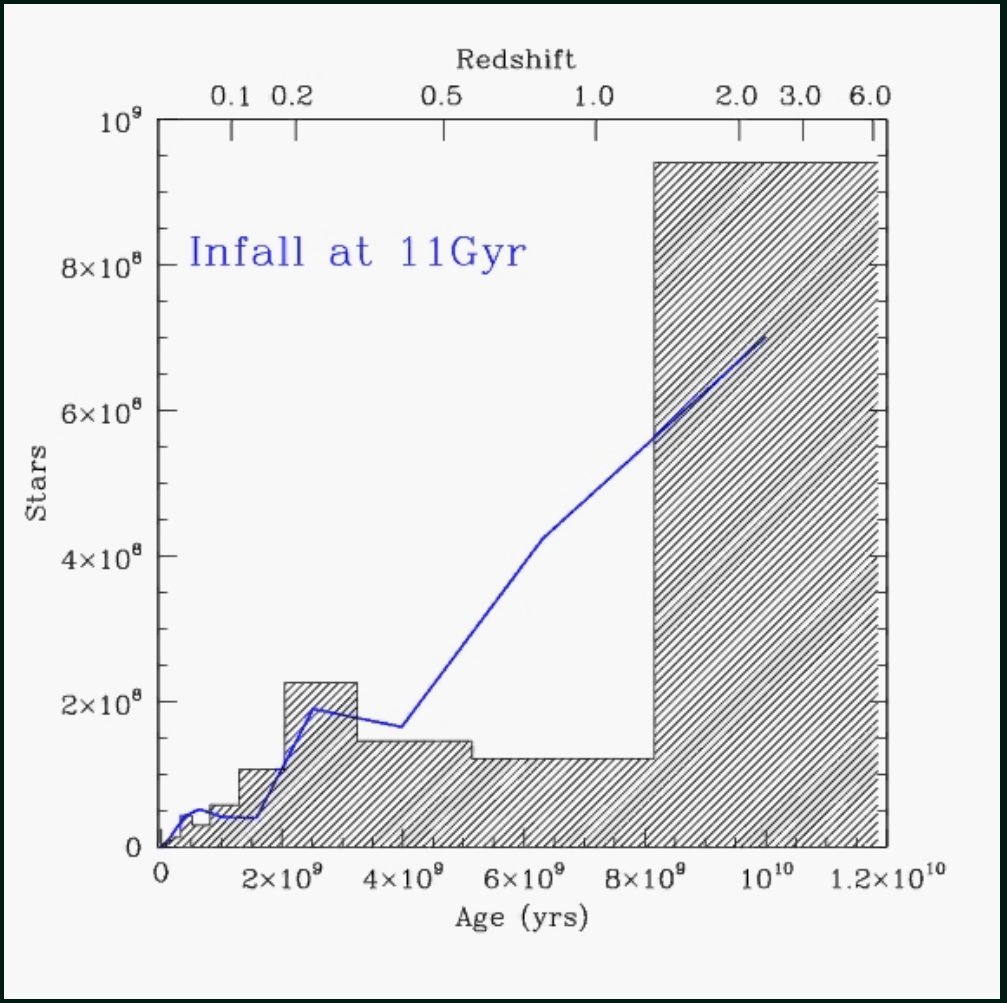
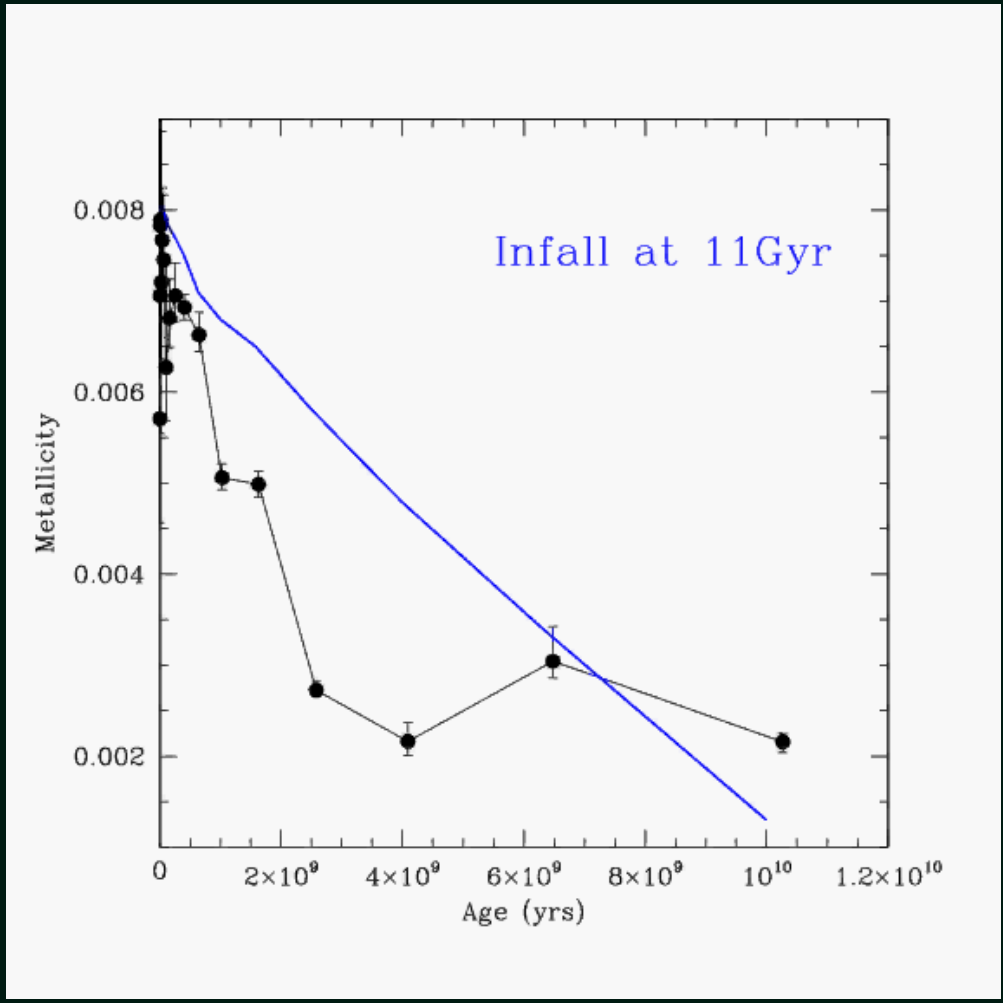


The Case for Infall





Does adding an infall event help?

Best Fit Parameters

tidal exponent = 4.6 [2.8,7.0)
tidal enhancement amplitude = 1.2 [1.0,1.6]

time of infall ~ 4 Gyr
mass fraction ~ 0.4 - 0.5

fraction of stars from triggered mode 10-70%

~ 5% of SMC stars formed in last Gyr

Conclusions:

Q: Does local environment affect galaxy evolution?
A: yes (SFH, morphology)

Q: Is the effect quantifiable?
A: yes (it is “impulsive”, it is dominant for SMC near pericenter, it can account for significant fraction of the total pop)

Q: Is the model transferable?
A: Unkown - depends on ability to scale and relative importance of other factors