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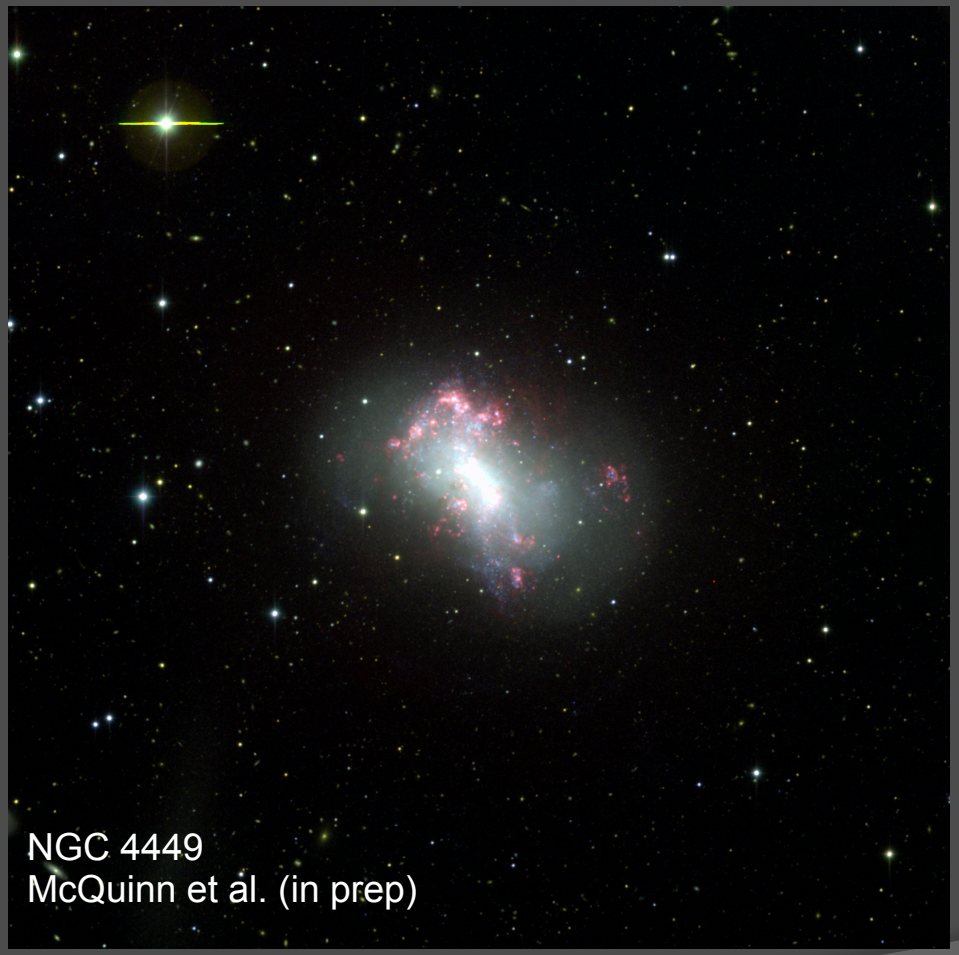
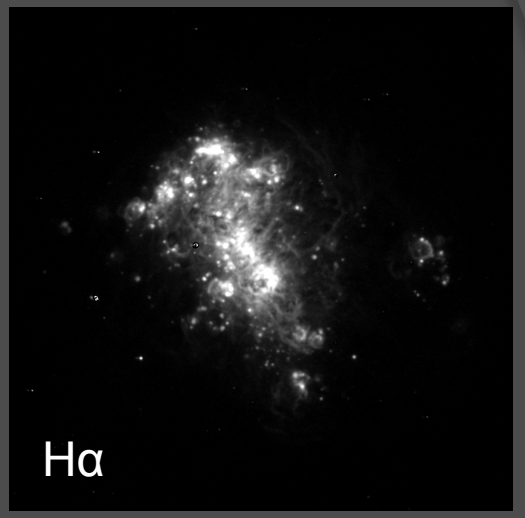
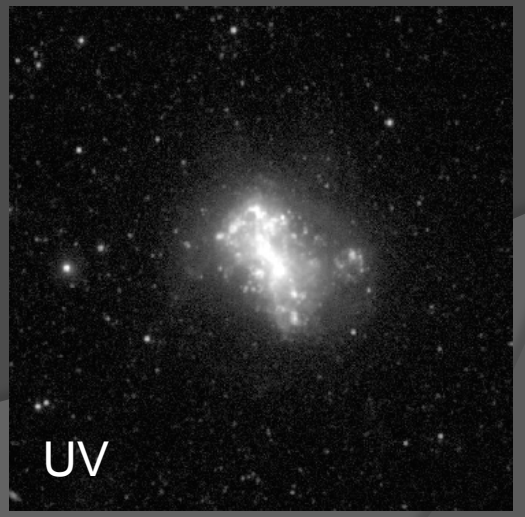
April 12, 2016

ARE WE CORRECTLY MEASURING THE STAR FORMATION IN GALAXIES?

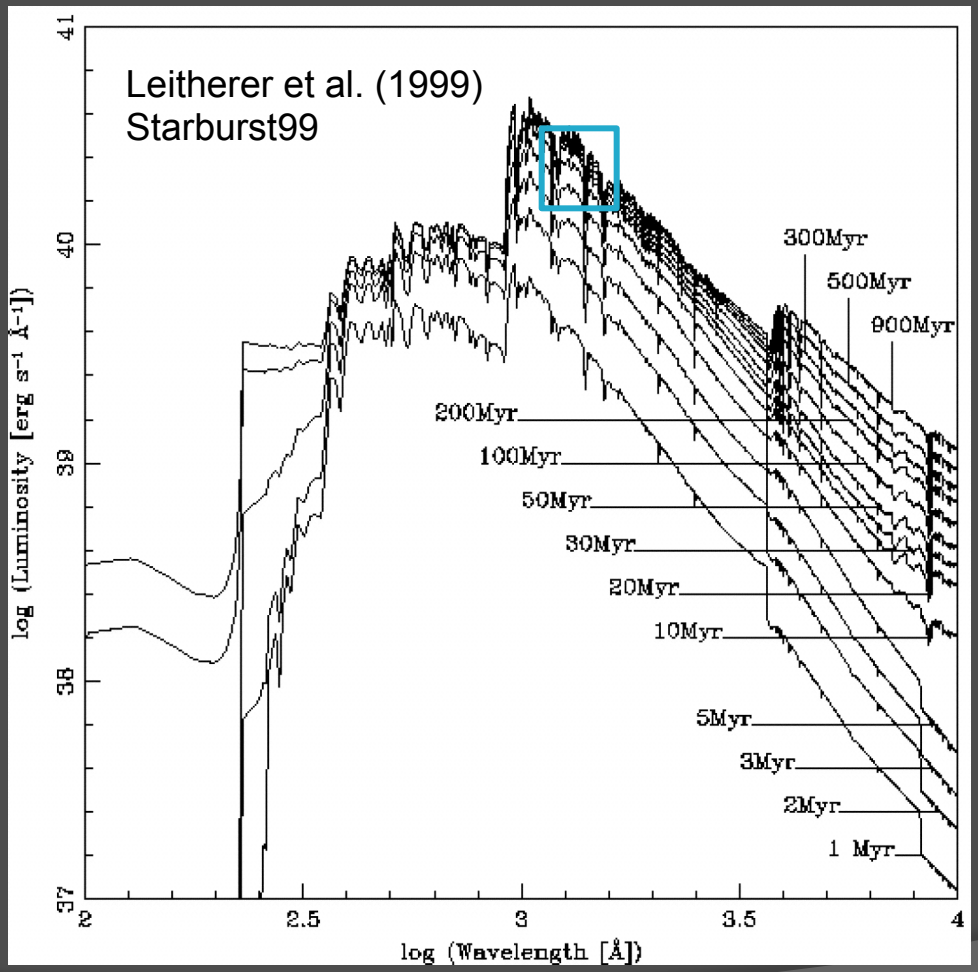
SFRs from Integrated light







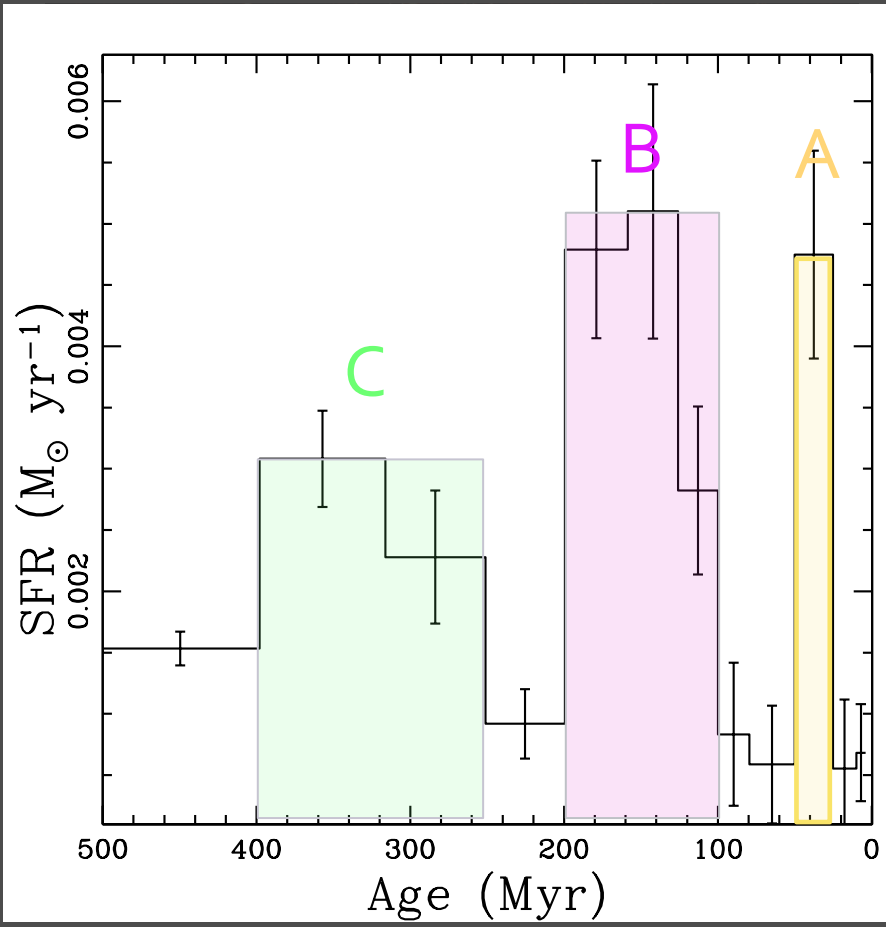
Synthetic spectra are used to calibrate the UV SFRs

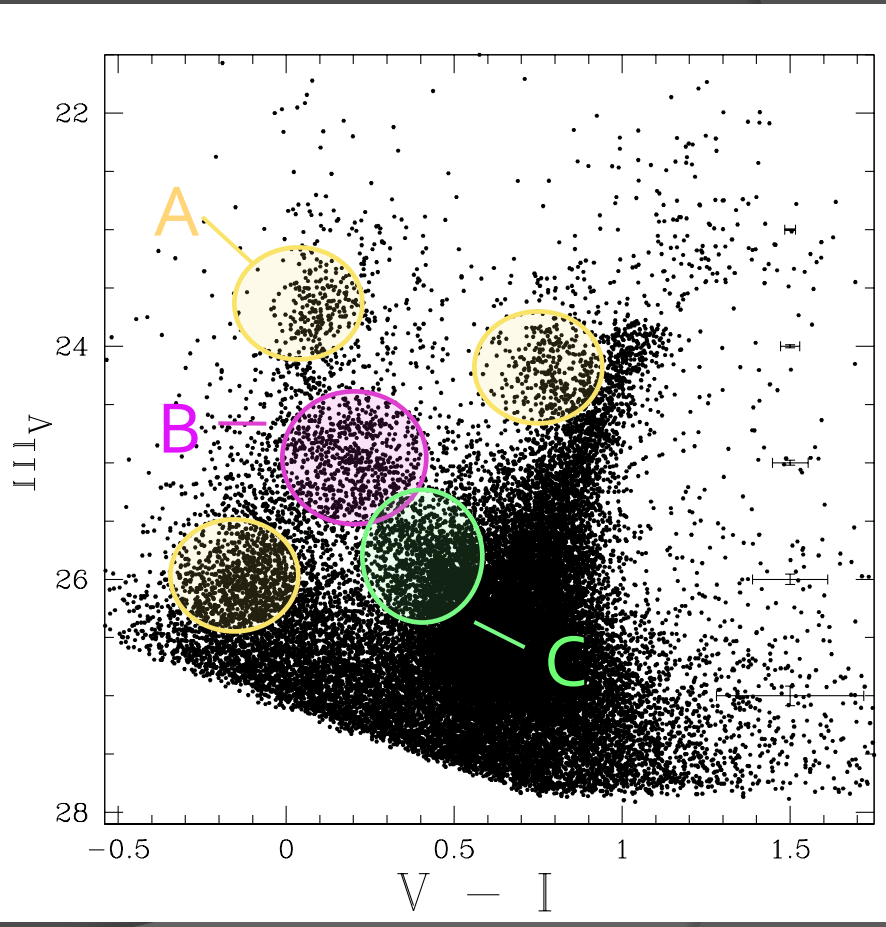


SFR ($M_\odot$/yr)	Ref.
1.4 x 10^{-28} L_{FUV}	Kennicutt (1998)
1.33 x 10^{-28} L_{FUV}	Hao et al. (2011) Murphy et al. (2011)
Where L_{FUV} is in units of erg s^{-1} Hz^{-1}	

Star Formation Histories from stellar populations

The Story of UGC 9128





McQuinn et al. (2010)

Independent comparison is possible with FUV SFRs and CMD-based SFRs

Sample Requirements

- Quantified star formation histories
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- Low
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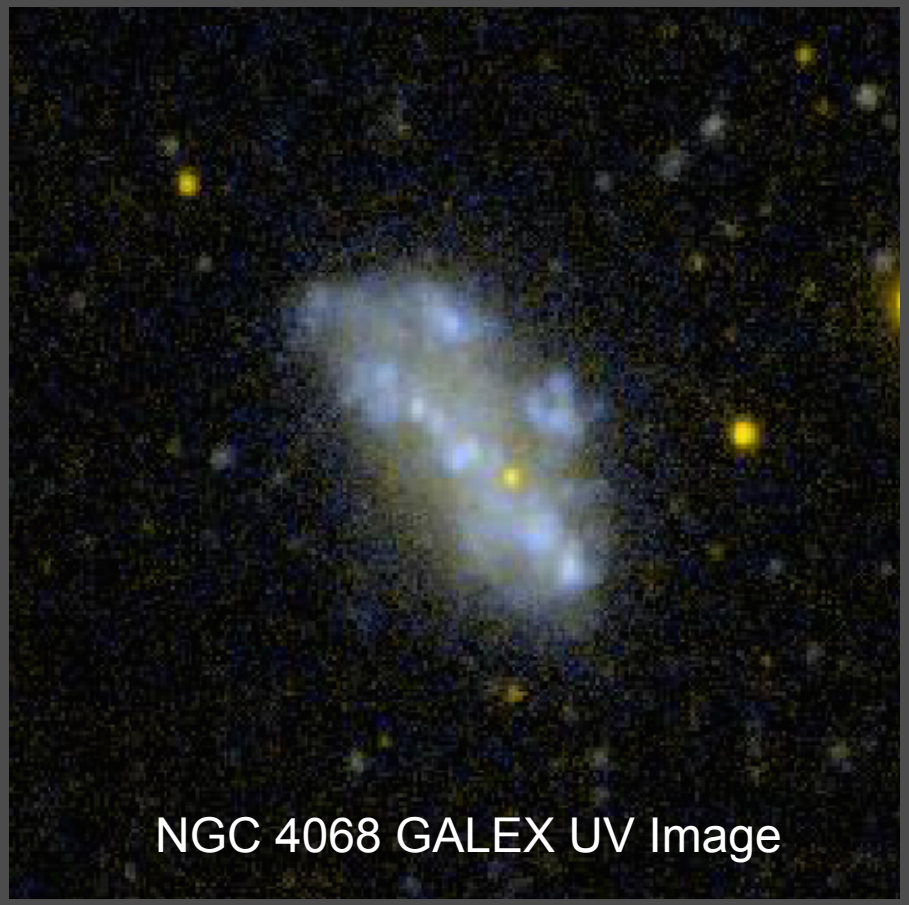
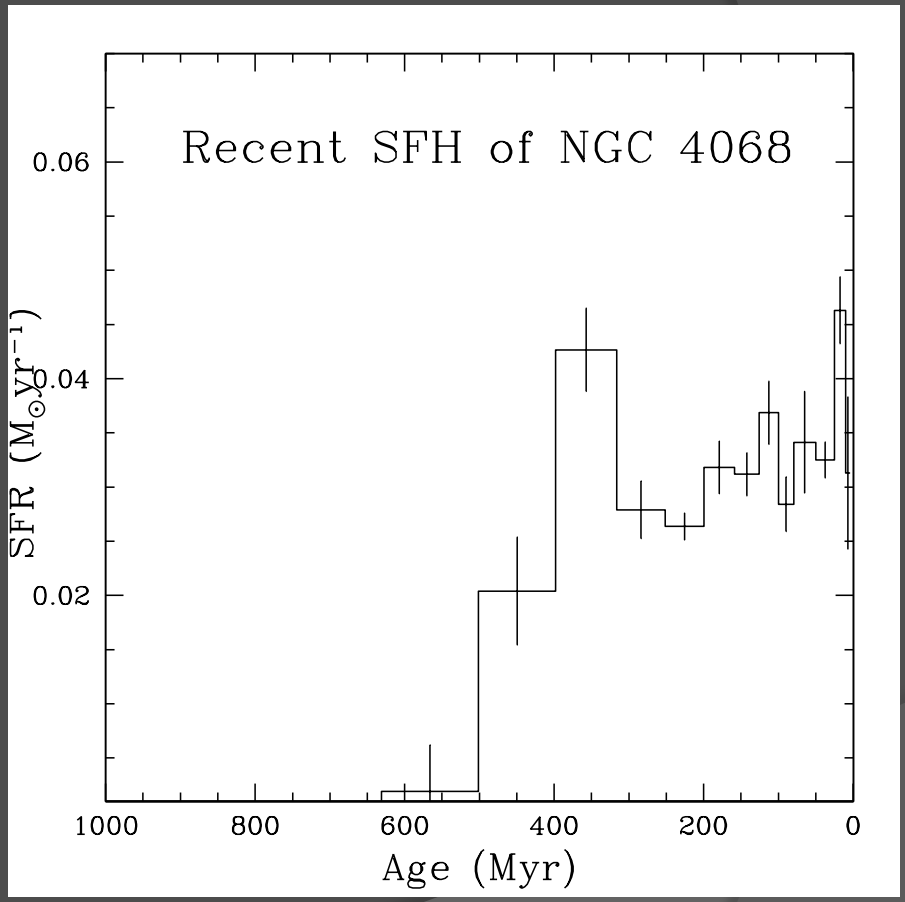
Integrated FUV SFR and CMD-based SFH





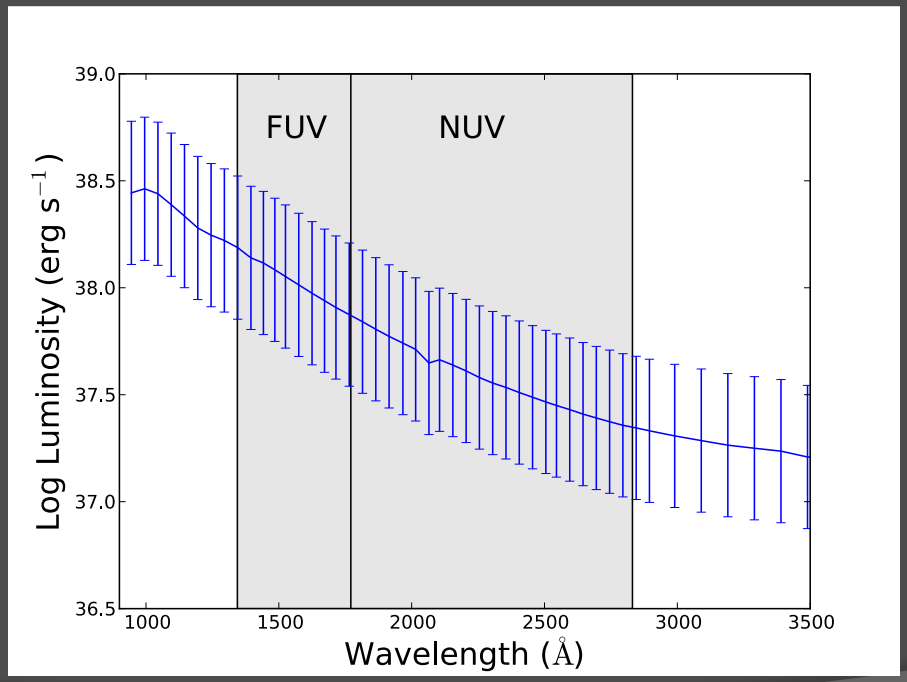
$SFR_{FUV} = 1.33 \times 10^{-28} L_{FUV}$

Check the inputs and the models

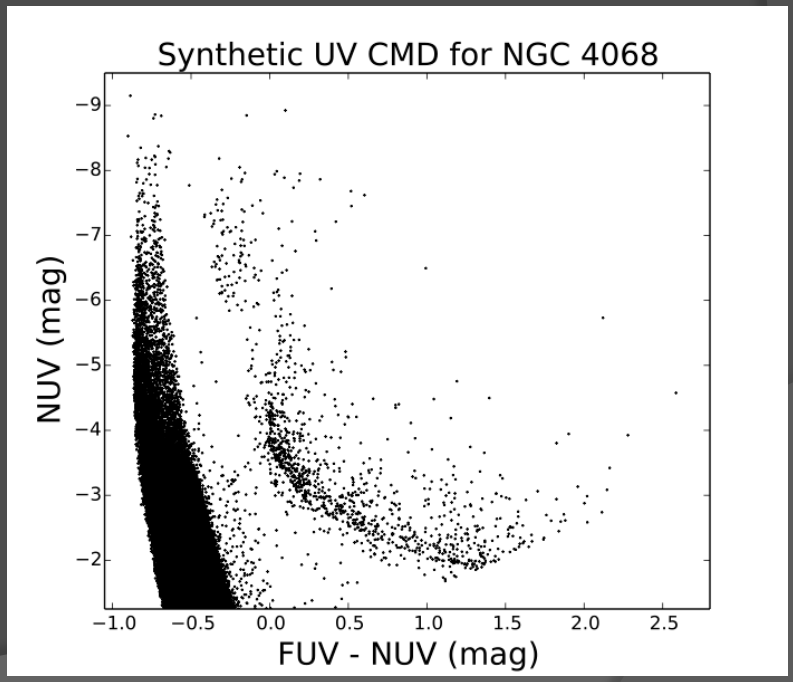
Input the CMD-SFRs into different models to predict the UV fluxes

Compare the UV fluxes to the observations

Synthetic Spectral Model

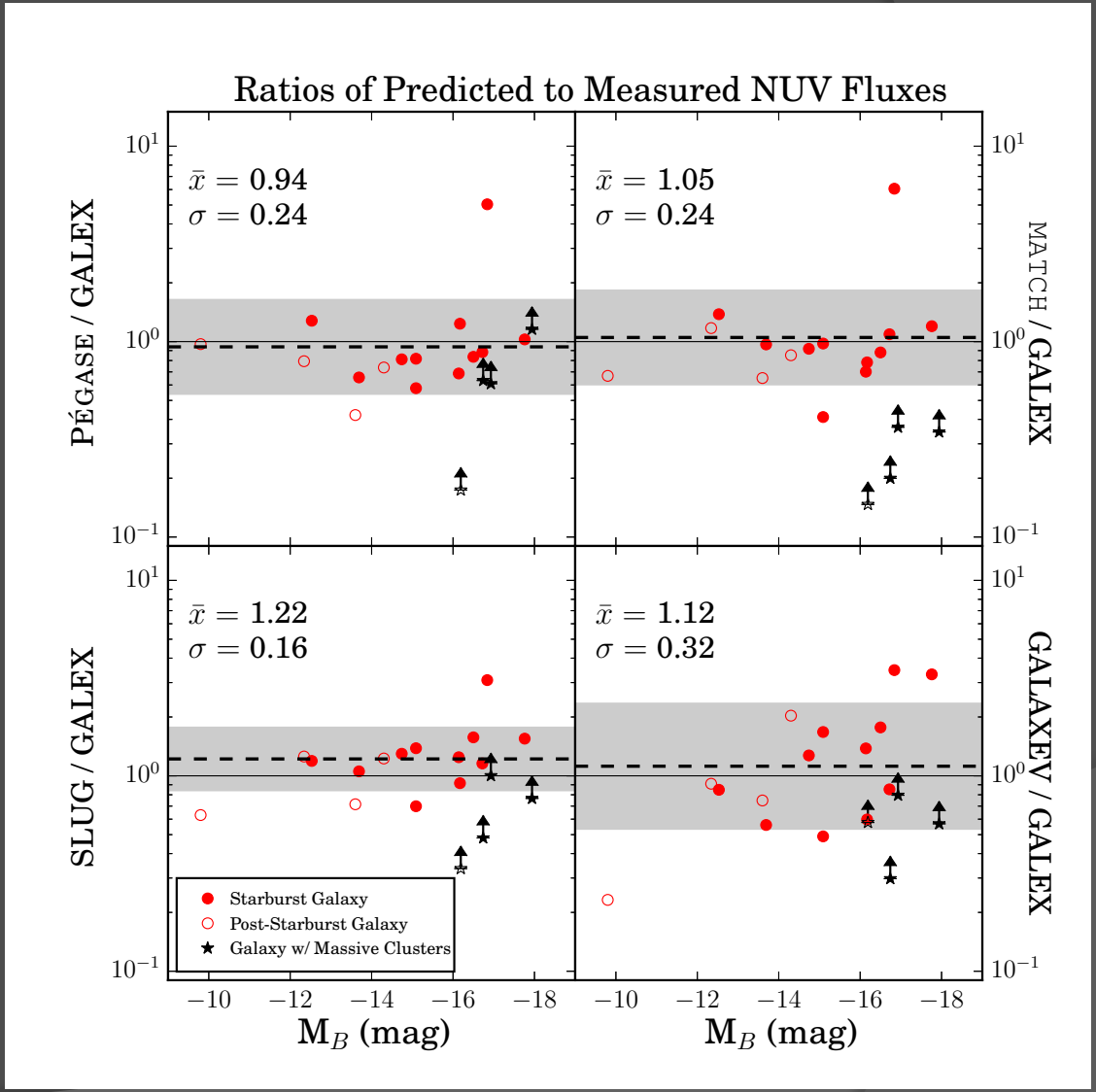


Synthetic Stellar Populations

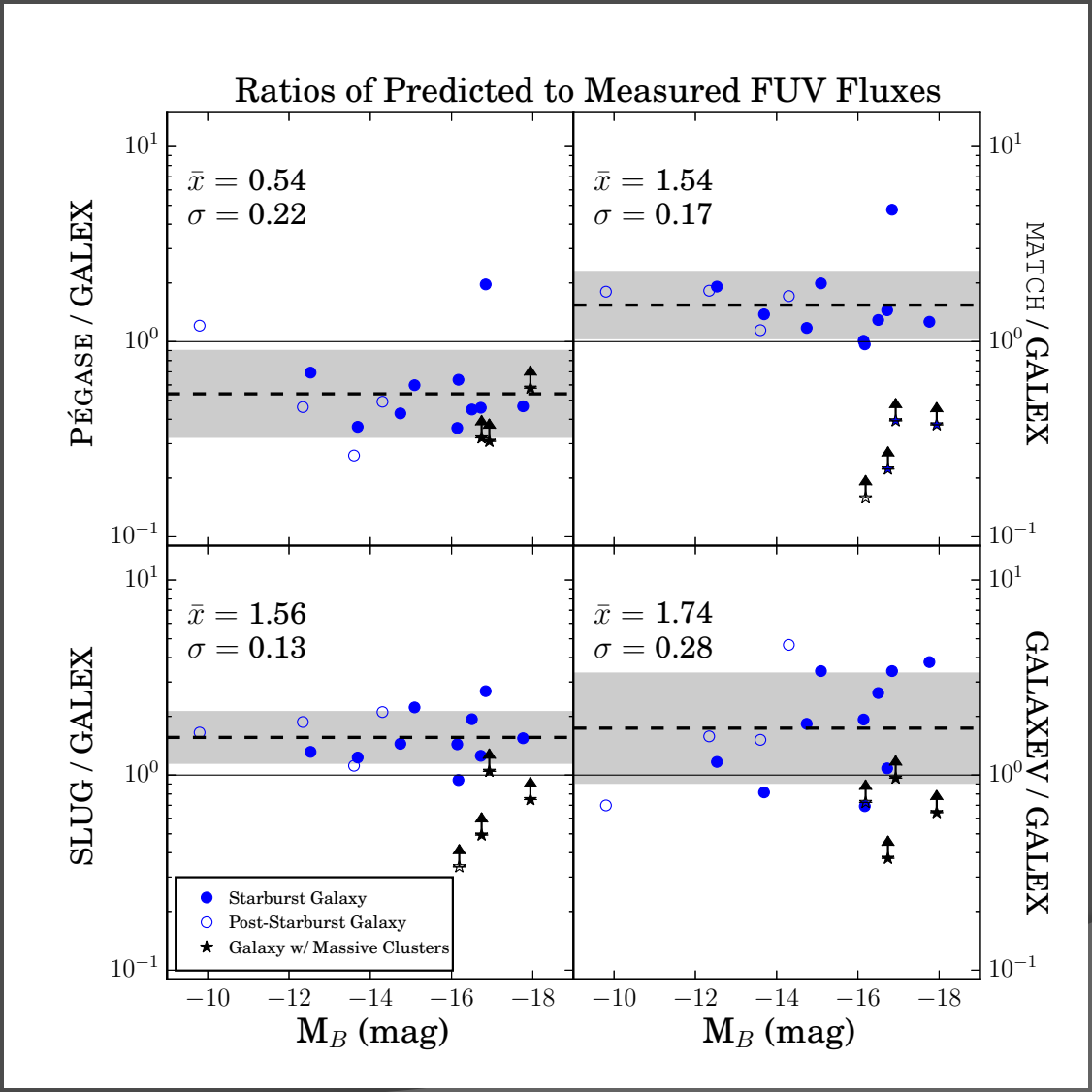


Comparison of NUV Predictions with Observations

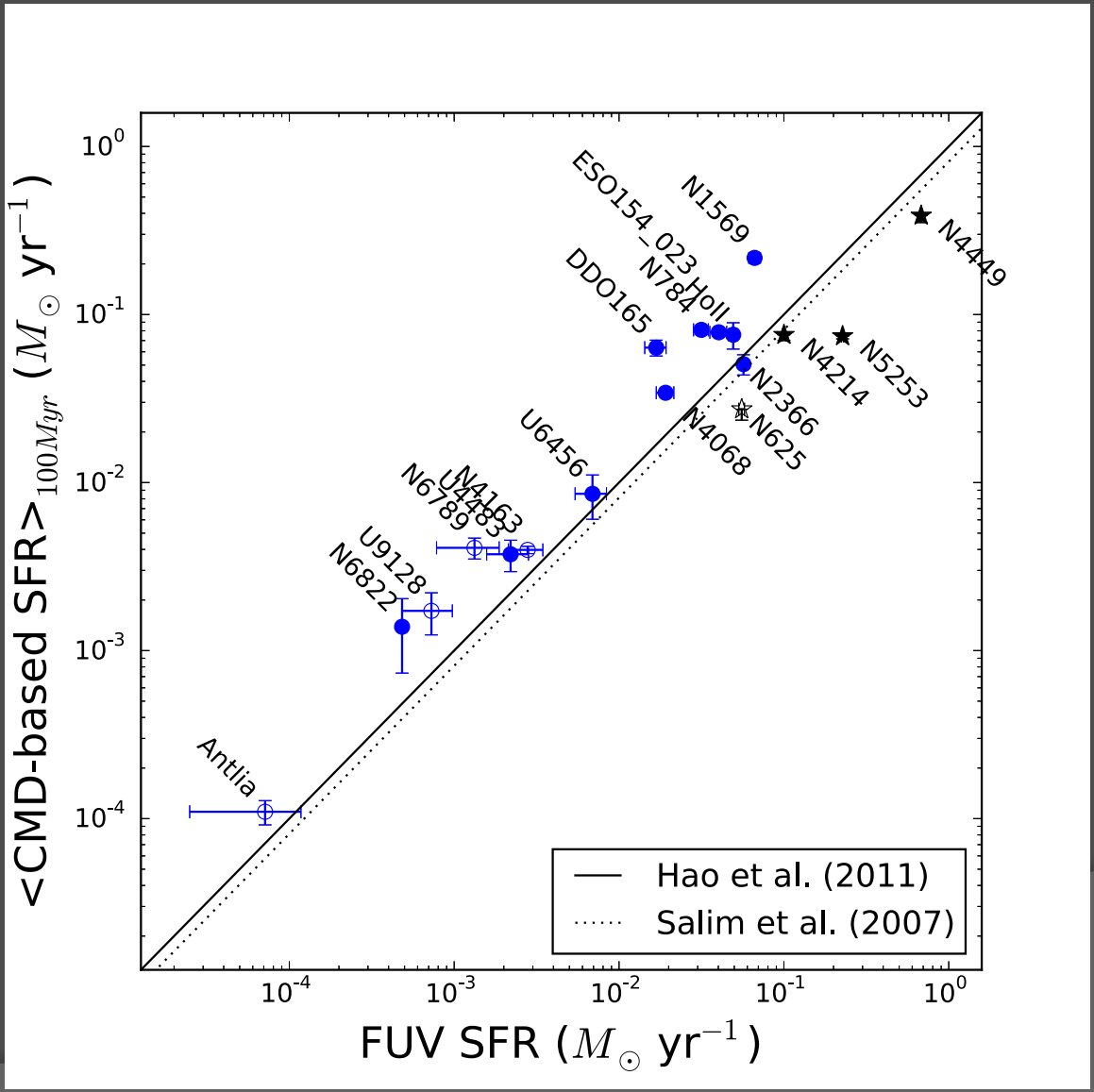
Extinction	✔
Stochasticity	✔
Stellar Evolution Models	✔
CMD-based SFRs	✔



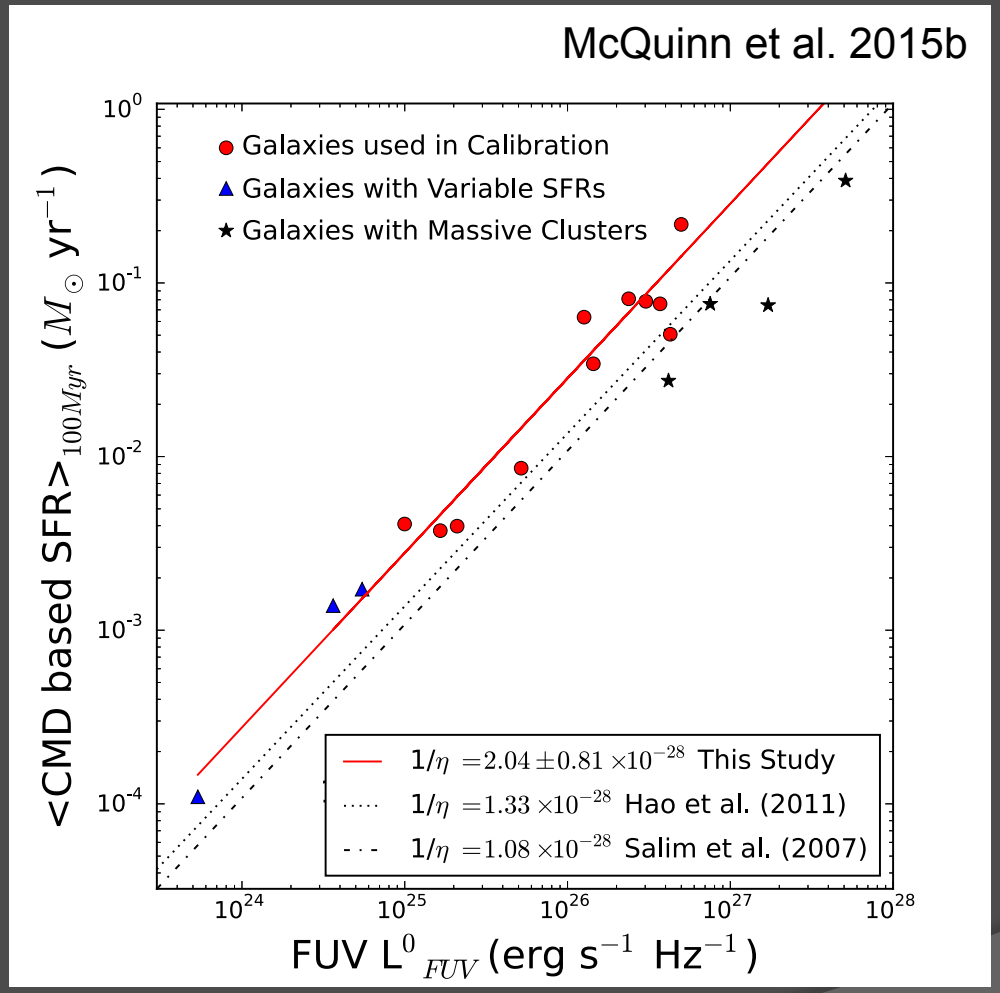
Comparison of FUV Predictions with Observations



Comparison of CMD-based SFRs and FUV SFRs



Quantifying the difference between integrated FUV SFRs and CMD-based SFRs



FUV SFR = 2.04 ± 0.81 x 10^{-28} L^0_{FUV} (erg s^{-1} Hz^{-1})

Summary

- Comparison between CMD-SFRs and integrated FUV SFRs are off by ~50%
- Differences between SFR indicators are not due to poorly met assumptions or extinction
- The UV SFR scaling relation, while easy to use, does not strictly hold. Secondary (non-linear) factors are not well-quantified yet.

Is a scaling relation all that's needed?