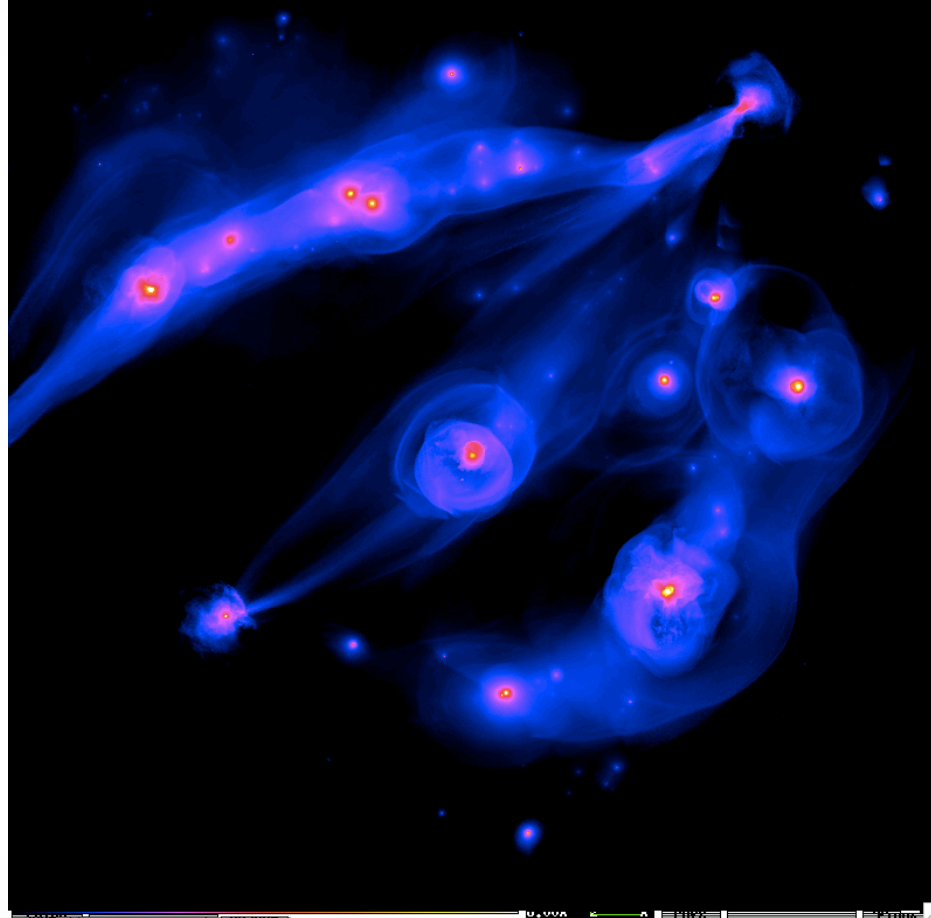


(very) Initial Results from an Extremely high-resolution Dwarf Galaxy Simulation



Ferah Munshi

University of Oklahoma

- Fabio Governato:: Alyson Brooks:: Tom Quinn:: Piero Madau •

CHANGA



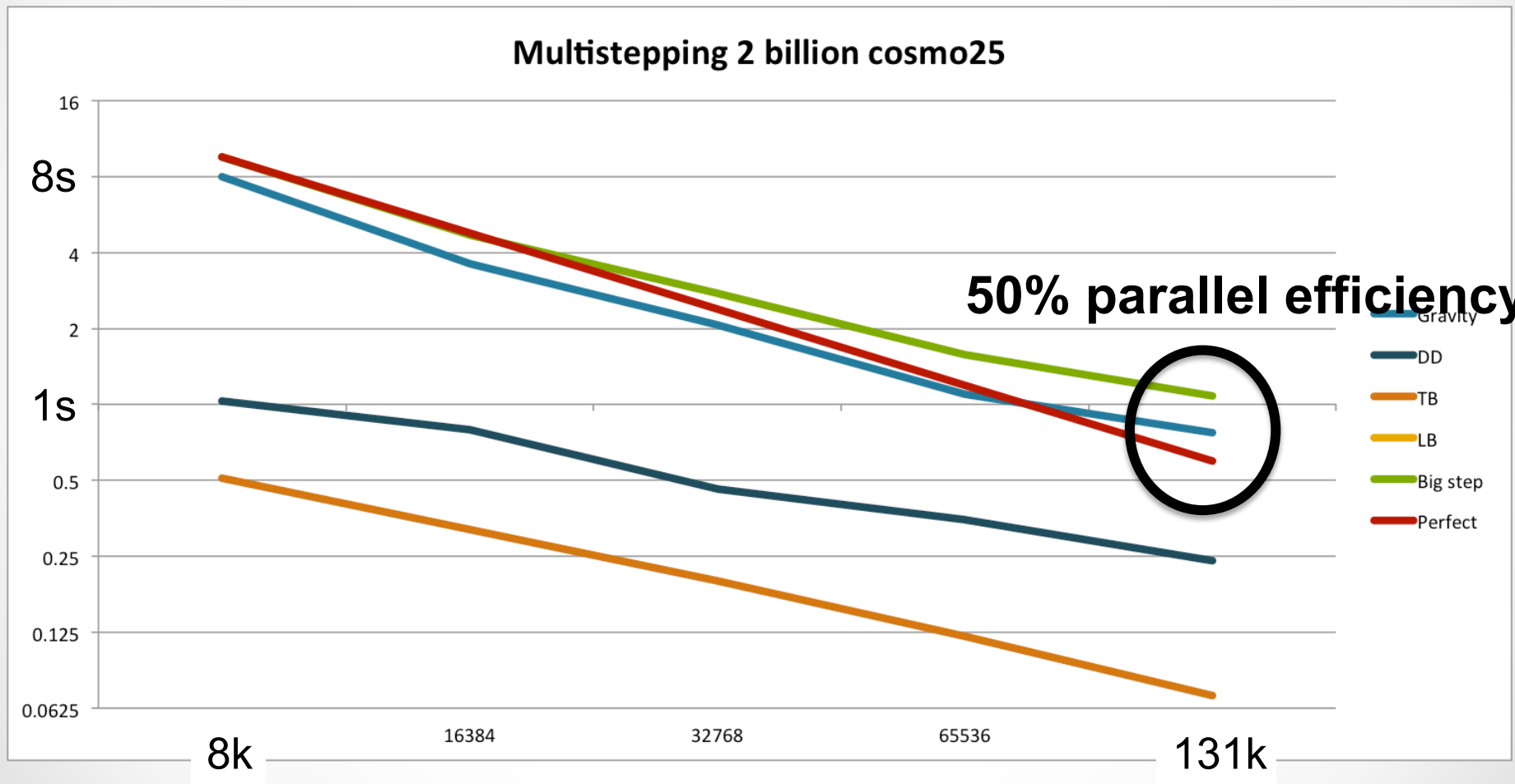
UNLEASHED

Charm Nbody GrAvity solver

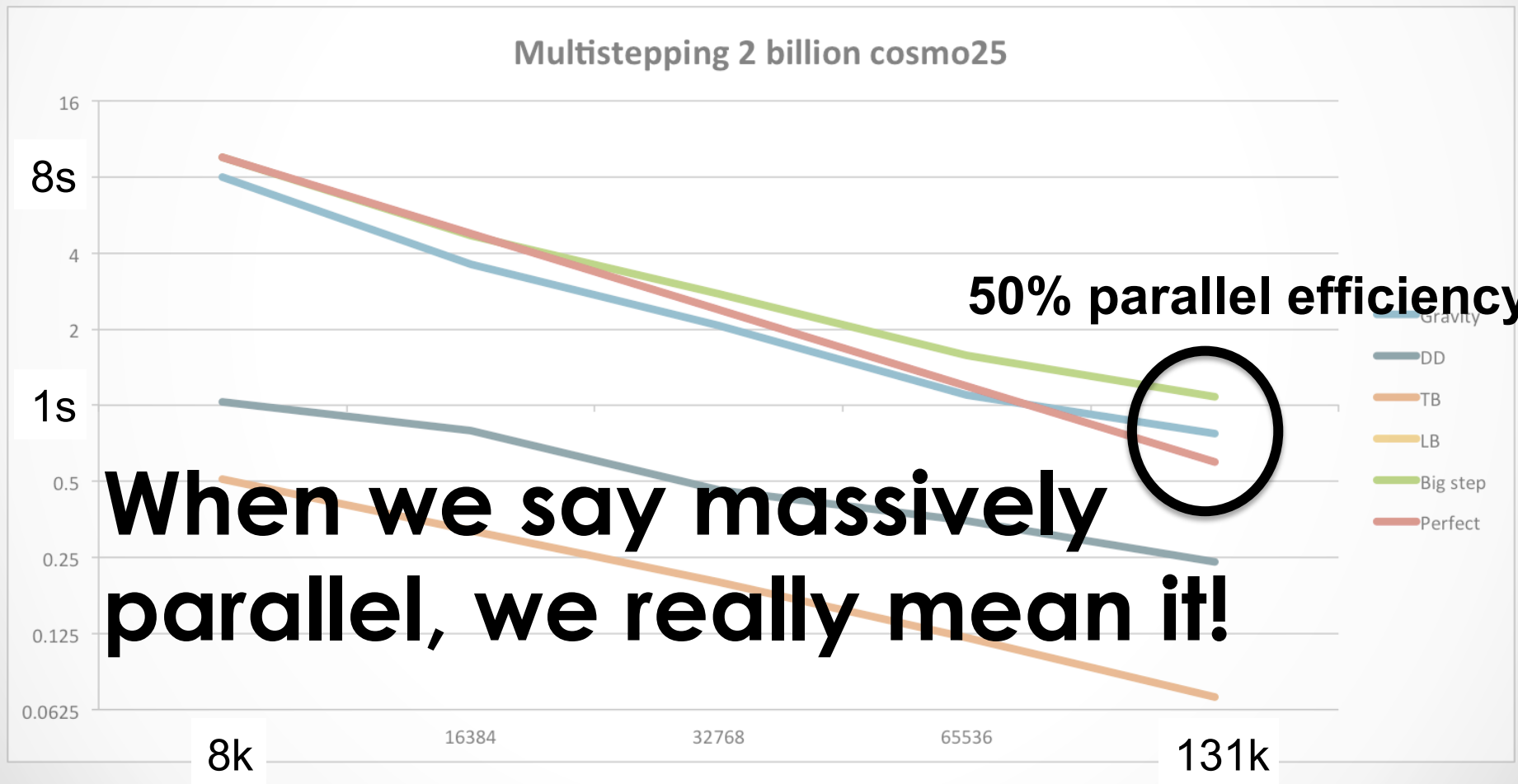
- Massively parallel SPH
- SNe feedback creating realistic outflows
- SF linked to shielded gas
- Early Stellar Feedback
- Optimized SF parameters
- **NEW** SPH implementation

Menon+ 2014, Governato+ 2014

ChaNGa scaling to 100k+ cores



ChaNGa scaling to 100k+ cores



The 40 Thieves:

Hopkins et al. (2011), Stinson et al. (2012),
Governato et al. (2014)

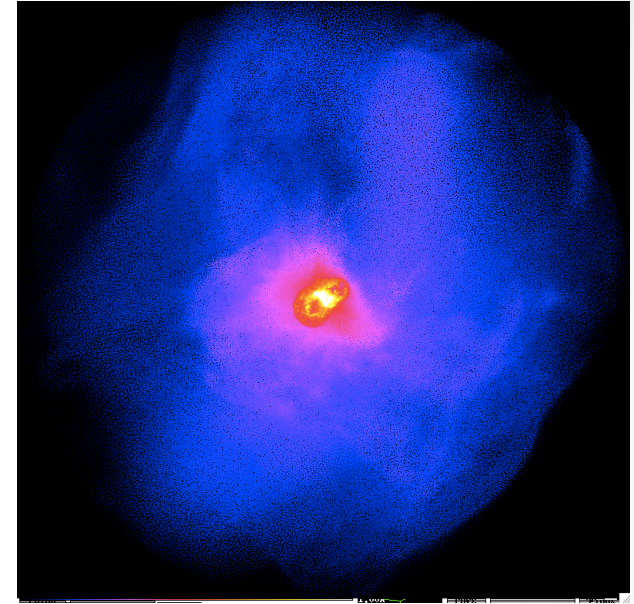
Effective resolution $(4096)^3$

Gravity resolution: 60pc

SPH resolution: 6pc

$z \sim 129-0$ (currently at $z \sim 0.4$)

Will be complete in a week



Early Stellar Feedback

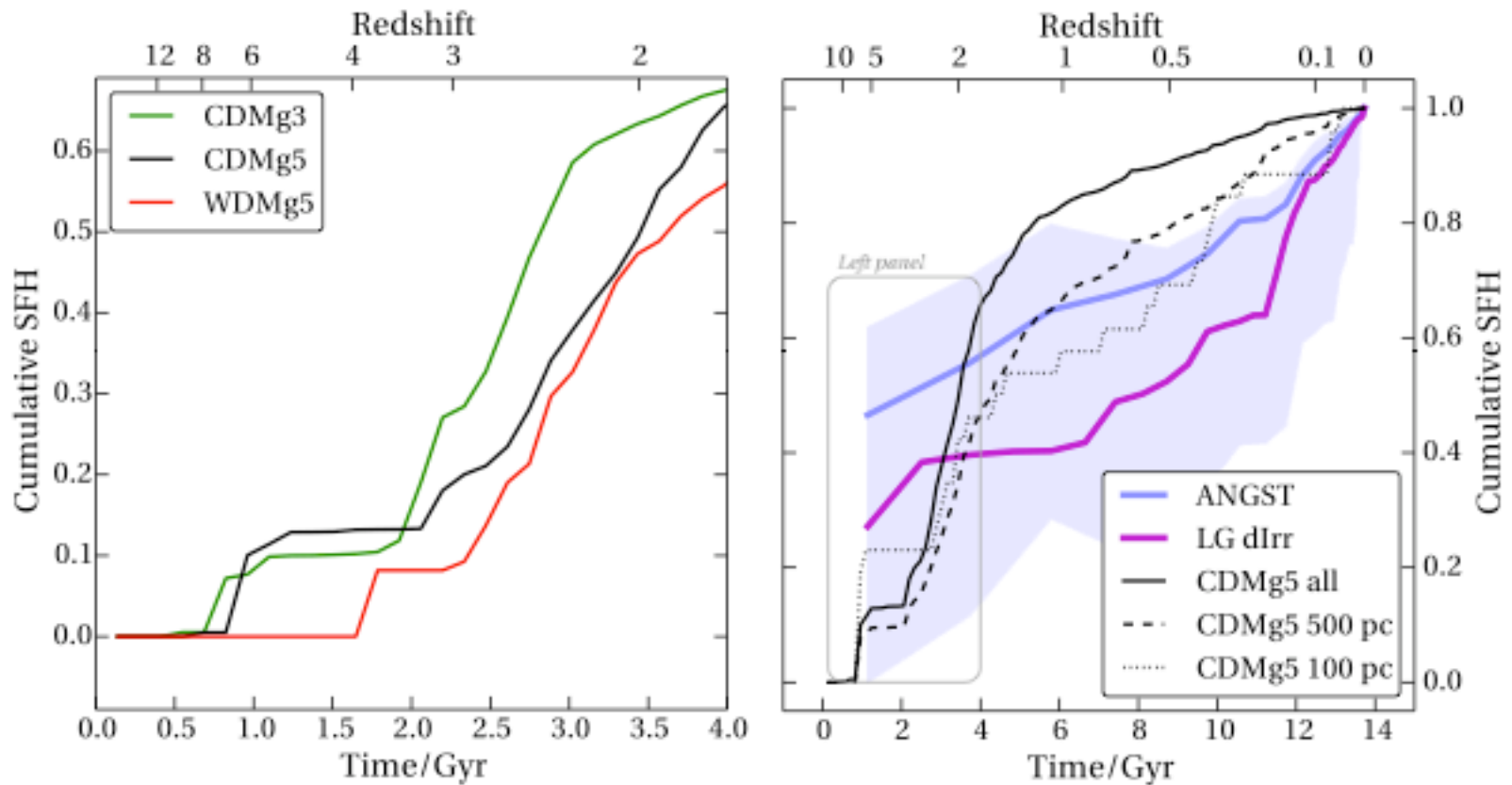
Radiation energy from young
massive stars

Energy injected: $2e49/M_{\text{sun}}$

Gas cooling is **not** shut off

Simulation so far...

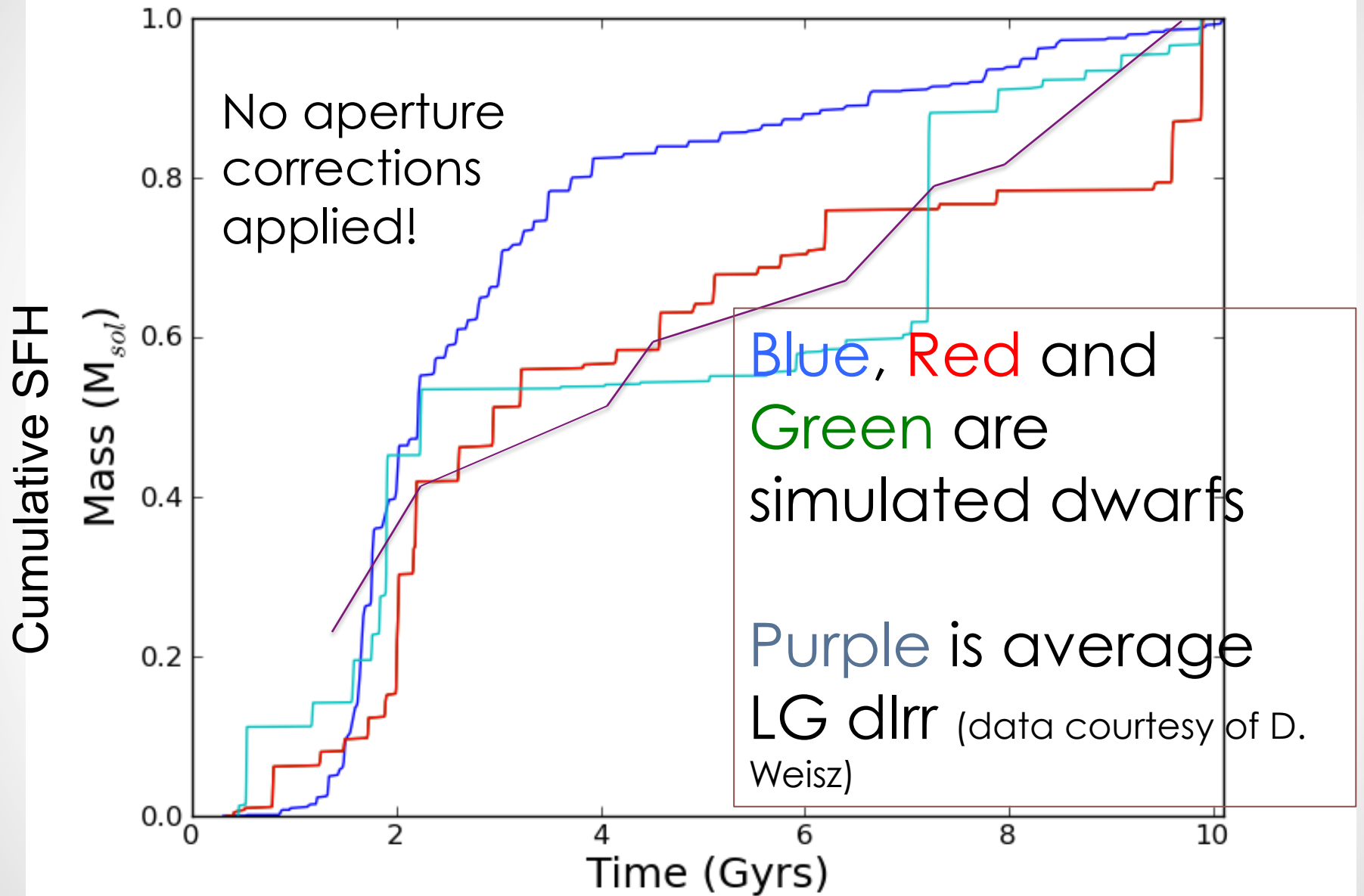
Halo	M _{vir}	V _{max}	Star Mass	Gas Mass
1	1.7e10	44 km/s	6.3e7	2.6e8
2	1.0e10	37 km/s	1.1e7	3.8e8
3	7.8e9	33 km/s	4.6e7	2.8e8
4	7.7e9	31 km/s	1.3e7	1.0e8
5	7.6e9	31 km/s	1.5e7	8.2e7
6	5.3e9	28 km/s	4.9e6	1.1e8
7	3.5e9	22 km/s	2.7e7	4.7e7



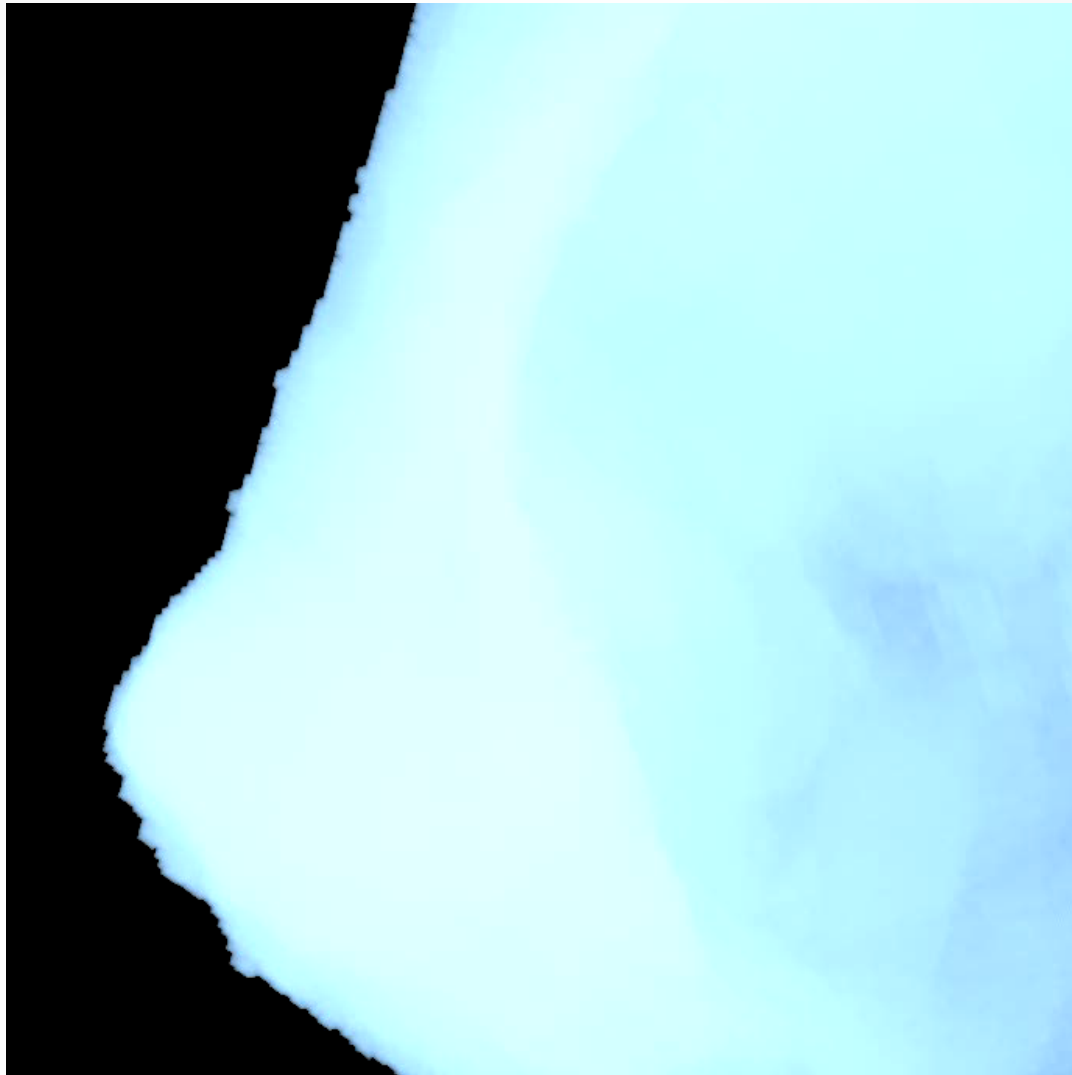
Governato et al. (2014) g5 run: same resolution, same physics as 40 thieves

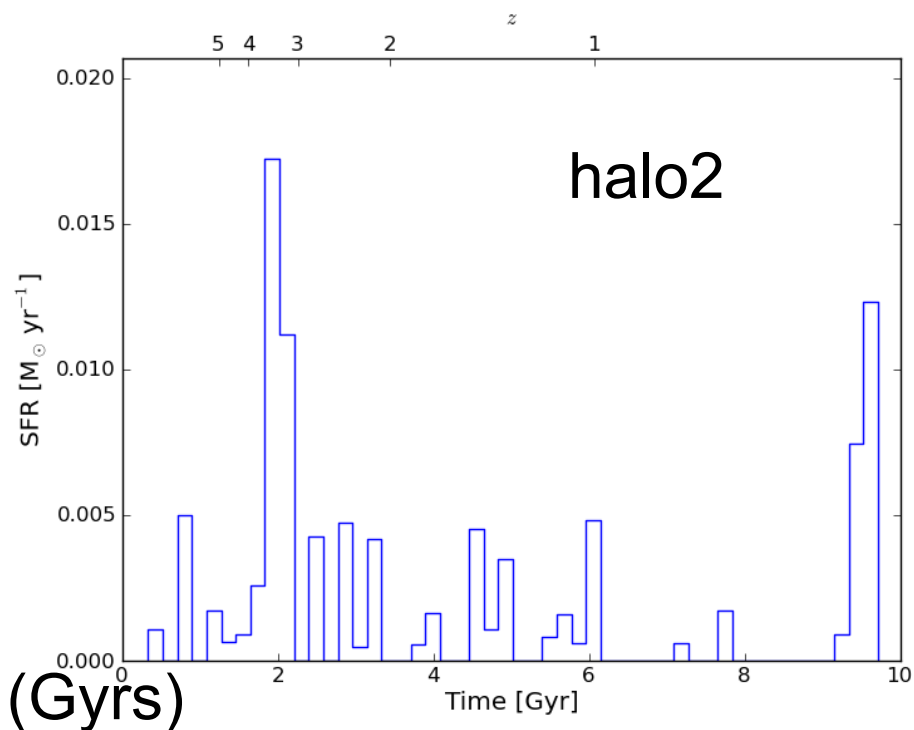
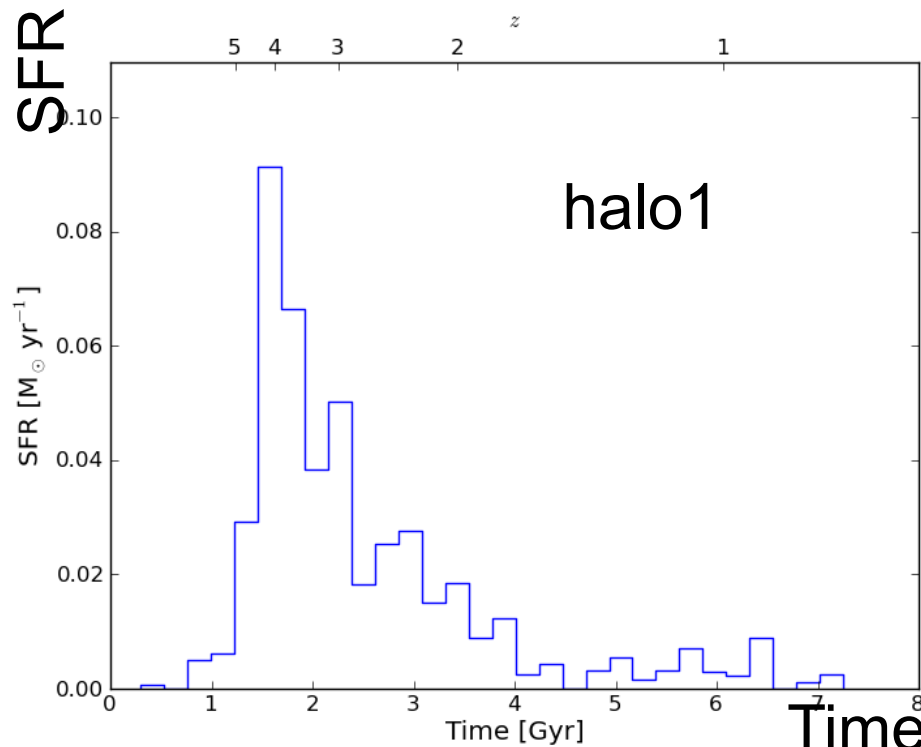
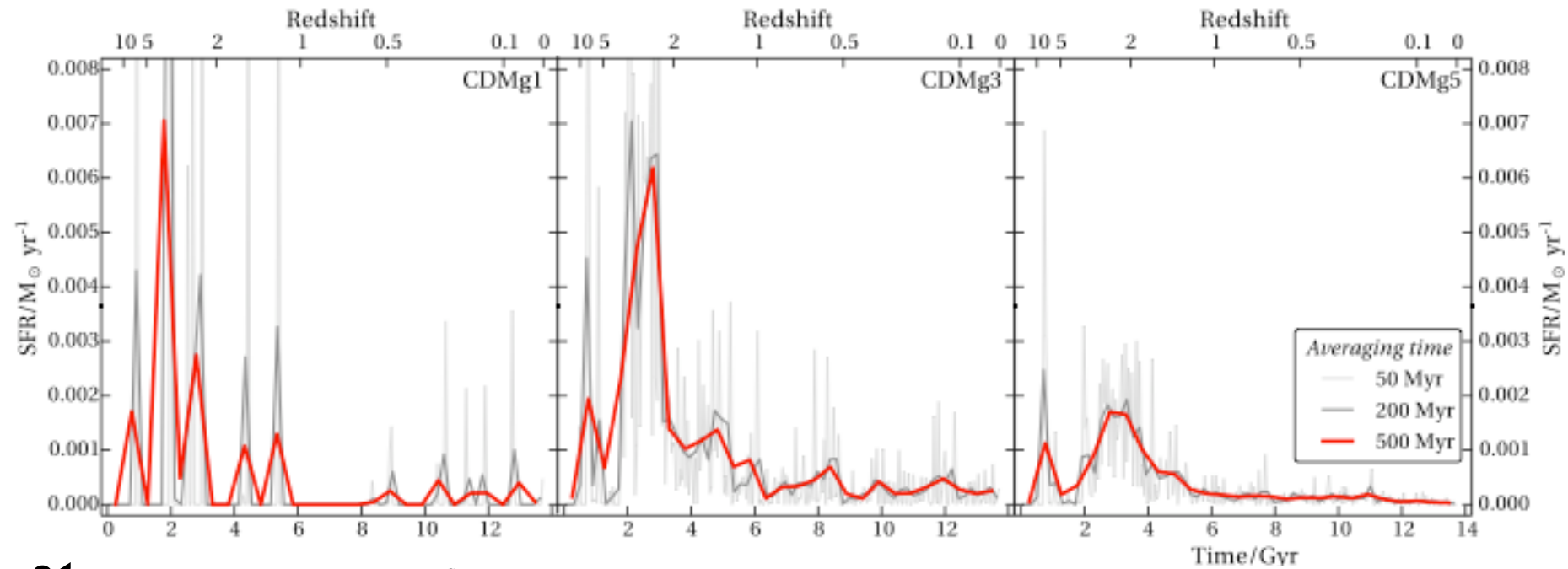
With correct apertures, g5 run matches LG dwarfs and ANGST dwarfs

MLN* Plot!

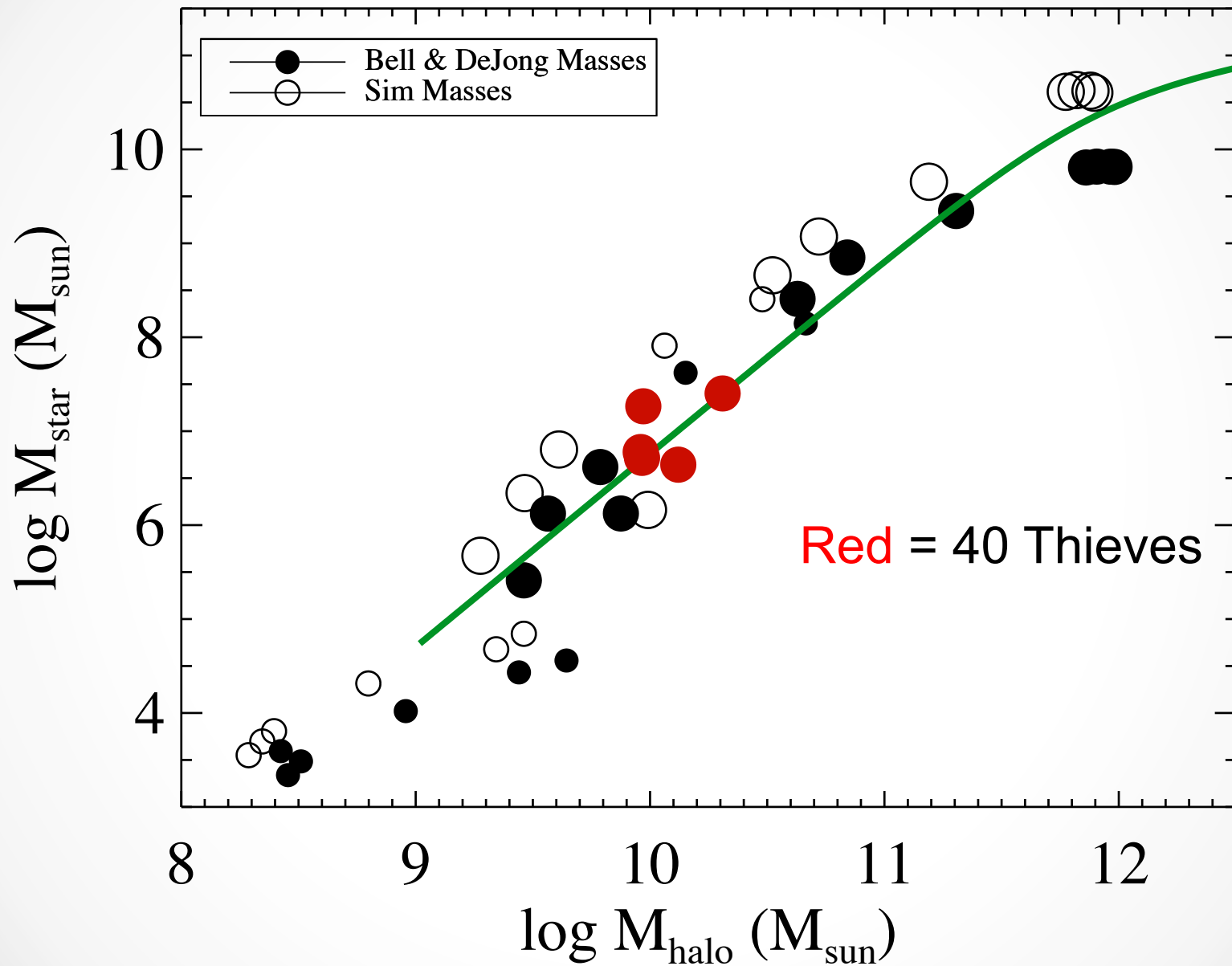


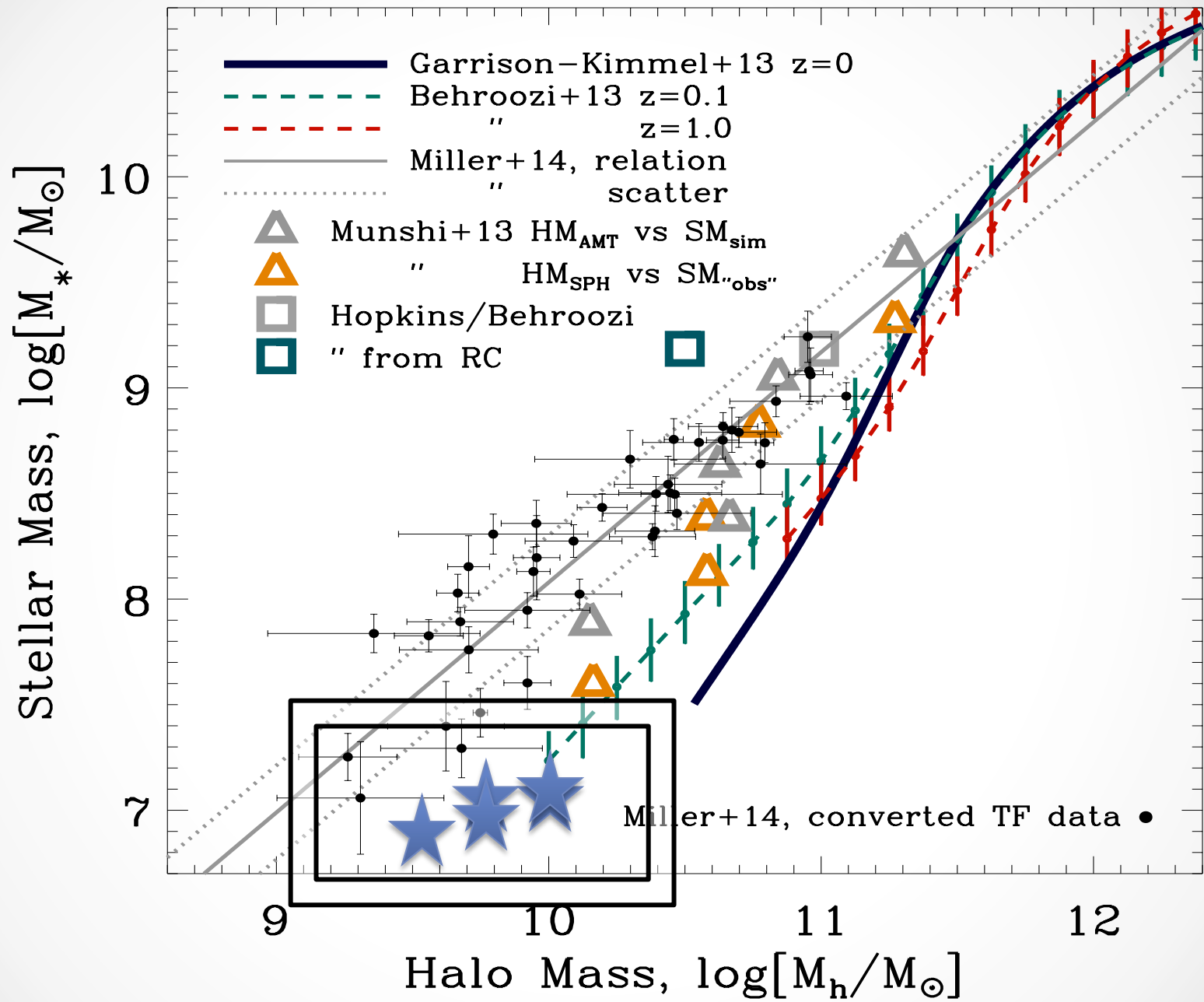
*made last night





MLN Plot!





Lots of science...

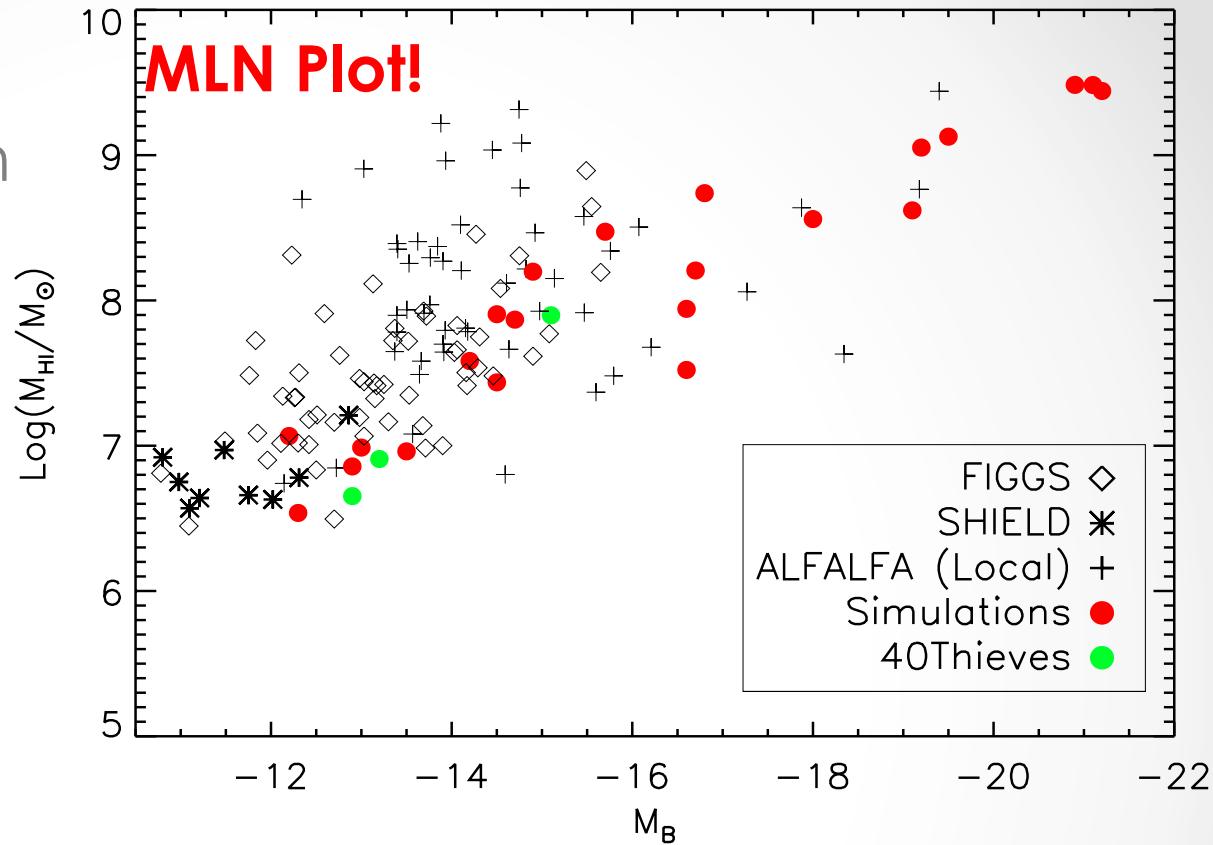
The redshift evolution of the SMHM for low mass systems

Statistical study of HI & baryon fractions in small systems

Disk thicknesses with/without early stellar feedback

Lyman Alpha escape fractions

Non-CDM physics



Lots of science...

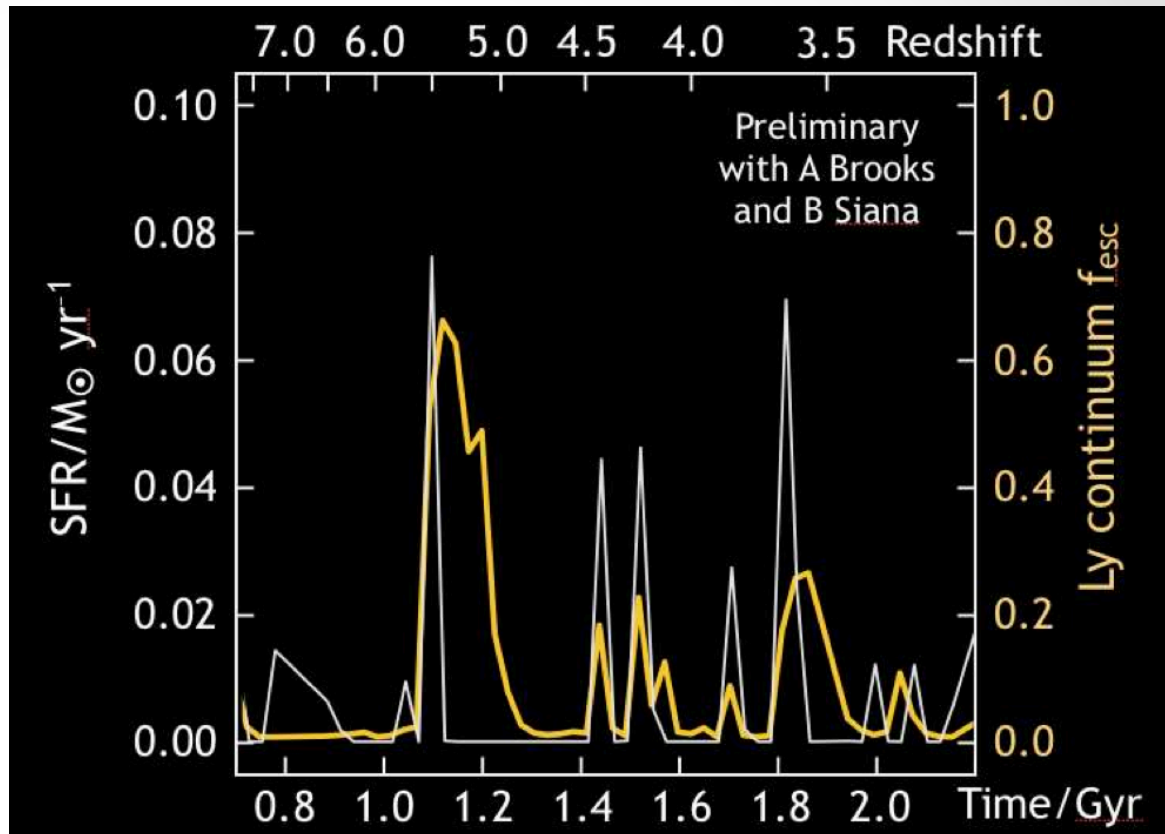
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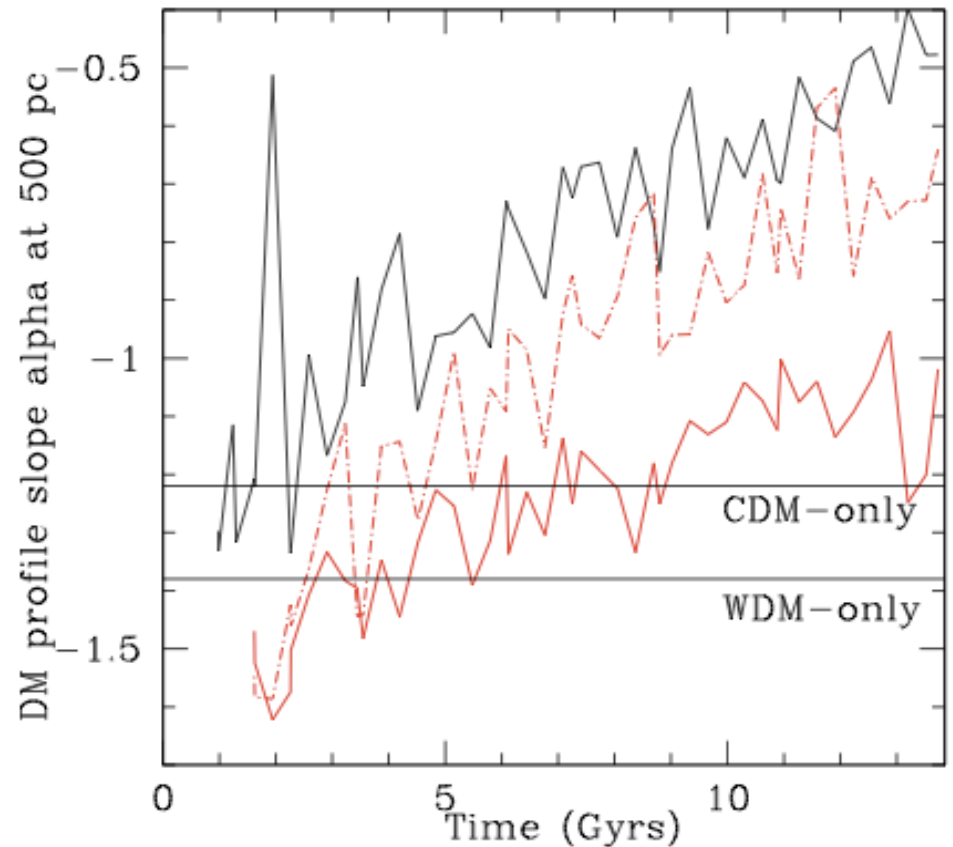
The redshift evolution of the SMHM for low mass systems

Statistical study of HI & baryon fractions in small systems

Disk thicknesses with/without early stellar feedback

Lyman Alpha escape fractions

Non-CDM physics



Conclusions

- 40 Thieves will be a great data set for new science
 - SMHM relationship
 - Gas Fractions & Baryon Fraction
 - Ly-alpha escape fractions
 - DM physics