

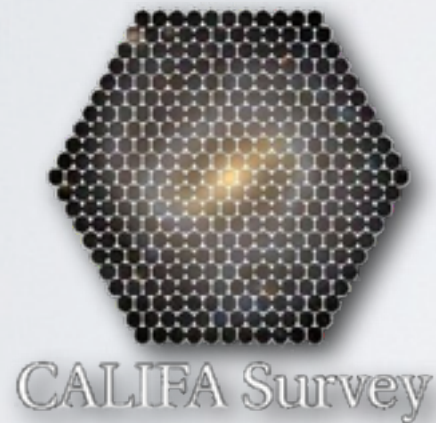


THE CALIFA SURVEY: A PANORAMIC VIEW OF GALAXIES

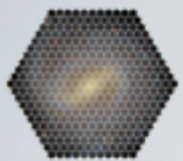
Rubén García-Benito
(IAA-CSIC)

&

the CALIFA collaboration



“Estallidos 2015” • 11-13 April 2015



CALIFA (CALAR ALTO Legacy Integral Field Area survey)

S.F. Sánchez et al. 2012, A&A, 538, 8

Science drivers:

- * Model the stellar population and constrain the star formation histories
- * Trace the distribution of ionized gas and chemical abundances for the gas phase
- * Measure the stellar and gaseous kinematics

<http://califa.caha.es>

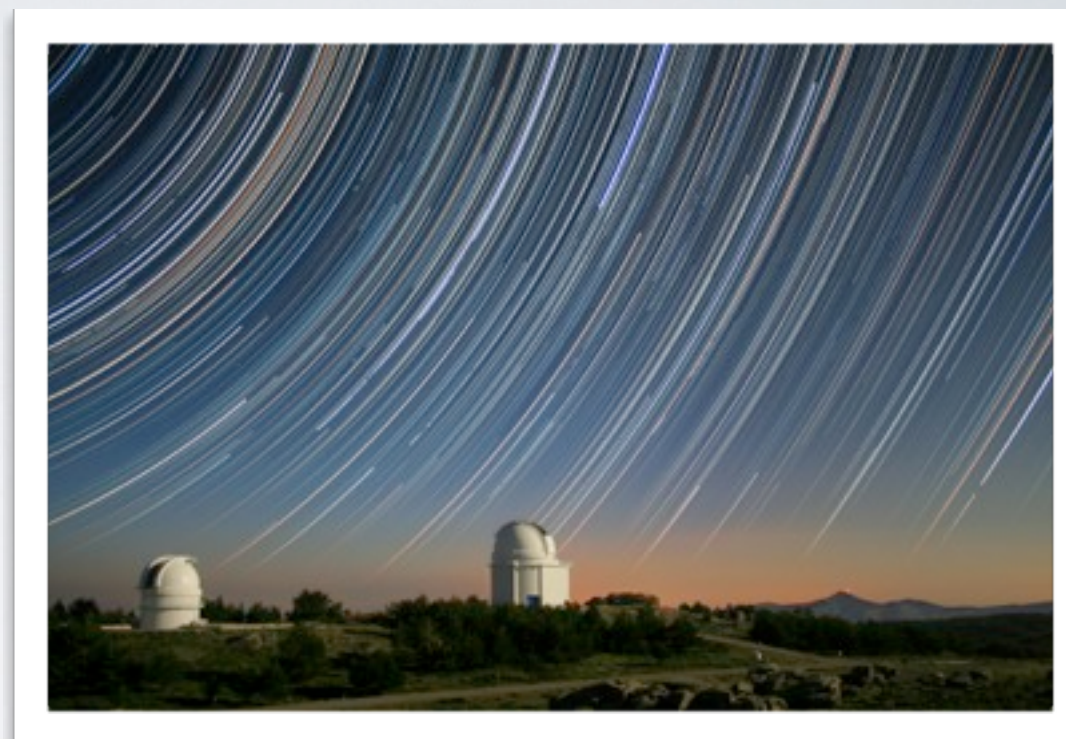
~ 80 members / 13 countries

P.I.: S. F. Sánchez (Granada & México)

P.S.: C.J. Walcher (Potsdam)

250 dark nights in 3 years:

IFU PMAS/PPAK @ 3.5m CAHA (Almería)



600
galaxies

$0.005 < \text{redshift} < 0.03$

★ Large homogeneous sample

937 galaxies
Mother sample

Apparent angular
diameter selection
from SDSS DR7

Volume-complete
(correction)

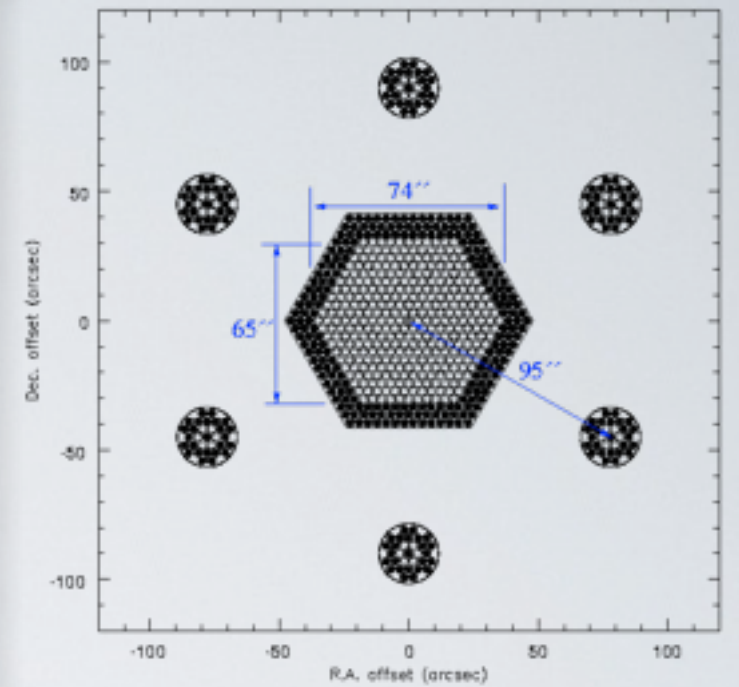


600
galaxies

$0.005 < \text{redshift} < 0.03$

★ Large homogeneous sample

937 galaxies
Mother sample



★ Large FoV (1'x1')

Fibers 2.7 arsec
~ 0.5 - 1 kpc

3 dithering:
final 1 arsec
sampling
~200-300 pc

600
galaxies

$0.005 < \text{redshift} < 0.03$

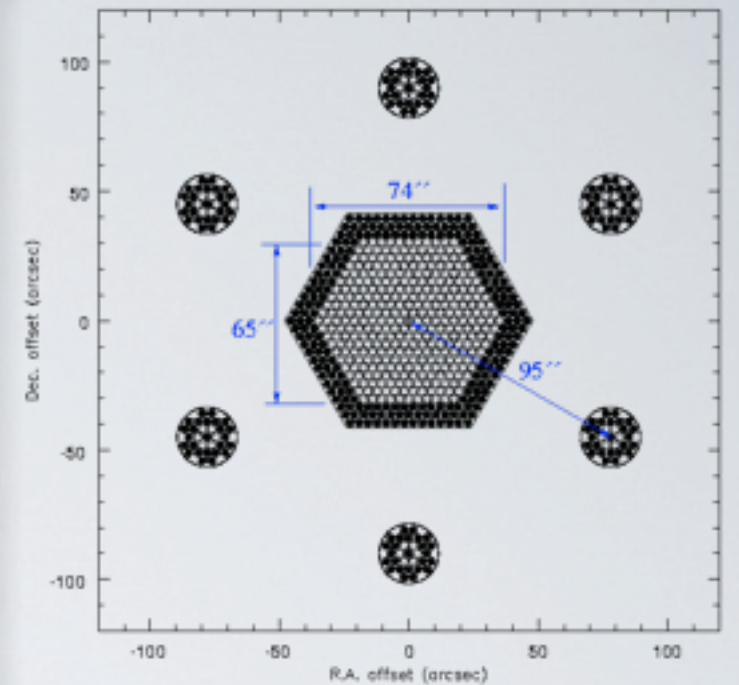
★ Large homogeneous sample

937 galaxies
Mother sample

λ range:
3700-7000 Å

★ Cover optical λ

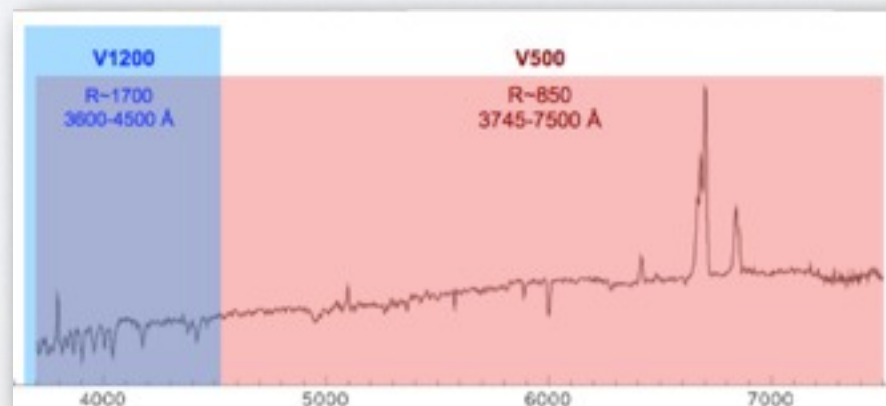
V1200@R = 1650
V500@R = 850



★ Large FoV (1'x1')

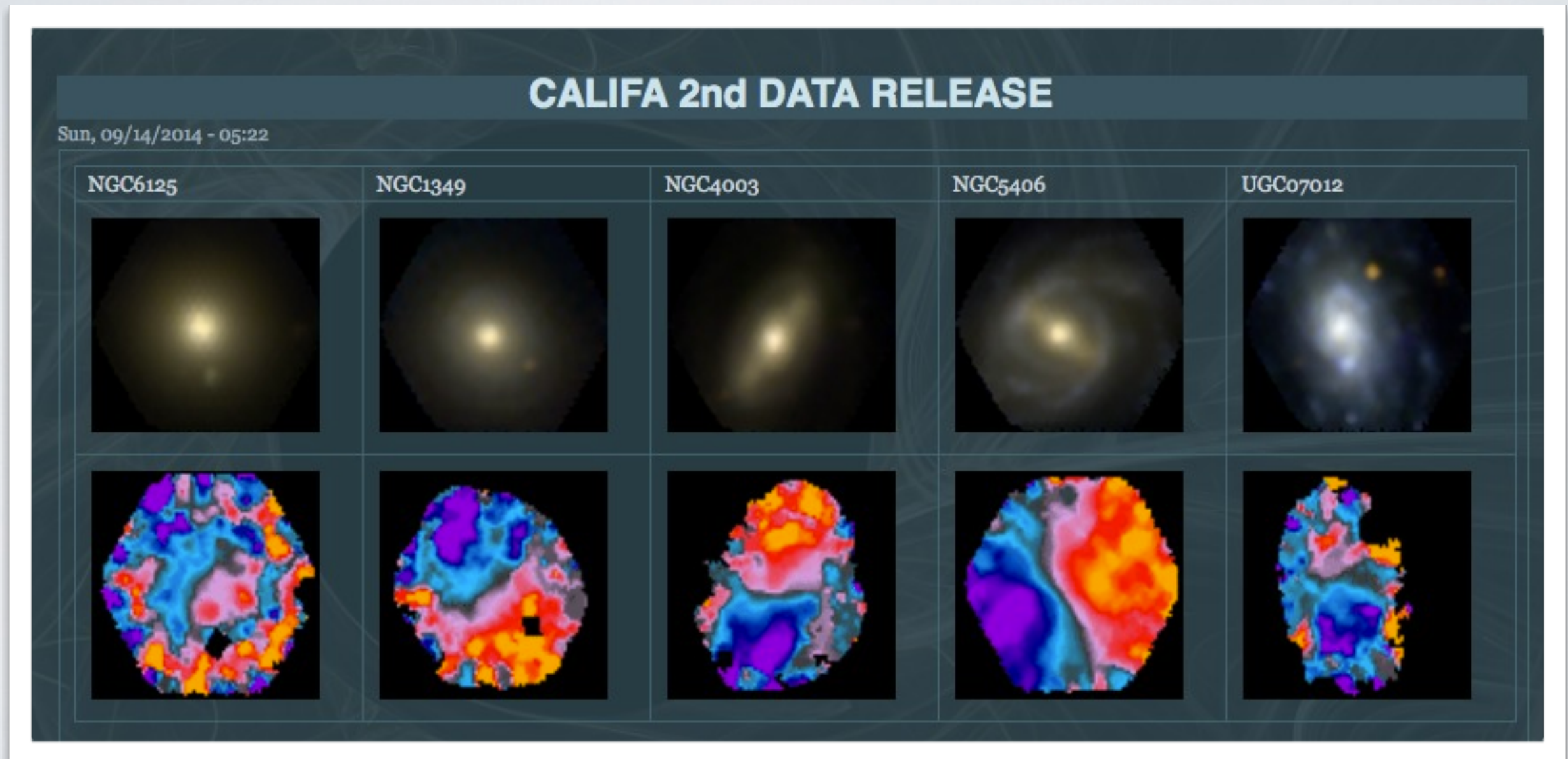
Fibers 2.7 arcsec
~ 0.5 - 1 kpc

3 dithering:
final 1 arcsec
sampling
~200-300 pc



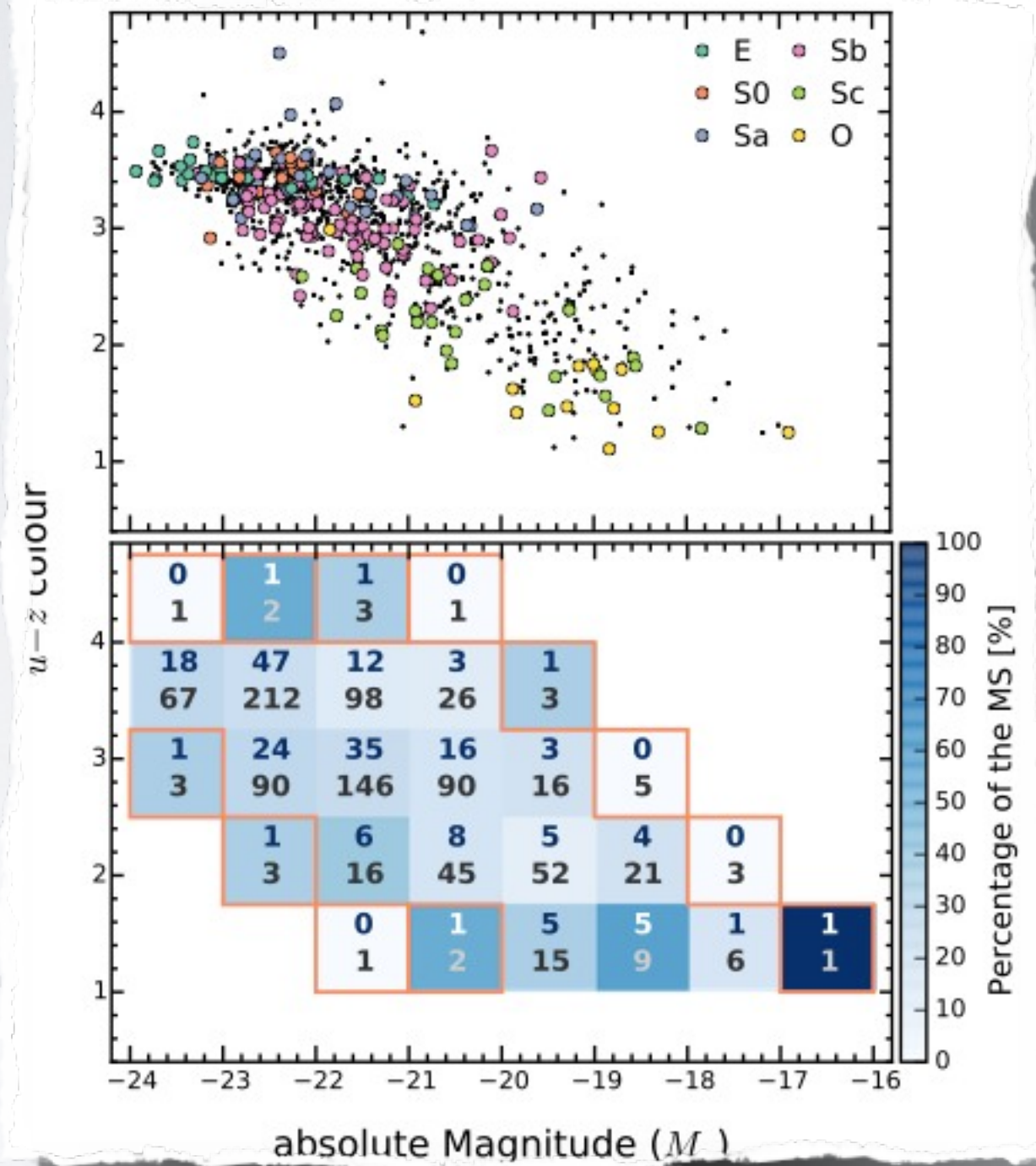
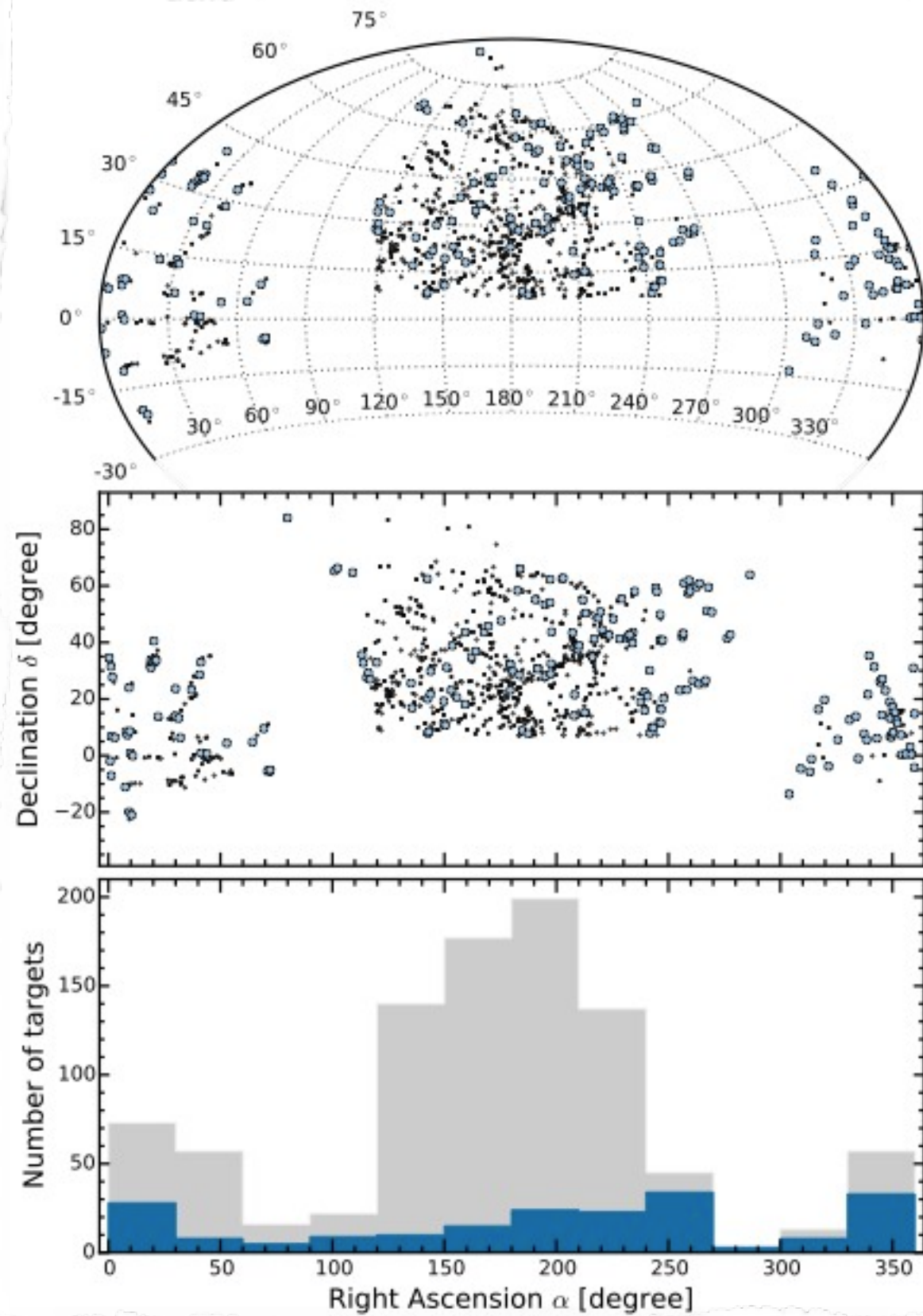
CALIFA DR2

LEGACY

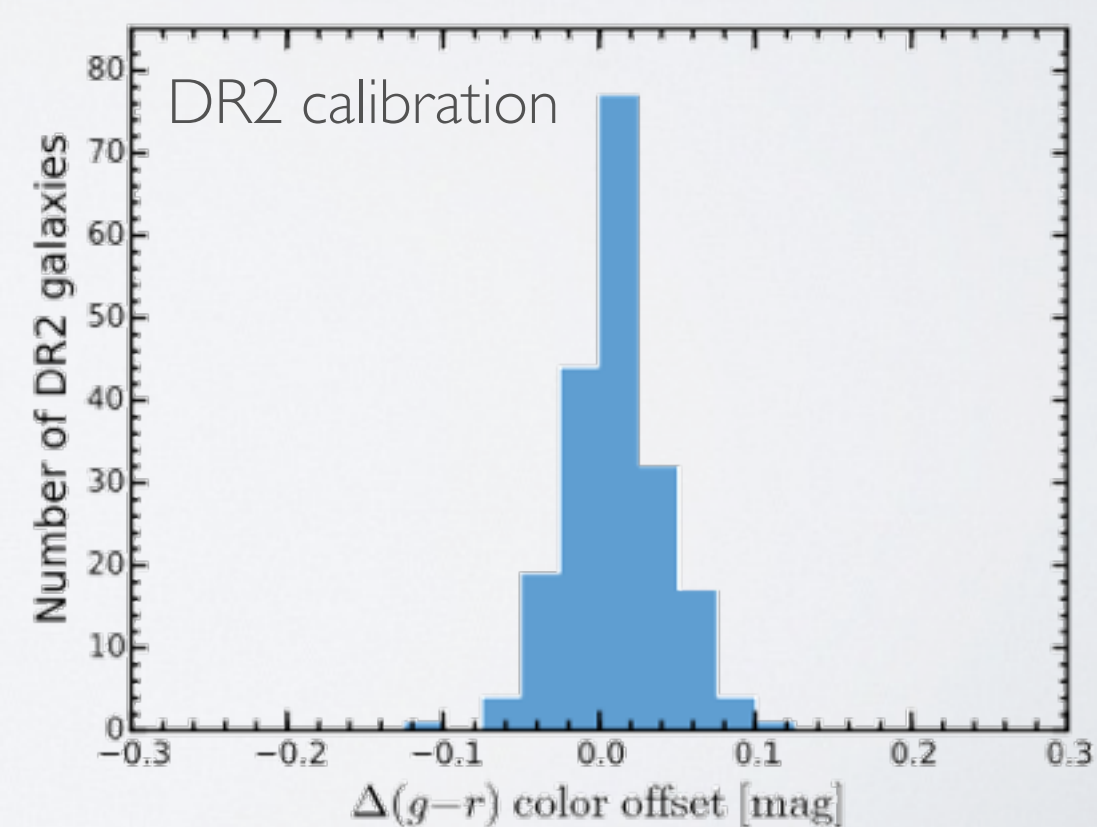
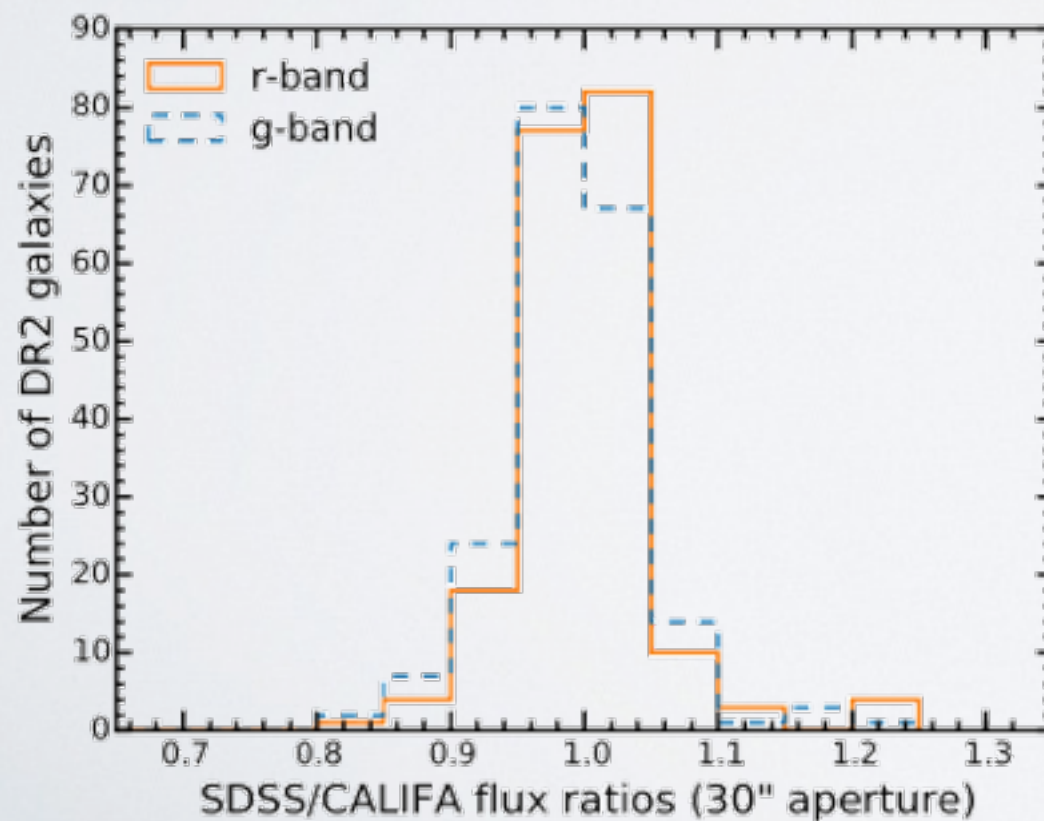
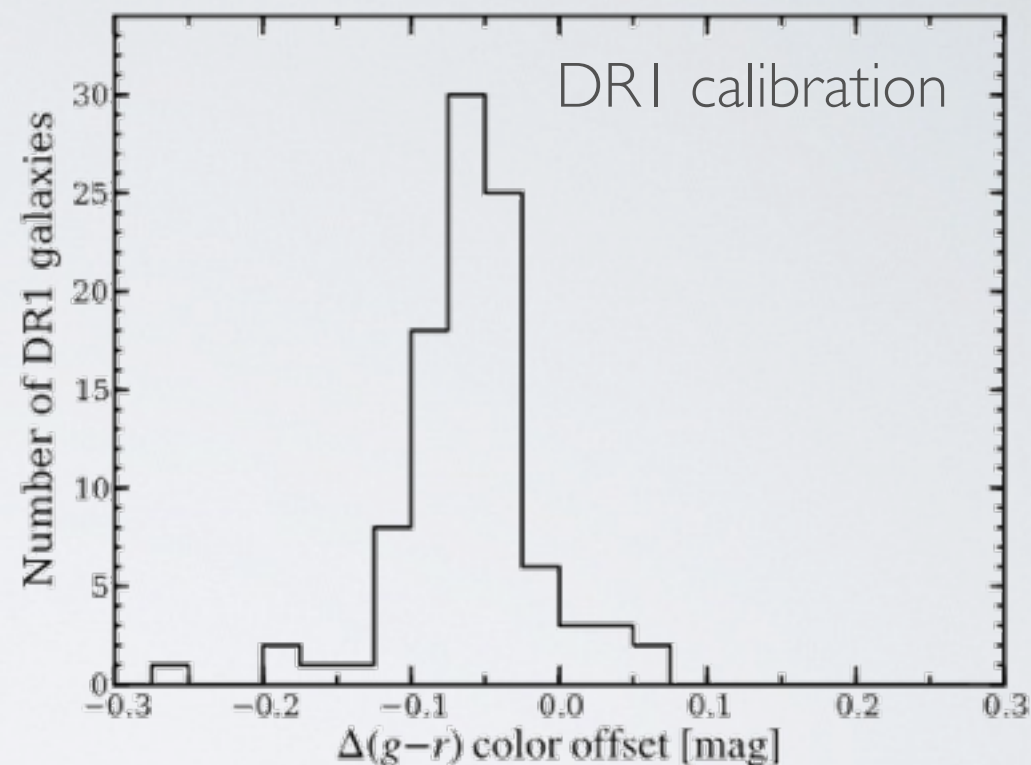
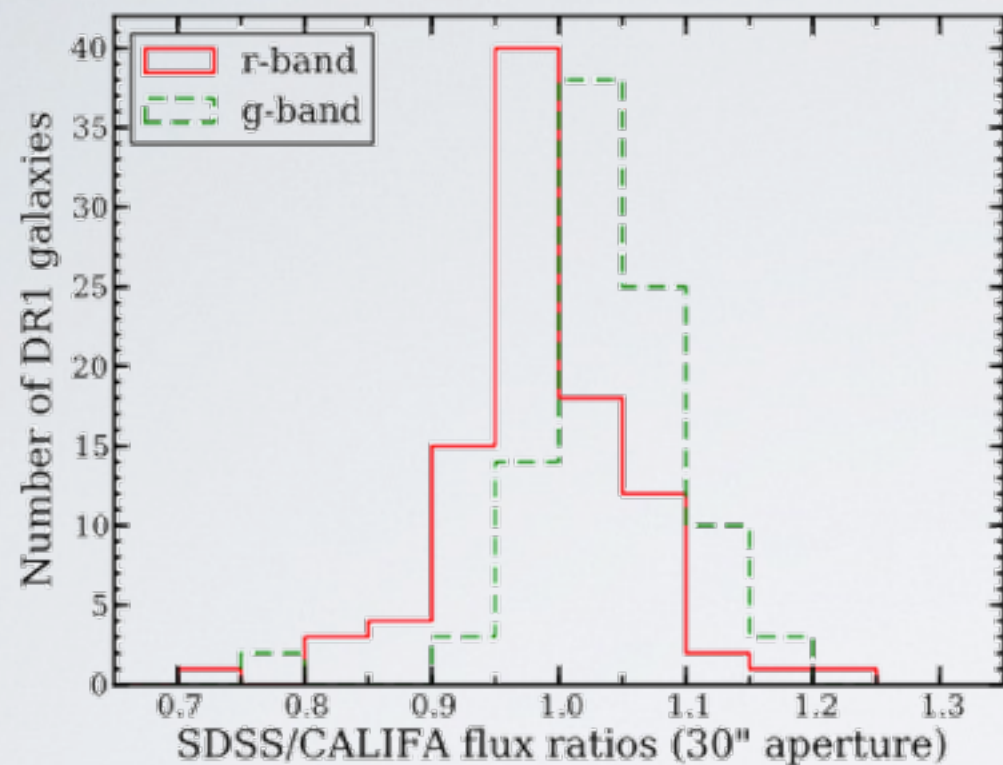


DR2: García-Benito et al. *A&A* 2015

CALIFA DR2



CALIFA DR2 - New calibration (V500)



8000 downloads!

DR1 ~ 2 years

DR2 ~ 4 months

CALIFA DR2 - Legacy



Galactic
“Paleonlotogy”!



CALIFA
IAA+UFSC
Stellar Population
group



Rosa González Delgado



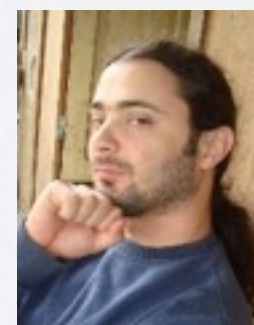
Enrique Pérez



Roberto Cid Fernandes



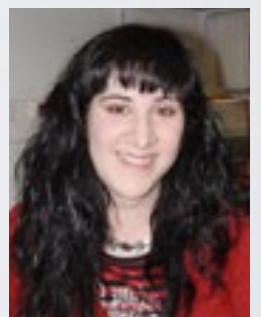
Ruben García-Benito



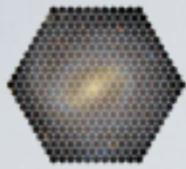
André Amorim



Rafael López



Clara Cortijo-
Ferrero

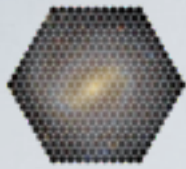


ANALYSIS TOOLS

Decomposing galaxy spectra

$$\text{[Galaxy Image]} = M1 \text{ [Star Image]} + M2 \text{ [Galaxy Image]} + M3 \text{ [Spectrum Image]} \dots$$

The method



Decomposing galaxy spectra



The method

$$\mathbf{L}_{\text{gal}}(\lambda) = \sum_{\mathbf{t}, \mathbf{Z}} \mathbf{M}_{\text{SSP}}(\mathbf{t}, \mathbf{Z}) \times \mathbf{SSP}(\lambda; \mathbf{t}, \mathbf{Z}) \times \mathbf{e}^{-\tau(\lambda)}$$



Observables:
Full spectrum



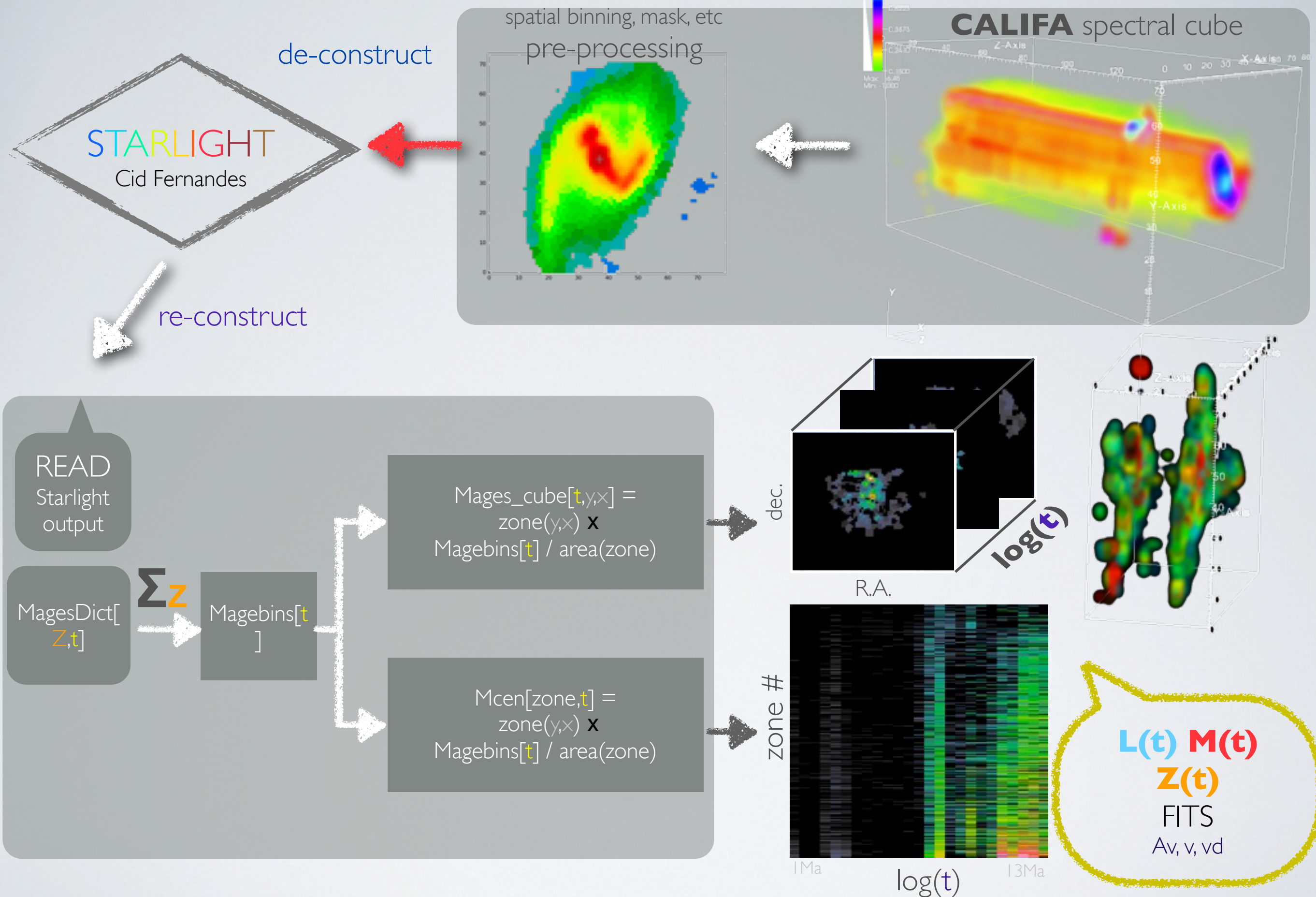
SFH:
*Mass or
light fractions*



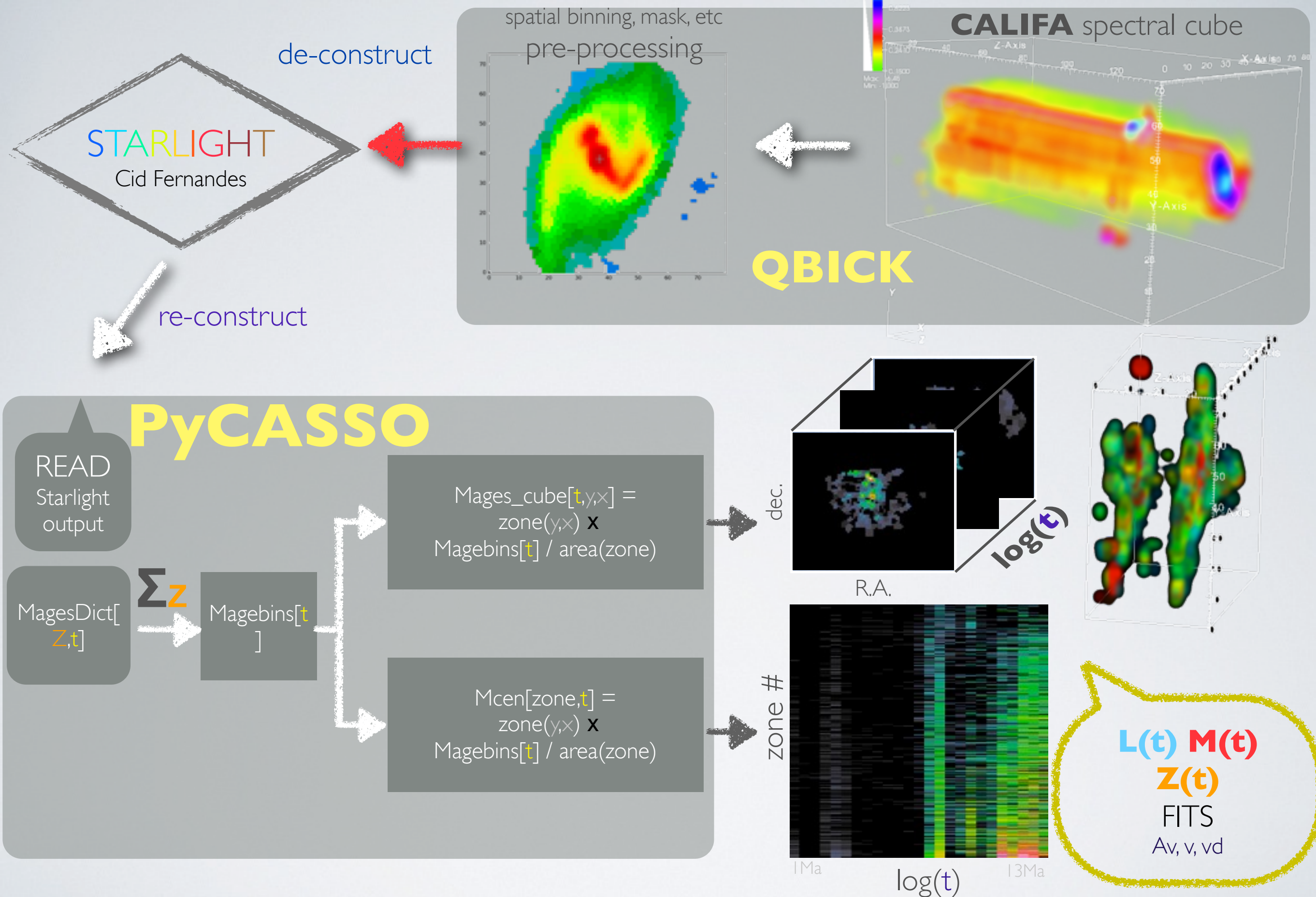
Spectral Base



Dust



Processing & Analysis pipelines



Processing & Analysis pipelines

Resolving galaxies in time and space: I:

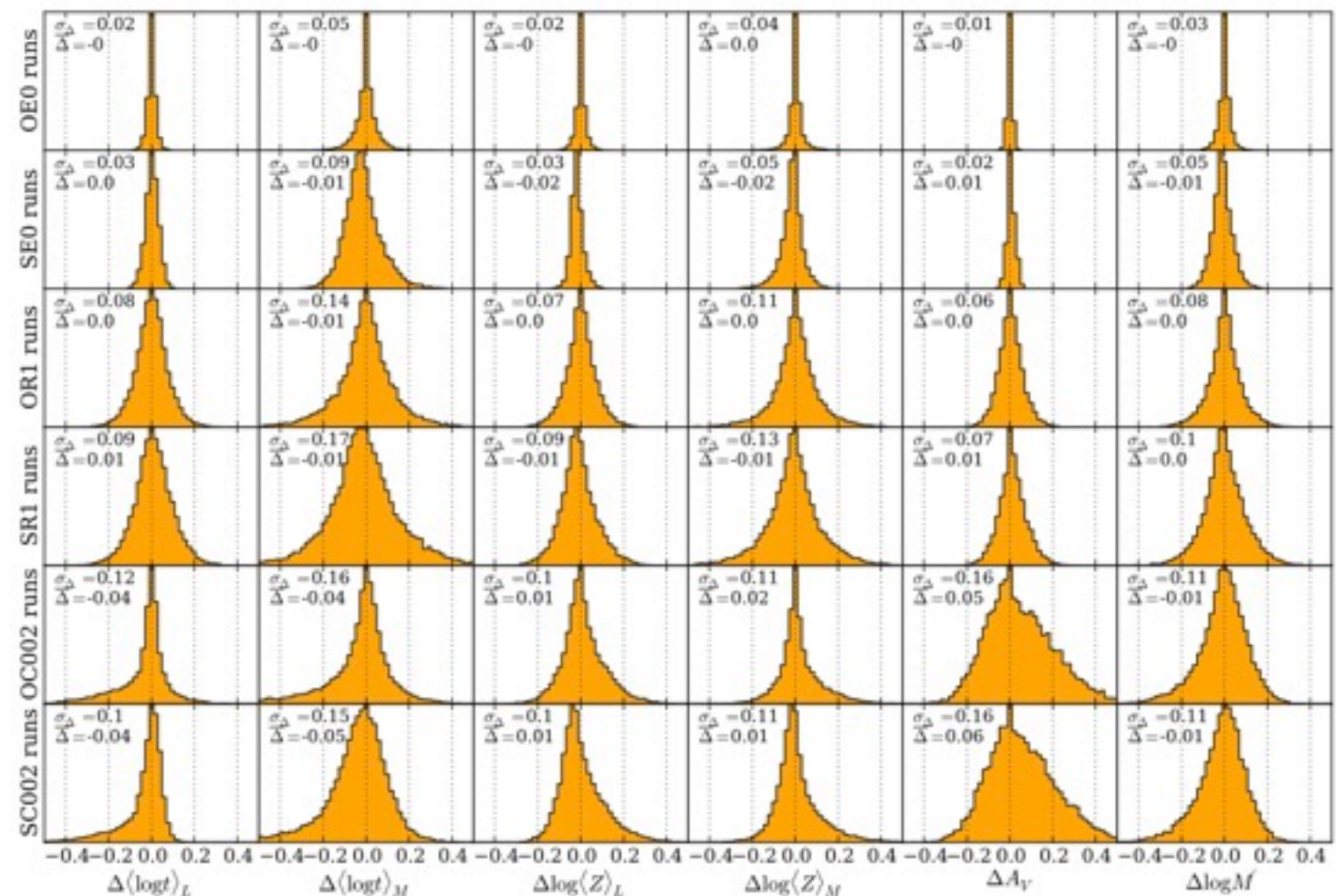
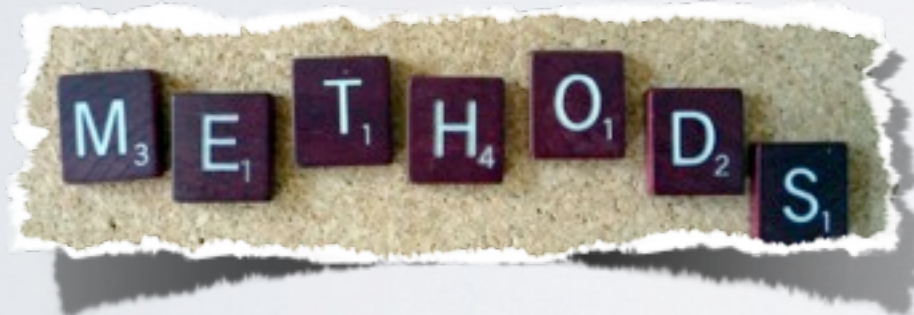
Applying STARLIGHT to CALIFA data cubes

R. Cid Fernandes^{1,2}, E. Pérez¹, R. García Benito¹, R. M. González Delgado¹, A. L. de Amorim², S. F. Sánchez^{1,3}, B. Husemann⁴, J. Falcón Barroso^{5,6}, P. Sánchez-Blázquez⁷, C. J. Walcher⁴, and D. Mast^{1,3}

Resolving galaxies in time and space: II:

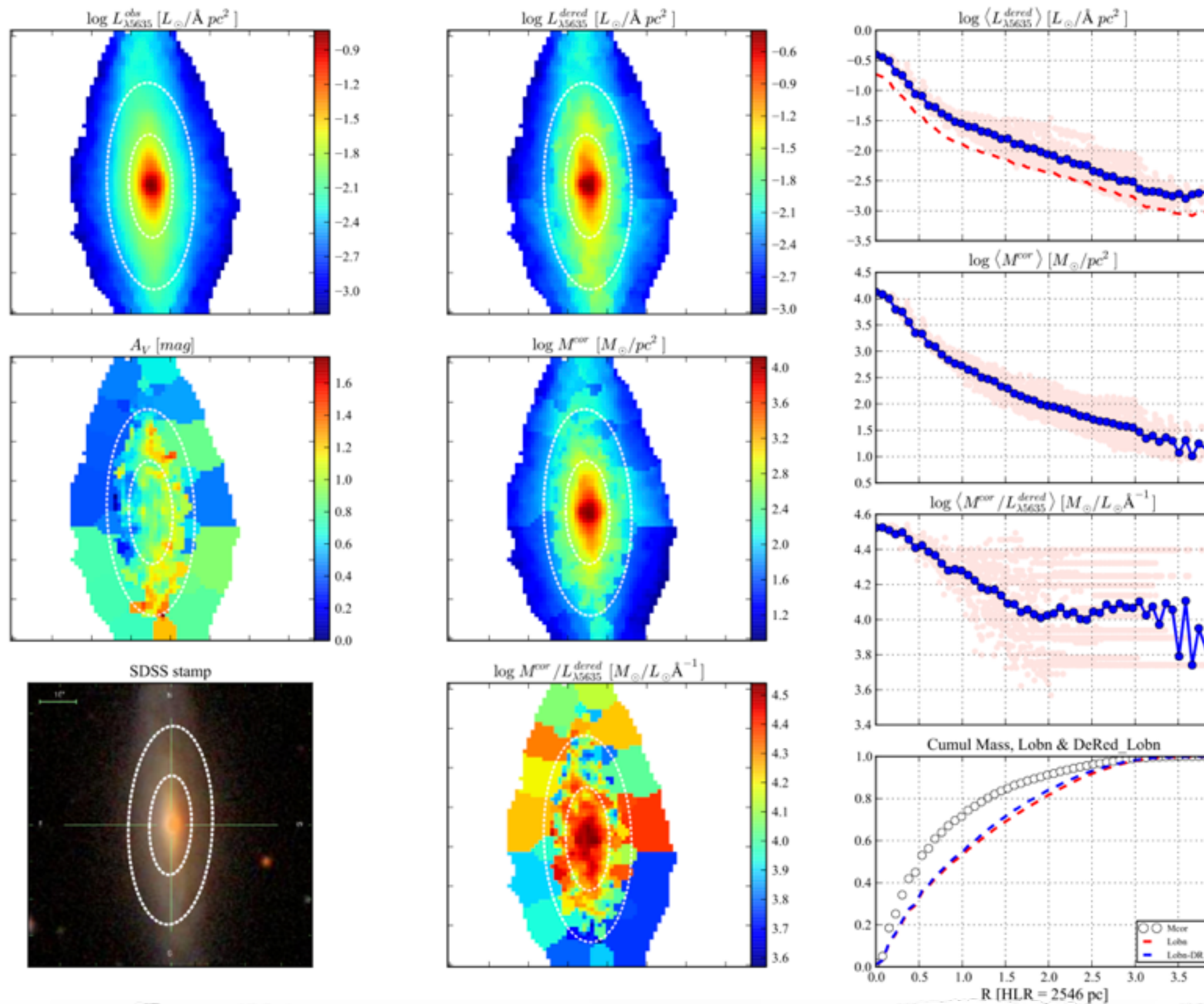
Uncertainties in the spectral synthesis of datacubes

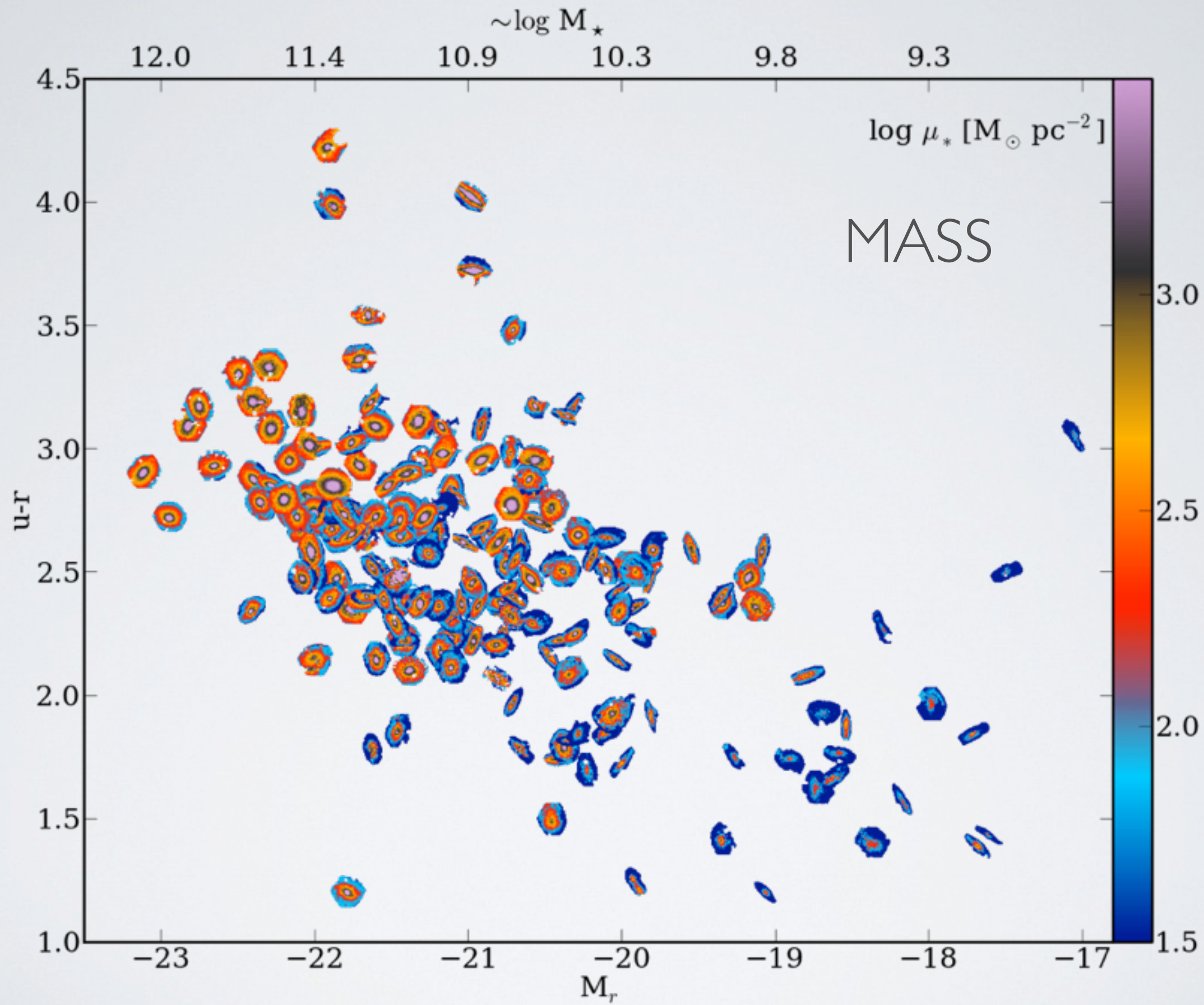
R. Cid Fernandes^{1,2}, R. M. González Delgado², R. García Benito², E. Pérez², A. L. de Amorim^{1,2}, S. F. Sánchez^{2,3}, B. Husemann⁴, J. Falcón Barroso^{5,6}, R. López-Fernández², P. Sánchez-Blázquez⁷, N. Vale Asari¹, A. Vazdekis^{5,6}, C. J. Walcher⁴ and D. Mast^{2,3}

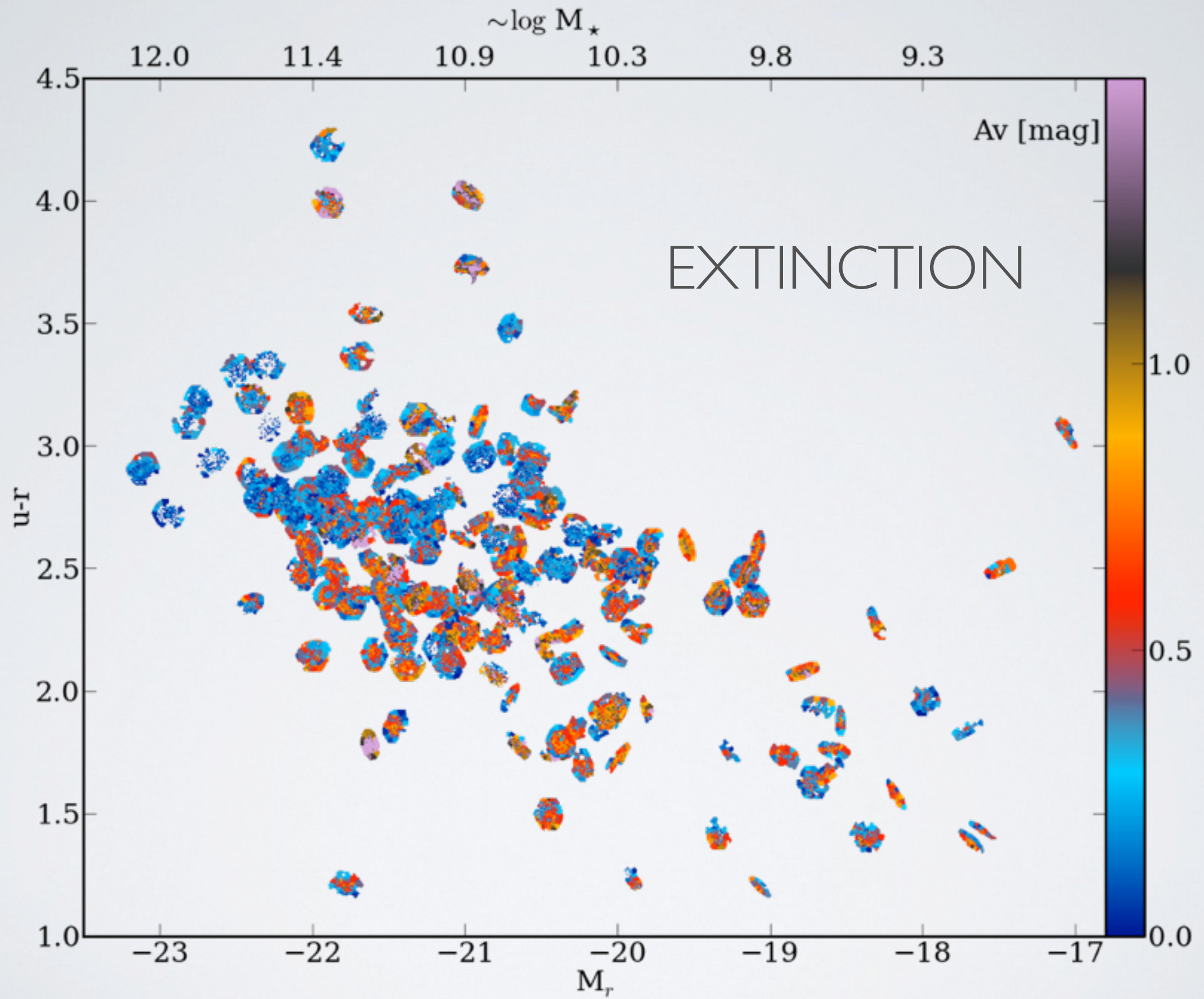


PyCASSO Products

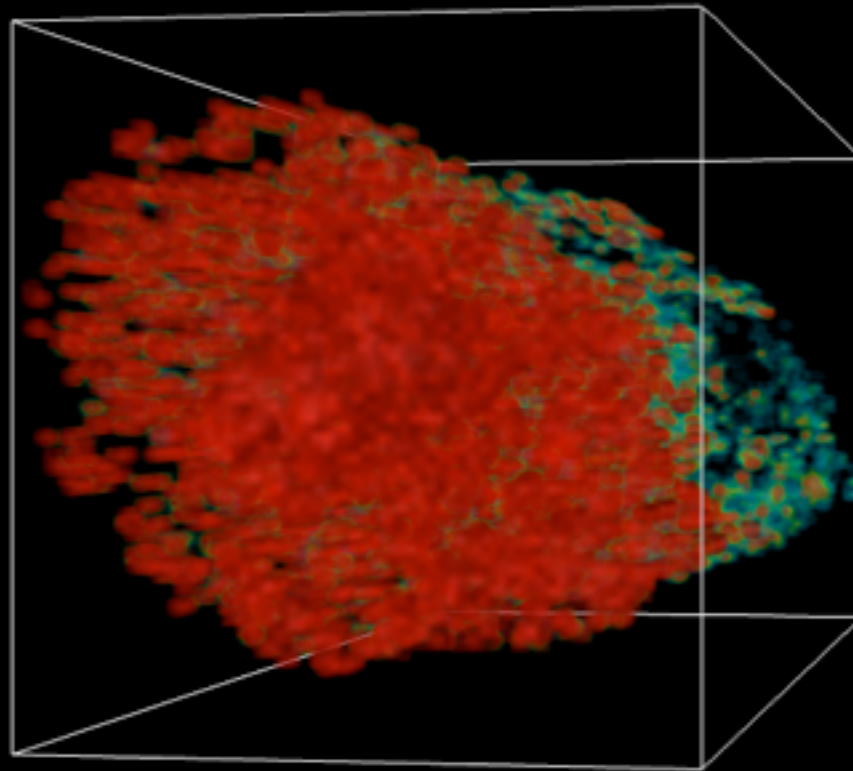
[Fig02] ... K0001 0.3.6 d13c512 w/base Bgsd01 || FWHM=0.5dex ; $\Delta R=1.0$ pix || IC5376

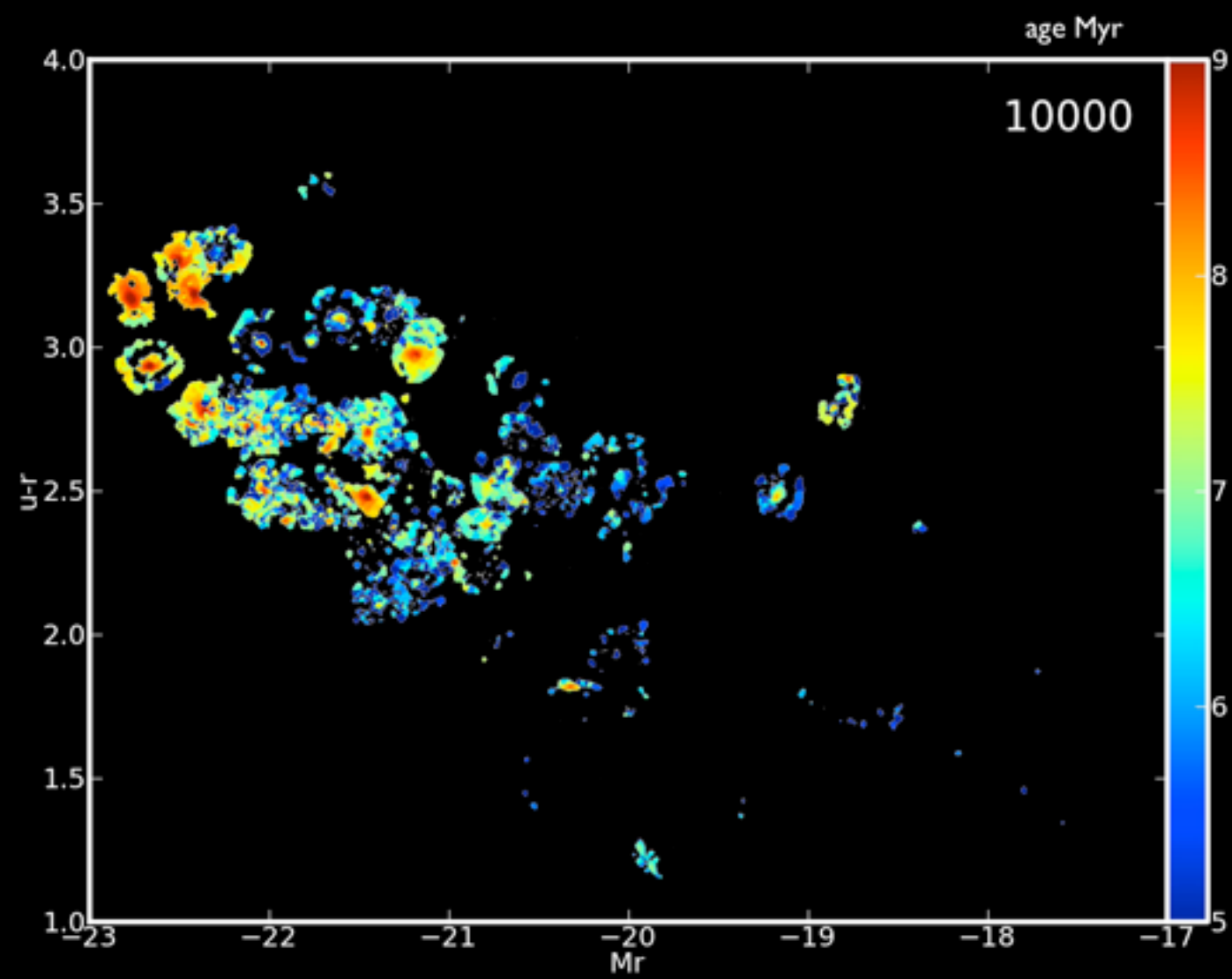


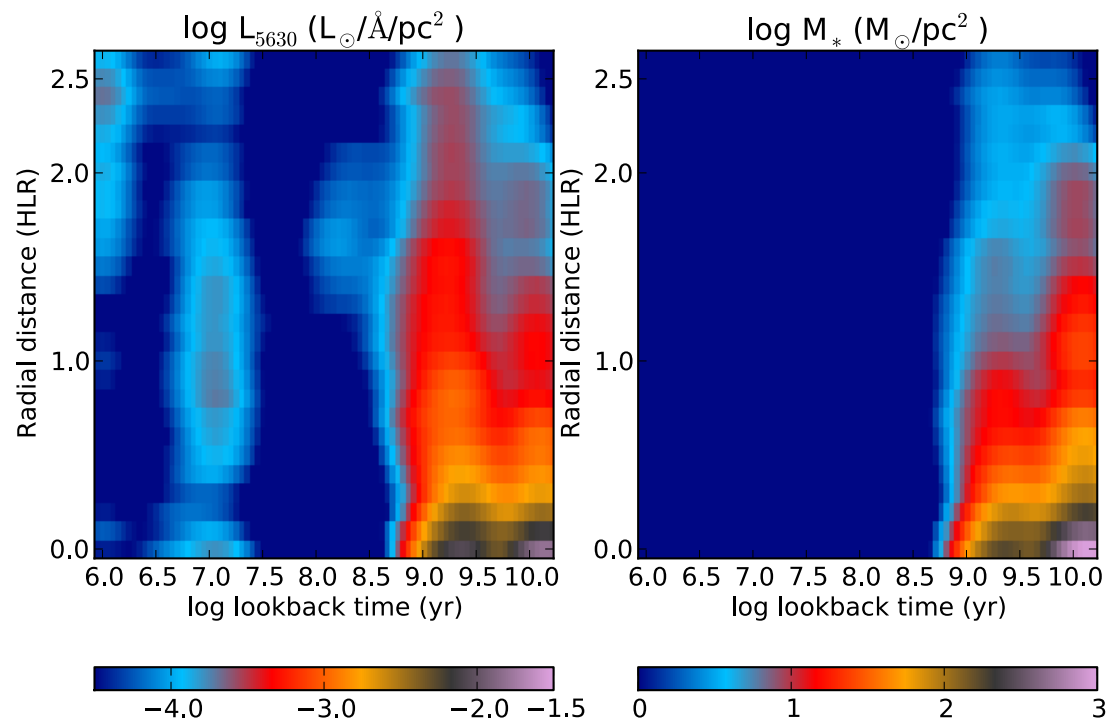




Mass growth.





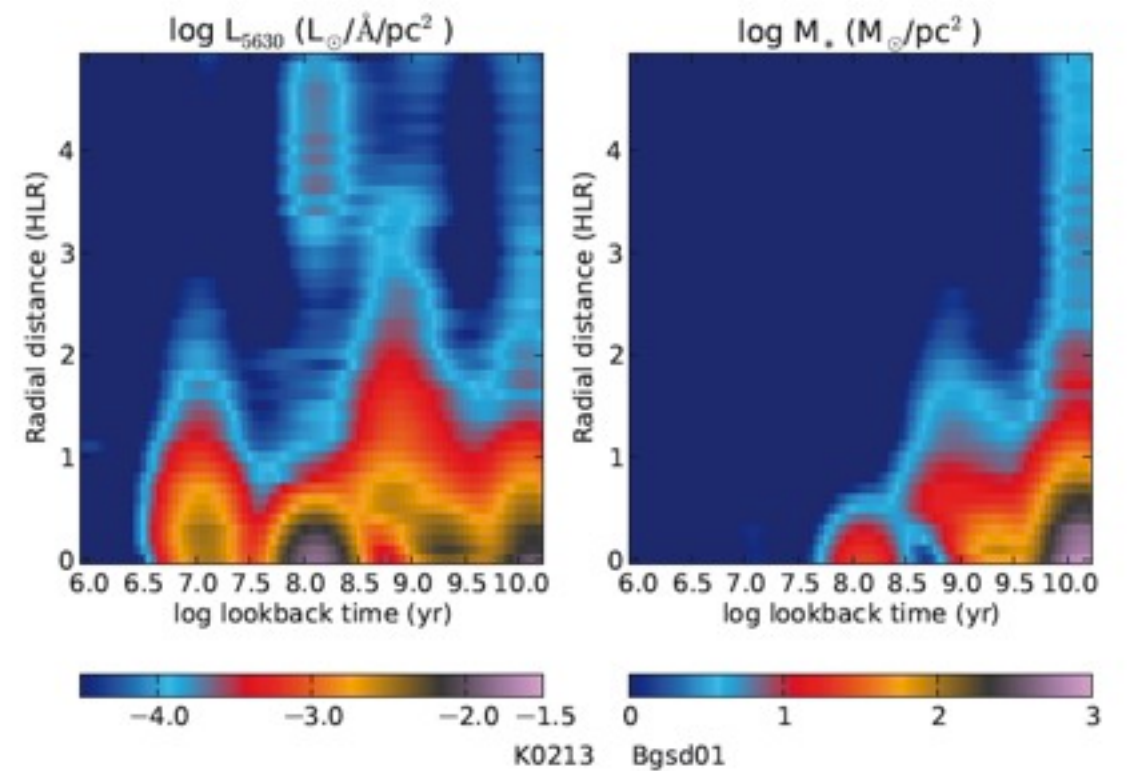


$\log y [\text{yr}]$

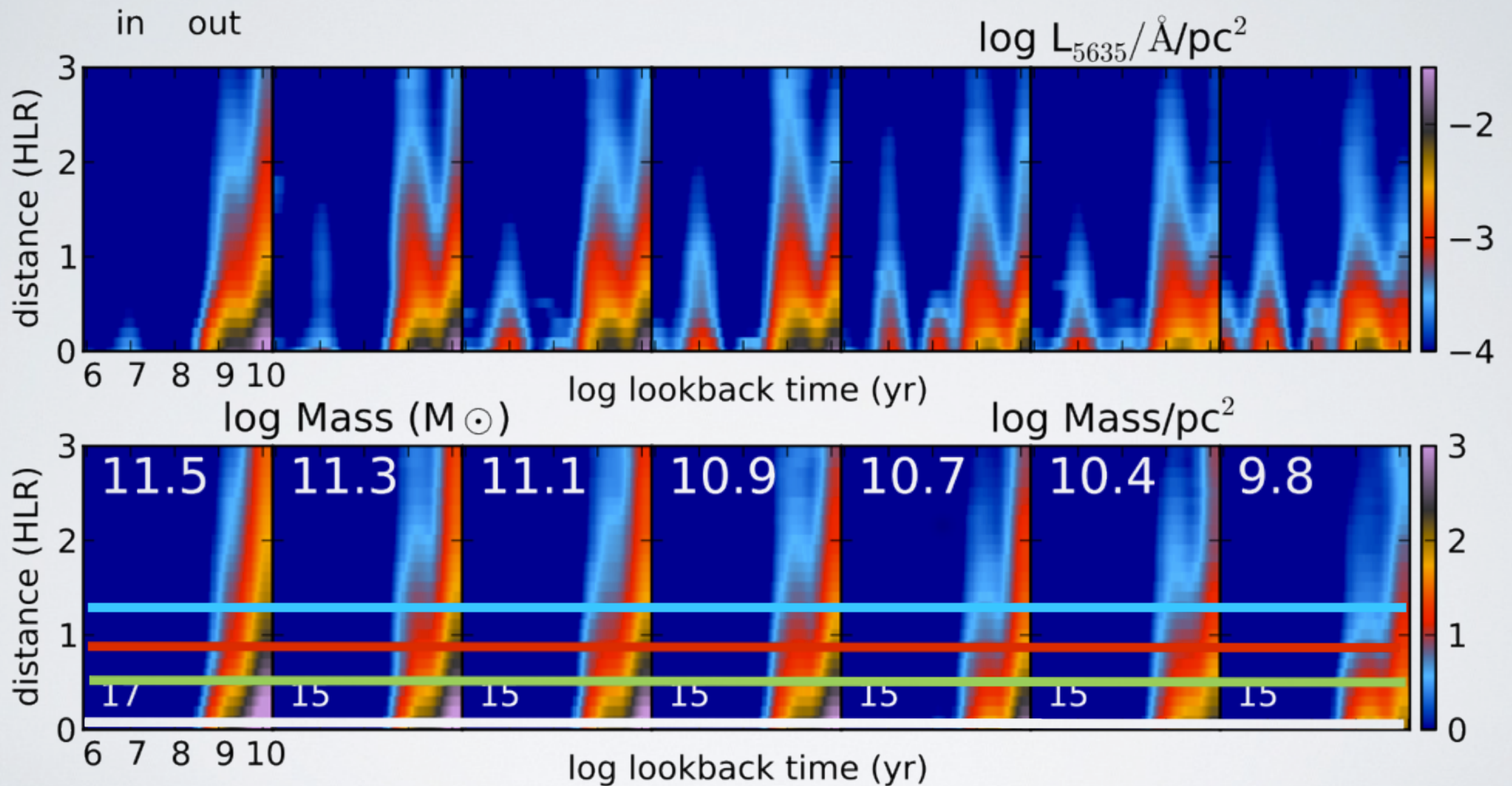
$R [\text{HLR}]$



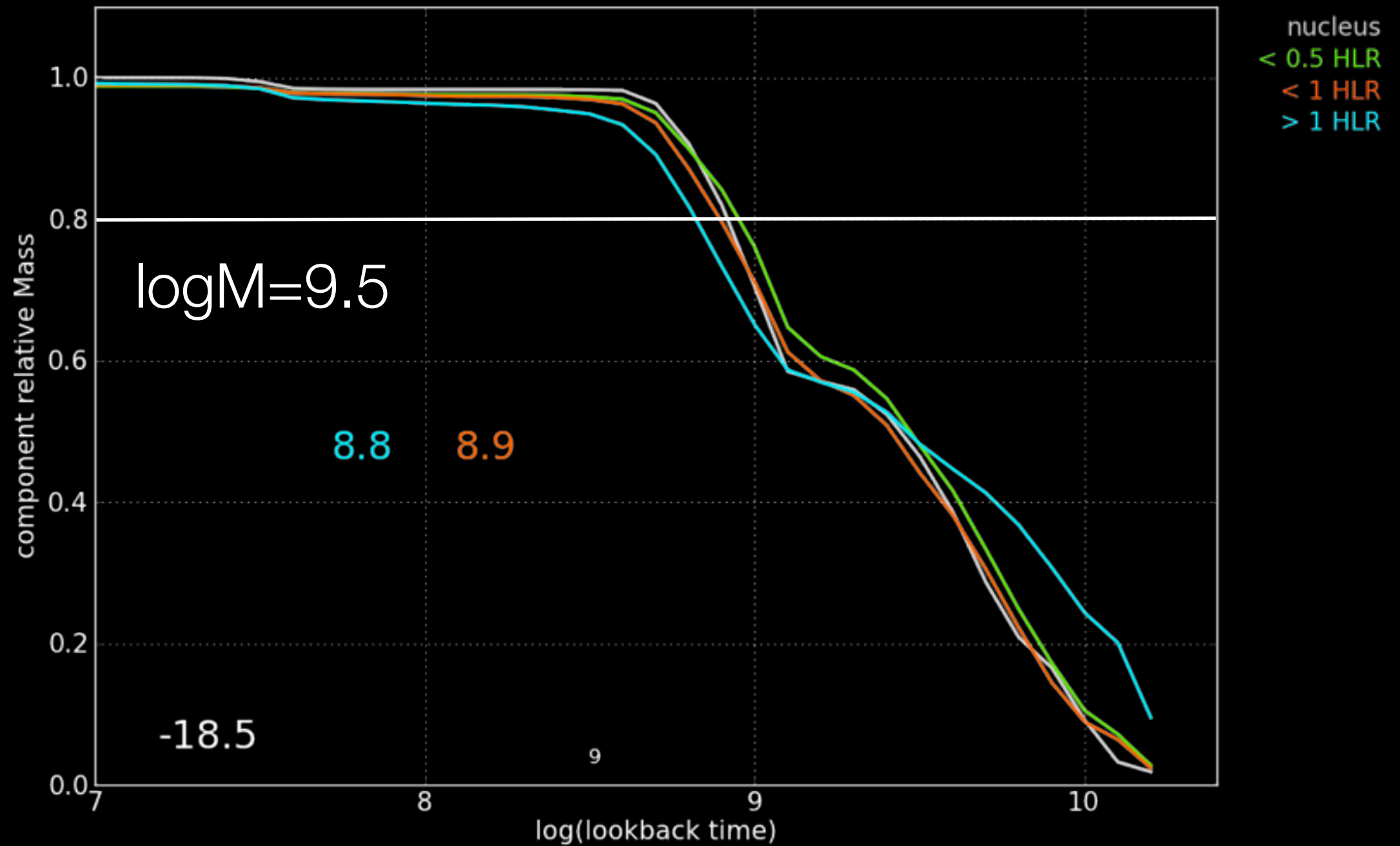
NGC 2623 (merger)



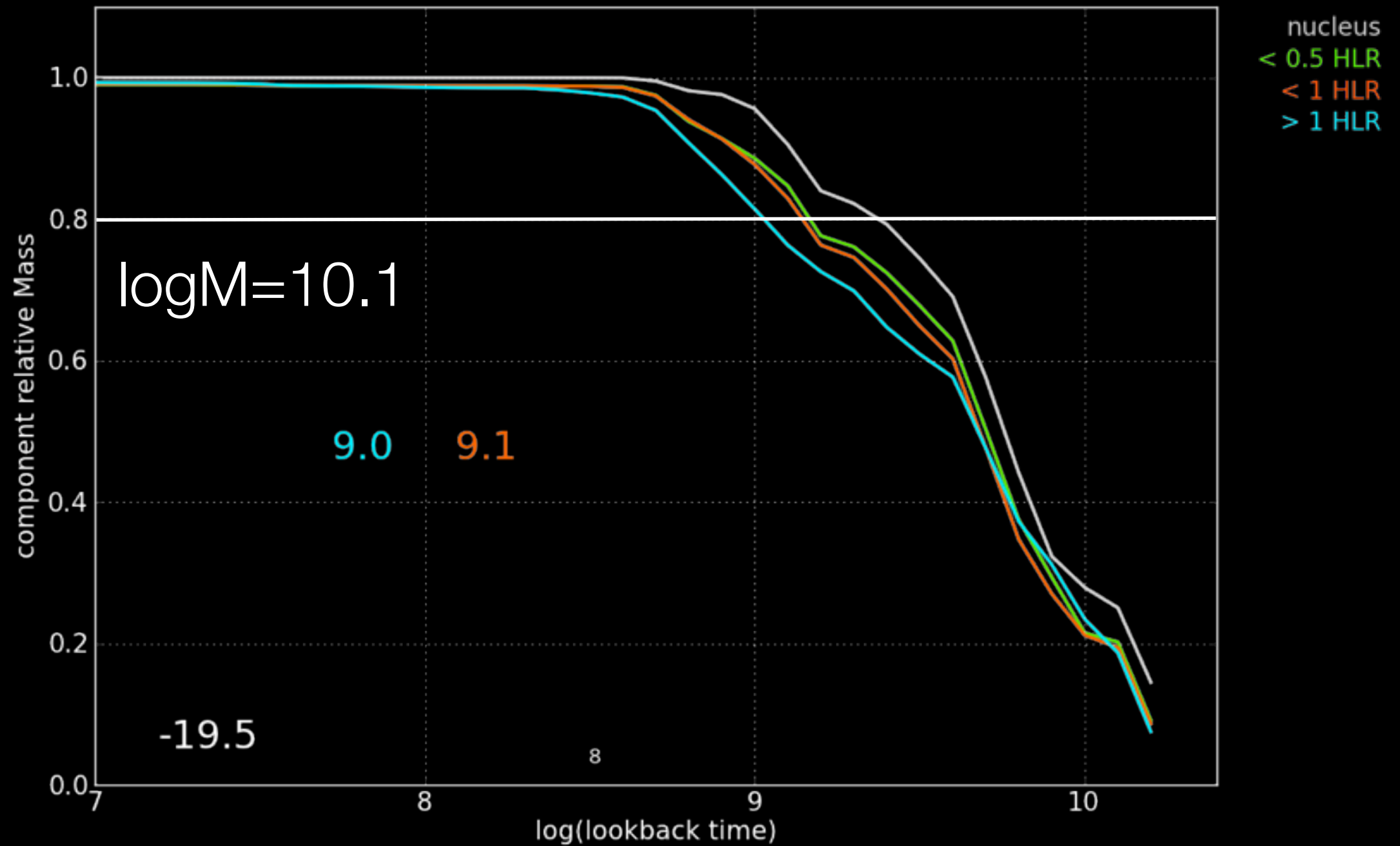
Stacking by galaxy mass



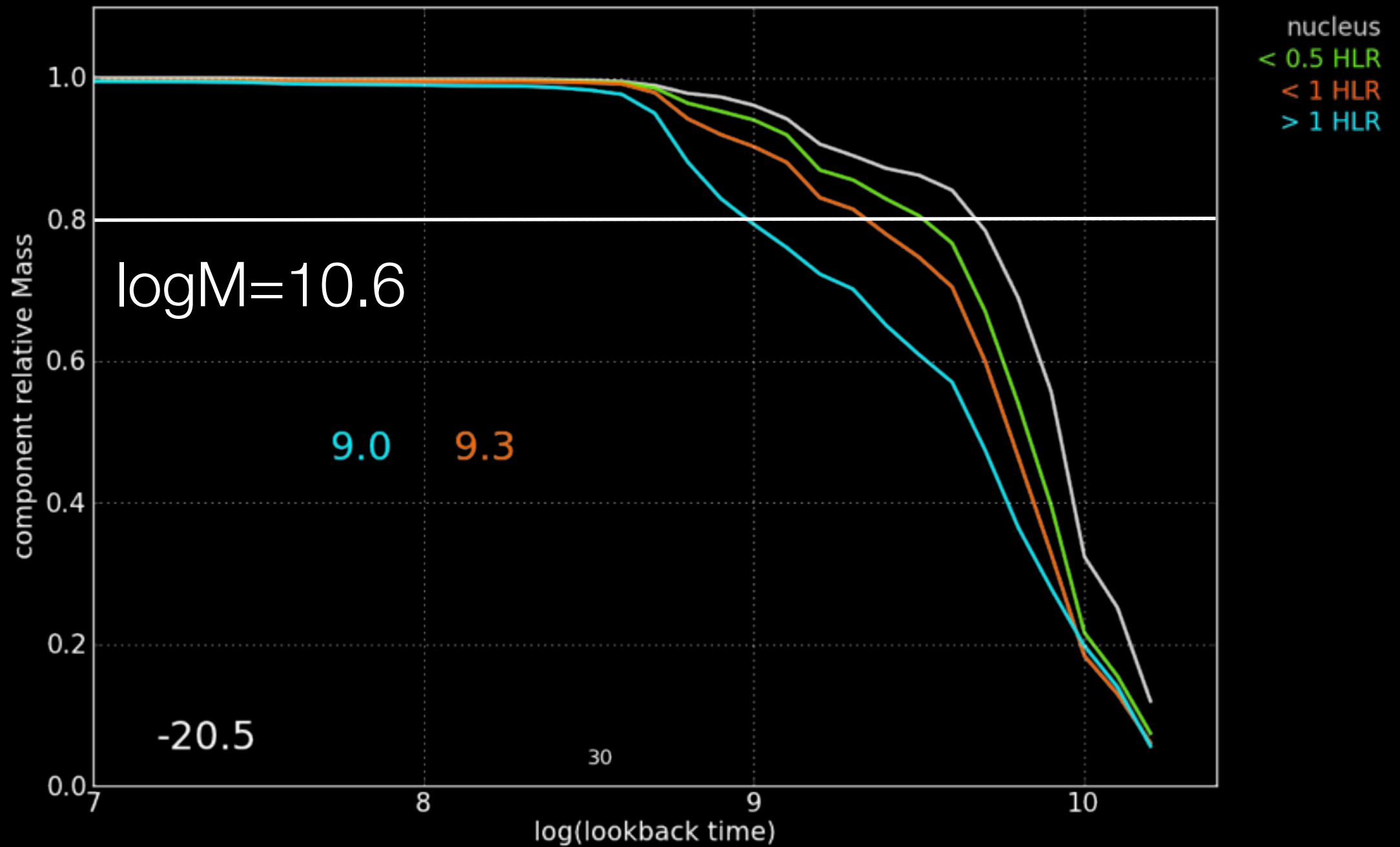
Mass growth curve



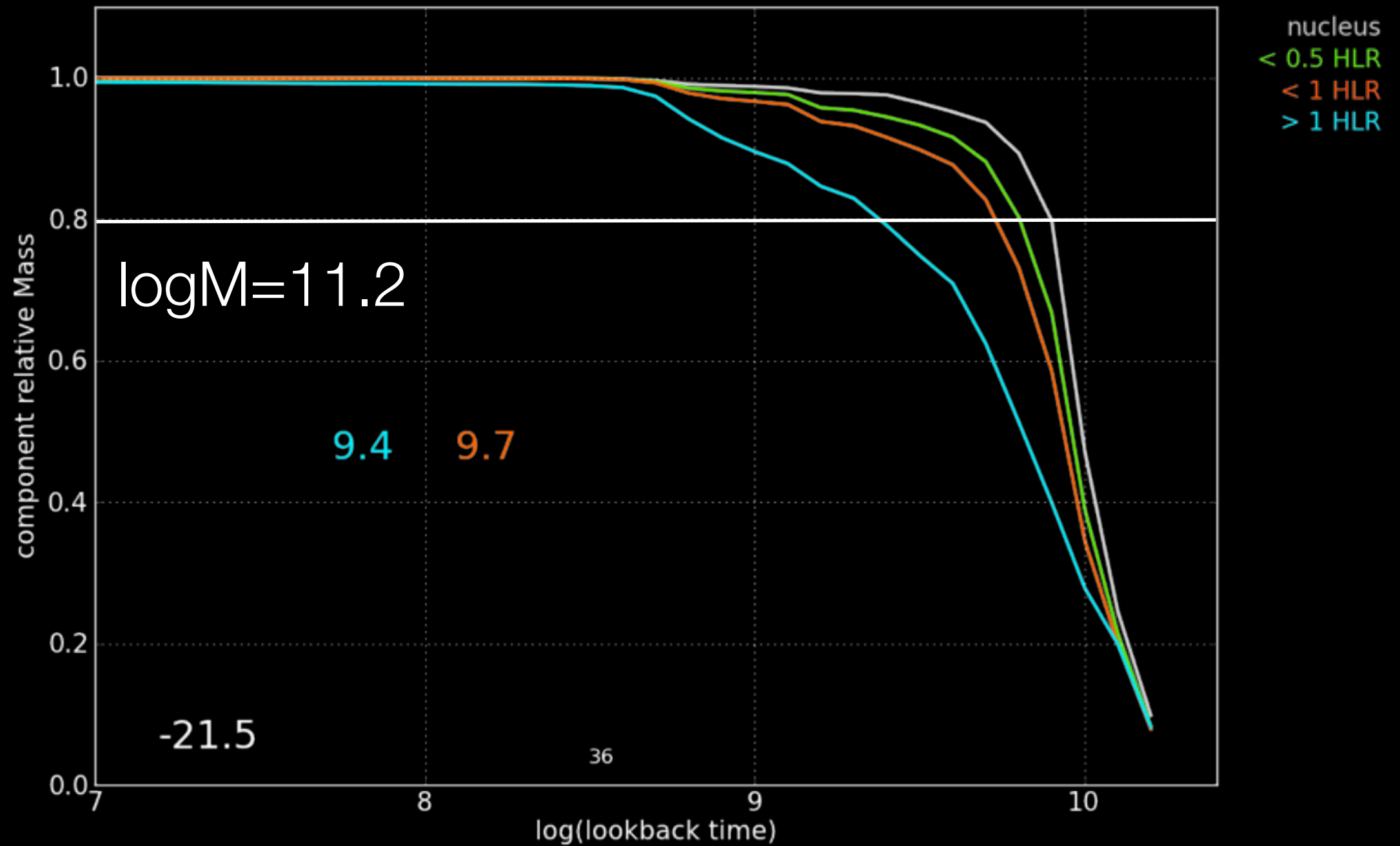
Mass growth curve



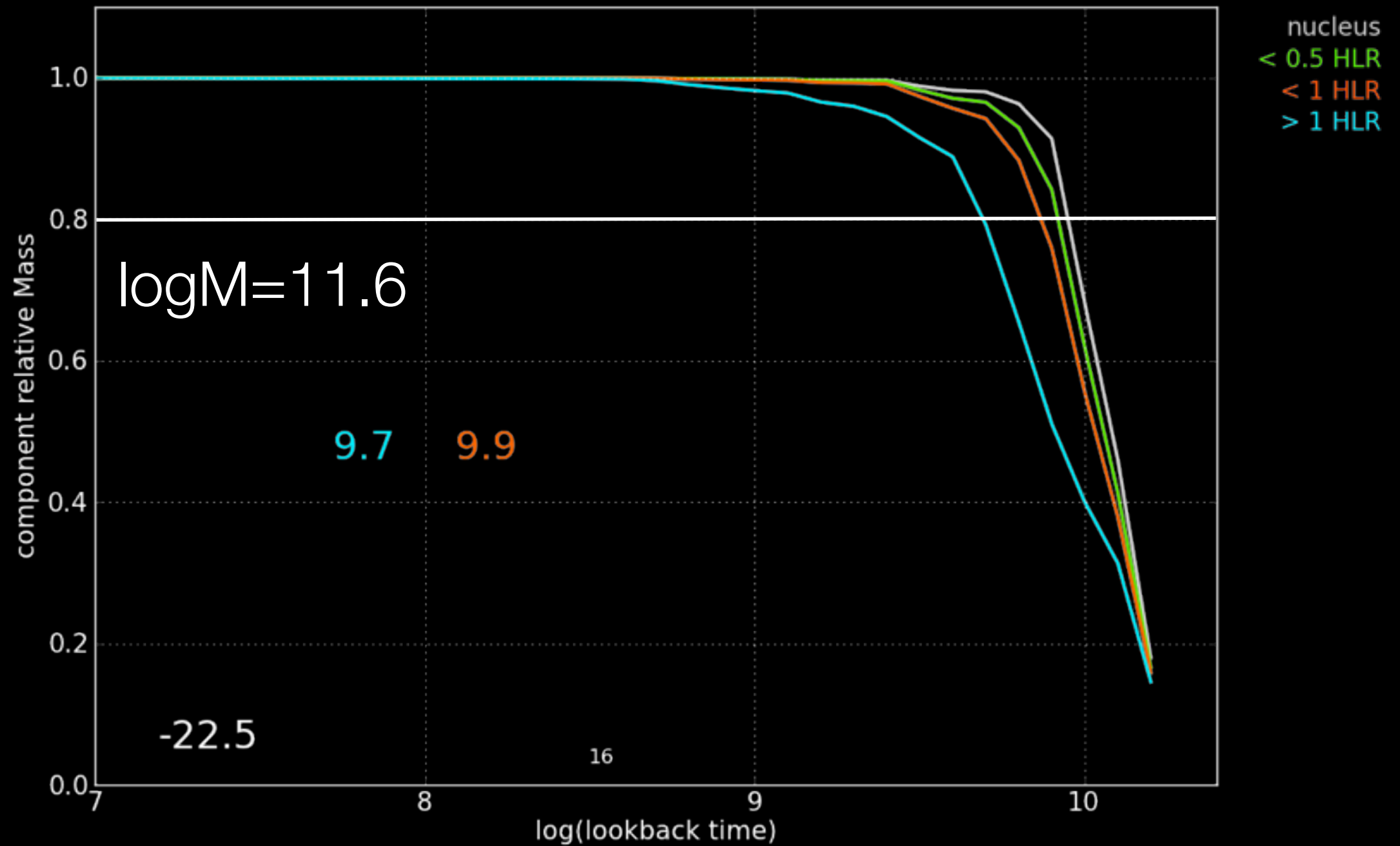
Mass growth curve



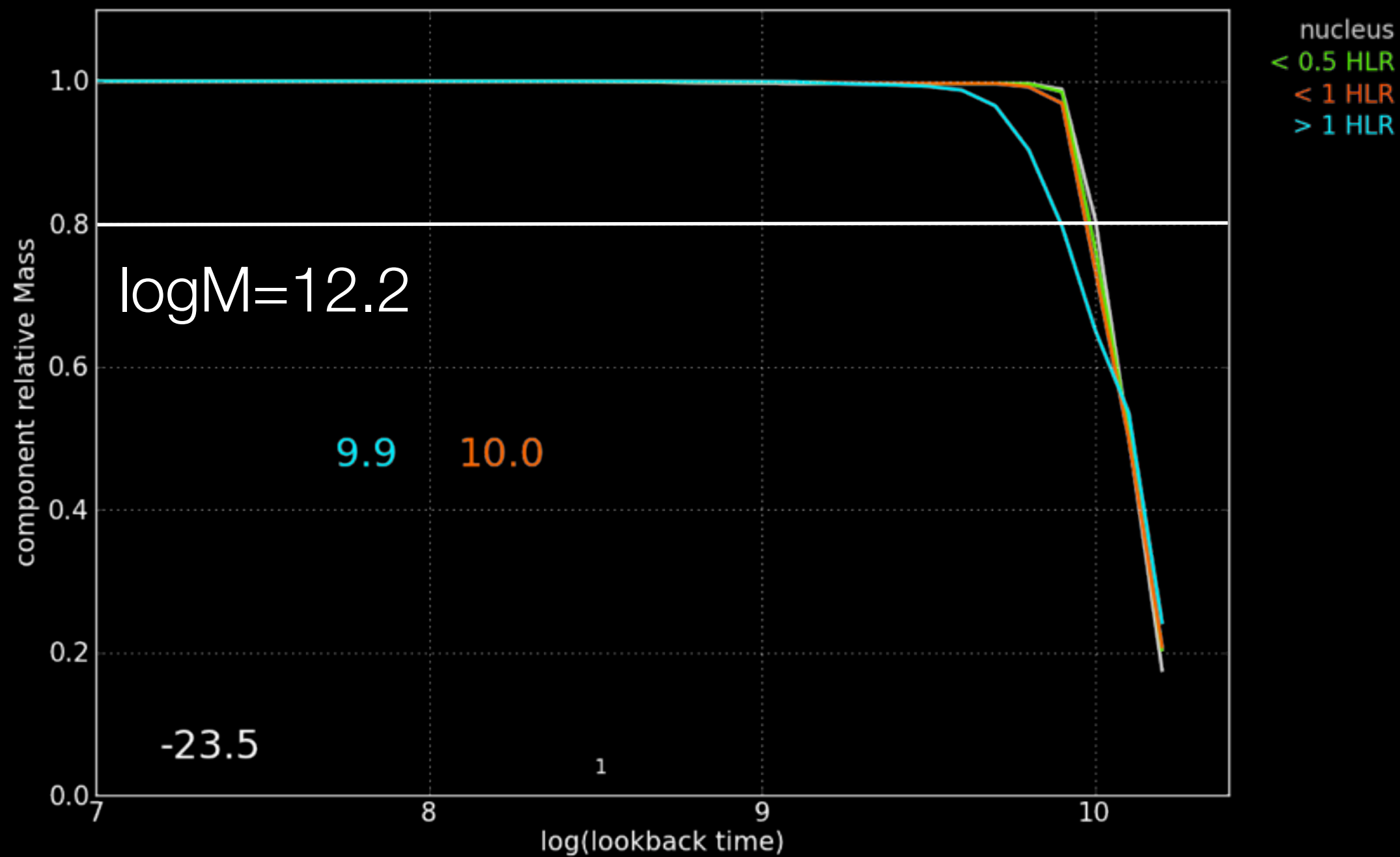
Mass growth curve



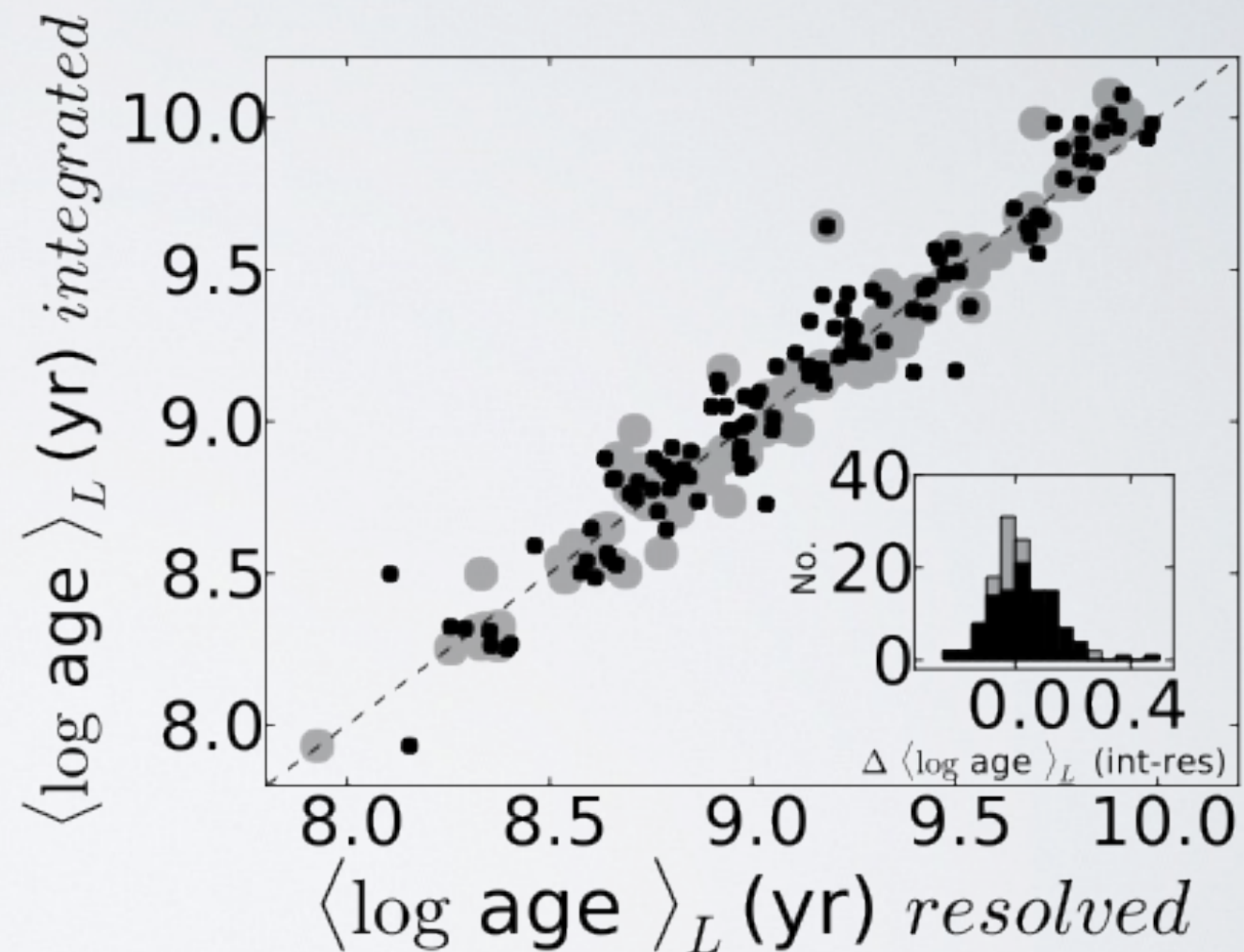
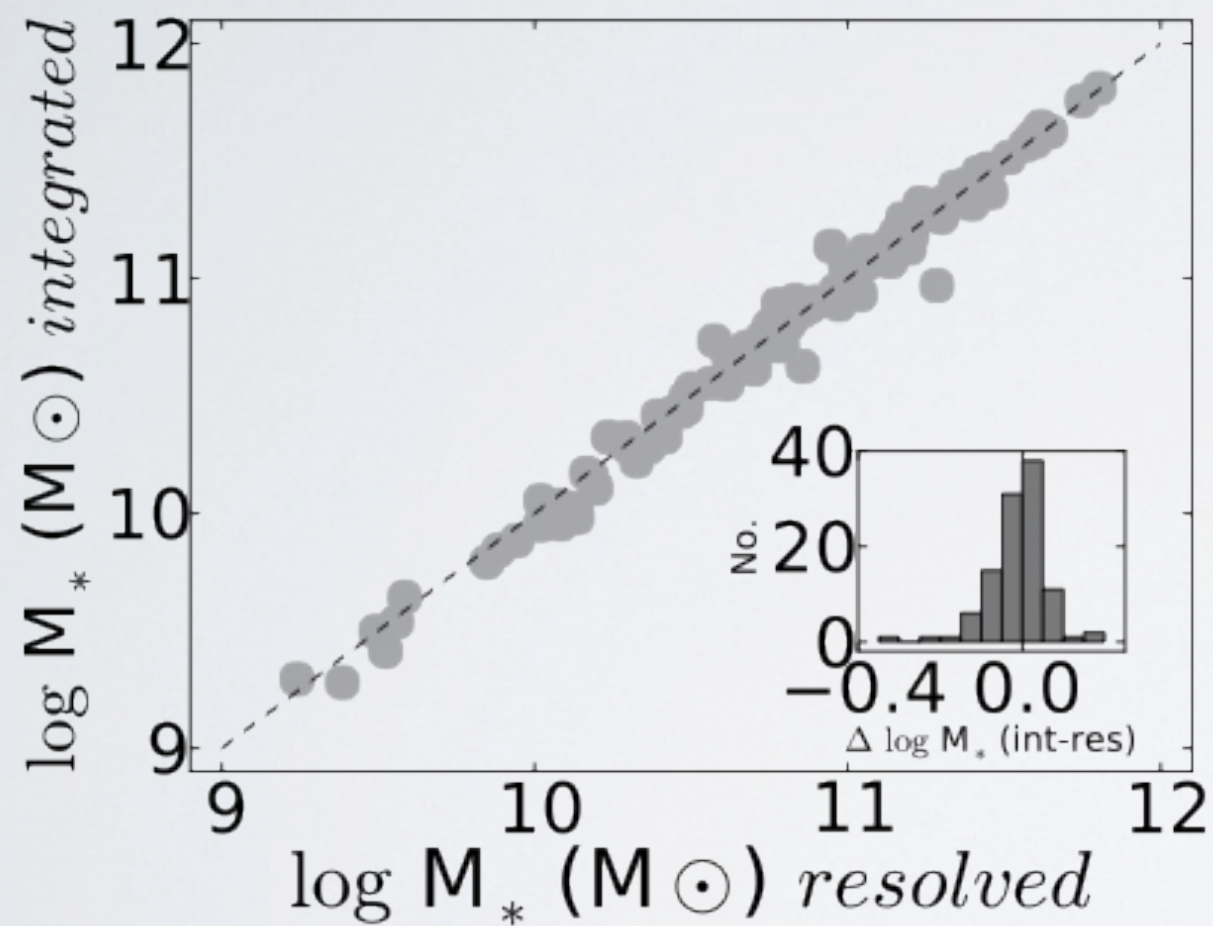
Mass growth curve



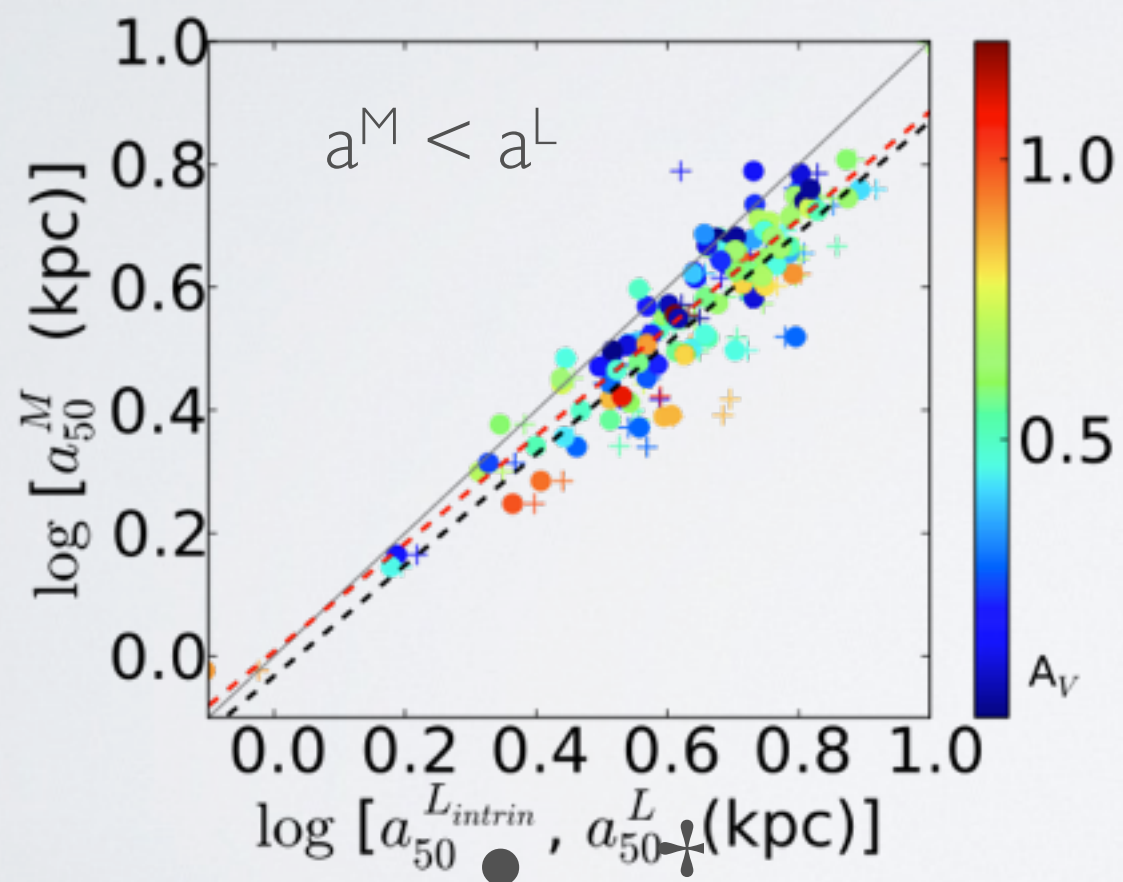
Mass growth curve



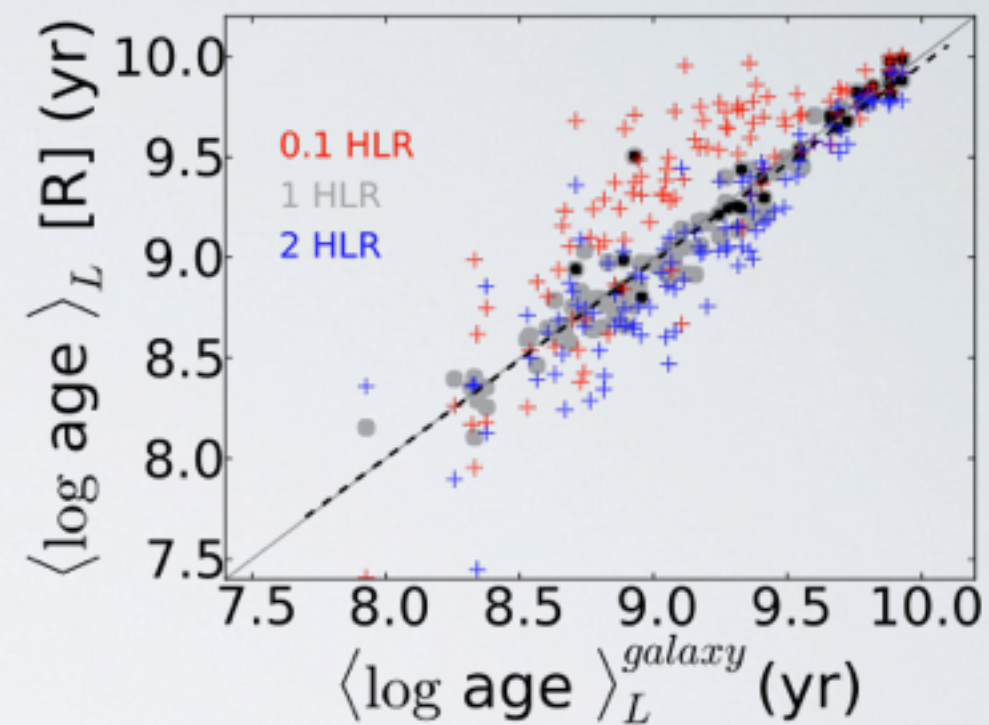
Integrated vs resolved stellar properties



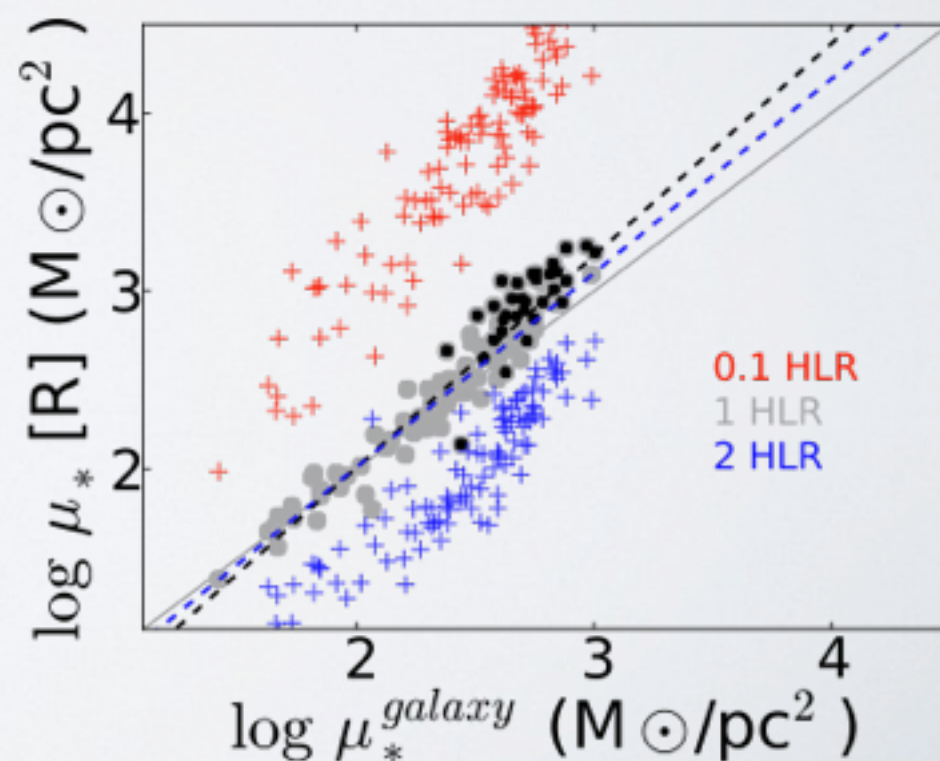
Mass Radius vs Light Radius



Averaged vs properties
at HLR



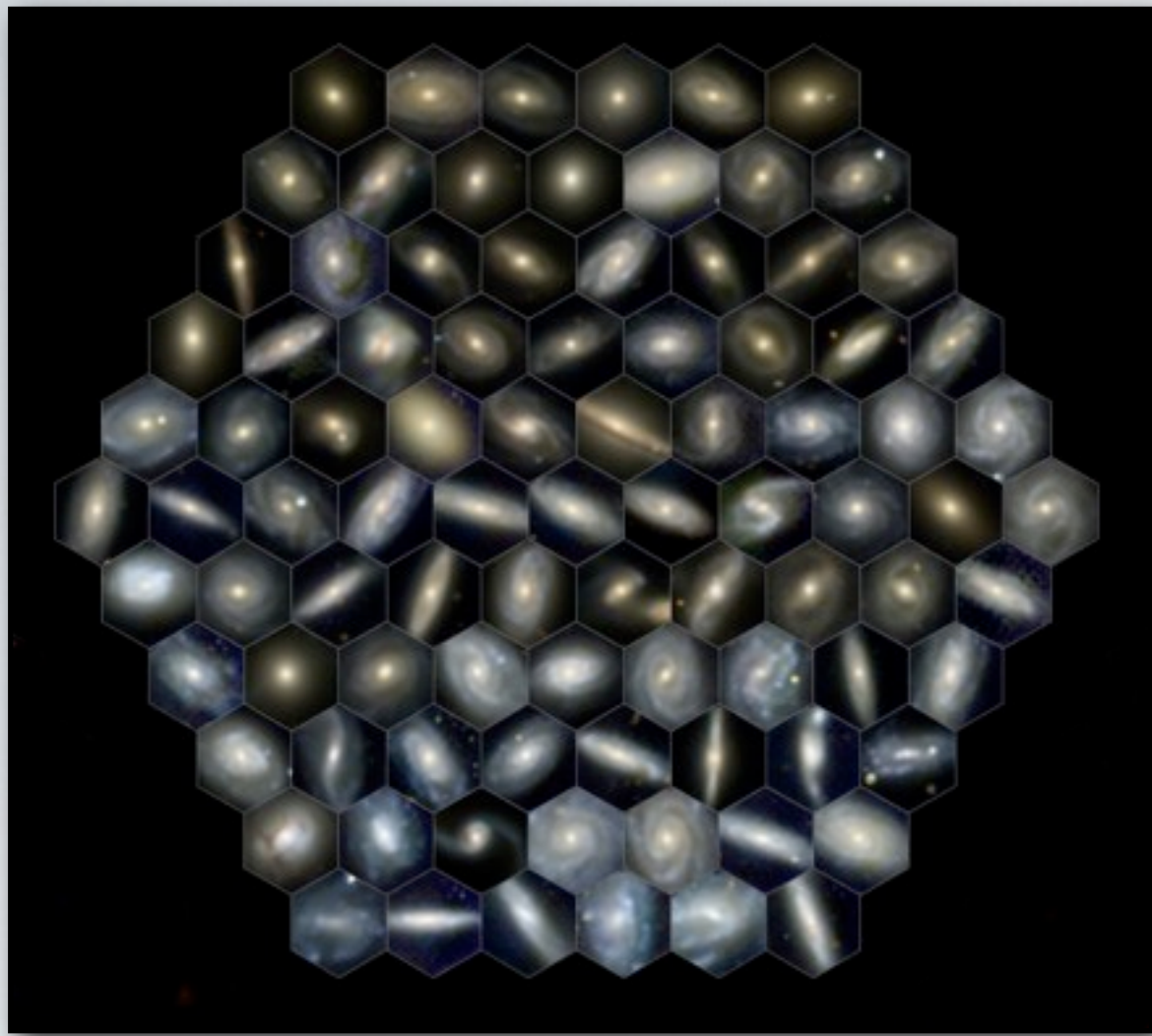
Effective radius are really “effective”

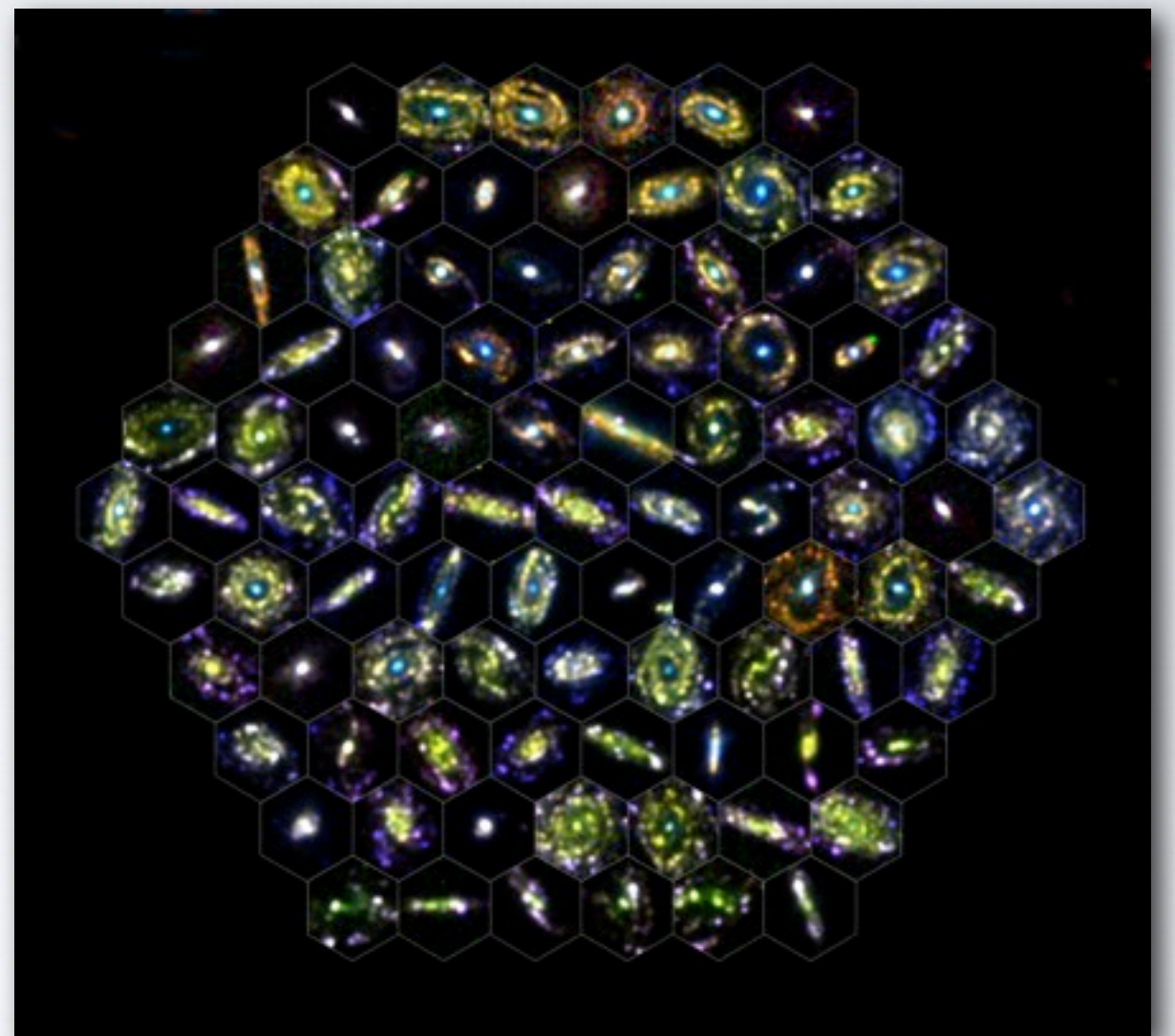
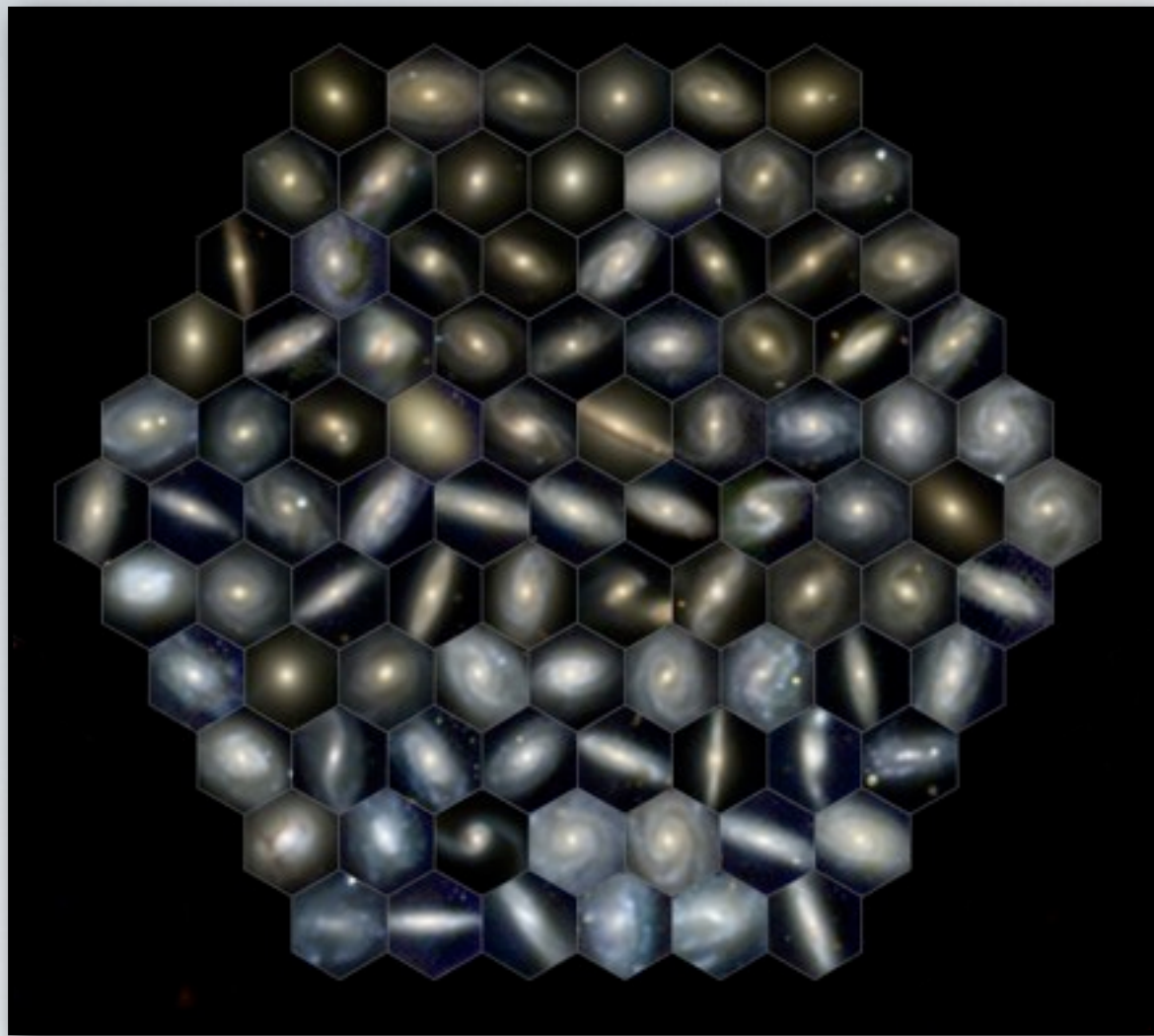


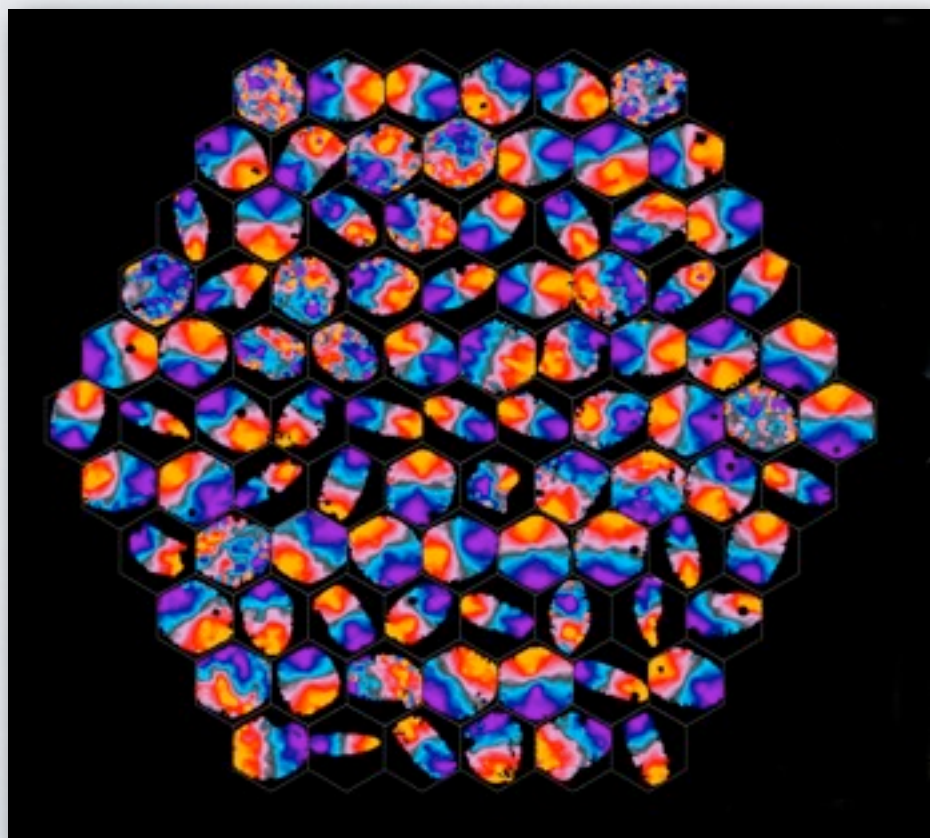
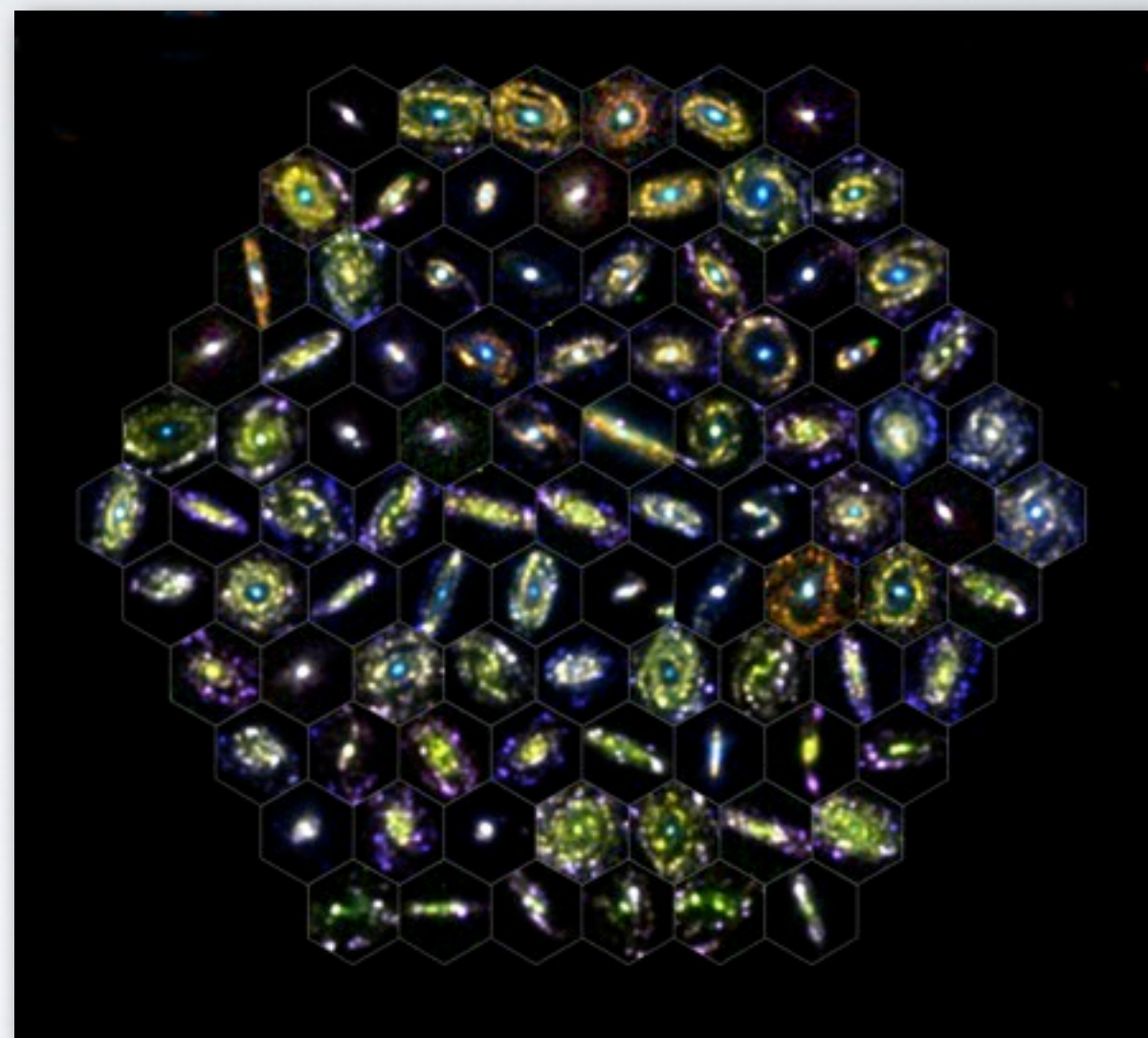
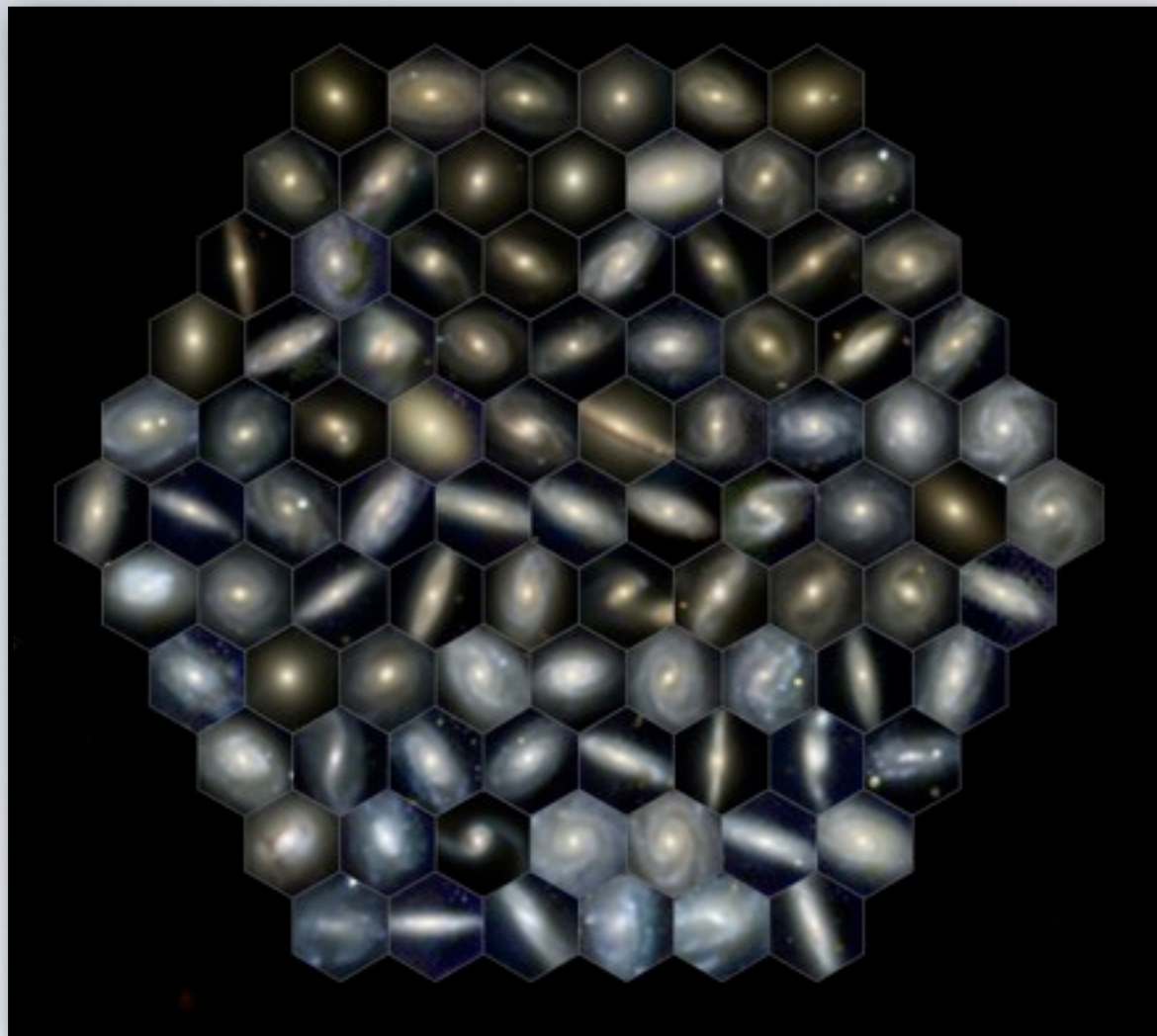
THE CALIFA SURVEY

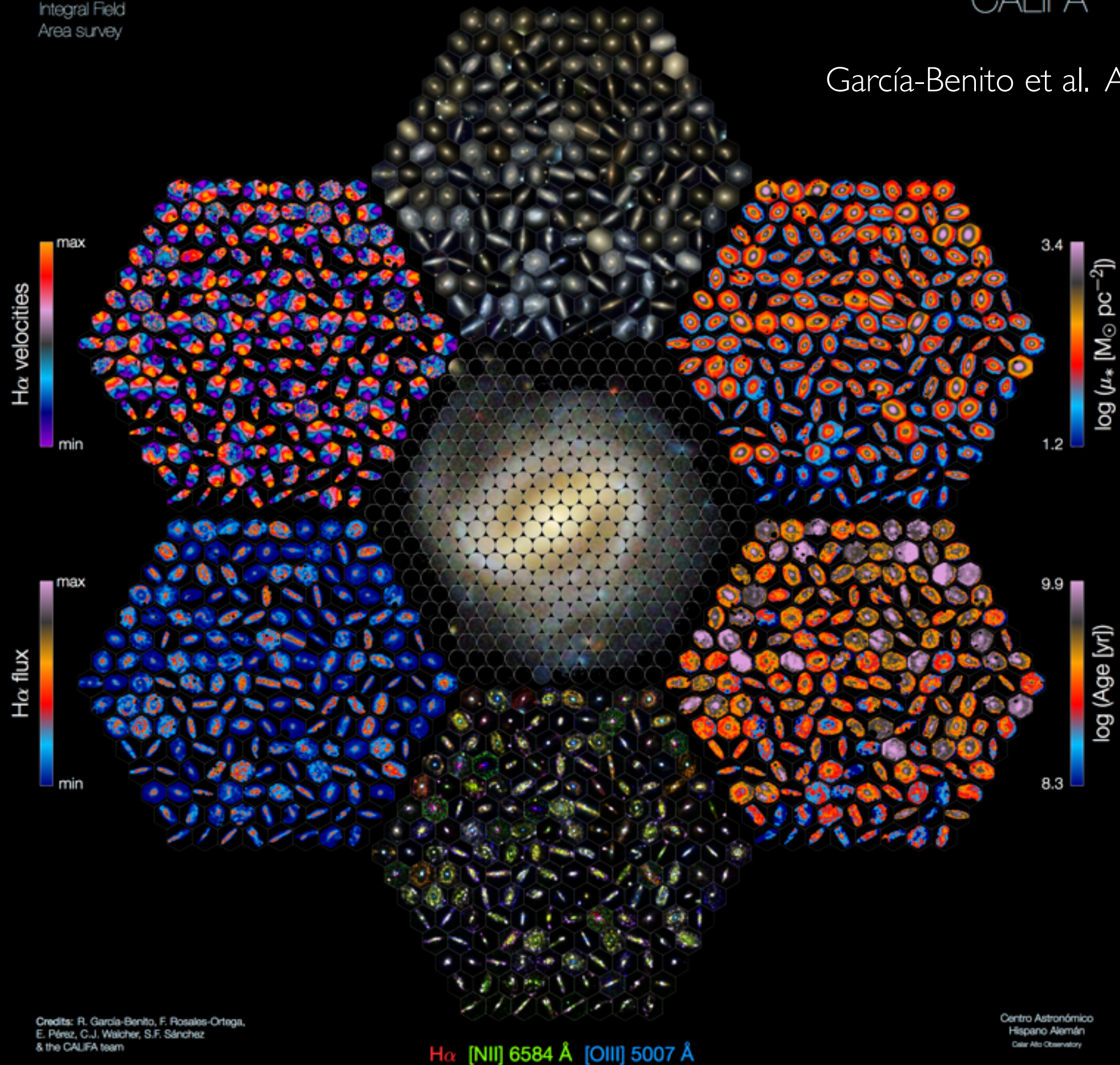
A PANORAMIC VIEW OF GALAXIES





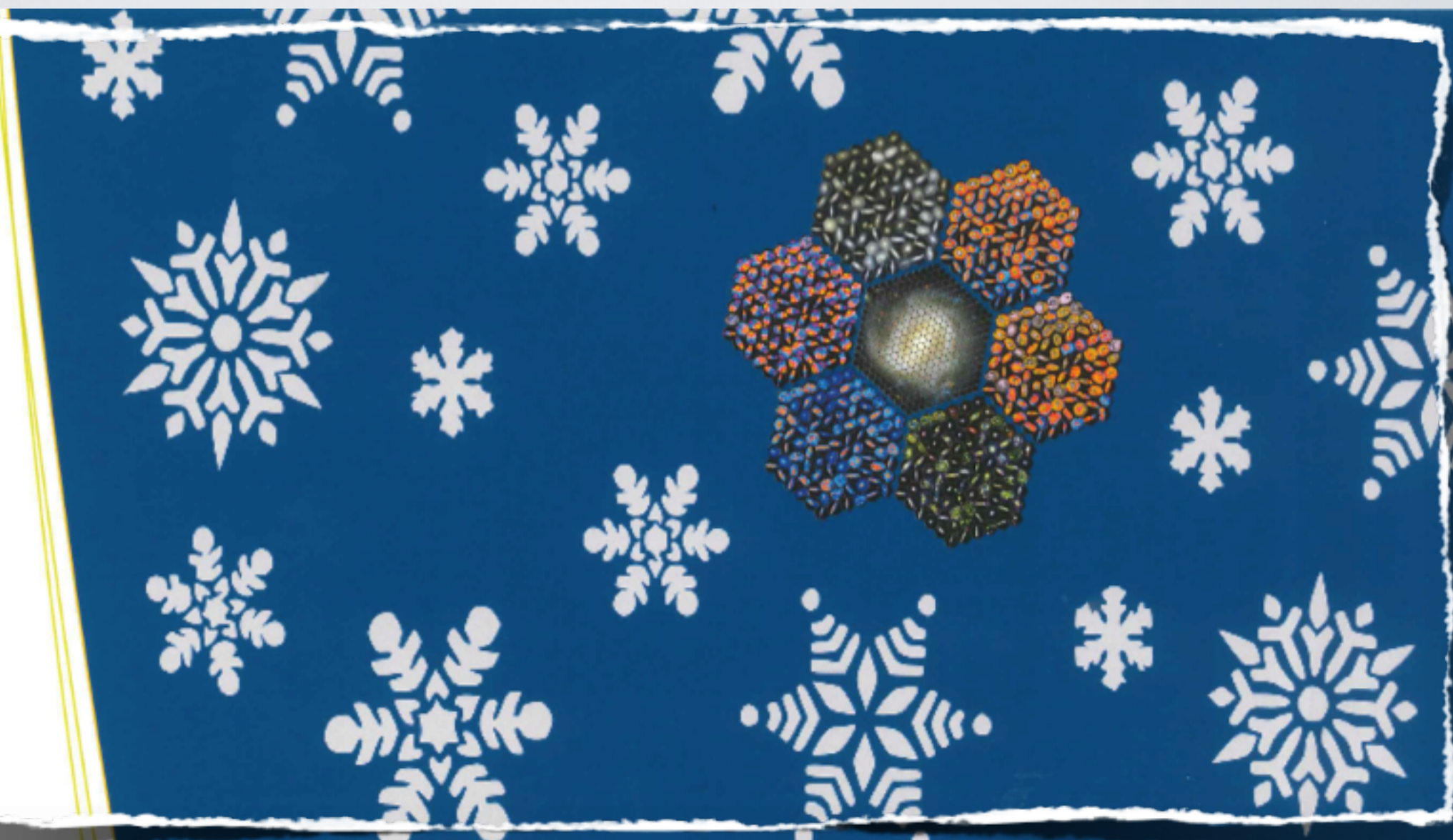








AIP



IAA CALIFA documentary





CALIFA in 3D!