ASTRODEEP

Unveiling the power of the deepest images of the Universe

Multi-wavelength Galaxy Decompositions

Victoria Bruce

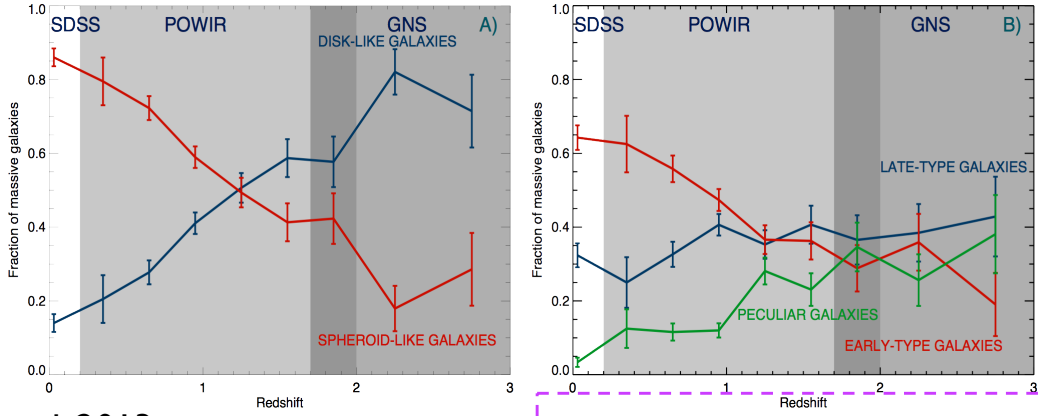
University of Edinburgh

Non-Astrodeep Collaborators: Michele Cirasuolo, Tom Targett, Fernando Buitrago + other CANDELS team members

THE UNIVERSITY of EDINBURGH

Galaxy Evolution Over 1<z<3

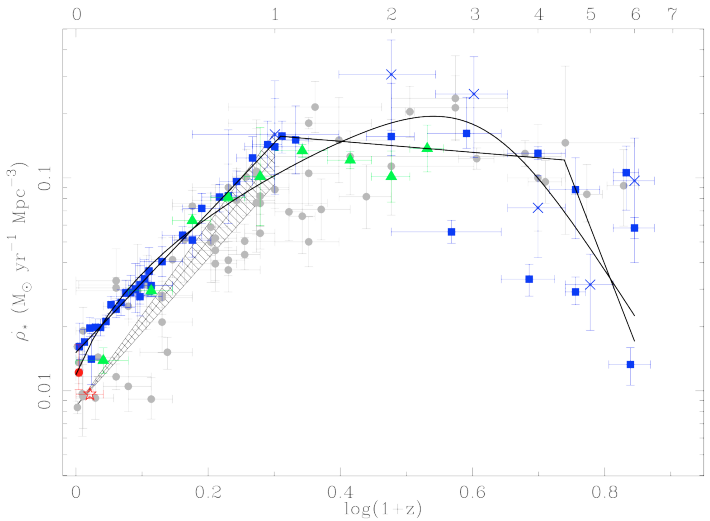
Galaxies at 1<z<3 appear to be undergoing dramatic structural transformations



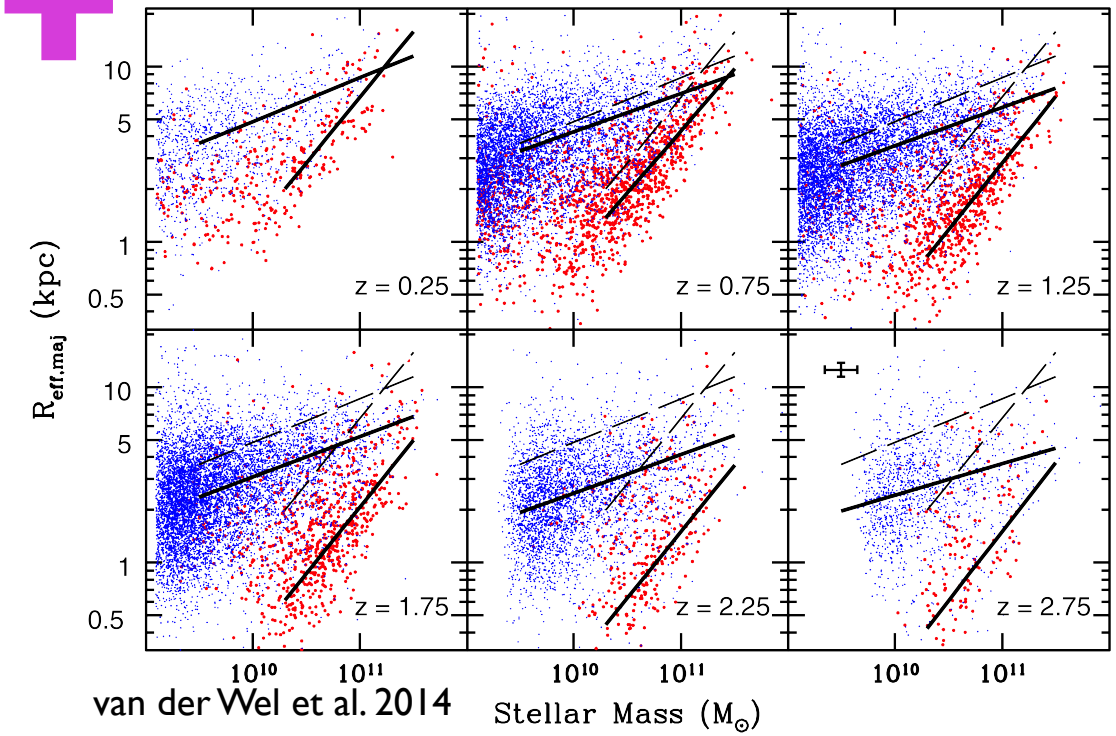
Buitrago et al. 2013

significant size evolution of the population

turnover in the star-formation rate density of the Universe



Hopkins & Beacom 2006



van der Wel et al. 2014

Morphological Bulge Disk Decomposition

CANDELS sample of ~400 galaxies at $M_* > 10^{11} M_\odot$ at $1 < z < 3$ in UDS and COSMOS, Bruce et al. 2012, 2014a, 2014b.

Define 3 components : disk n=1, bulge n=4, PSF

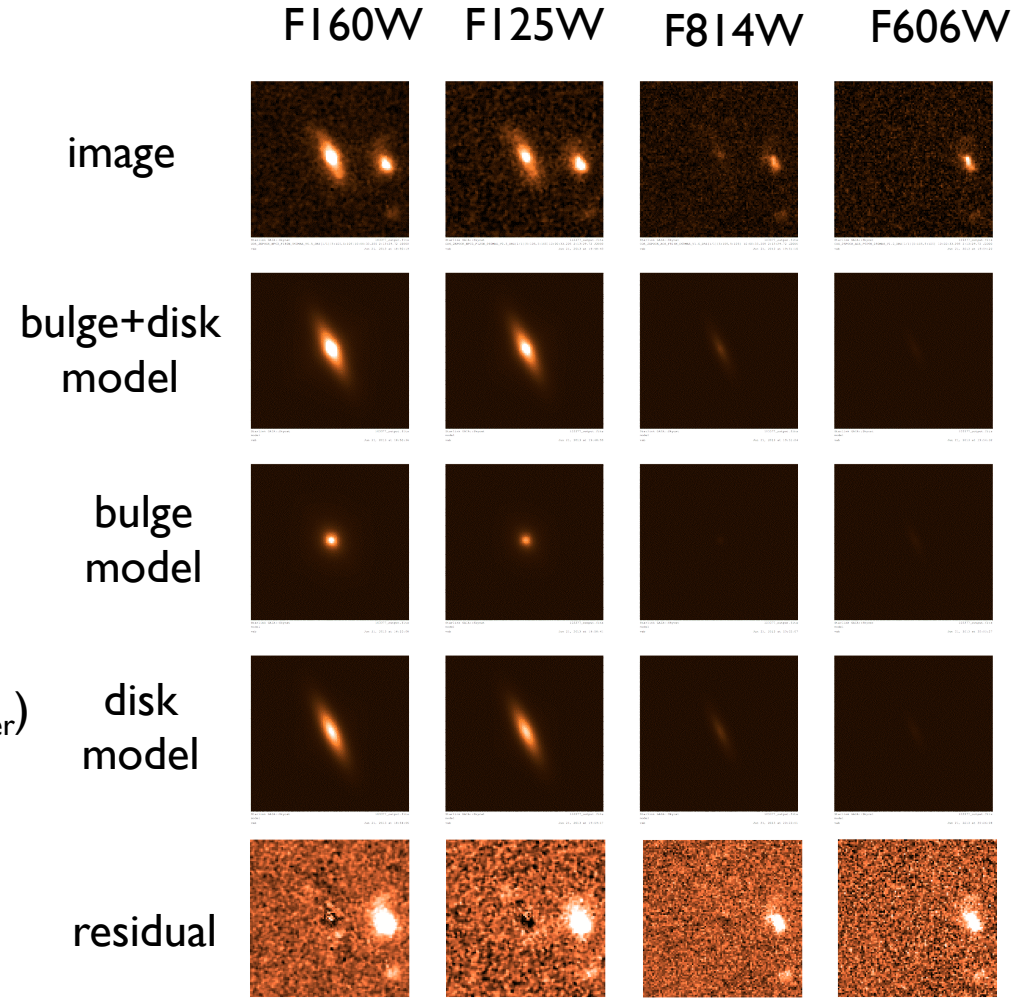
Models:

- bulge only
- disk only
- bulge + disk
- bulge + PSF
- disk + PSF
- bulge + disk + PSF

Adopt simplest model, unless a model with more free parameters has

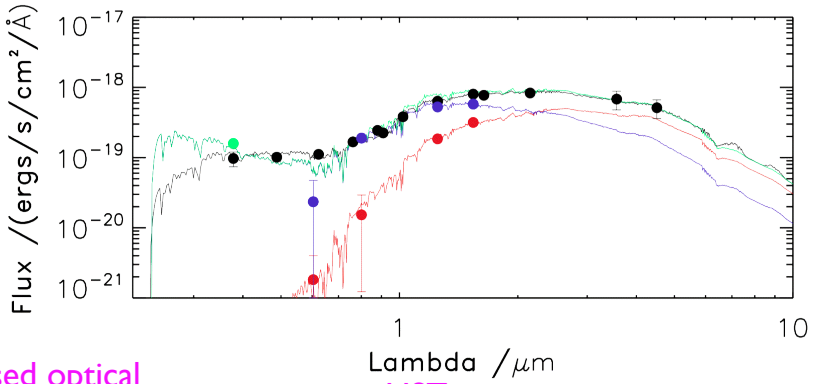
$$X^2_{complex} < X^2_{simpler} - \Delta X^2(d.o.f_{complex} - d.o.f_{simpler})$$

at the 3σ level.



Example SED Fitting

B/T<0.5



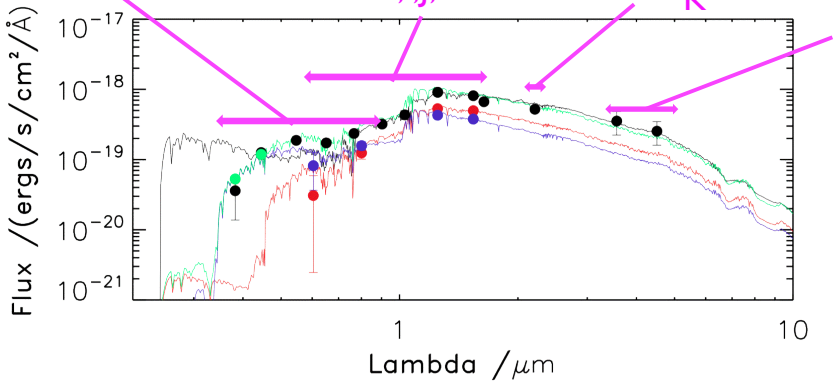
Ground-based optical
u,g,r,i,z or u,b,v,r,i,z

HST
v,i,J,H

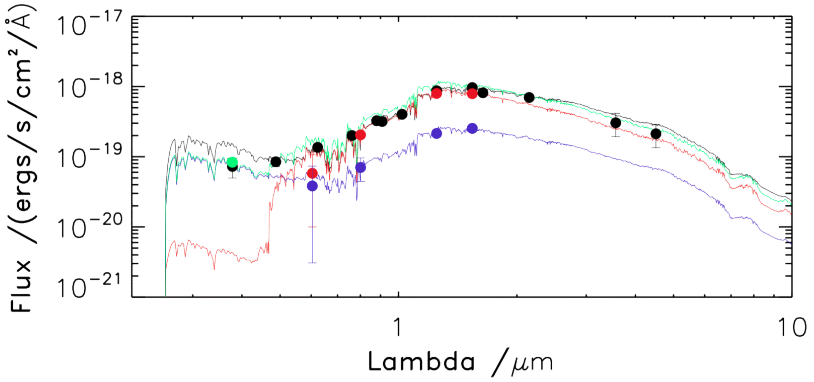
Ground-based
K

IRAC
3.6, 4.5

B/T=0.5

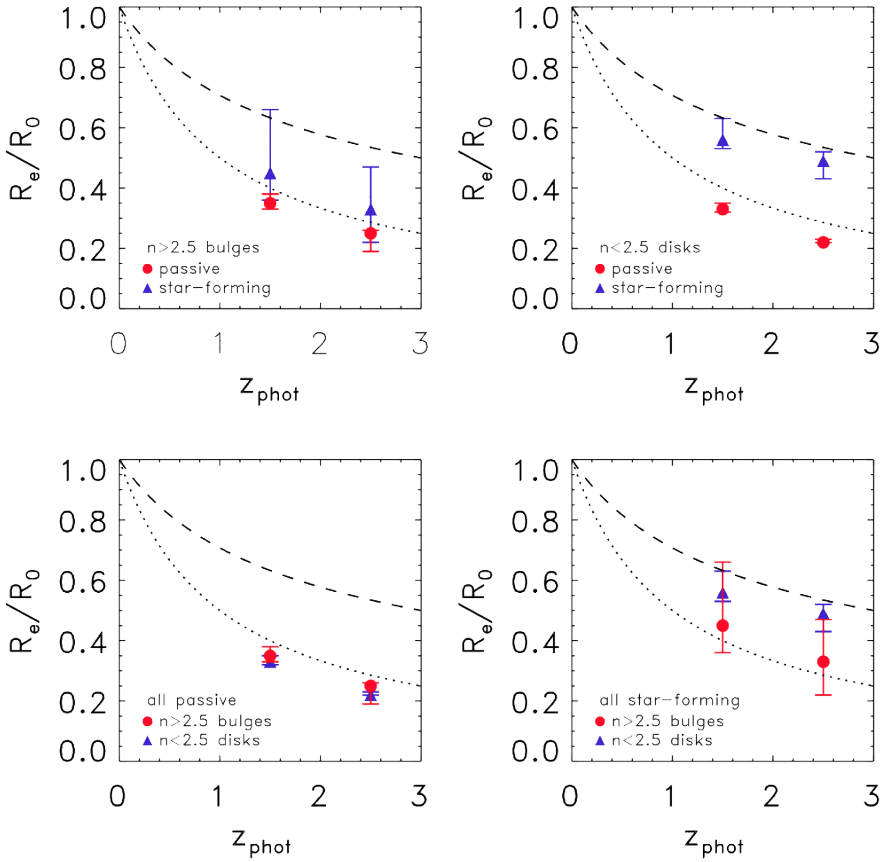


B/T>0.5

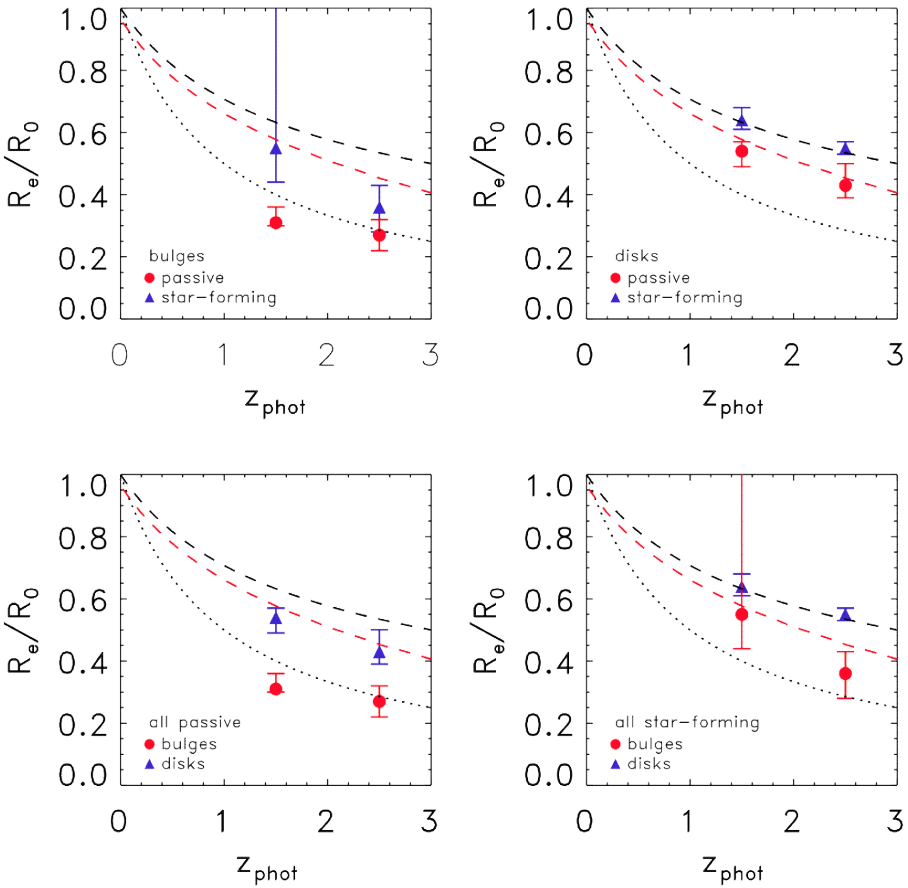


Size Evolution

single Sérsic fits using n=2.5



all bulge and disk components

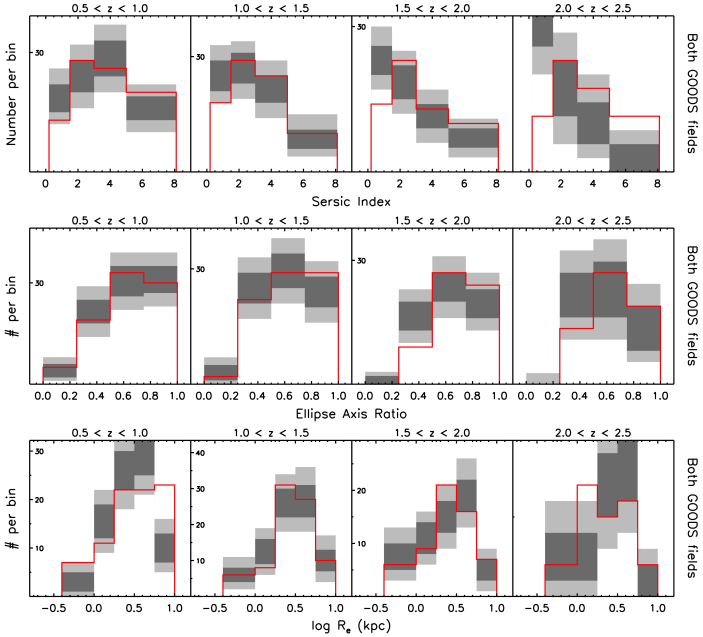


$R_e(z)/R_0 \propto (1+z)^{-1}$ for ETG's (van der Wel et al. 2008)

$R_e(z)/R_0 \propto (1+z)^{-0.5}$ for star-forming disks

1 Gyr earlier star-forming disk relation for the progenitors of passive disks

AGN Host Morphology Studies



Are AGN hosts better modeled with an additional central PSF component ?

Rosario et al. 2015

- Near-IR and optical data for morphological decompositions: CANDELS-GOODSS in WFC3:H_{160W}, J_{125W}, Y_{105W} and ACS:Y_{098M}, I_{814W}, i'_{775W}, V_{606W}, g'_{435W} (in addition to U_{CTIO}, U_{VIMOS}, $K_{s\ ISAAC}$ and IRAC 3.6 and 4.5 μm for photoz fitting).

- AGN catalogue : 4Ms Chandra Hsu et al. 2014 = Rangel et al. 2013+ Xue et al. 2011 +Lehmer et al. 2005 + Virani et al. 2006

<u>Mass Matching:</u>

- Binned in 0.5 redshift bins
- 1000 bootstrap samples
- Median of samples within each property bin

AGN Host Morphology Studies

