

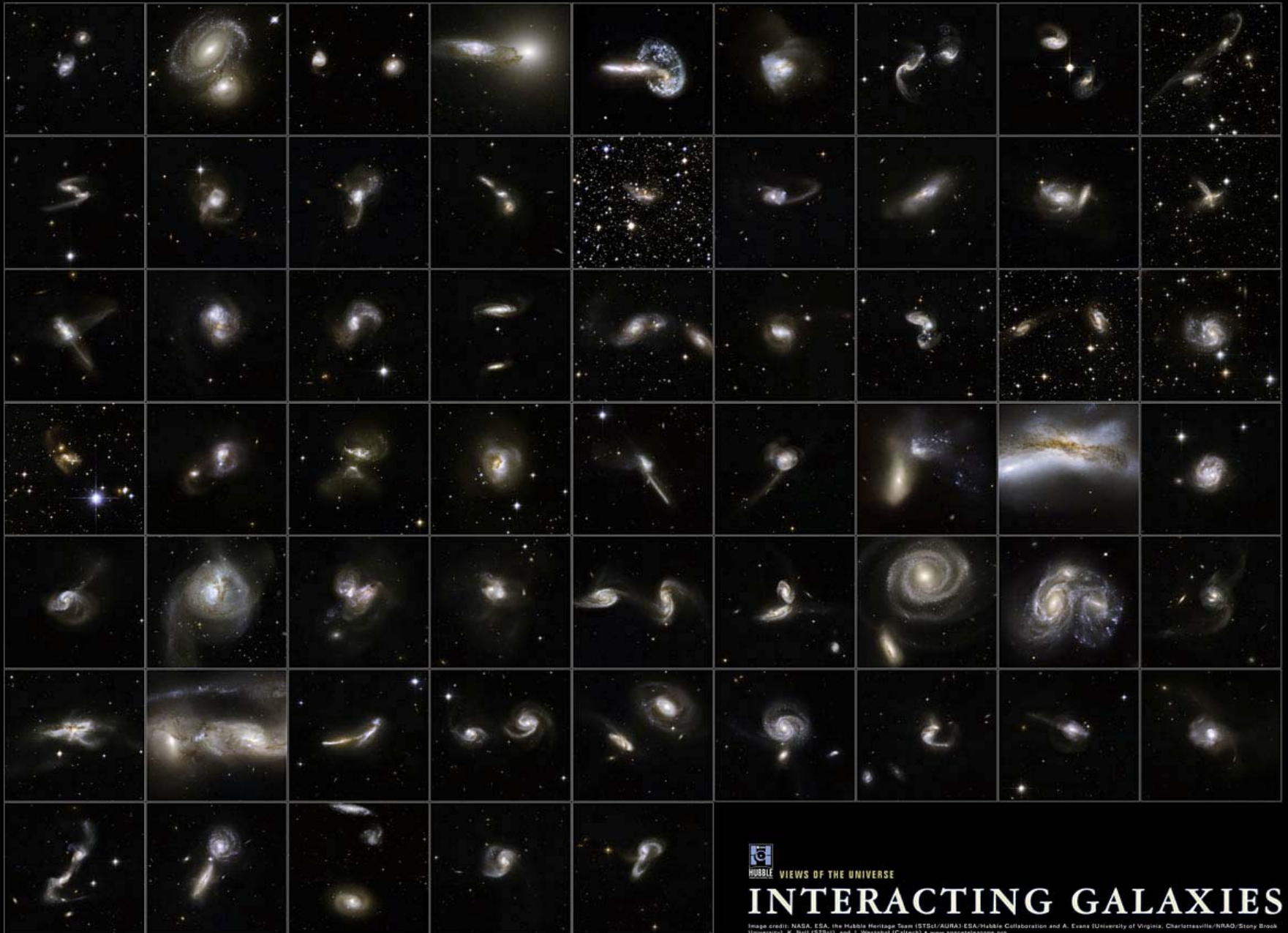
The background of the slide features a dark space scene with a prominent blue and white galaxy merger in the center. Above the main image, there is a grid of orange and yellow stars on the left, and a stylized grey and blue logo on the right. The text 'UKIDSS' is written in a light purple font in the upper right corner.

UKIDSS

TIARA Winter School
2012-02-08

Evolution of merger rate since $z=2$ from the UKIDSS--Ultra Deep Survey

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4. Will Hartley (University of Nottingham, UK)
5. Chris Simpson (Liverpool John Moores University, UK)
6. Omar Almaini (University of Nottingham, UK)
7. Christopher Conselice (University of Nottingham, UK)



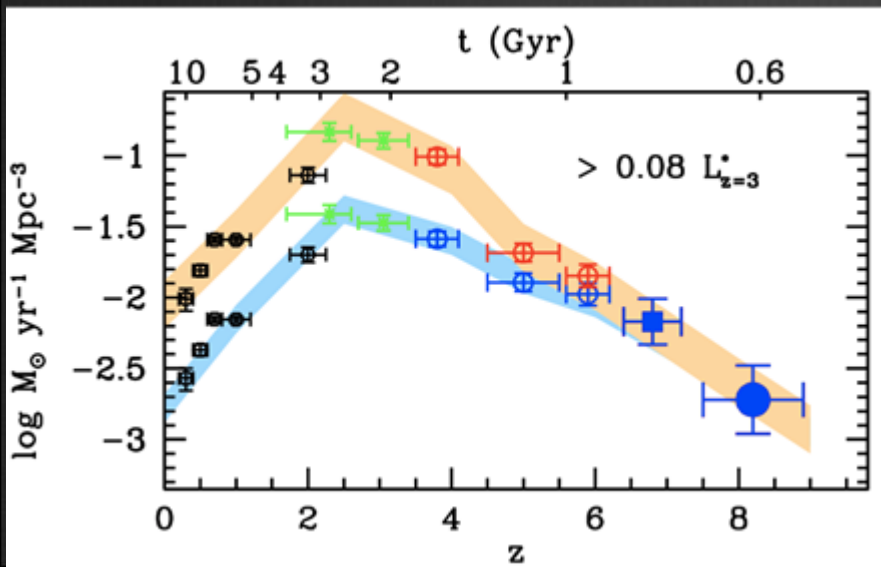
 HUBBLE VIEWS OF THE UNIVERSE

INTERACTING GALAXIES

Image credit: NASA, ESA, the Hubble Heritage Team (STScI/AURA), ESA/Hubble Collaboration and A. Evans (University of Virginia, Charlottesville/NRAO/Stony Brook University), K. Noll (STScI), and J. Westphal (Caltech) • www.spacetelescope.org

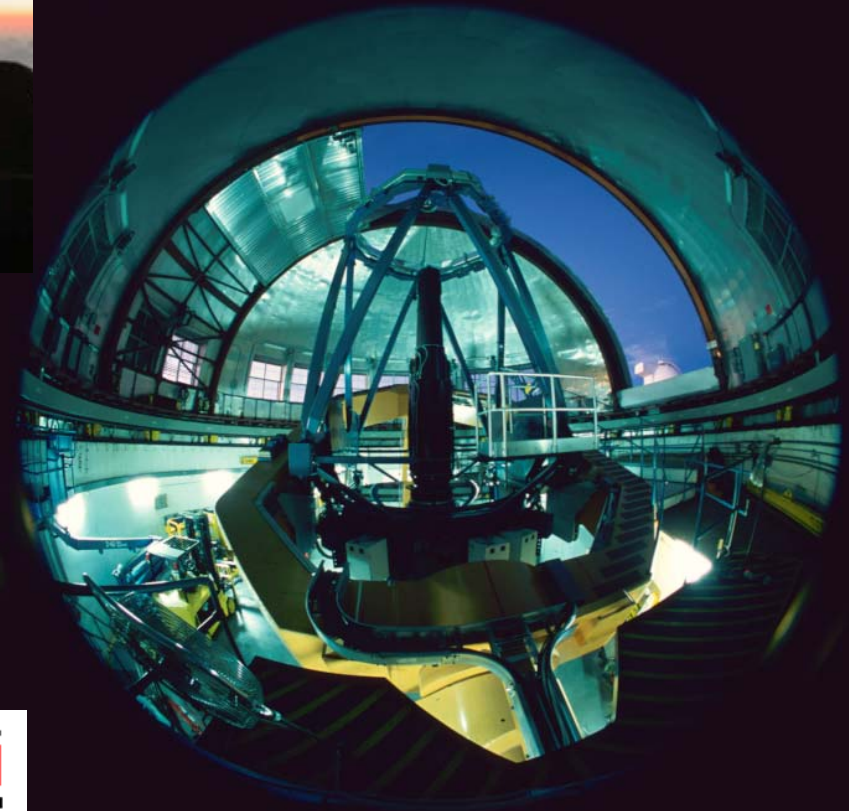
Mergers

- ☉ Merging governs the mass assembly history and evolution of the galaxies.
- ☉ So far only studies up to $z \sim 1$ conducted (or at $z > 3$)
- ☉ Range $1 < z < 3$ period at which mass assembly completed
- ☉ Requires NIR data, sampling a large volume.



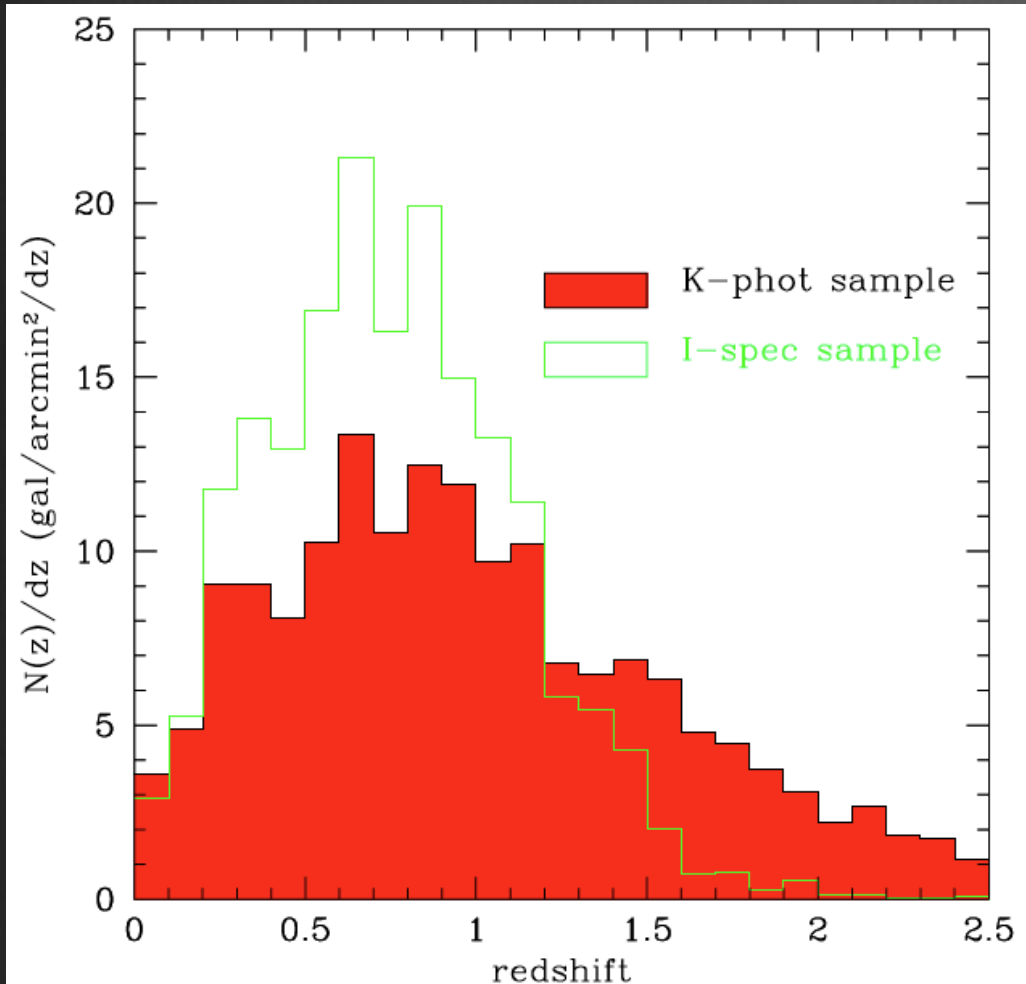
Bouwens et al. (2010)

The UKIRT Wide-Field CAMera



WFCAM
UKIRT

Advantages of IR observation



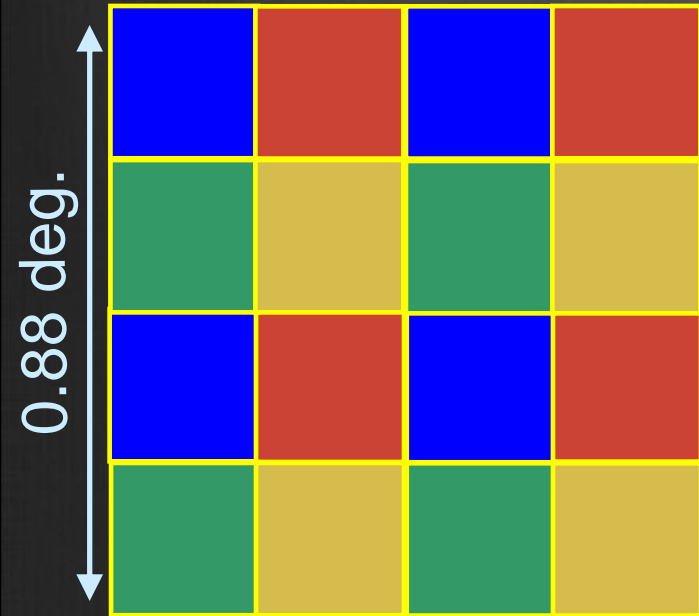
More high redshift galaxy sample
More passive galaxy sample

Median Redshift
K (0.91)
I (0.76)

The UKIDSS Ultra-Deep Survey

Depths achieved so far:

(5σ , 2" apertures, AB)



ESO release:

DR8: $K=24.6$, $H=24.2$, $J=24.9$

seeing : $J\sim 0.80''$ $H\sim 0.85''$ $K\sim 0.75''$

World release:

DR5: $K=24.0$, $H=23.7$, $J=23.9$

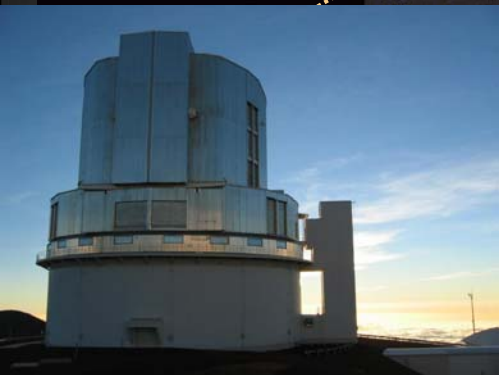
seeing : $J\sim 0.90''$ $H\sim 0.85''$ $K\sim 0.75''$

Almaini et al. 2011

<http://www.nottingham.ac.uk/astronomy/UDS>

The Subaru/XMM Deep Field

RA = 02 18 00, Dec = -05 00 00



$B=28.4, V=27.8, R=27.7, i'=27.7, z'=26.7$
($3\sigma, 2''$, AB) Furusawa et al. 2008



$u^*=27.5$
($3\sigma, 2''$, AB)
2011

Foucaud et al.

Optical

Subaru (SXDF)
CFHT (U-band)
HST (CANDELS)

Far Infrared

Spitzer (SpUDS)

Ultraviolet

Galex

X-ray

XMM (SXDF)

Radio

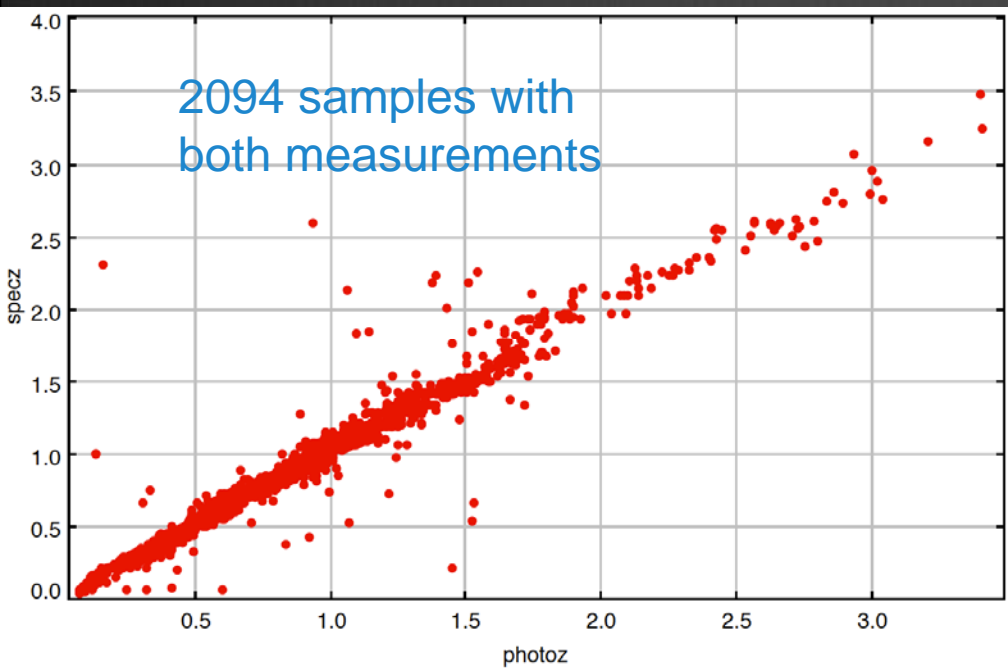
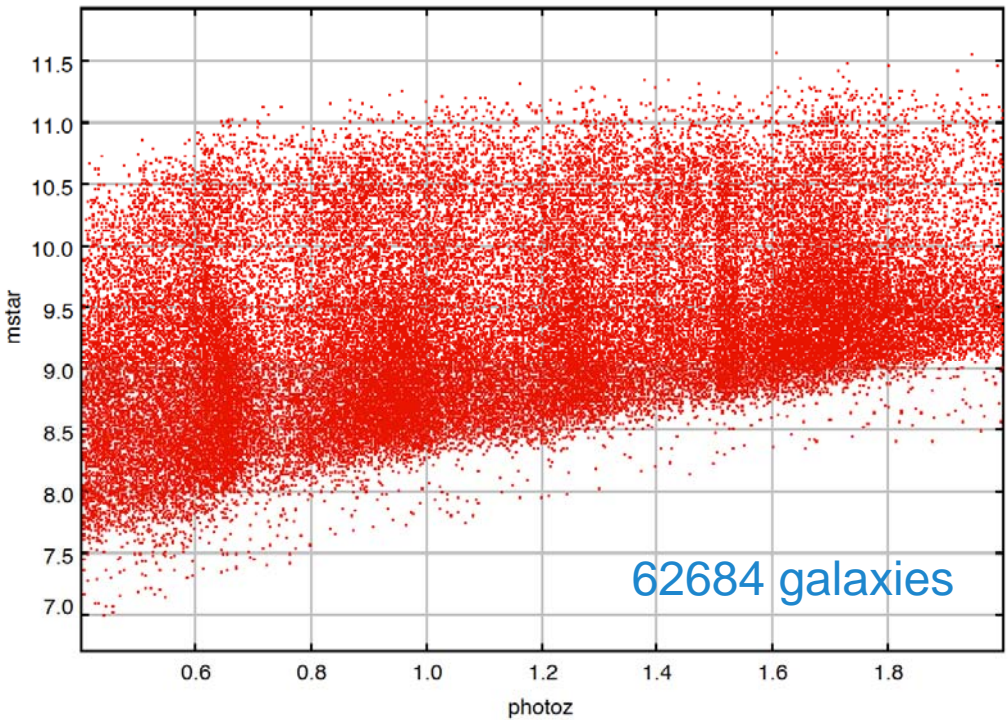
VLA

Submm

SCUBA (SHADES)

Spectro

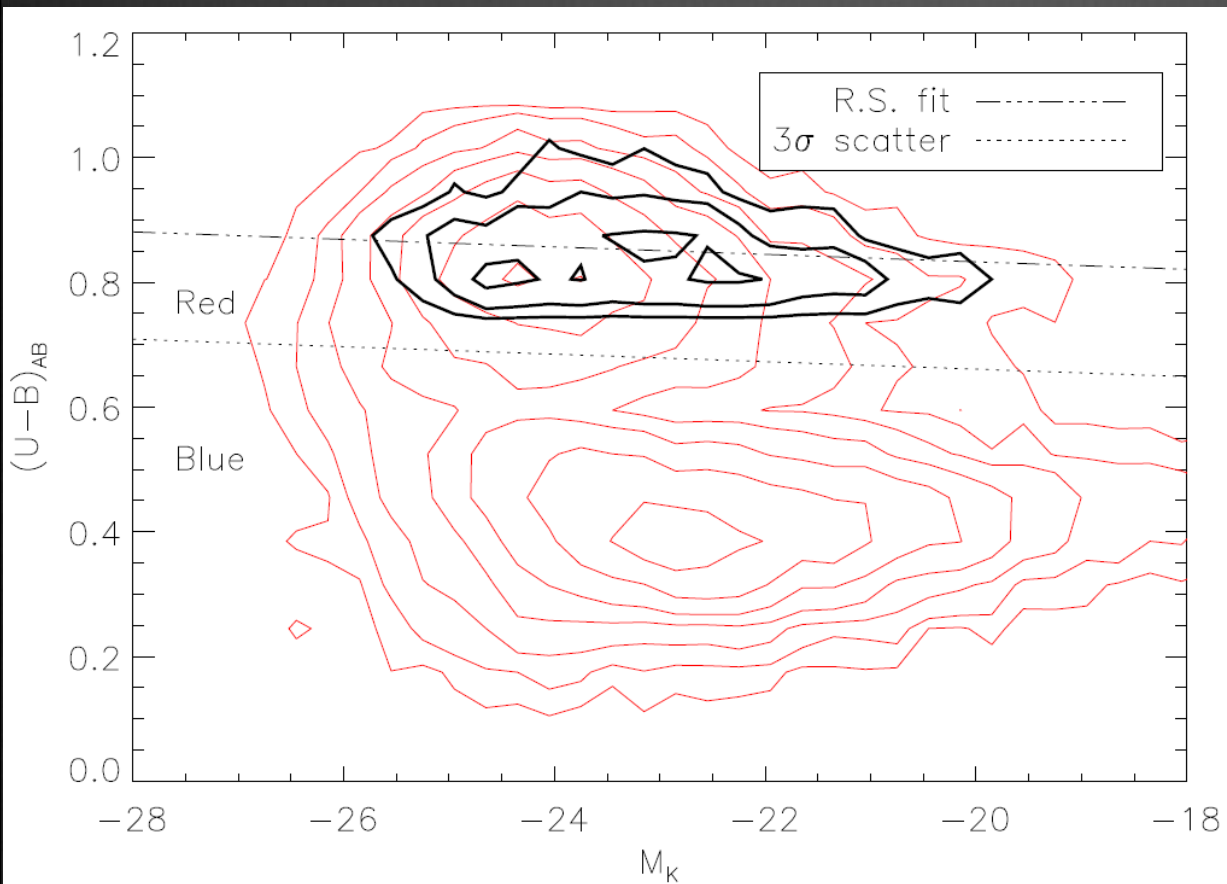
VLT-VIMOS/FORS2
(UDSz⁷)



Photometric redshift
distribution
UKIDSS-UDS (DR8)

$Z_{\text{sigma}} = 0.03$

Color Bimodality in UKIDSS-UDS (Color-Luminosity plot)



The red sequence was defined by fitting a line of the form

$$U - B = a \times M_K + b$$

$$(-7.09 \times 10^{-3}) \times M_K + 0.52$$

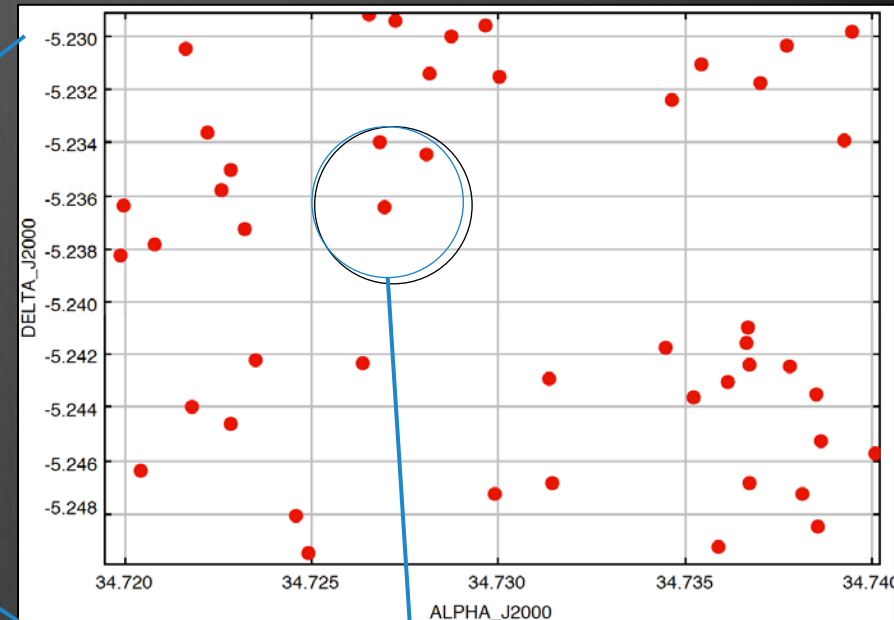
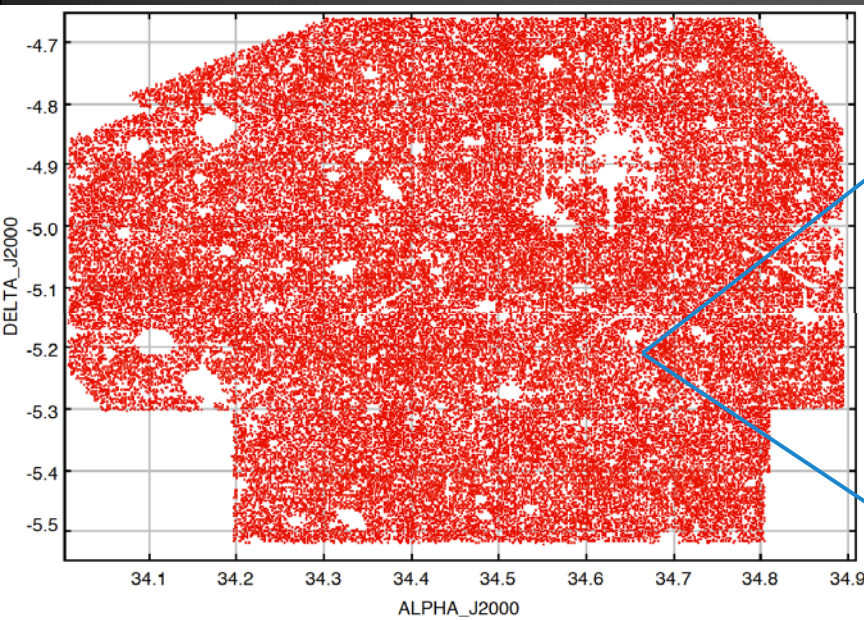
Hartley et al. (2010)

How to define the candidates of major mergers in UKIDSS-UDS

- $5 \text{ kpc} < r_{\text{sep}} < 30 \text{ kpc}$
- Upper limit for close pairs
- Lower limit for deblending
- $\Delta K < 1.5$
- For major merger
- Mass Ratio smaller than 4



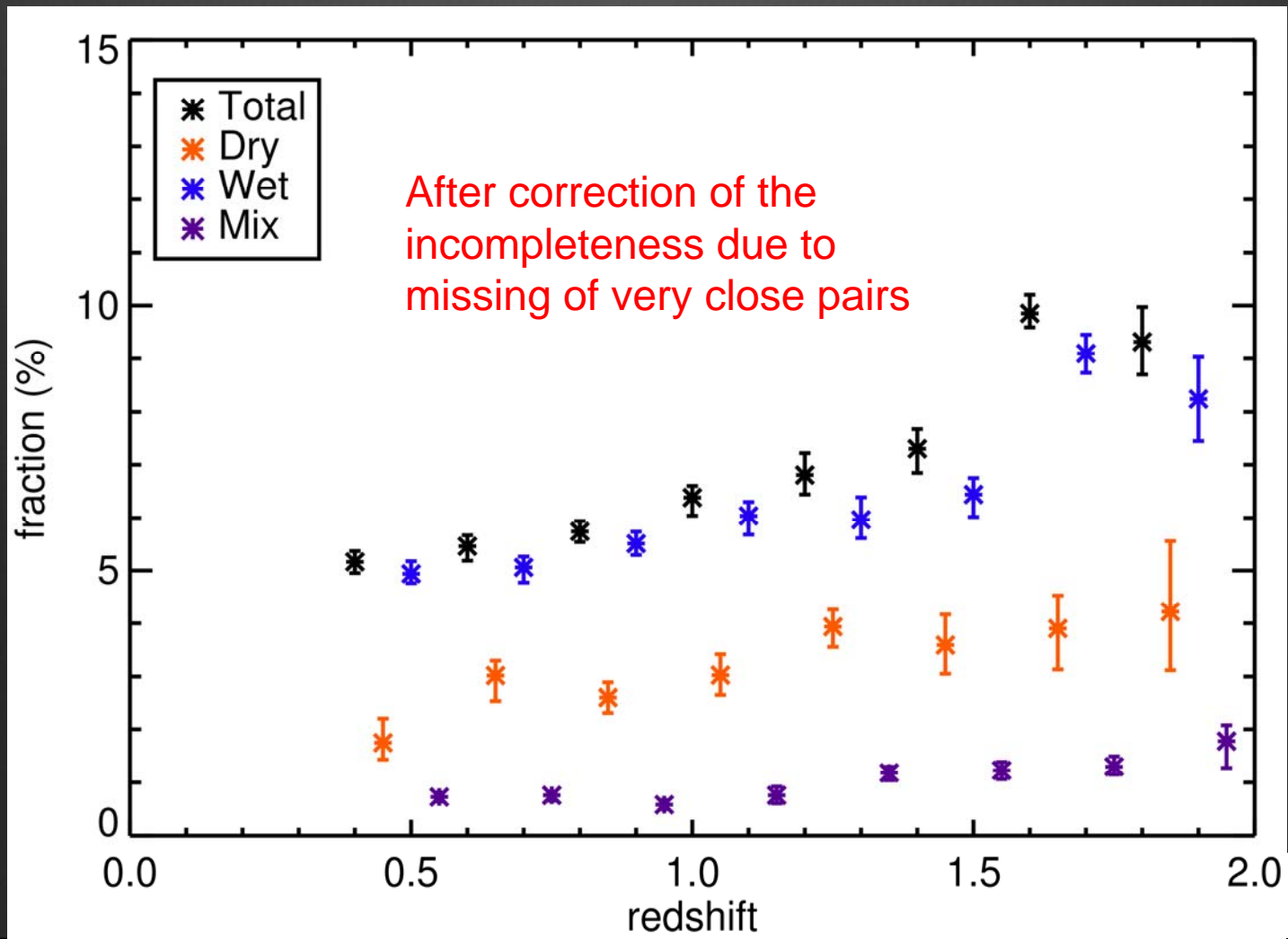
Projection Field correction



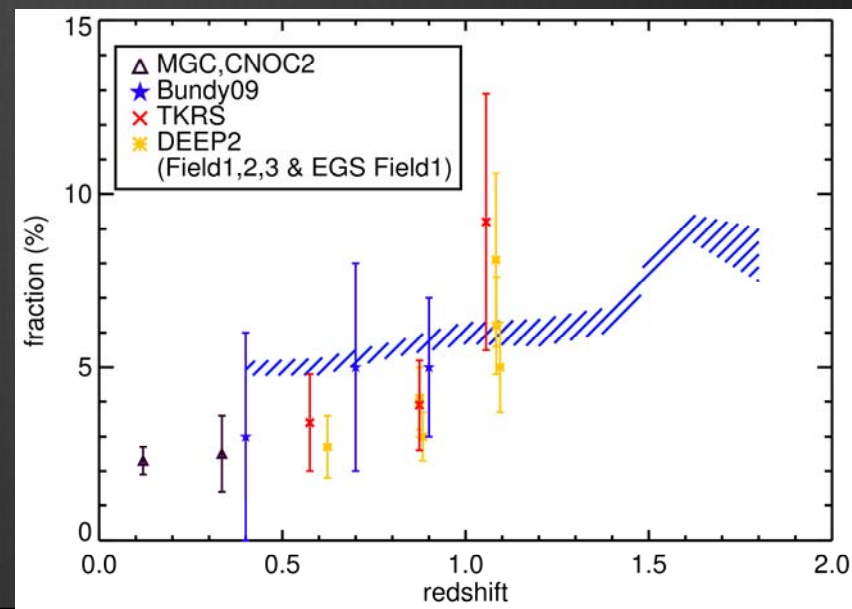
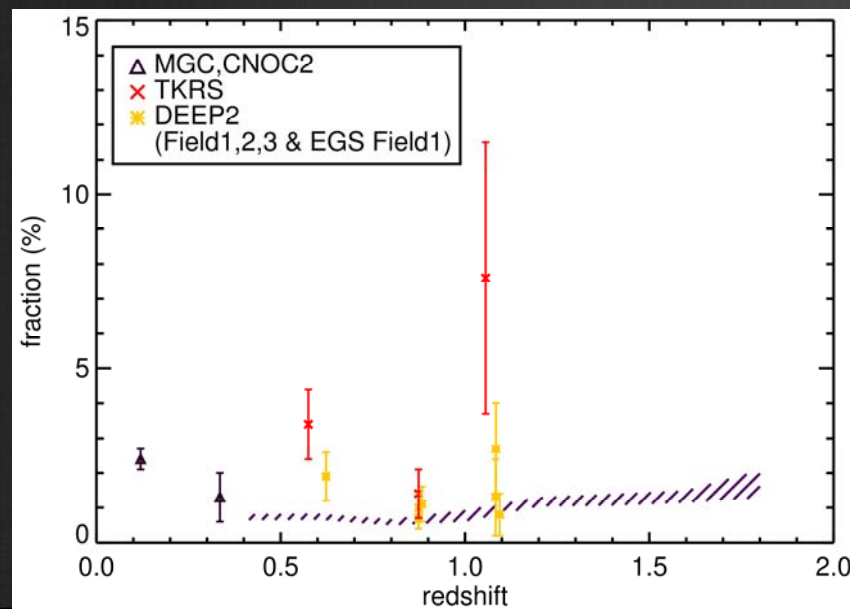
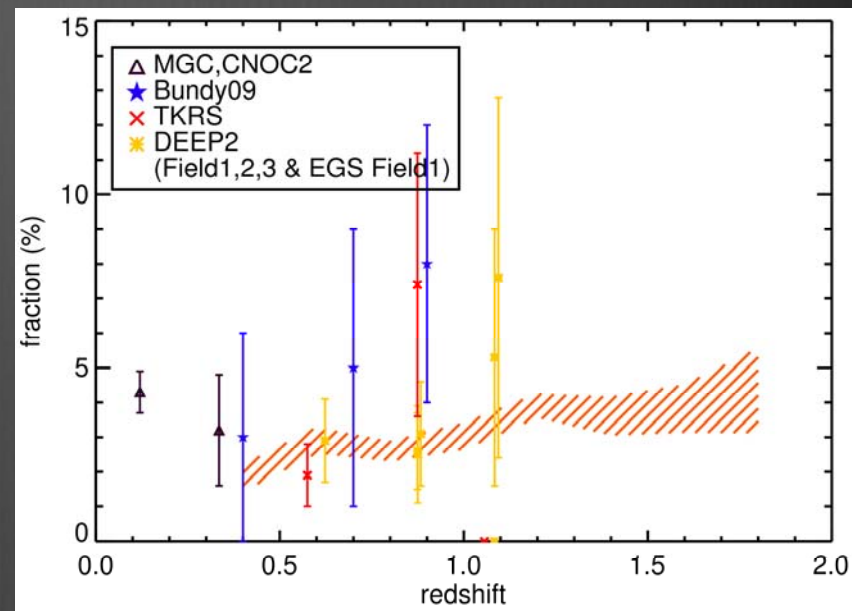
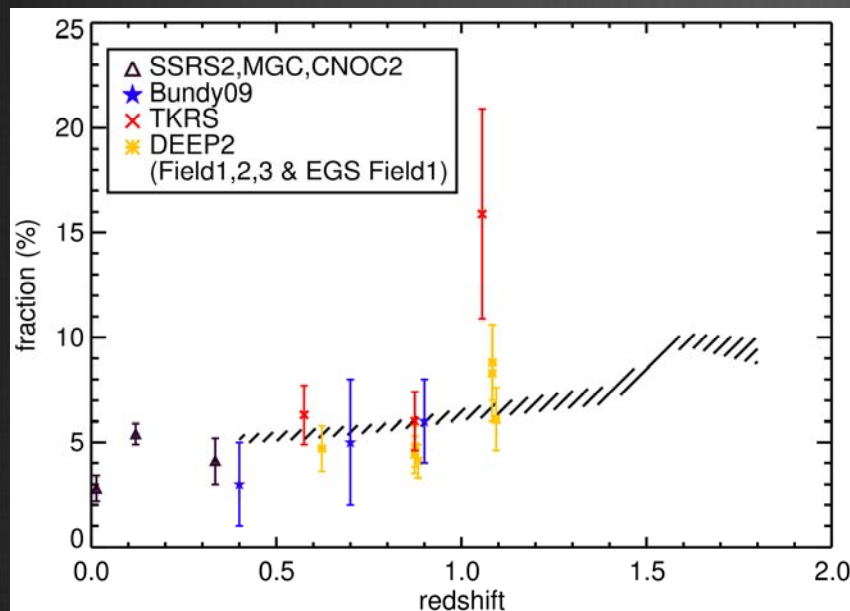
For a given host galaxy, the measured sky density of possible contaminants is multiplied by the area of the corresponding search annulus to determine the contamination rate per galaxy. This is then summed across the potential host sample to estimate the total number of field contaminants, N_{corr} .

Threshold of Close galaxy pair

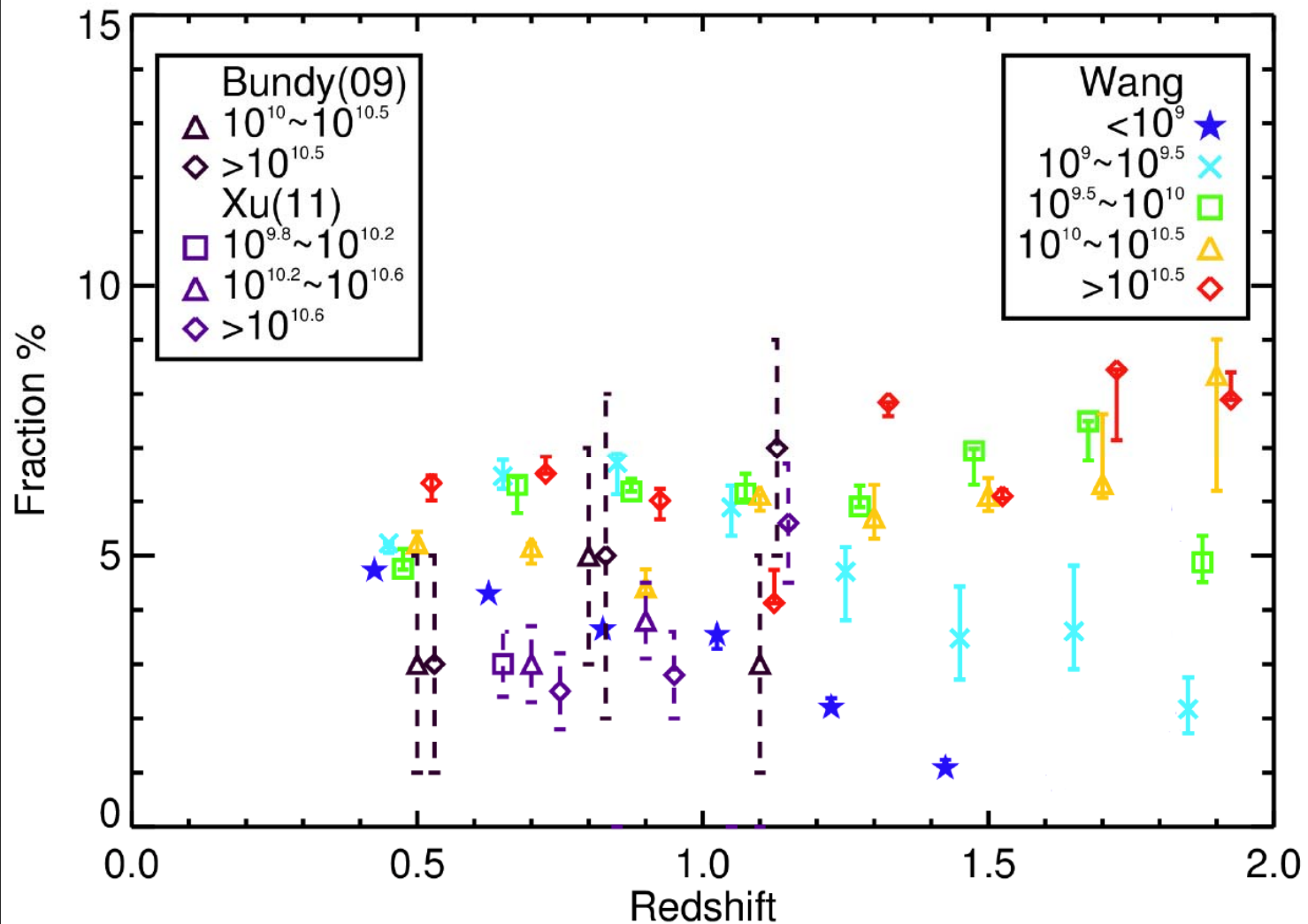
Pair fraction (0.4~2.0) of UKIDSS-UDS DR8
(After projection correction)
(Monte Carlo simulation within 100 repetition)



Comparison with another photometric study




merger rate within different mass range



Summary

- Largest photo-z pair sample $0.4 < z < 2.0$
- Major mergers rate low ($\sim 5\%$) ($5\% \sim 10\%..?$)
- No significantly increase with redshift to $z \approx 2$ or mild evolution from $z \sim 0.4$ to $z \sim 2$ after the correction of incompleteness pair selection within high redshift (over $z \sim 1$)
- Wet merging higher rate than Dry merging
- Significant mass segregation around $1 \sim z \sim 2$
- More to come (UDSz VLT spectroscopy, weighting factor from simulation work.)



THANKS FOR YOUR LISTENING