

WANDELS

A deep VIMOS survey of the CANDELS UDS and CDFS fields

Unveiling the astrophysics of high-redshift galaxy evolution

WANDS

*Unveiling the astrophysics of
high-redshift galaxy evolution*

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19 COUNTRIES

VANDELS: motivation

Submitted to ESO call for public spectroscopy surveys with VIMOS. Original proposal was therefore focused on two key aspects:

- ⊙ Legacy value to astronomy community
- ⊙ Different science from previous VIMOS surveys (e.g. VVDS, zCOSMOS, VIPERS, VUDS..)

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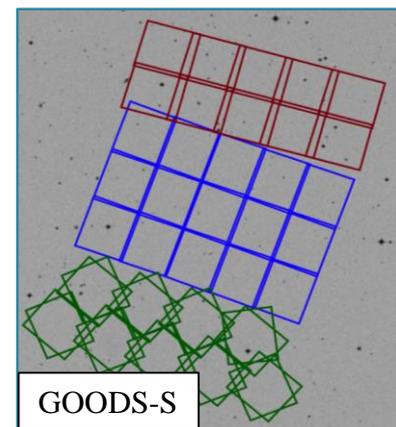
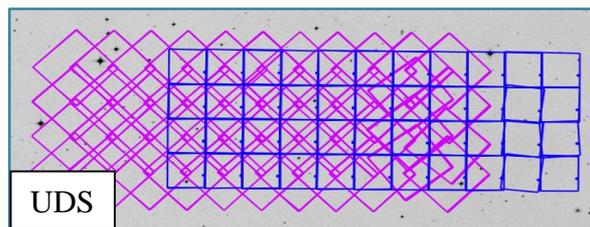
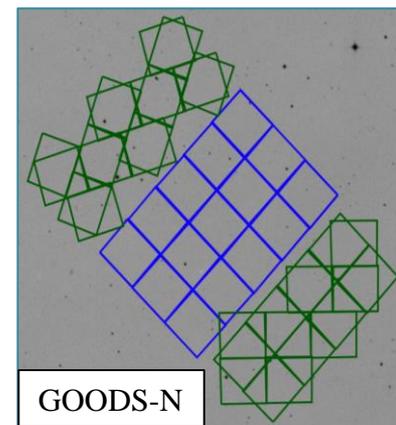
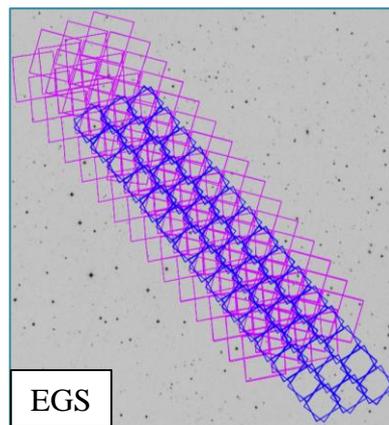
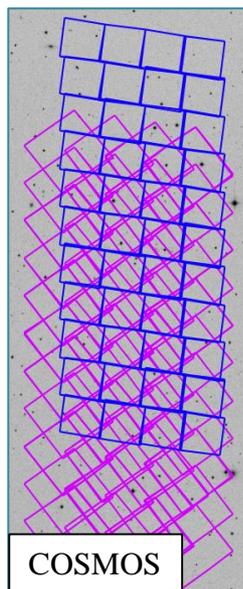
Four key elements of VANDELS:

- ⊙ Small area (0.2 sq. degrees), best available multi-wavelength data
- ⊙ Ultra-long integrations, minimum 20 hours per source (80 hour max)
- ⊙ Medium resolution spectra (MR grism)
- ⊙ Pre-selection biased to very high redshift (85% of targets at $z > 3$)

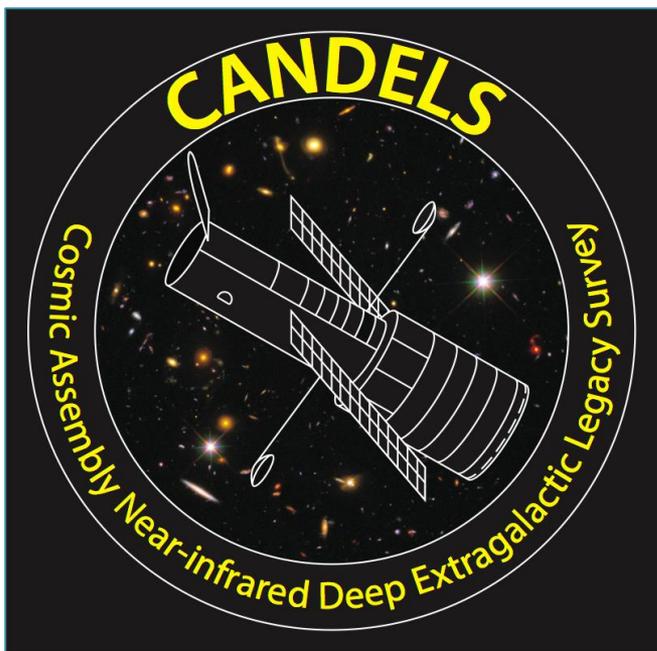
VANDELS: survey fields



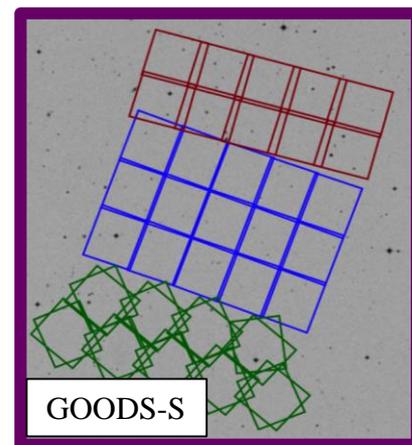
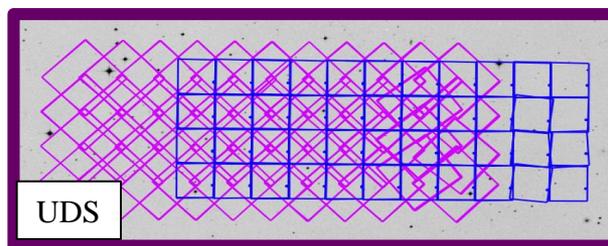
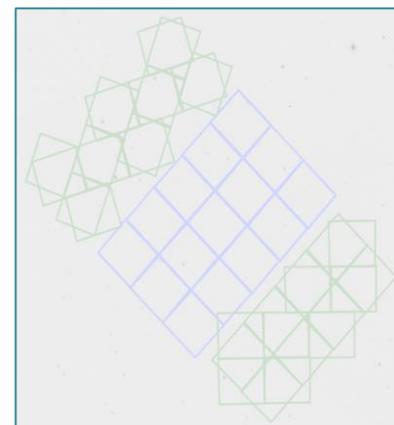
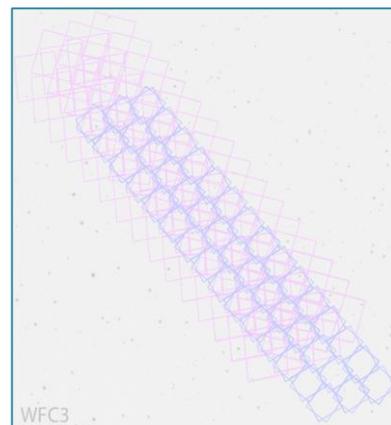
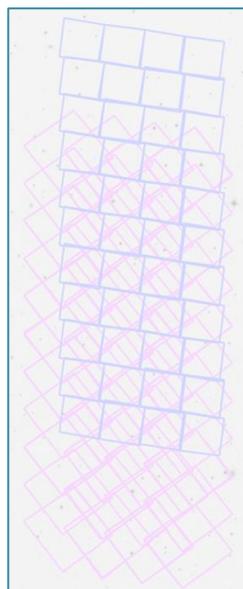
HST optical/near-IR imaging survey covering 0.2 square degrees split over 5 survey fields



VANDELS: survey fields



HST optical/near-IR imaging survey covering 0.2 square degrees split over 5 survey fields



VANDELS targets the two southern CANDELS fields, exploiting unrivalled 15+ band ($0.3\mu\text{m}$ - $4.5\mu\text{m}$) photometry and near-IR grism spectra (3D-HST)

VANDELS: motivation

Primary Targets

- ⊙ Star-forming galaxies at $2.5 < z < 5.0$ ($H_{AB} < 24$)
- ⊙ Passive galaxies at $1.5 < z < 2.5$ ($H_{AB} < 22.5$)
- ⊙ Lyman-break galaxies at $3.0 < z < 7.0$ ($H_{AB} < 26.5$)

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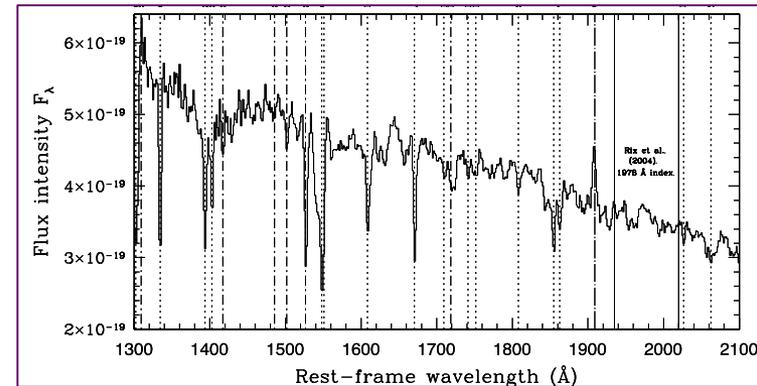
Combine ultra-deep optical spectroscopy with near-IR grism spectroscopy and $0.3\mu\text{m}$ - $4.5\mu\text{m}$ photometry to measure *physical* tracers of galaxy evolution: age, mass, dust, SFR, outflows, stellar+gas metallicity....

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Absorption line metallicities



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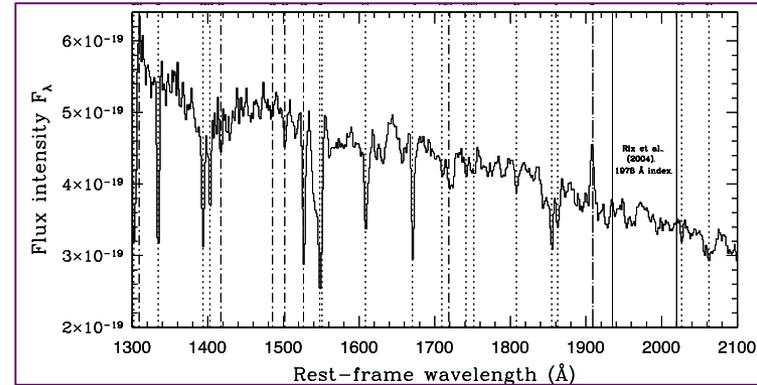
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Primary Targets

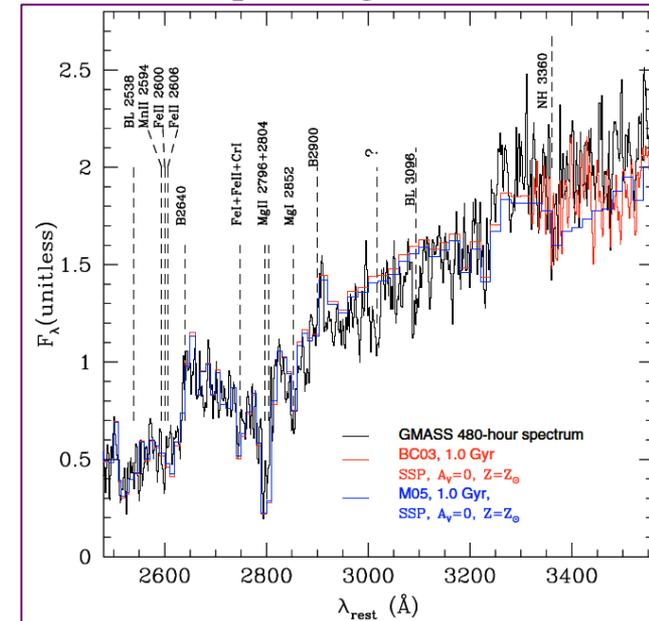
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Absorption line metallicities



UV+optical age constraints



VANDELS: motivation

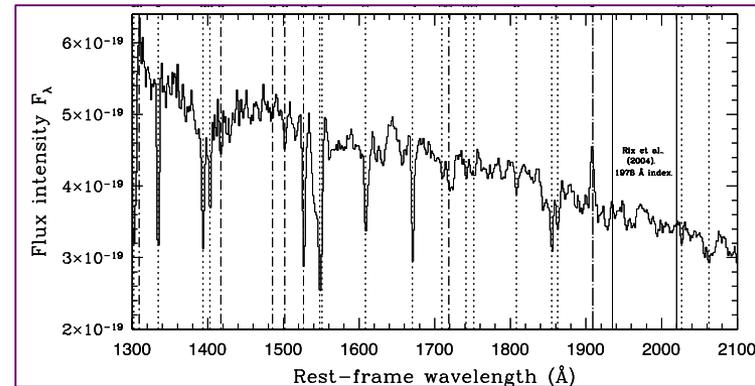
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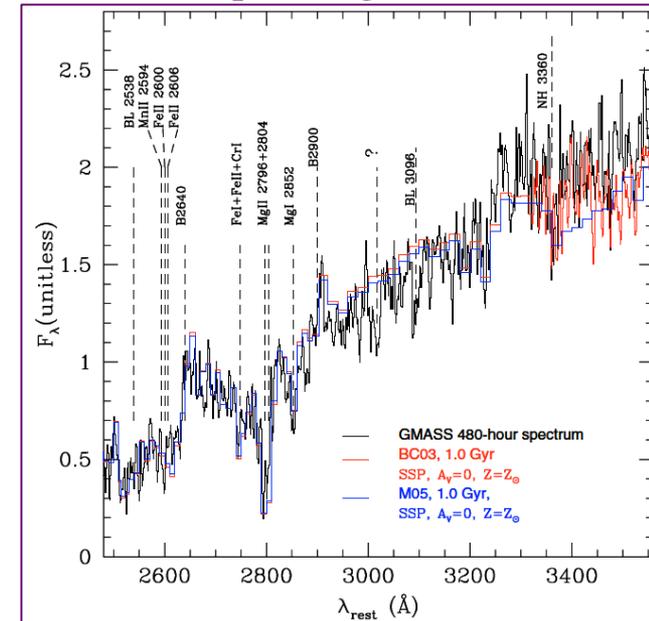
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Provide sufficient signal-to-noise and resolution to measure physical properties from *individual* spectra as well as stacks

Absorption line metallicities



UV+optical age constraints

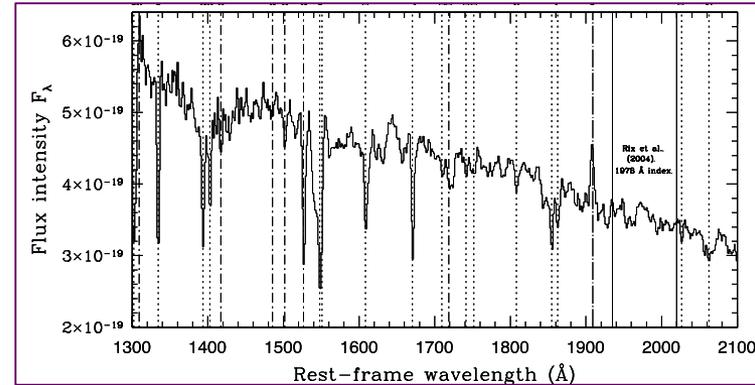


VANDELS: motivation

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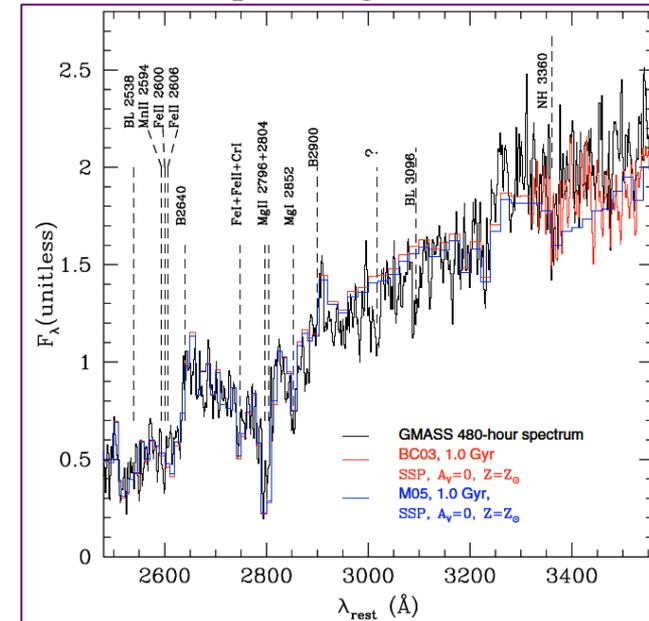
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Absorption line metallicities



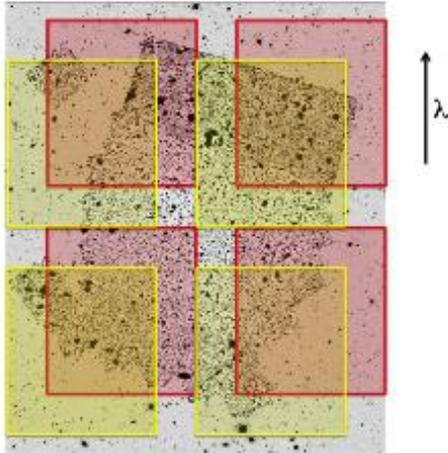
Fundamental aim is to move beyond redshift measurement and extract *physical* information from the spectra

UV+optical age constraints

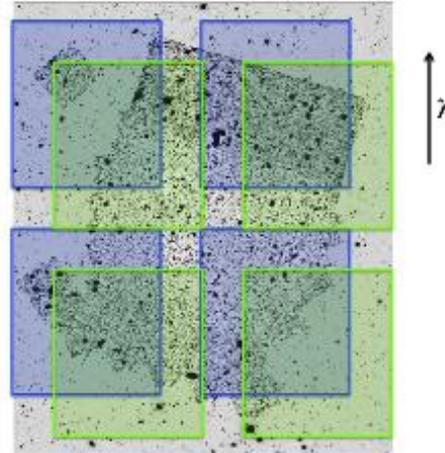


VANDELS: observations

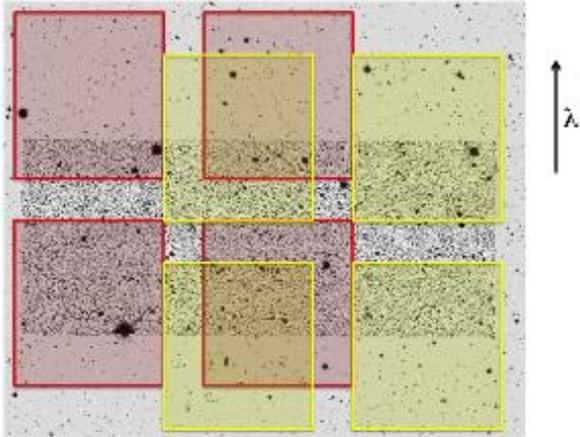
CDFS: Pointings 1+2



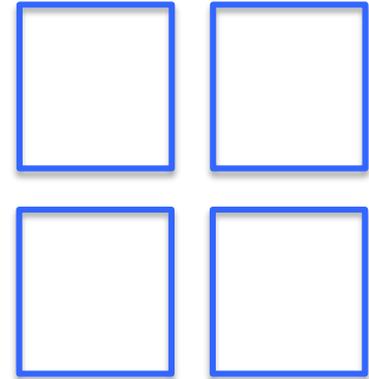
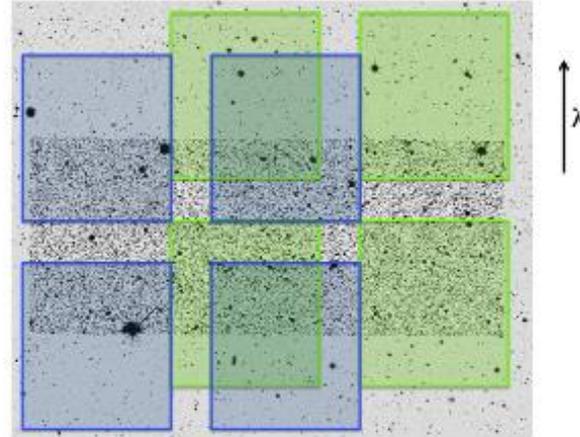
CDFS: Pointings 3+4



UDS: Pointings 1+2

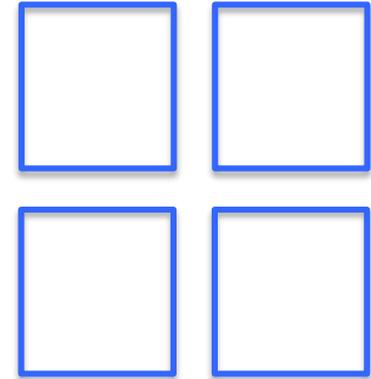
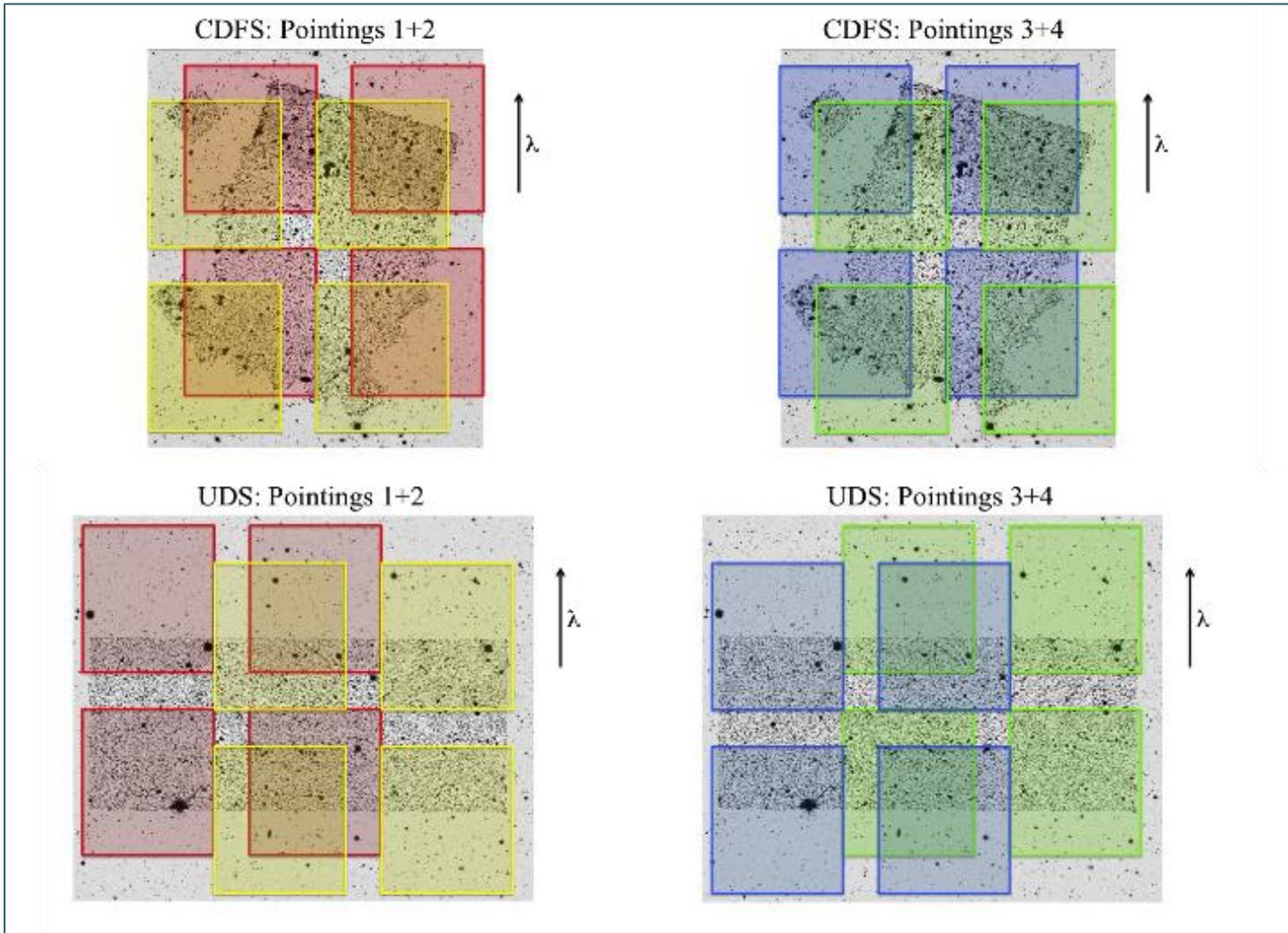


UDS: Pointings 3+4



VIMOS FOOTPRINT

VANDELS: observations



VIMOS FOOTPRINT

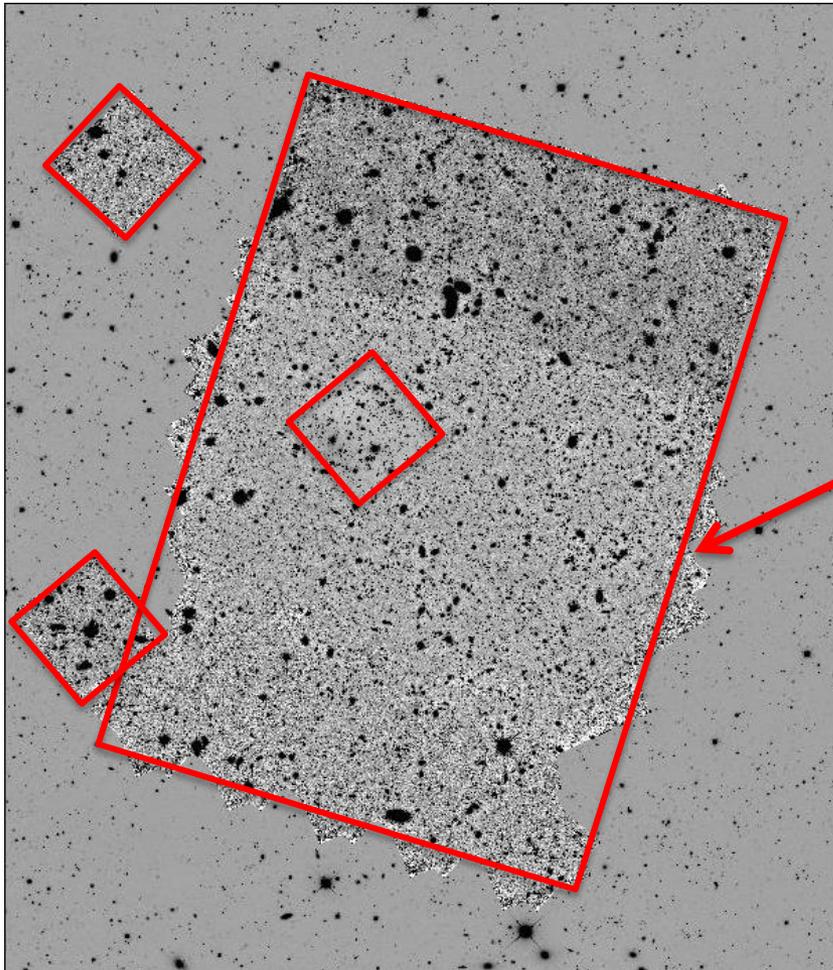
8 pointings in total, designed to cover HST imaging area
(75% of slits allocated to HST area)

VANDELS: photo-z pre-selection

VANDELS will exploit the multi-wavelength photometry in UDS and CDFS to do uniquely robust photometric redshift pre-selection....

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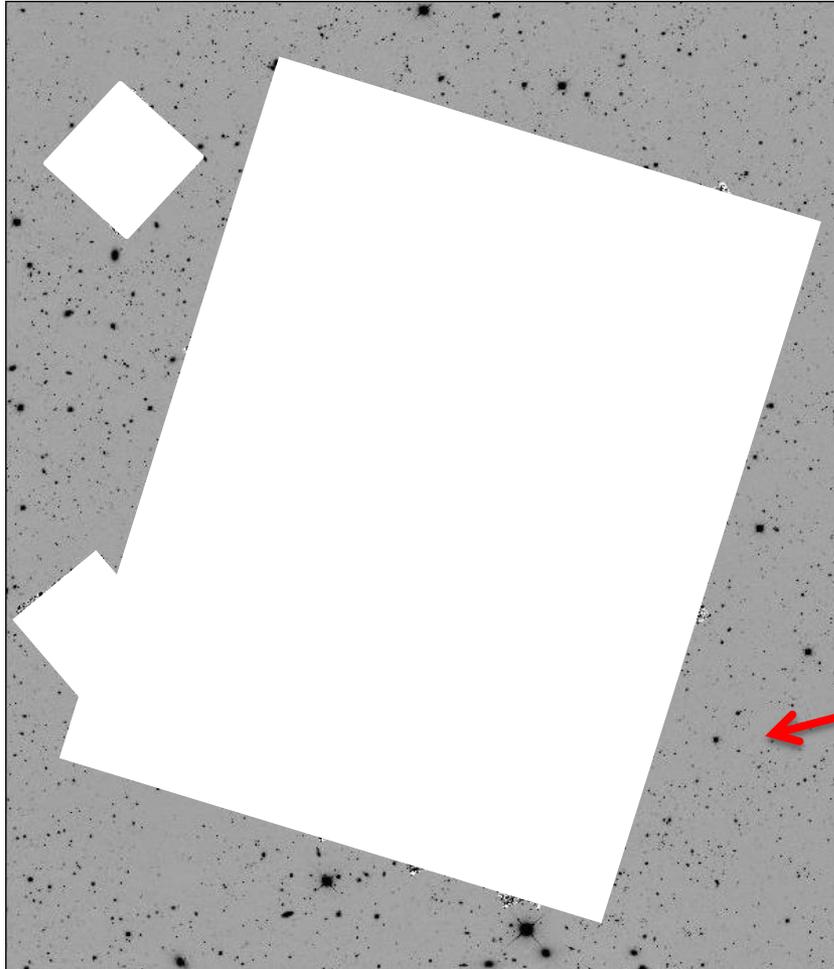


In area covered by CANDELS HST imaging use the Guo et al. (2013) TFIT catalogues featuring aperture matched, 14-band photometry 0.3-4.5 μ m

VANDELS CDFS FIELD

VANDELS: photo-z pre-selection

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VANDELS CDFS FIELD

For extended CDFS region, Edinburgh VANDELS catalogue, utilizing a combination of 16-band photometry:

VIMOS U+R imaging

GEMS HST imaging in V_{606} and Z_{850}

Subaru medium band imaging (7 bands)

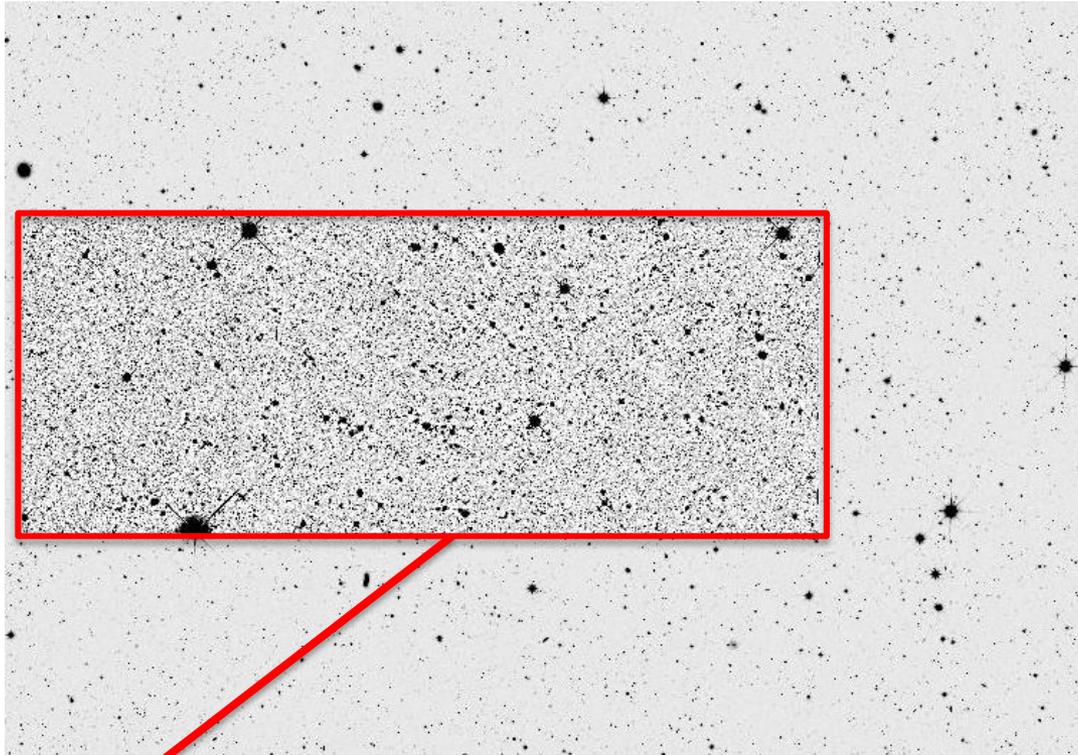
J+K imaging from TENIS survey on CFHT

H-band imaging from VISTA VIDEO survey

IRAC “supermap” of all CDFS Spitzer programmes

VANDELS: photo-z pre-selection

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VANDELS UDS FIELD

Within CANDELS HST region, exploit Galametz et al. (2013) TFIT catalogue, which features 15-band aperture matched photometry covering 0.3-4.5 μ m

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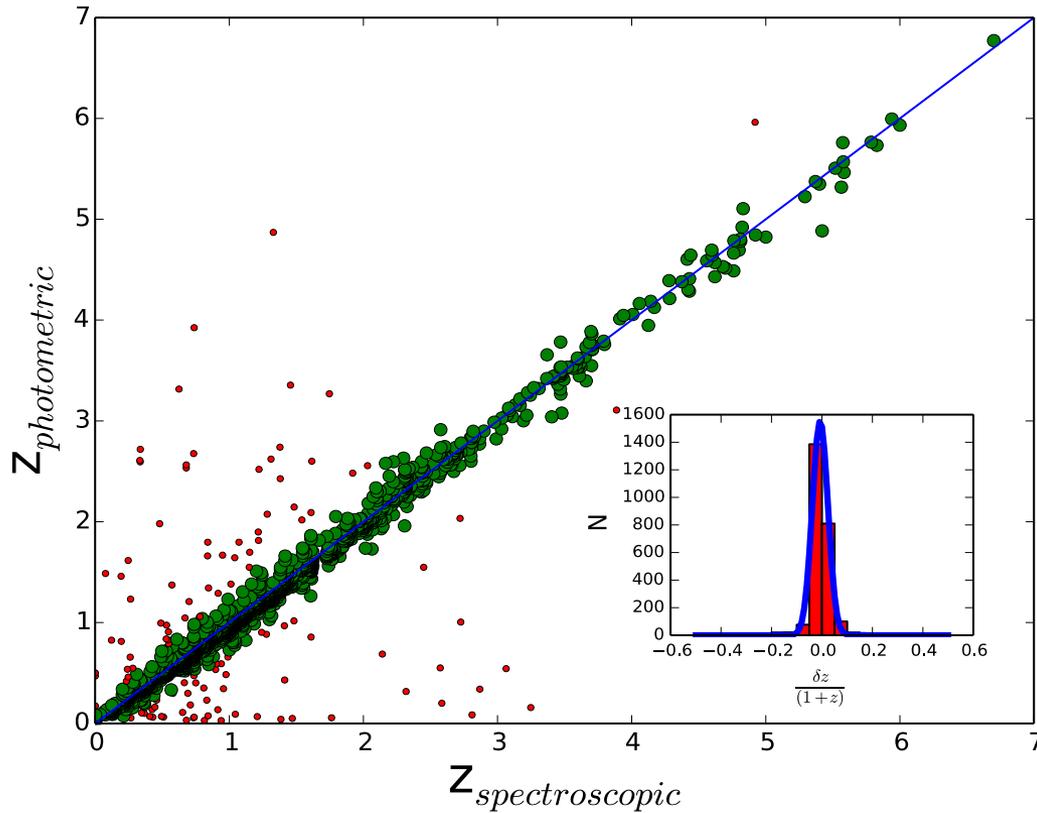


VANDELS UDS FIELD

Within extended UDS region, Edinburgh VANDELS catalogue using 13-band photometry:
CFHT U-band, Subaru BVR_{iz}_{nb}, VIDEO Y-band, JHK from UKIDSS UDS, IRAC from SEDS

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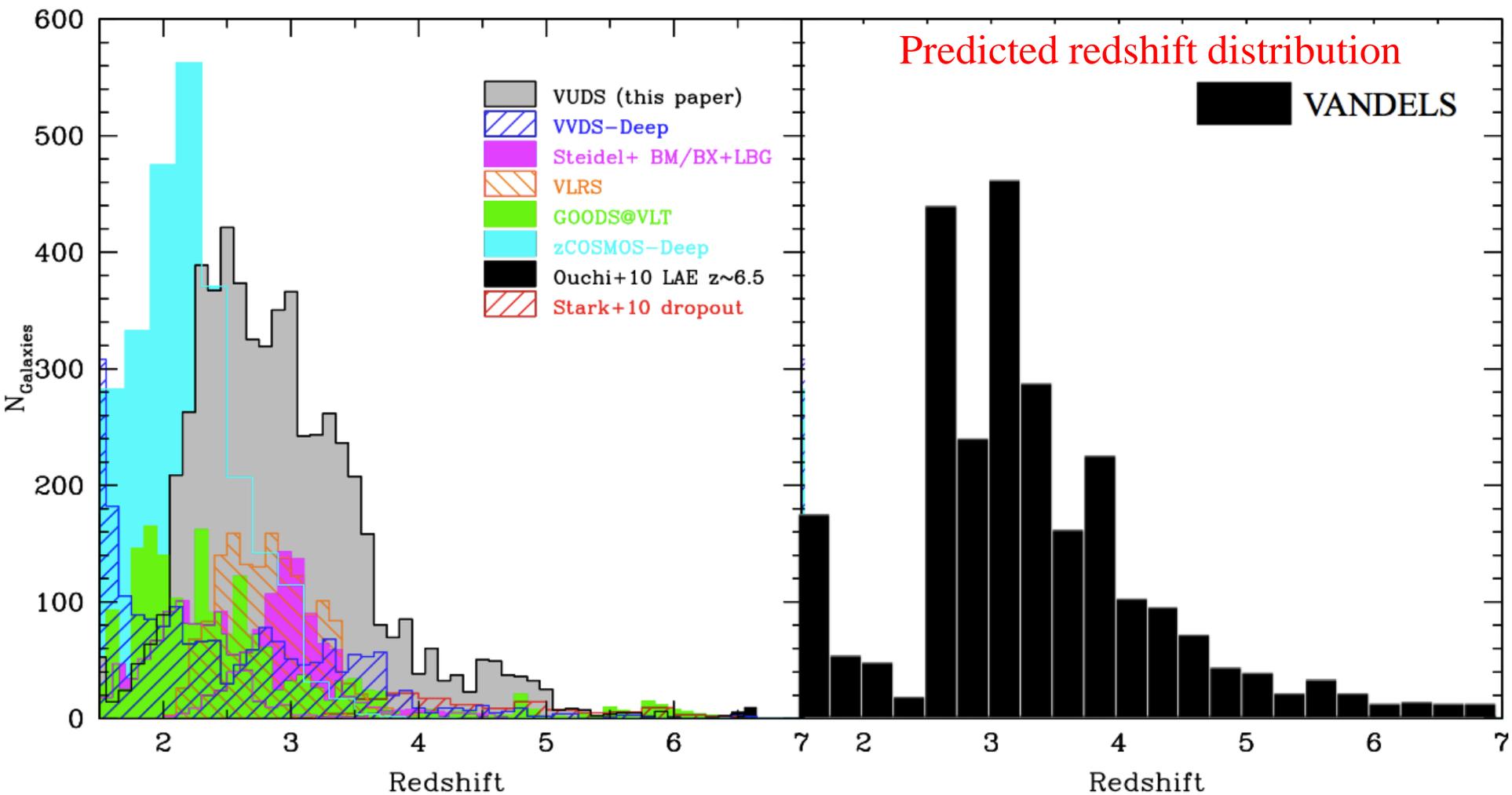
CDFS photometric redshifts

$$\sigma_{\text{MAD}}=0.013$$

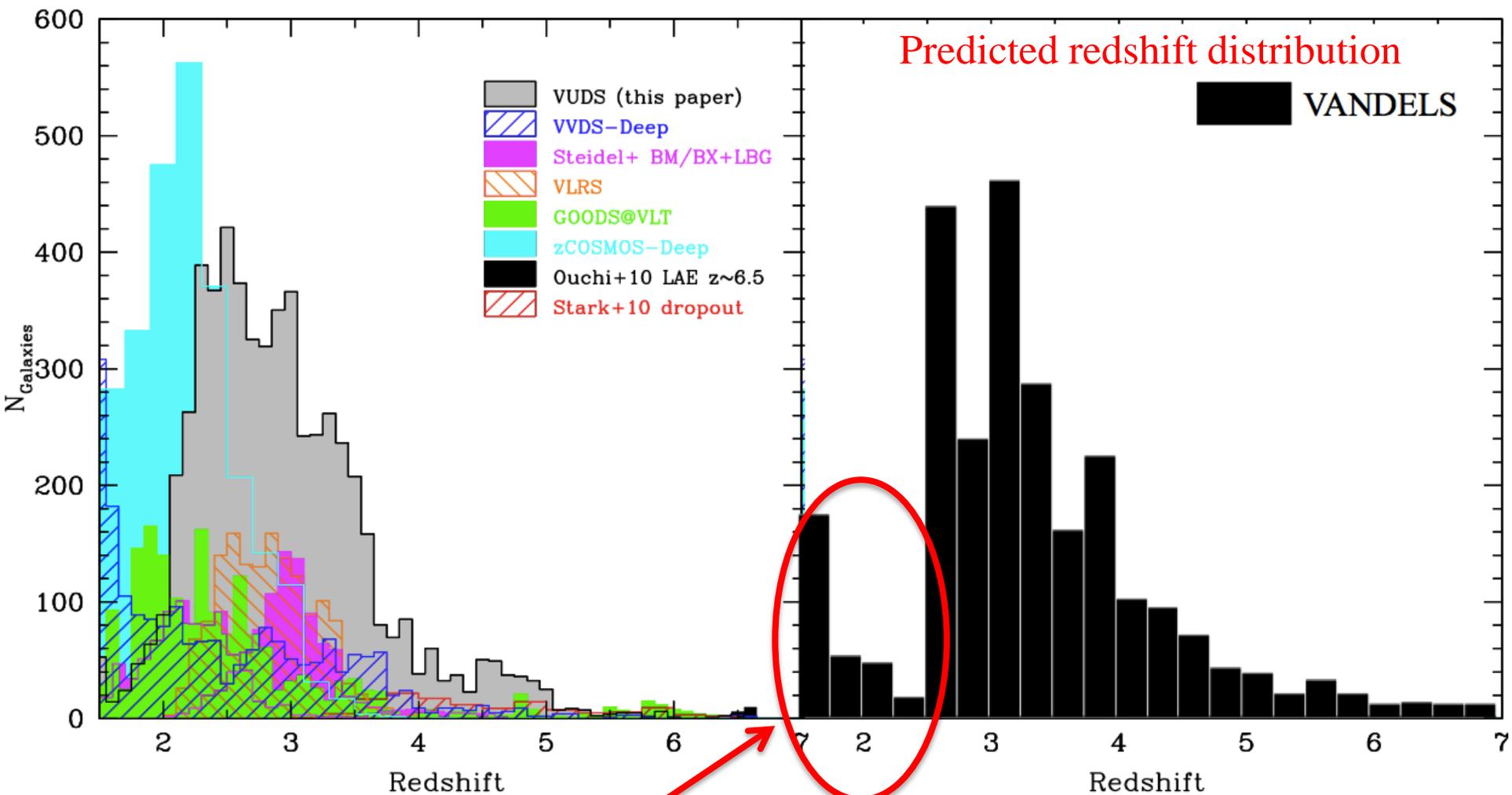
Outlier fraction < 4%
down to $H_{\text{AB}}=26$

Aim is for <100 low-redshift interlopers in final sample of 2600 galaxies

VANDELS: photo-z pre-selection



VANDELS: photo-z pre-selection



Passive galaxy sub-sample at $1.5 < z < 2.5$

VANDELS: test observations

Allocated two observing runs in Nov/Dec 2014 to test mask preparation and observing strategy. Obtained ~10 hours of integration in both UDS and CDFS on two masks.

Example 2D spectra from UDS mask:



LAE at $z=3.72$



Type 1 AGN at $z=3.97$



LAE at $z=4.62$

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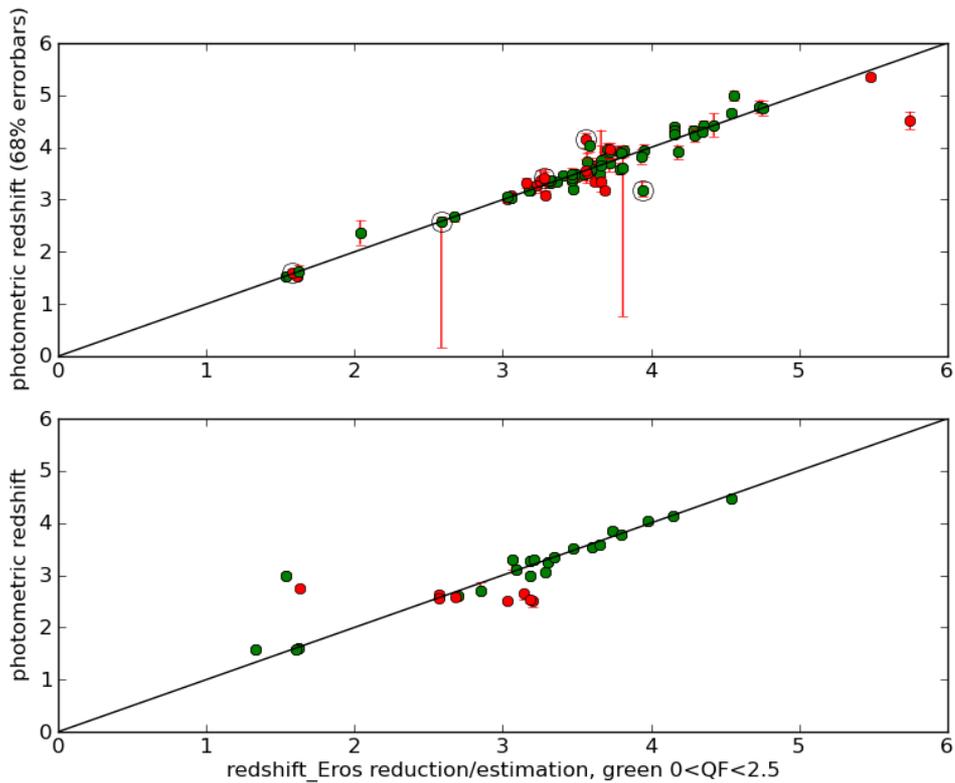


LAE at $z=4.62$

data not obtained in the best conditions, but still clearly useful for testing target selection....

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$Z_{\text{spec}} - Z_{\text{phot}}$ comparison from test mask
in CDFS:

Green = high quality redshift

Red = low quality redshift

Target selection appears to be working well...

VANDELS: schedule

VANDELS has been allocated 912 hours of visitor mode observations, to be carried out in four observing seasons (Aug-Dec) during 2015-2018. All raw data are immediately public on ESO archive, and reduced data will be released ~9 months after observations.

Provisional Data Release Schedule:

Data release	Date	No. of completed spectra			No. of partially complete spectra			Total
		20-hrs	40-hrs	80-hrs	40-hrs(50%)	80-hrs(25%)	80-hrs(50%)	
DR1	Sept 2016	160	160	0	320	320	160	1120
DR2	Sept 2017	320	480	160	320	320	160	1760
DR3	Sept 2018	480	960	320	0	0	320	2080
DR4	Sept 2019	640	1280	640	0	0	0	2560

Data Reduction:

Data reduction is being carried out in Milan, by the team responsible for reducing VIMOS data obtained in VVDS, zCOSMOS, VIPERS and VUDS surveys

Summary

- ⊙ 912 hours of VIMOS visitor time: 2015-2018
- ⊙ 20-80 hour integrations focused on $z > 3$ star-forming galaxies
- ⊙ Science goals: ages, masses, metallicities and outflows at high- z
- ⊙ Raw data immediately public
- ⊙ Reduced data released ~ 9 months after observations taken
- ⊙ Full details can be found at: vandel.inaf.it



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