VIDEO+SERVs
A deep and wide near-infrared view of the Universe

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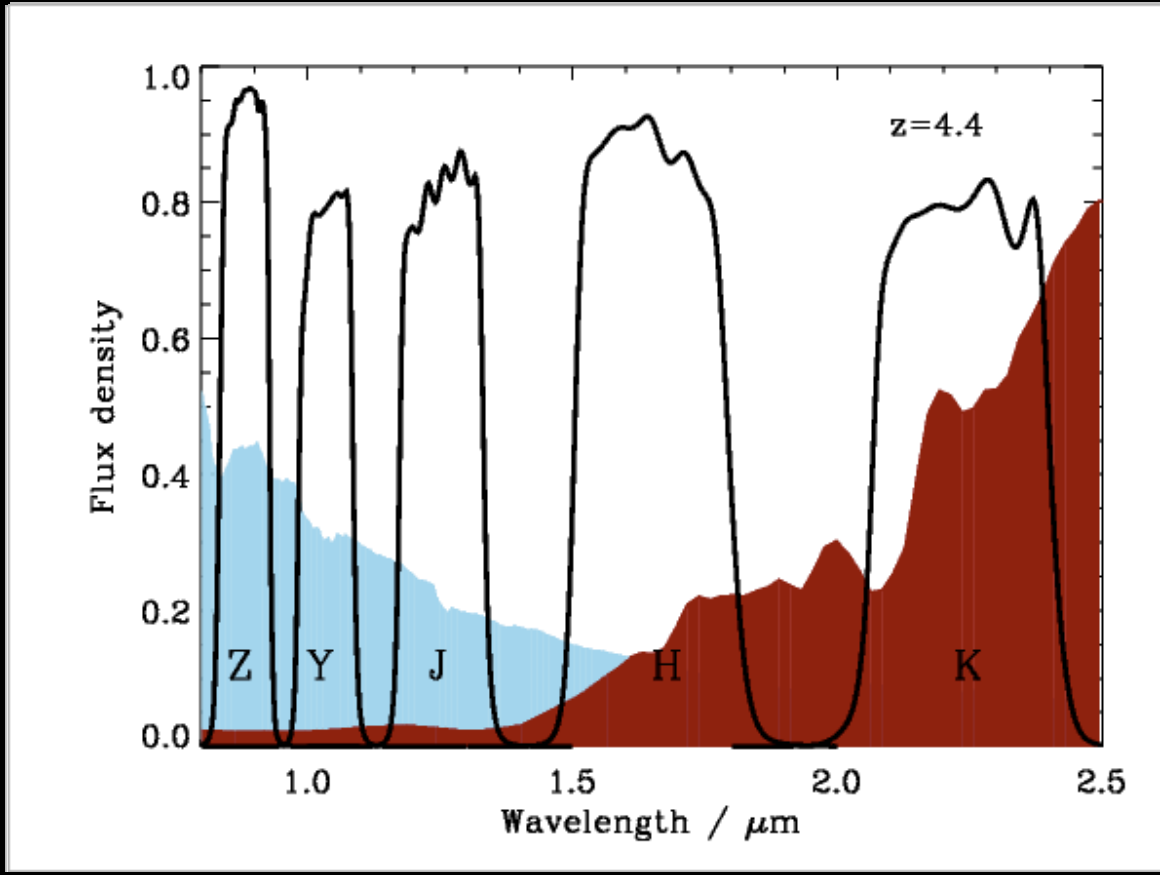
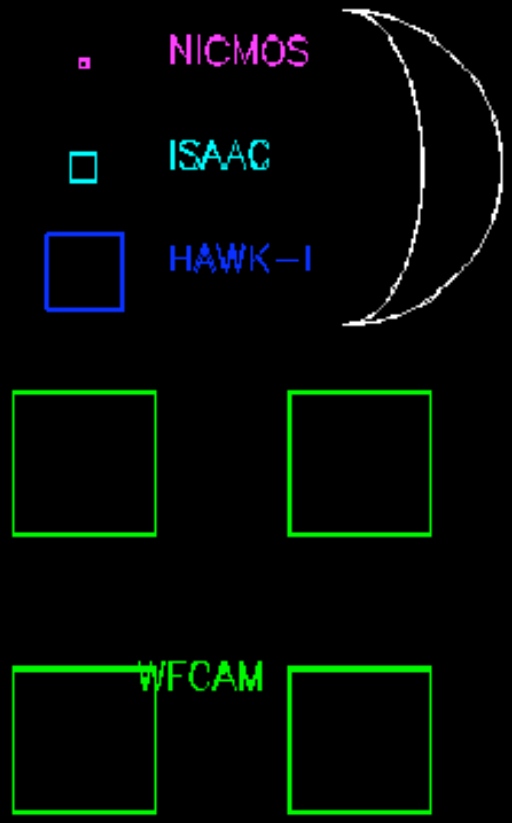
How do you get a *complete* picture galaxy evolution?

We can move to longer wavelengths.

But need different detectors, telescopes and techniques.



The near-infrared view of galaxy formation and evolution

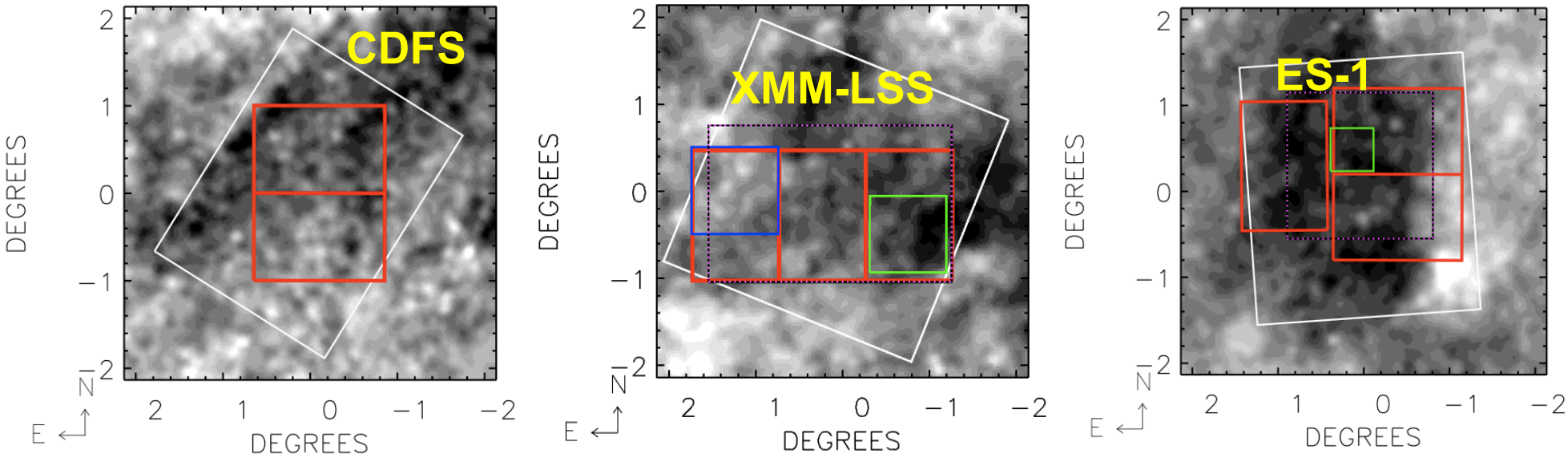


Survey speed >3x faster than WFCAM and better sensitivity in the Z,Y,J wavebands

ESO-VISTA public surveys

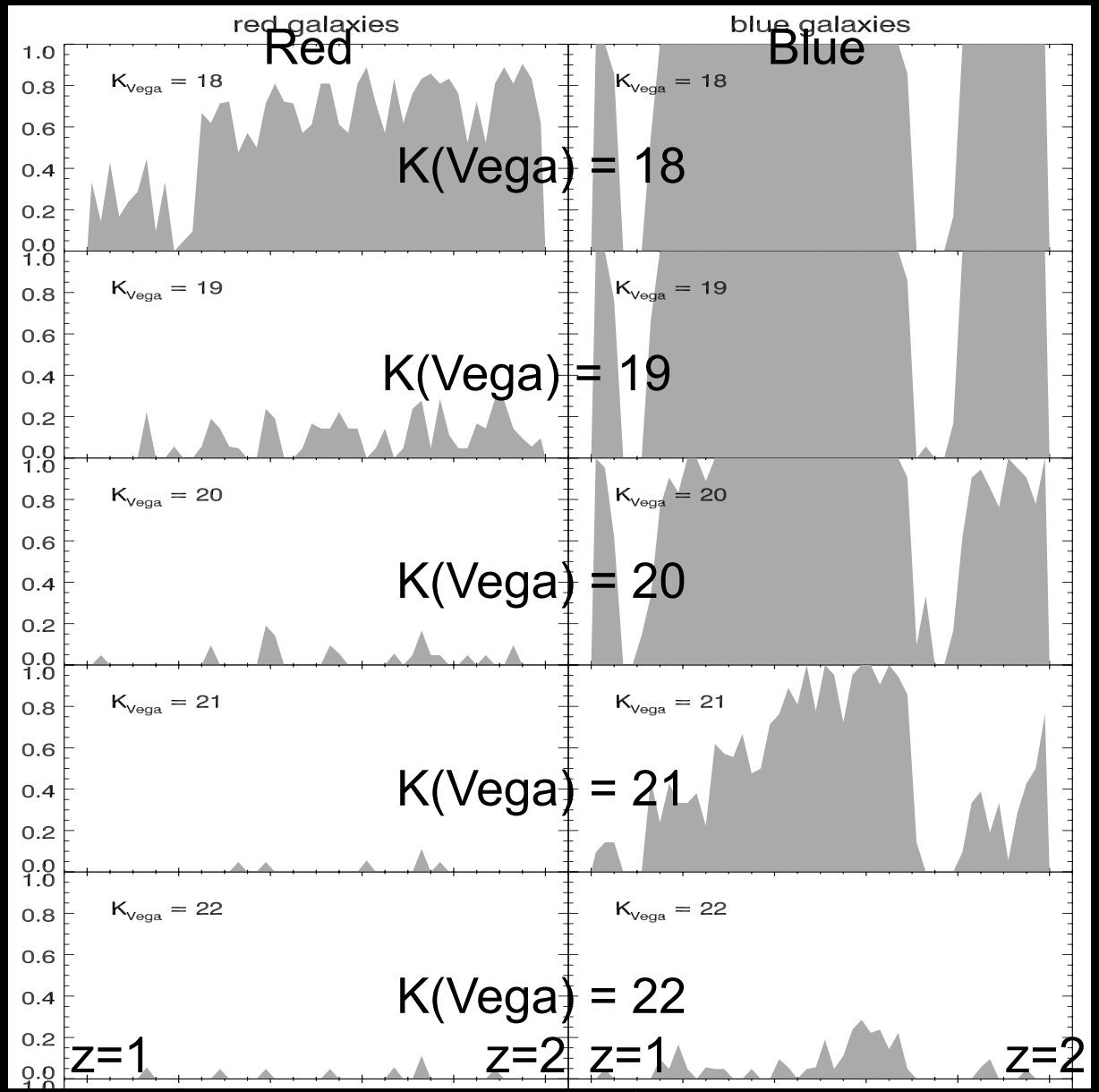
- VHS (Richard McMahon) ~17000sq.deg (z<0.6)
- VIKING (Will Sutherland) ~1000sq.deg (z<1.2)
- **VIDEO (Matt Jarvis) ~12sq.deg (z>1)**
- Ultra-VISTA (LeFevre/Dunlop/Franx/ Fynbo)~1sq.deg (z>5)
- VVV (Dante Minitti & Phil Lucas)
- VMC Survey (Maria-Rosa Cioni)

The VIDEO Survey



Filter	Time (per source)	Time (full survey)	5σ AB	5σ Vega	UKIDSS -DXS	Seeing	Moon
Z	17.5 hours	456 hours	25.7	25.2	-	0.8	D
Y	6.7 hours	175 hours	24.6	24.0	-	0.8	G
J	8.0 hours	209 hours	24.5	23.7	22.3	0.8	G
H	8.0 hours	221 hours	24.0	22.7	22	0.8	B
K_s	6.7 hours	180 hours	23.5	21.7	20.8	0.8	B

Depth well-matched to FMOS



- Tests in automatic mode of "runz" (2dFGRS redshift code) to give *lower limits* on redshift completeness with FMOS spectra.

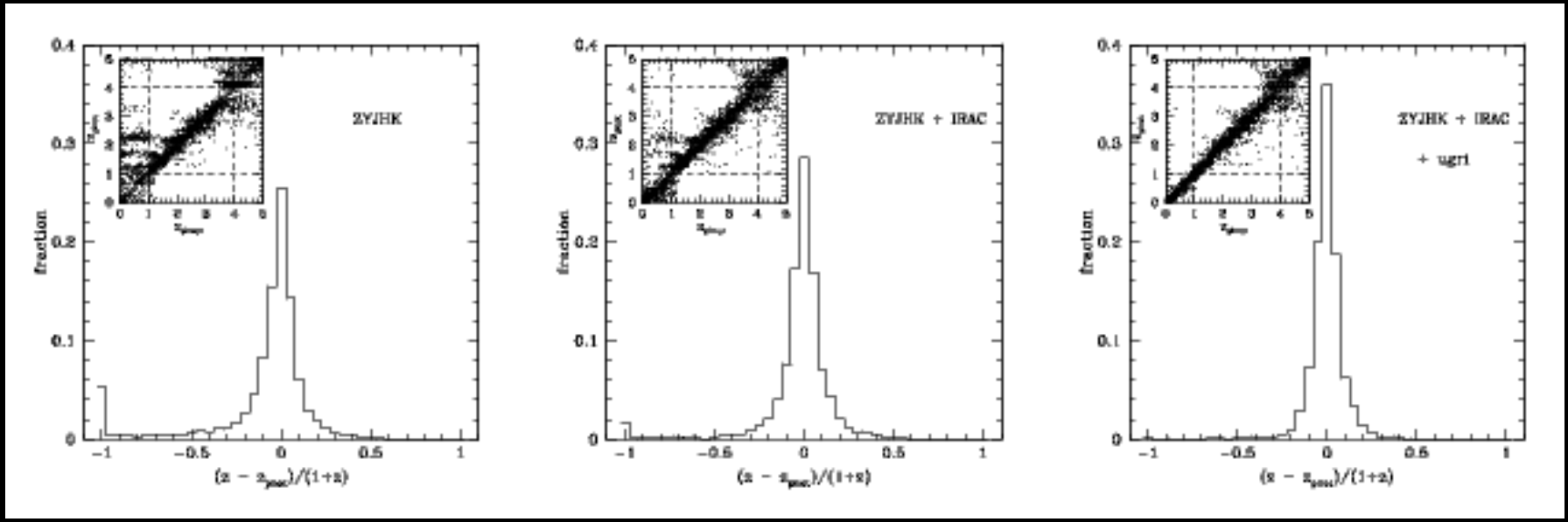
(Uses Tamura's spectrum simulator, 3600 sec exposure)

← VIDEO depth

- Also matches EUCLID all-sky survey depth.

The VIDEO Survey

Photometric redshifts



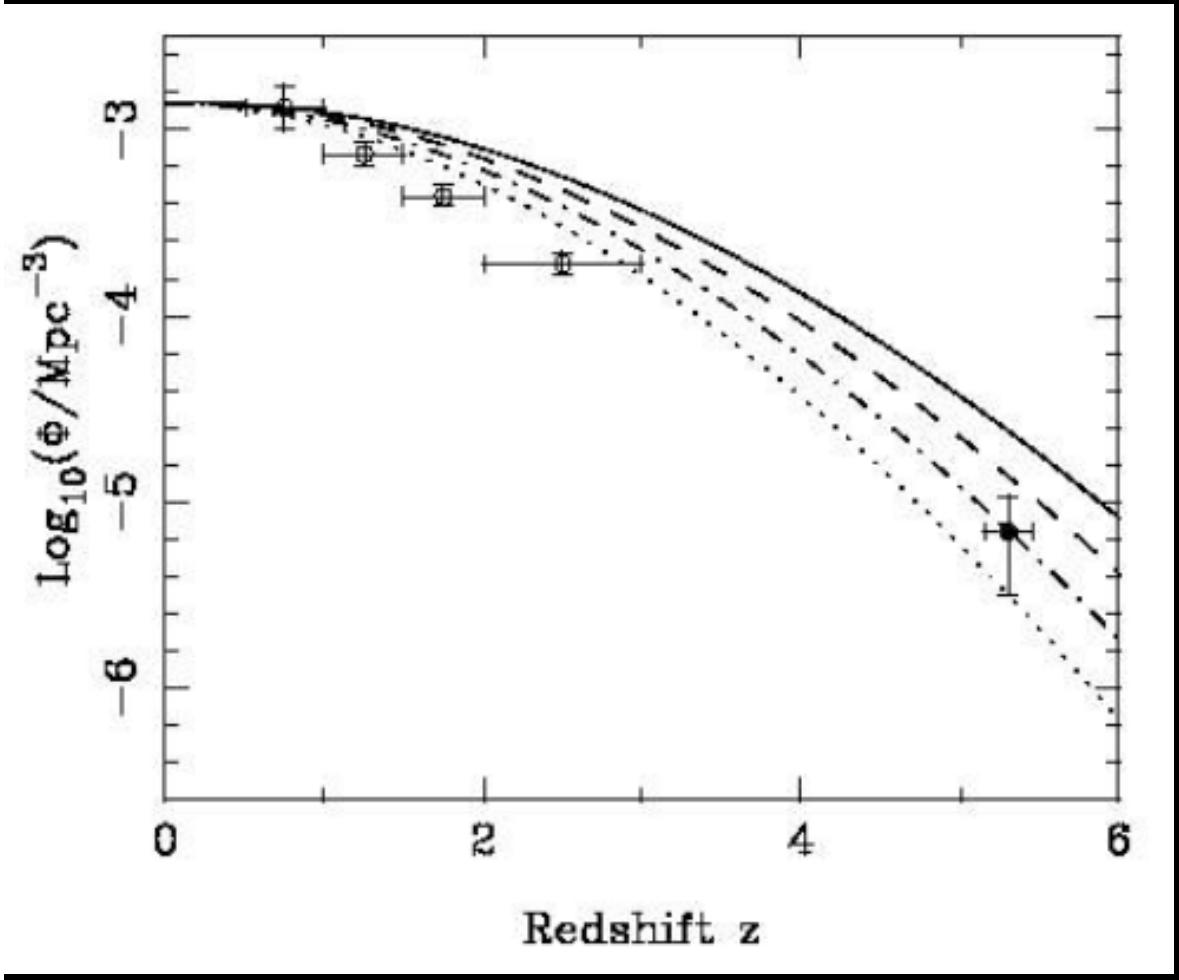
Get σ~0.1 with VIDEO+optical+SWIRE, up to z~4

Photo-zs preselect for FMOS follow-up

Train empirical code with spectroscopic results
→ improve photo-z precision

The VIDEO Survey

Galaxy Evolution – high-z galaxy space density

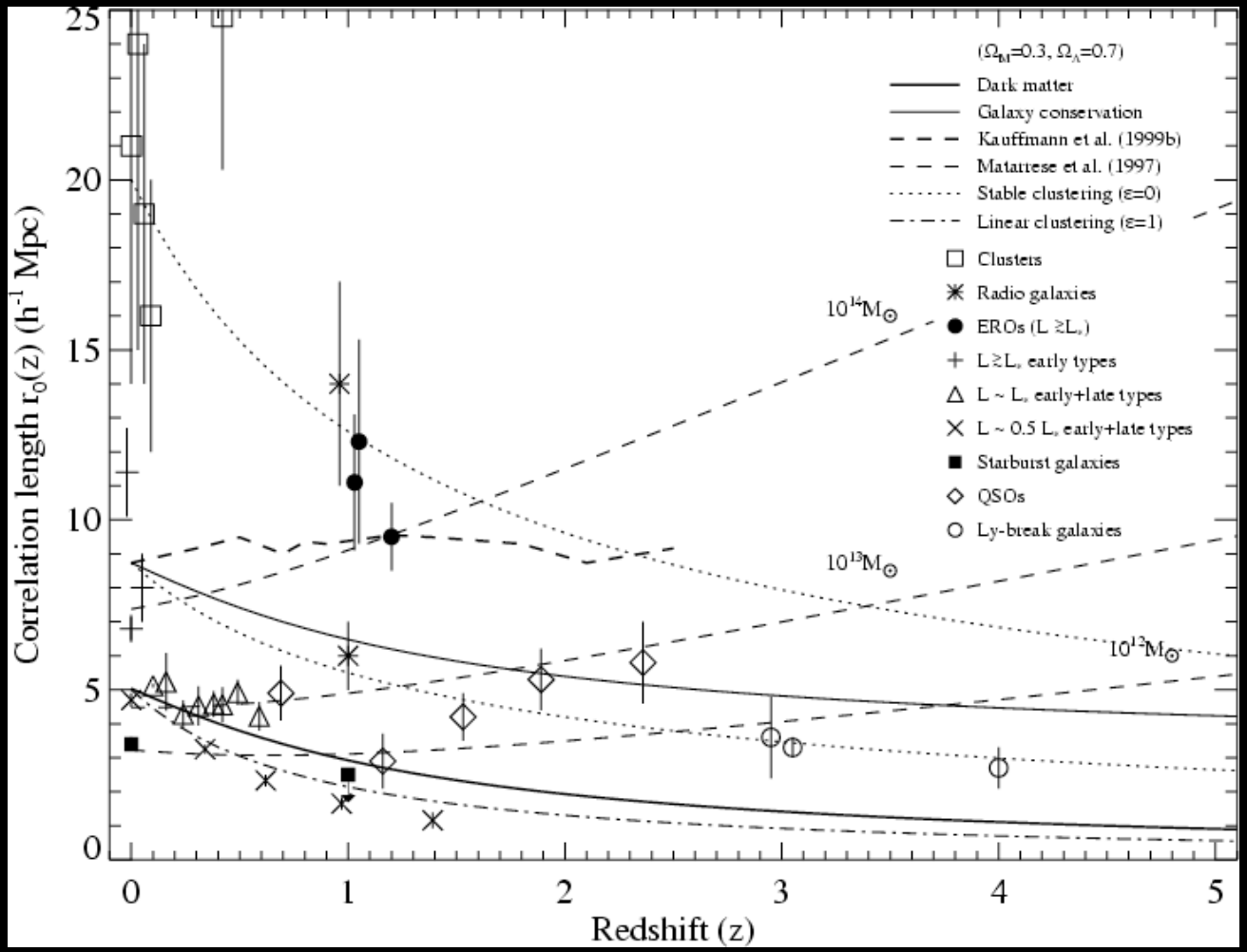


McLure et al. 2006

Number of galaxies with $M\sim10^{11}M_{\odot}$ (Based on 9 galaxies).
Curved lines from SAM of Bower et al. 2006 for various values of σ_8

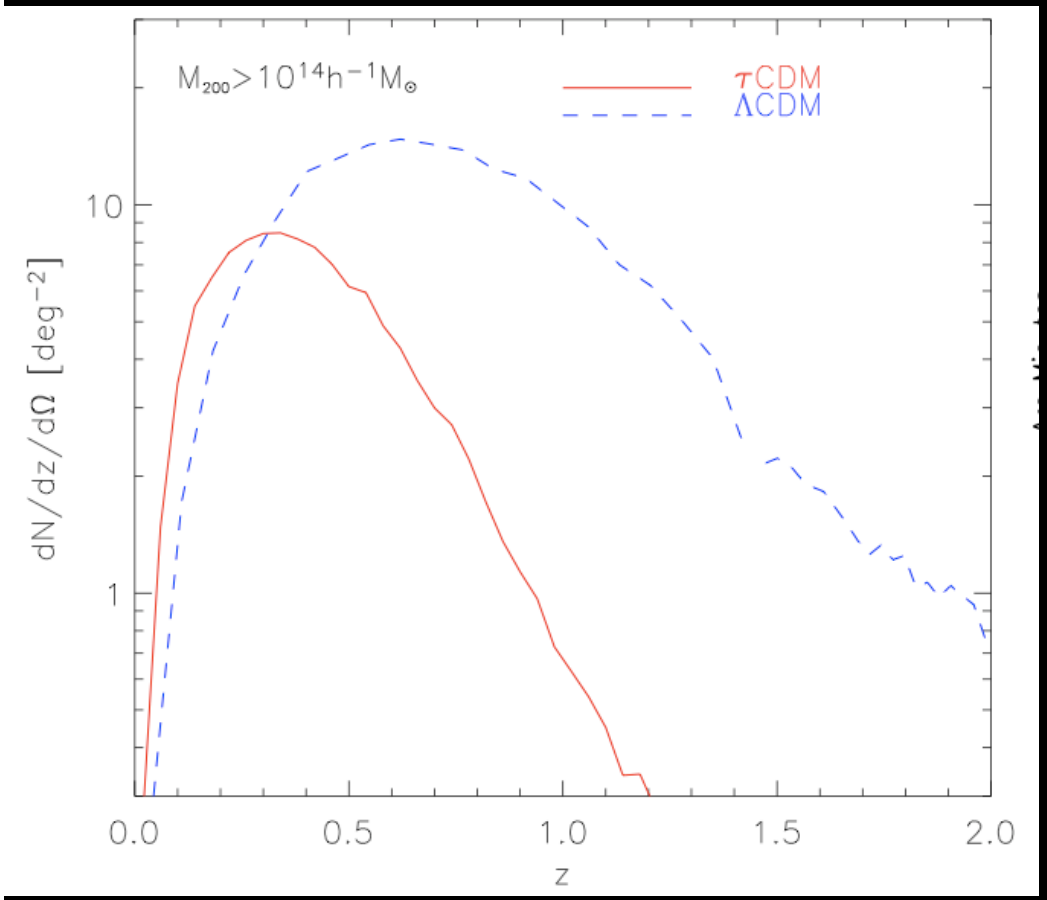
VIDEO will do this to 1mag fainter and 30x the area. Expect ~270 massive galaxies at z~5 and 140 at z~6.

Clustering



Overzier et al (2003)

VIDEO-ing galaxy clusters



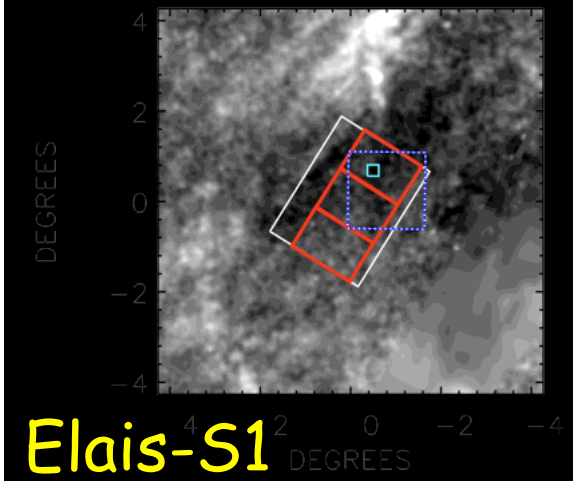
Evrard et al. 2002

Using similar techniques to those employed for the UDS, VIDEO will find…

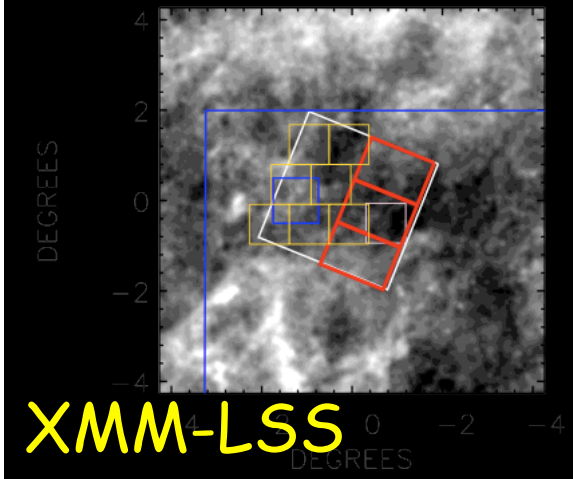
- 75 massive (>$10^{14}M_\odot$) clusters at z>1
- More than 10 at z>1.5

→ FMOS follow-up

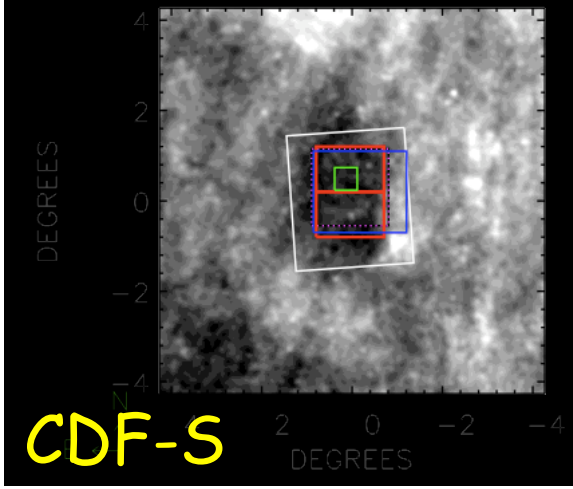
(Also have large array of complementary data from X-ray through to radio)



Elais-S1



XMM-LSS



CDF-S

VIDEO+SERVs+DES

Spitzer Representative Volume Survey (SERVS) approved to cover VIDEO survey regions + LH and Elais-N1

(1400 hours allocated – PI Mark Lacy

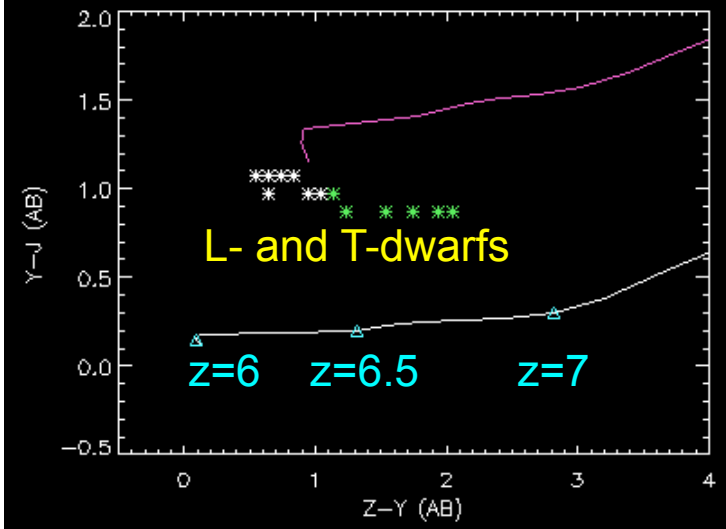
Management: Matt Jarvis, Seb Oliver and Duncan Farrah

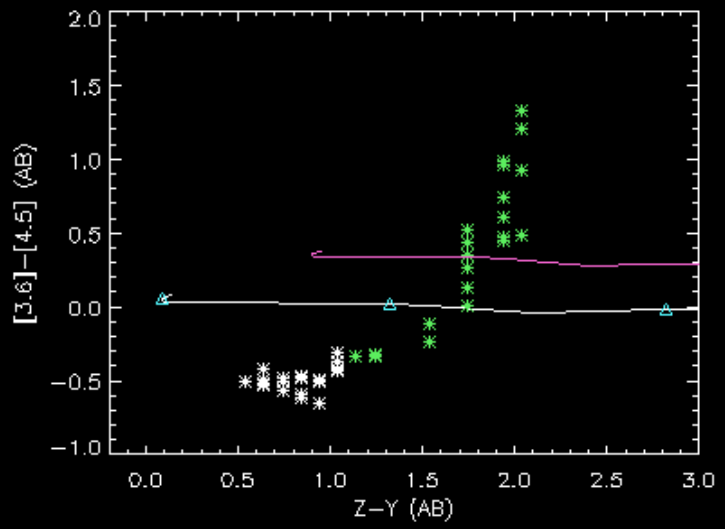
Will provide 3.6 and 4.5um data to slightly deeper levels than the VIDEO depths (L* at z>5)

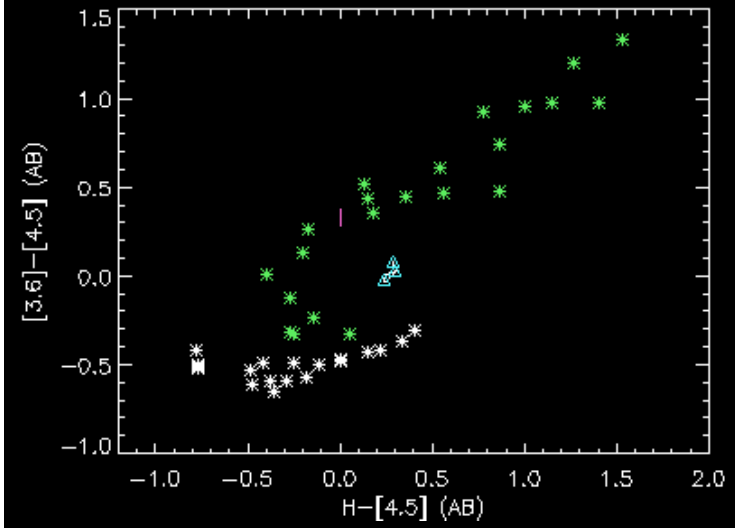
VIDEO entering data sharing agreement with the Dark Energy Survey. DES will have grizy photometry over VIDEO regions to depths of AB~27 (5sigma), starting in 2011.

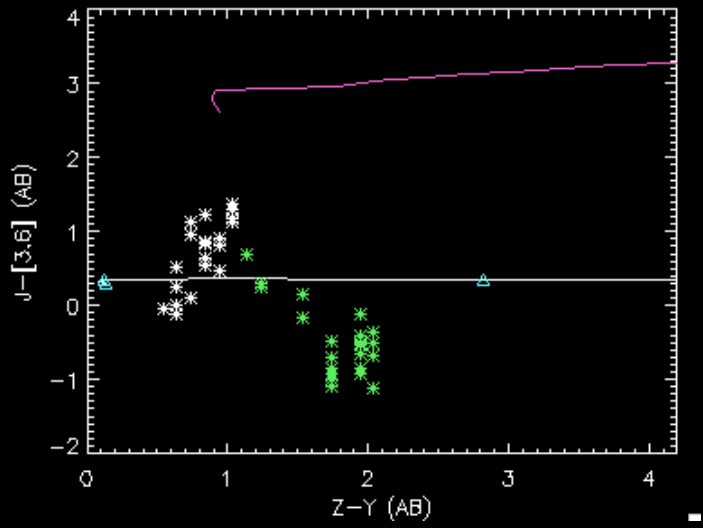
Concentrating on SNe science initially.

What can we learn about AGN?







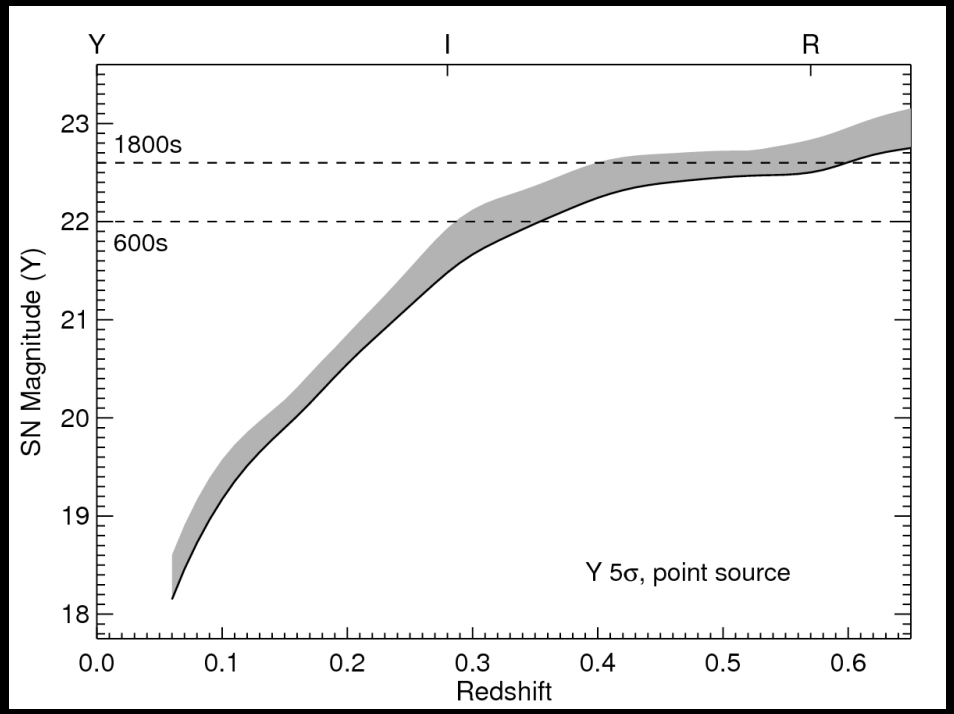


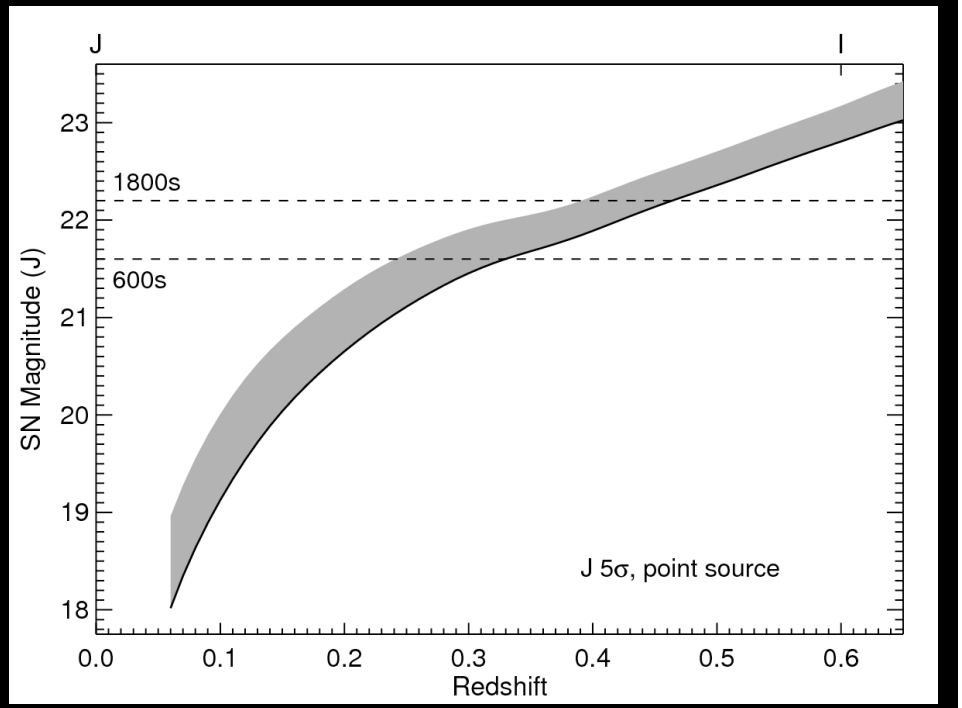
Depending on the QSO LF slope expect 10-30 z>6.5 QSOs in VIDEO

Z-Y vs Y-J very efficient at selection z>6.5 QSOs. VIDEO+SERVs crucially allows us to find the reddened high-z QSOs

VIDEO SN Ia with DES

- To z=0.5, ≈30 SNe Ia per rest-frame year per sq. deg.
  - For 5 months observer frame, expect ≈10
  - In 12 sq. deg., each cadenced over 5 months, ≈120 SNe Ia





Summary

- VIDEO is a 12 sq deg ESO public survey, in ES1, XMM-LSS, CDFS
- 5-sigma AB depths: 25.7 (Z), 24.6 (Y), 24.5 (J), 24.0 (H), 23.5 (K)
- Will be the best survey to study galaxy evolution as a function of both redshift and environment from 1<z<4 for L* and z>6 for the most massive galaxies
- Depth is well-matched to FMOS (UDS/Ultra-VISTA too deep, much smaller)
- 5 bands give accurate photo-zs for pre-selection (DXS only has 3)
- Complemented by SERVs: deep 3.6um and 4.5um, which improves photo-zs, enables efficient high-z QSO selection (inc. reddened), and provides accurate stellar masses.
- Complemented with DES grizy optical photometry from 2011
- Partial overlap with other exciting multi-wavelength surveys (UDS/SXDS, COMBO-17, XMM-LSS, GOODS-S, SWIRE, CFHTLS-D1, ATCA-ATLAS…)
- → FMOS spectra in (for example) UDS field can train VIDEO photo-zs