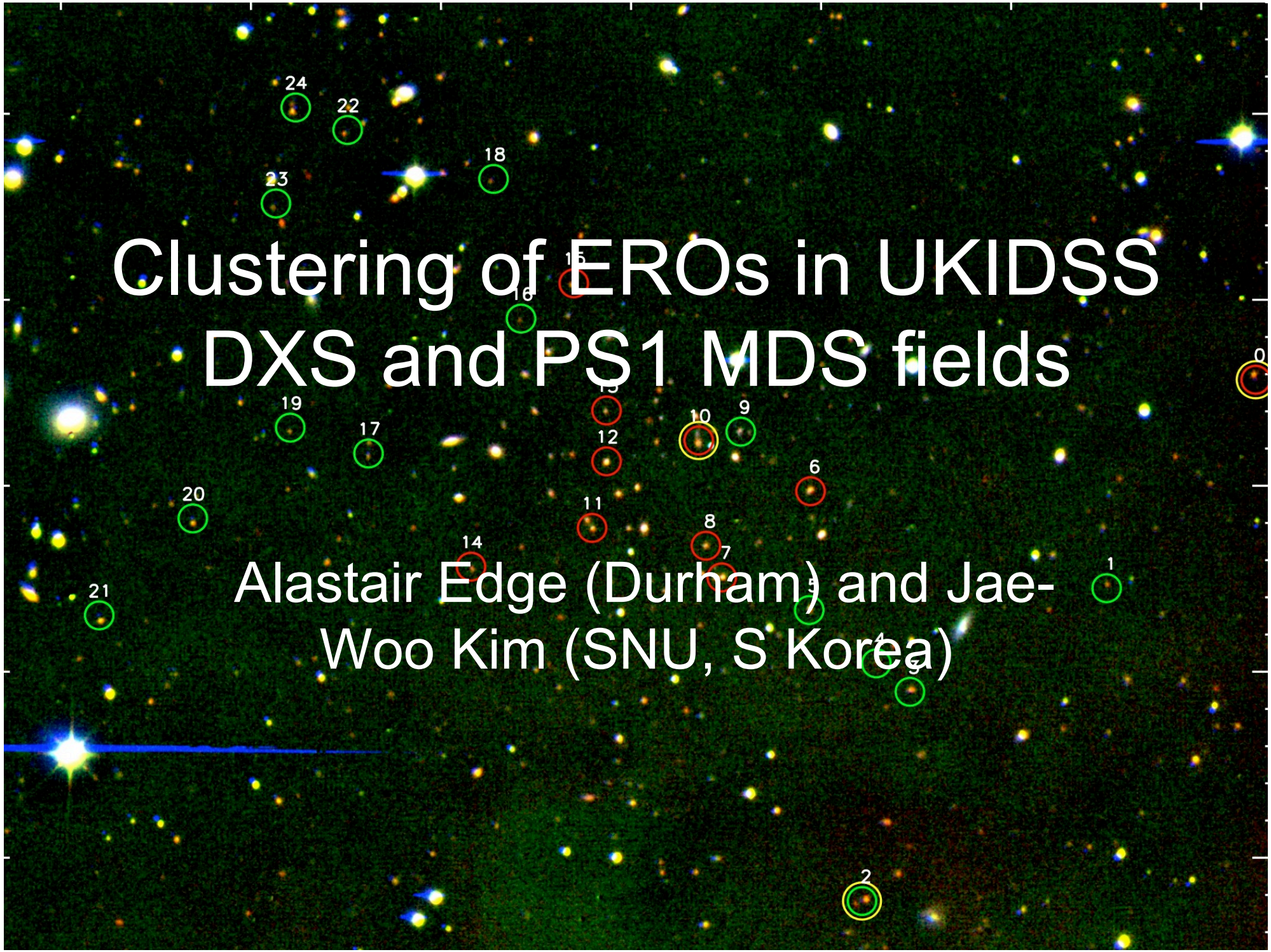


Clustering of EROs in UKIDSS DXS and PS1 MDS fields

Alastair Edge (Durham) and Jae-Woo Kim (SNU, S Korea)

UKIDSS DXS Science Objectives

The aims of the DXS were to map a cosmologically significant volume at z=1-2 through the detection of galaxies over a representative range of the galaxy luminosity function in the rest-frame optical bands.

"The imaging for a z=1-2 SDSS….."

Total Covered to now in DXS

In total there are 39 complete J+K WFCAM fields (~30 sq.deg.) and another 4 with full K coverage (~33 sq.deg.).

The J+K data for two areas (Elais-N1 and SA22) are complete, Lockman Hole is missing just one field in J and XMM-LSS is complete in K but only has 4 in J.

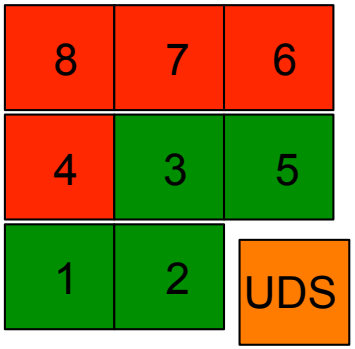
We also have six fields in H in SA22 taken in 2011/2 to fill the queue.

= K

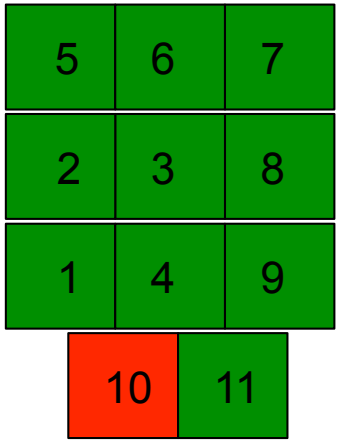
= JK

= JHK

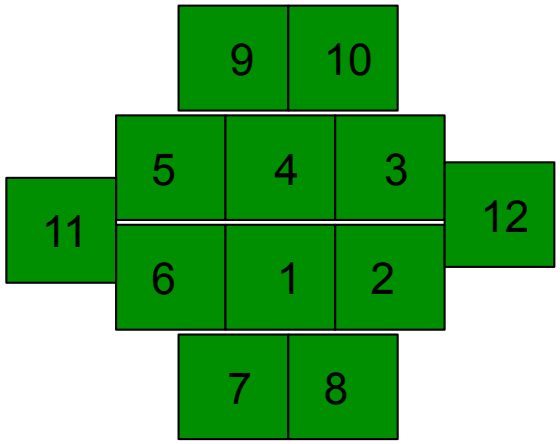
XMM LSS



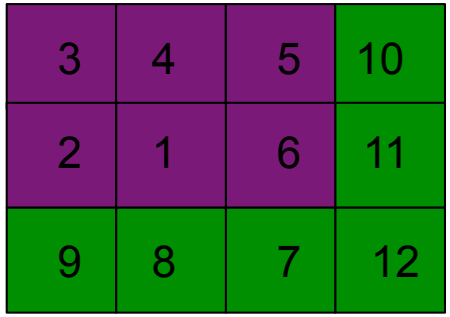
Lockman Hole



Elais N1



SA22



What did we ask for in 2001?

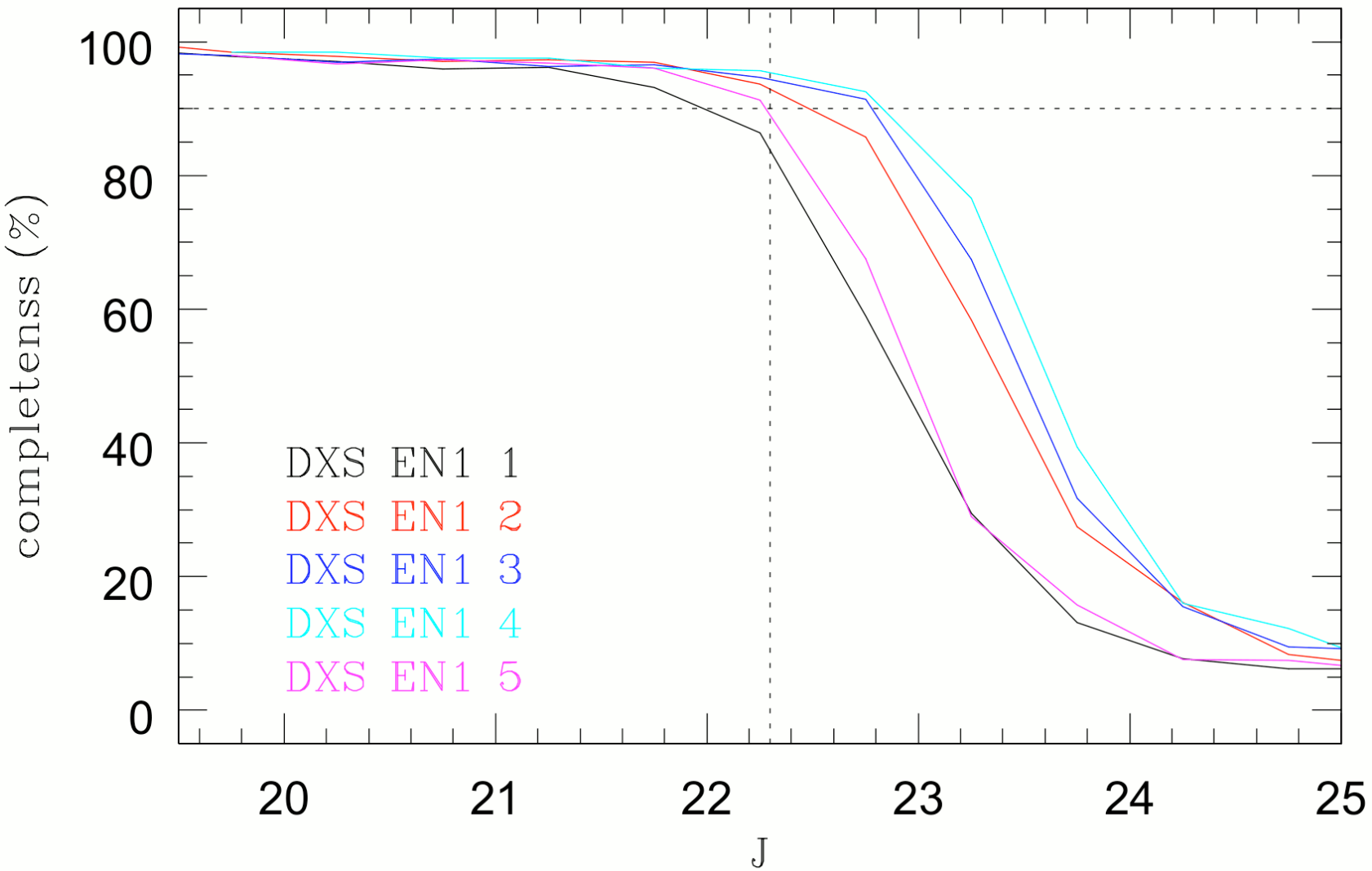
Looking back at the original DXS proposal I noticed that we originally requested 35 sq.deg. in J and K and 5 sq.deg. in H.

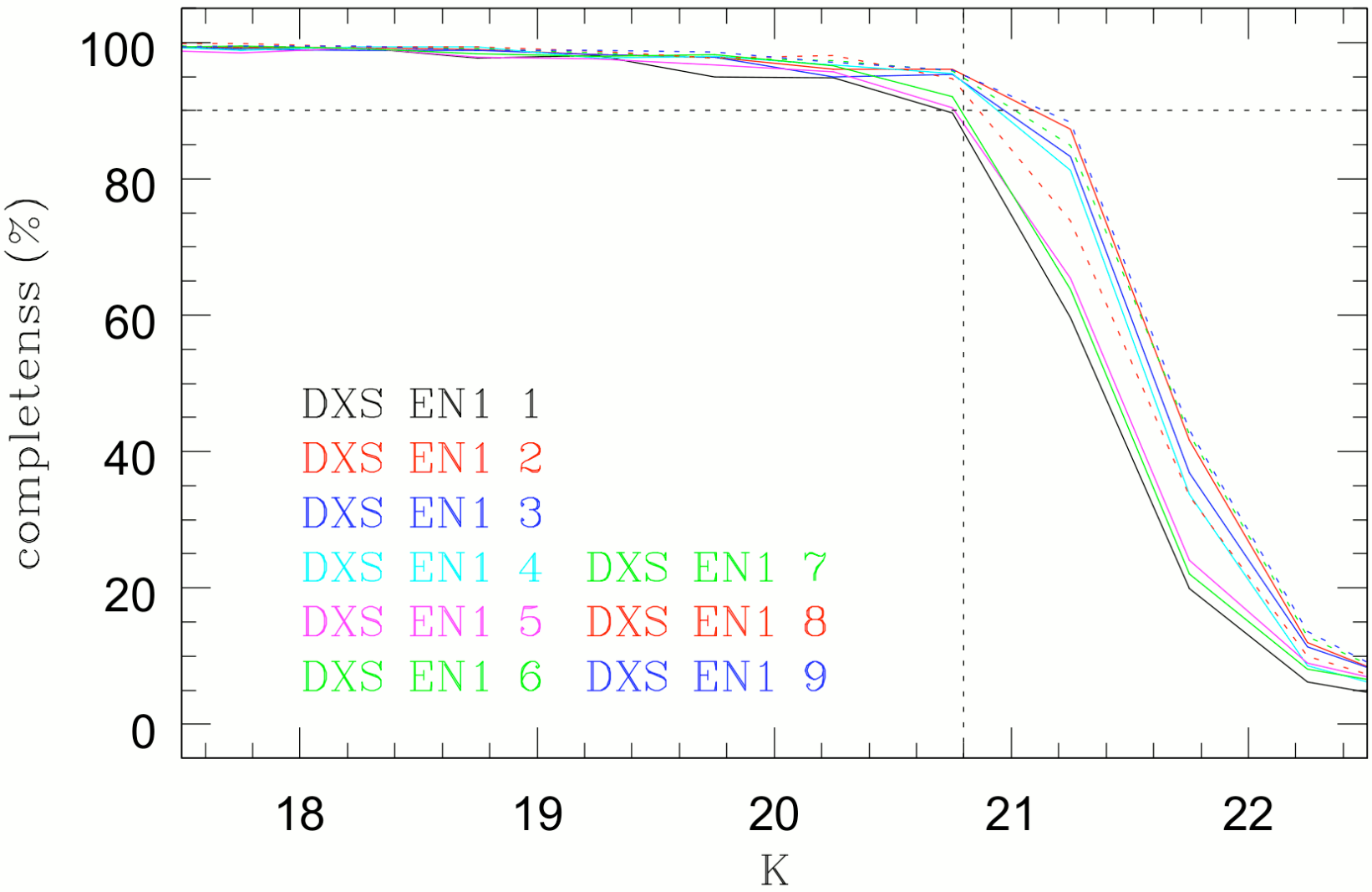
So we are *in area* now at 85 and 90% complete in J+K and K alone and 100% in H!

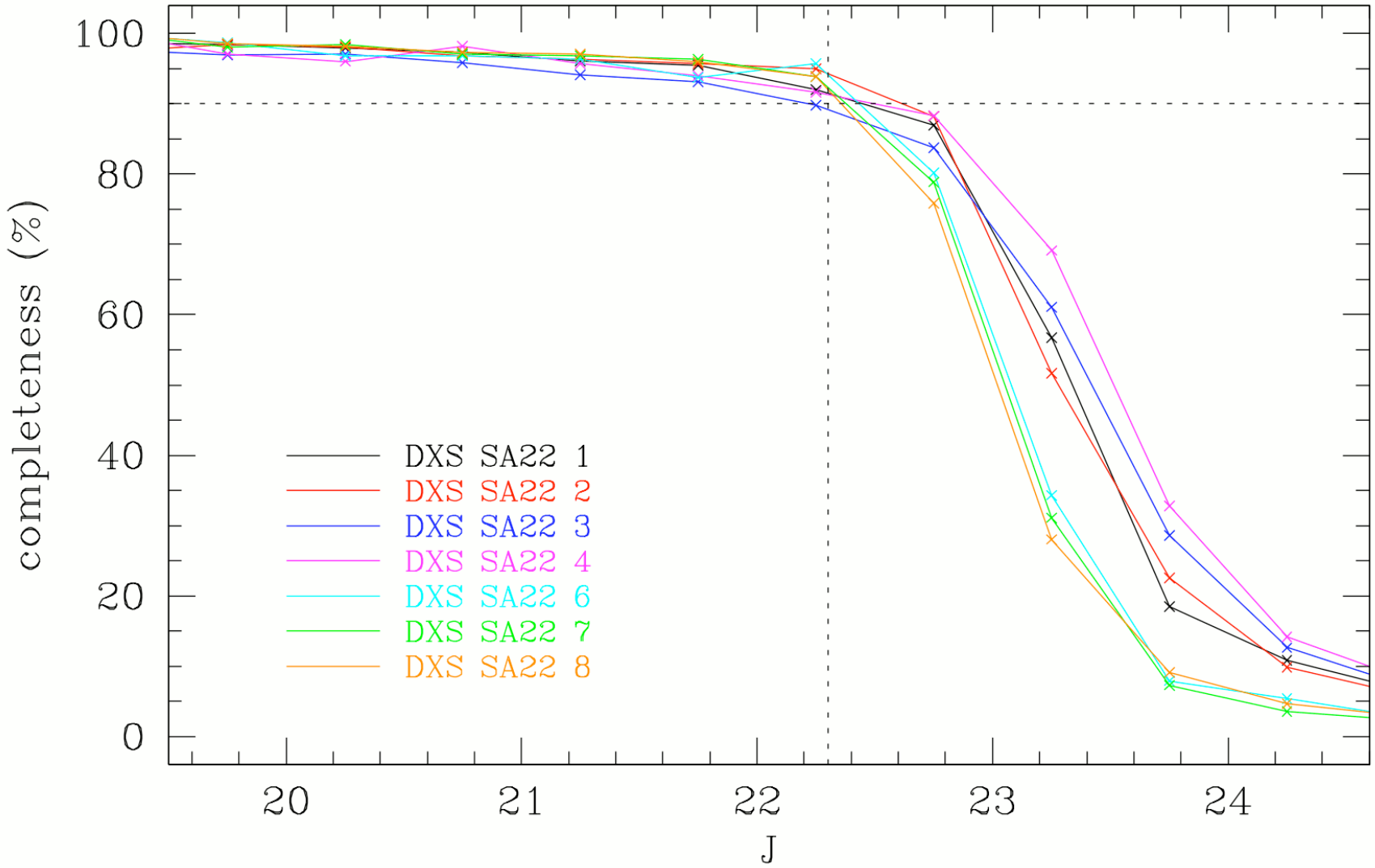
DXS depth estimates

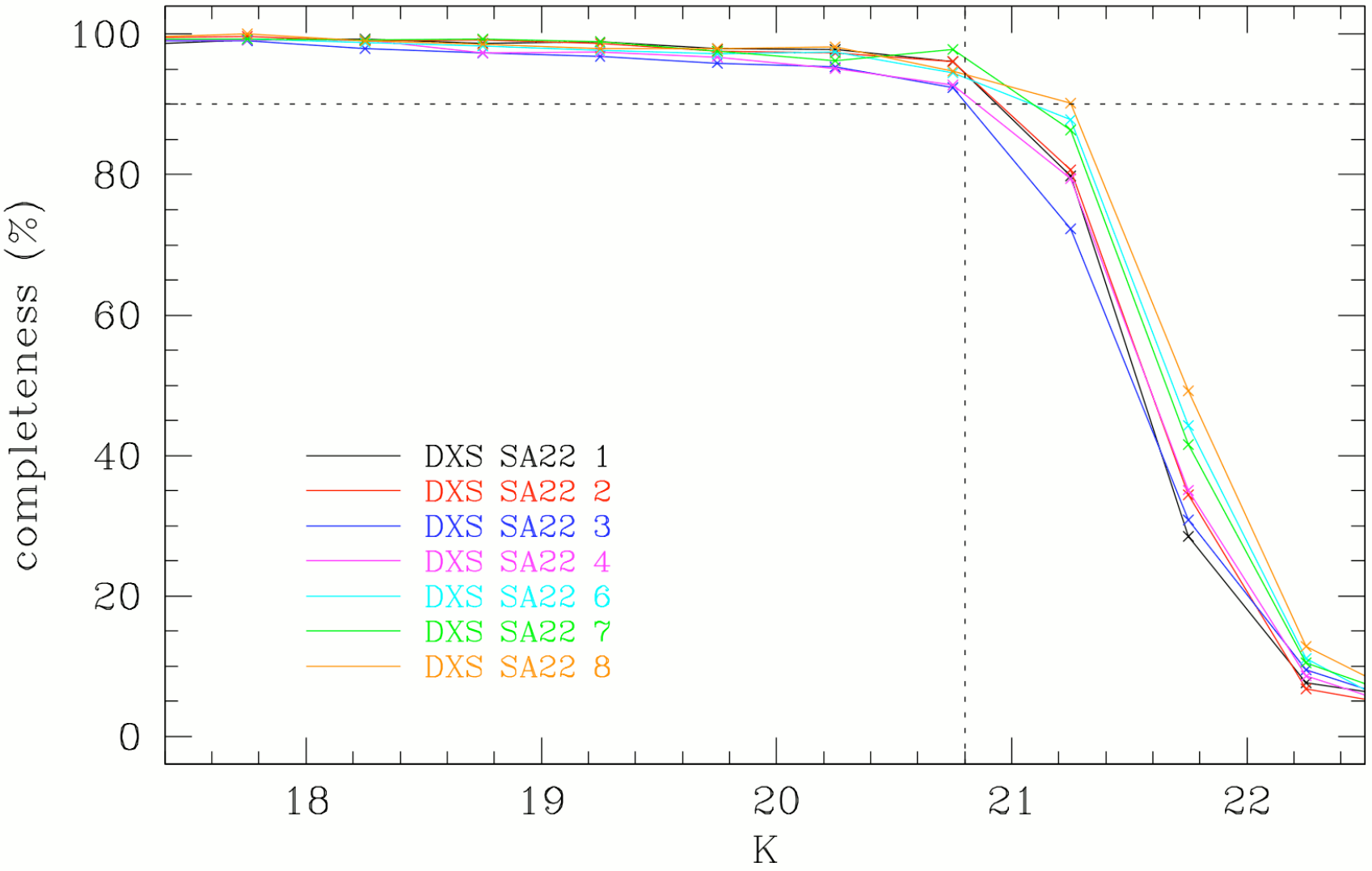
Using the recovery statistics of artificial stars and galaxies, Jae-Woo Kim has determined that the 90% completeness for point sources at 5σ is K>20.8 and J>22.3 for the large majority of the DXS fields screened in DR8.

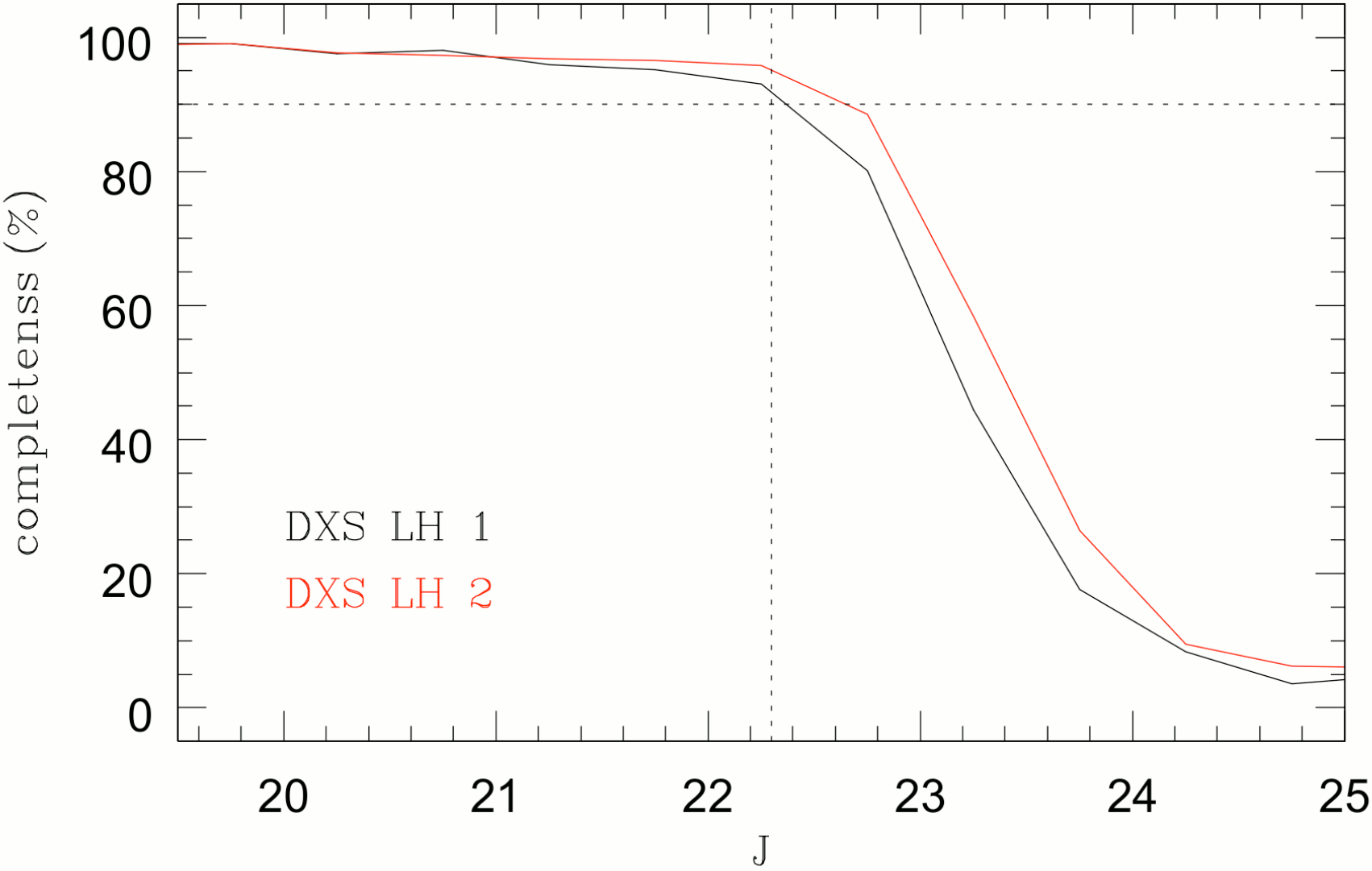
This compares well with the original requested depth of K=21.0 and J=22.5

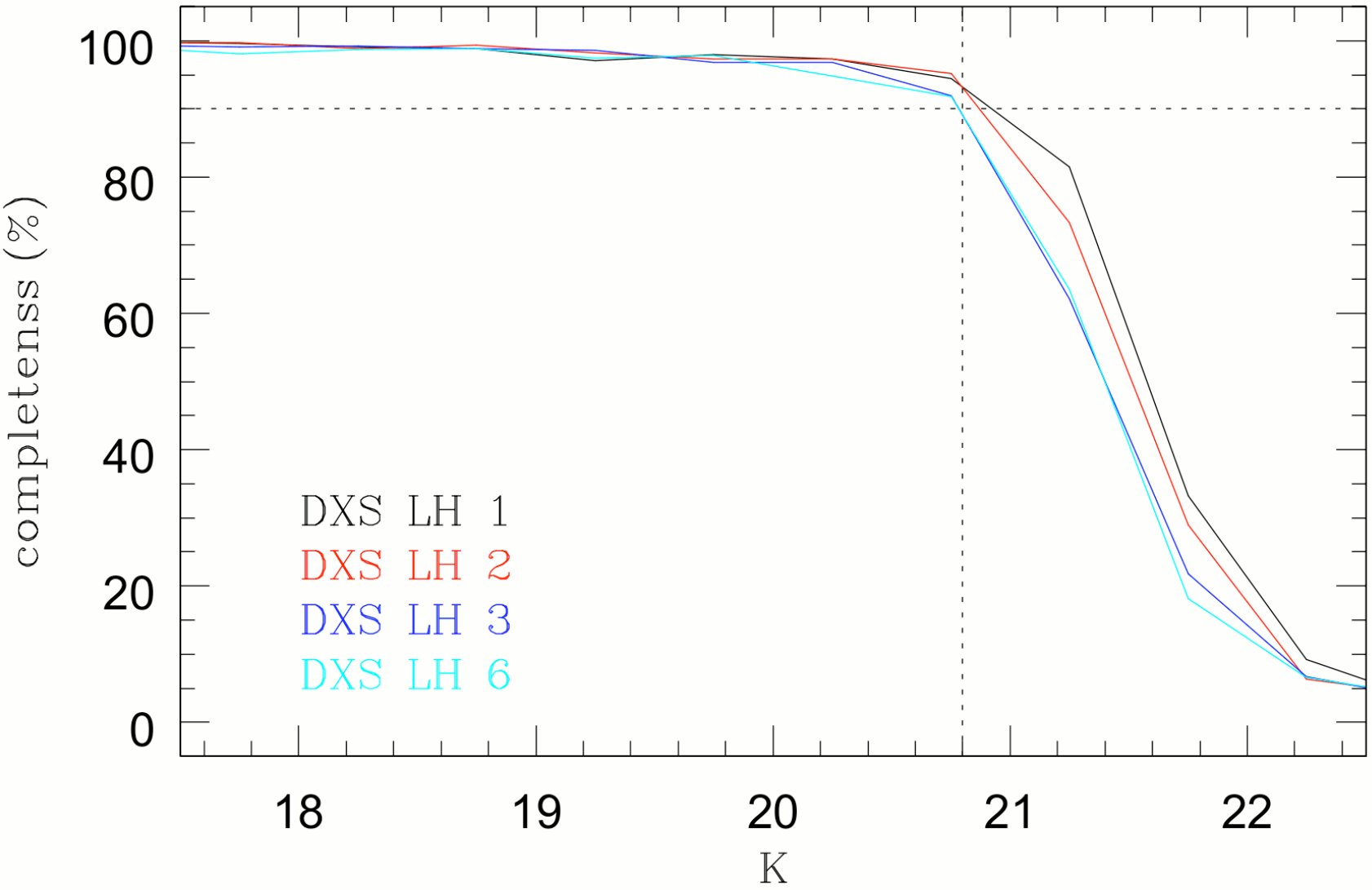

completenss (%)
100
80
60
40
20
0
20
21
22
23
24
25
J
DXS EN1 1
DXS EN1 2
DXS EN1 3
DXS EN1 4
DXS EN1 5


completenss (%)
100
80
60
40
20
0
18
19
20
21
22
K
DXS EN1 1
DXS EN1 2
DXS EN1 3
DXS EN1 4
DXS EN1 5
DXS EN1 6
DXS EN1 7
DXS EN1 8
DXS EN1 9


100
80
60
40
20
0
completeness (%)
20
21
22
23
24
J
DXS SA22 1
DXS SA22 2
DXS SA22 3
DXS SA22 4
DXS SA22 6
DXS SA22 7
DXS SA22 8


completeness (%)
100
80
60
40
20
0
18
19
20
21
22
K
DXS SA22 1
DXS SA22 2
DXS SA22 3
DXS SA22 4
DXS SA22 6
DXS SA22 7
DXS SA22 8

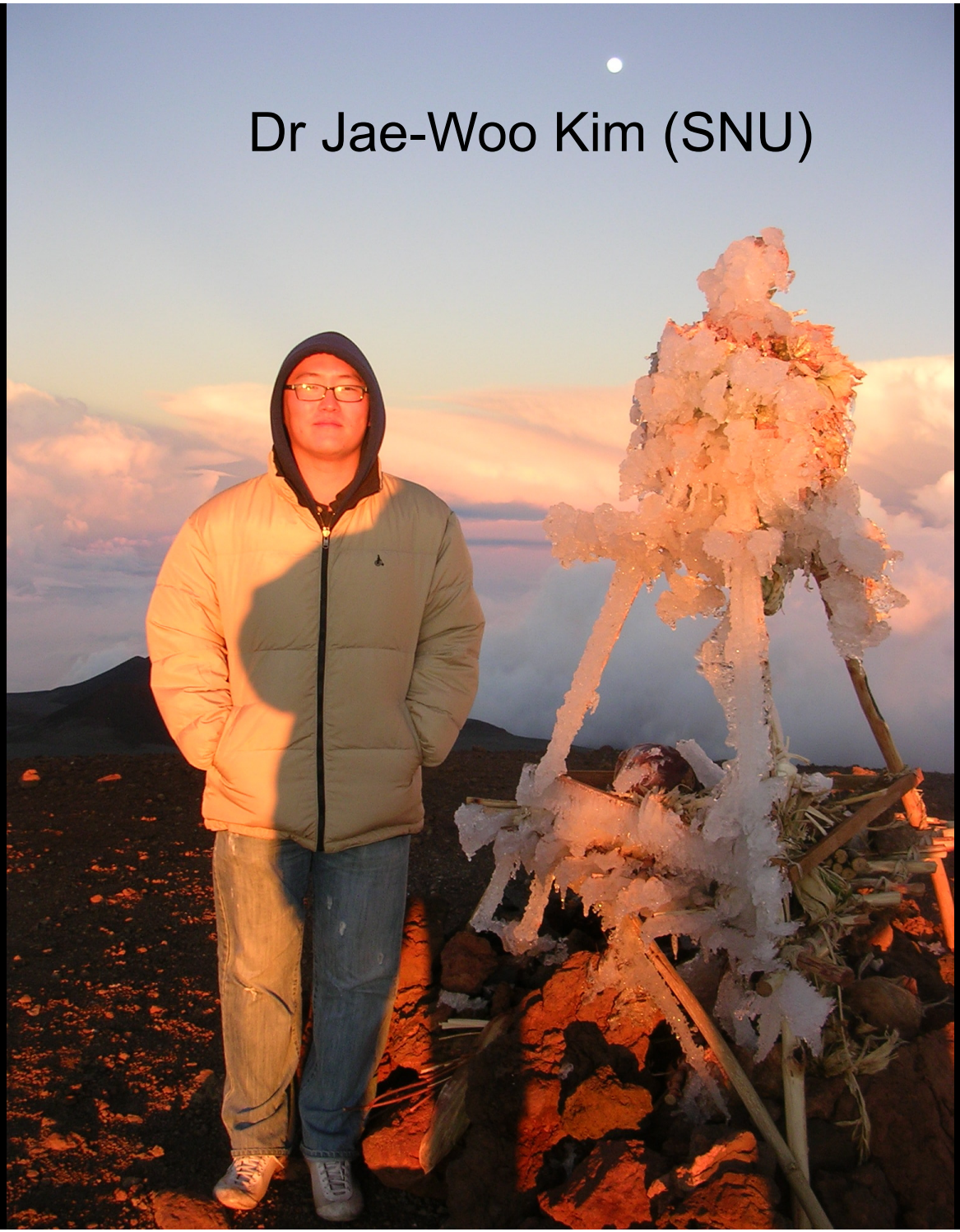

100
80
60
40
20
0
completenss (%)
DXS LH 1
DXS LH 2
20
21
22
23
24
25
J


completenss (%)
100
80
60
40
20
0
18
19
20
21
22
K
DXS LH 1
DXS LH 2
DXS LH 3
DXS LH 6

Science Exploitation

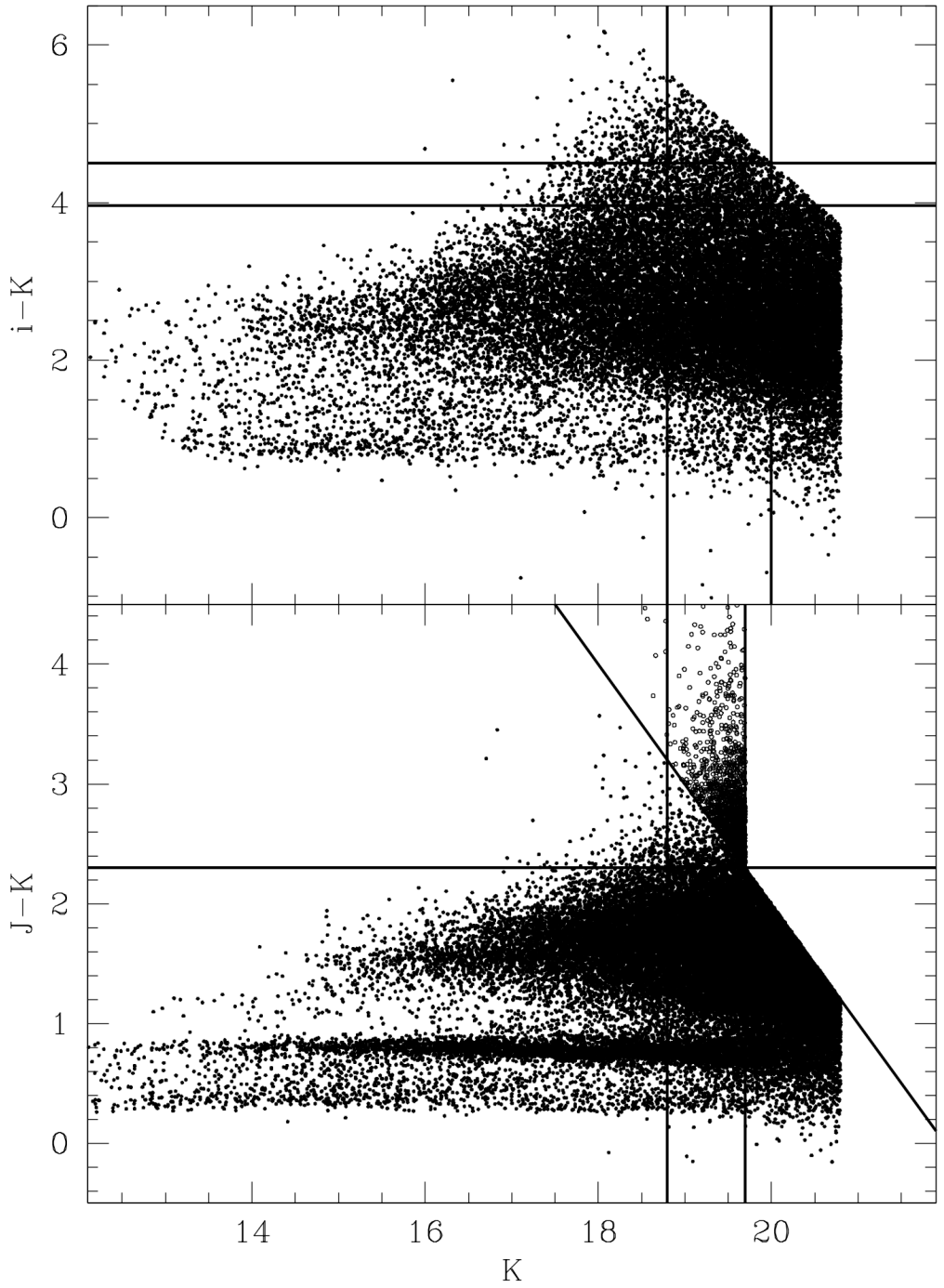
The easiest science to extract from any imaging survey is the angular clustering of objects.

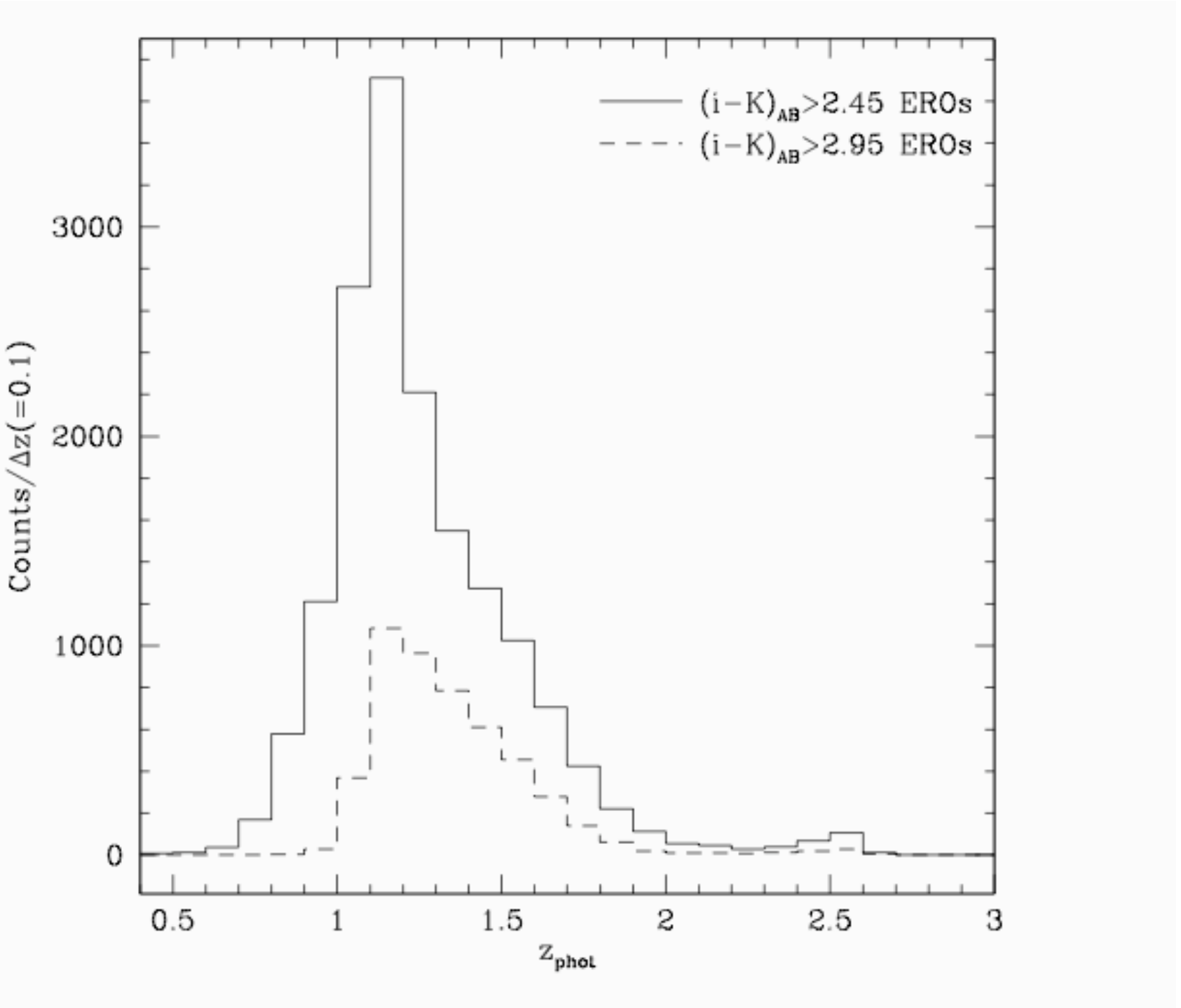
We have used the DXS to study this for massive z>1 galaxies (Kim et al 2011 and 2013).

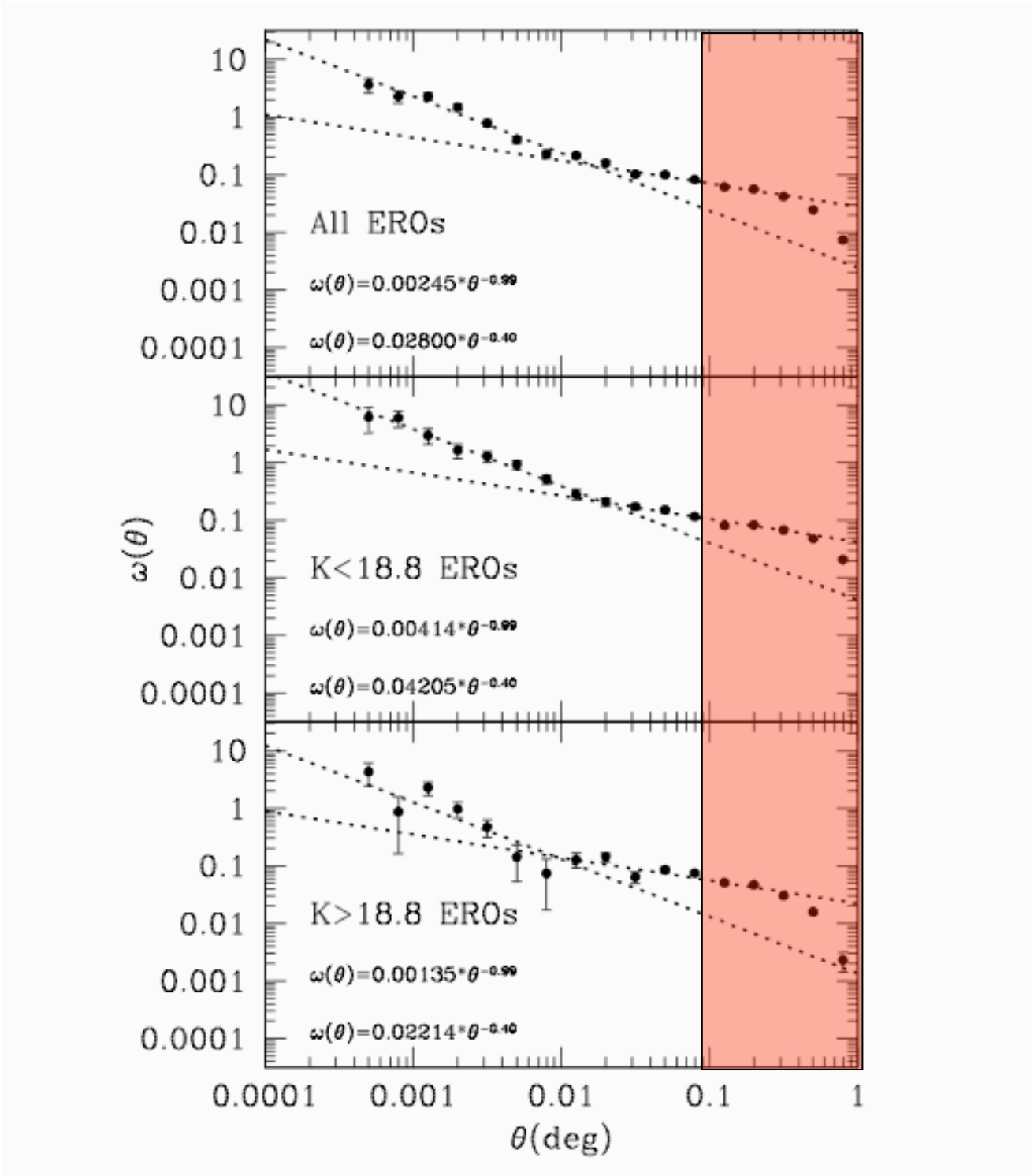

Dr Jae-Woo Kim (SNU)

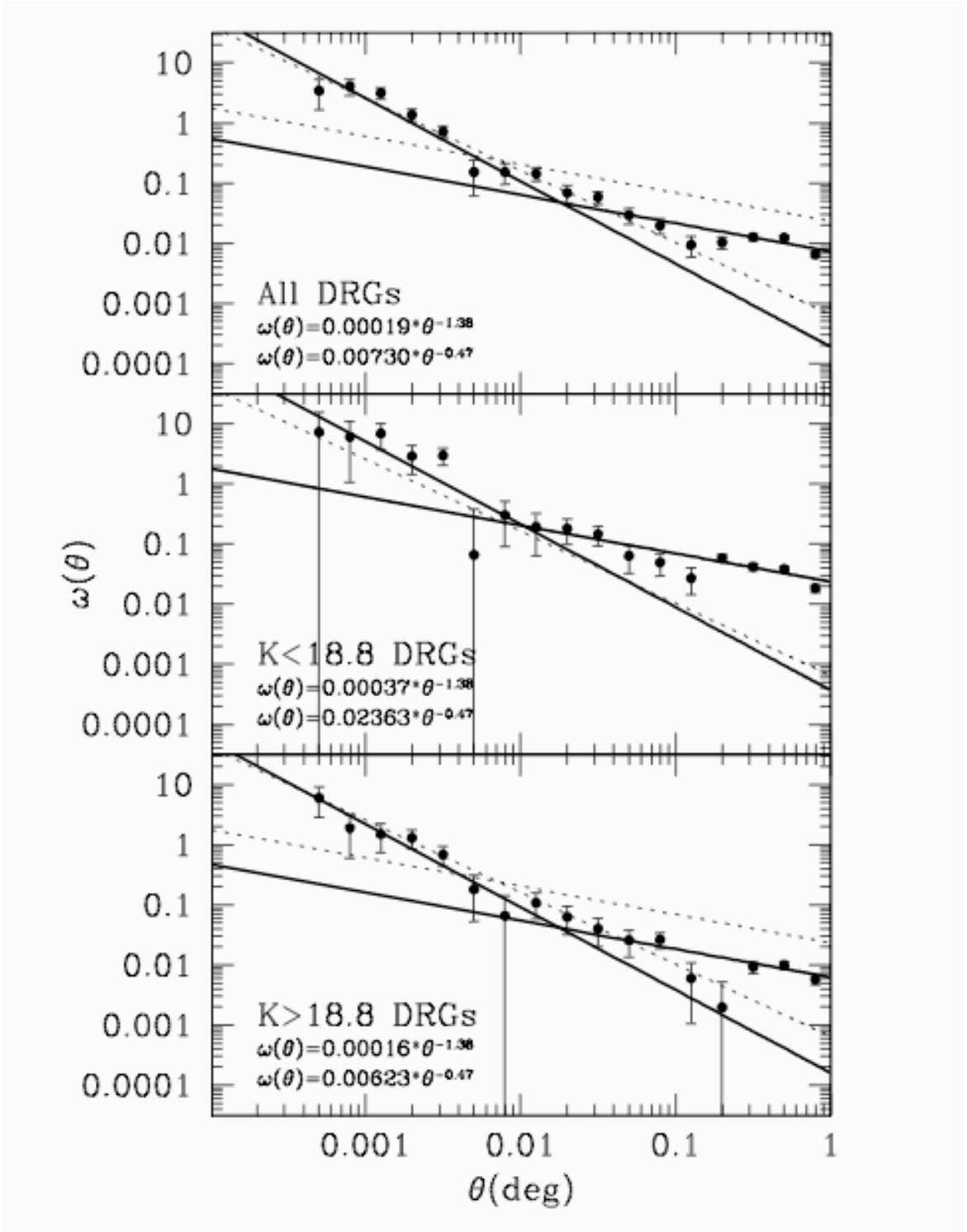
EROs

DRGs

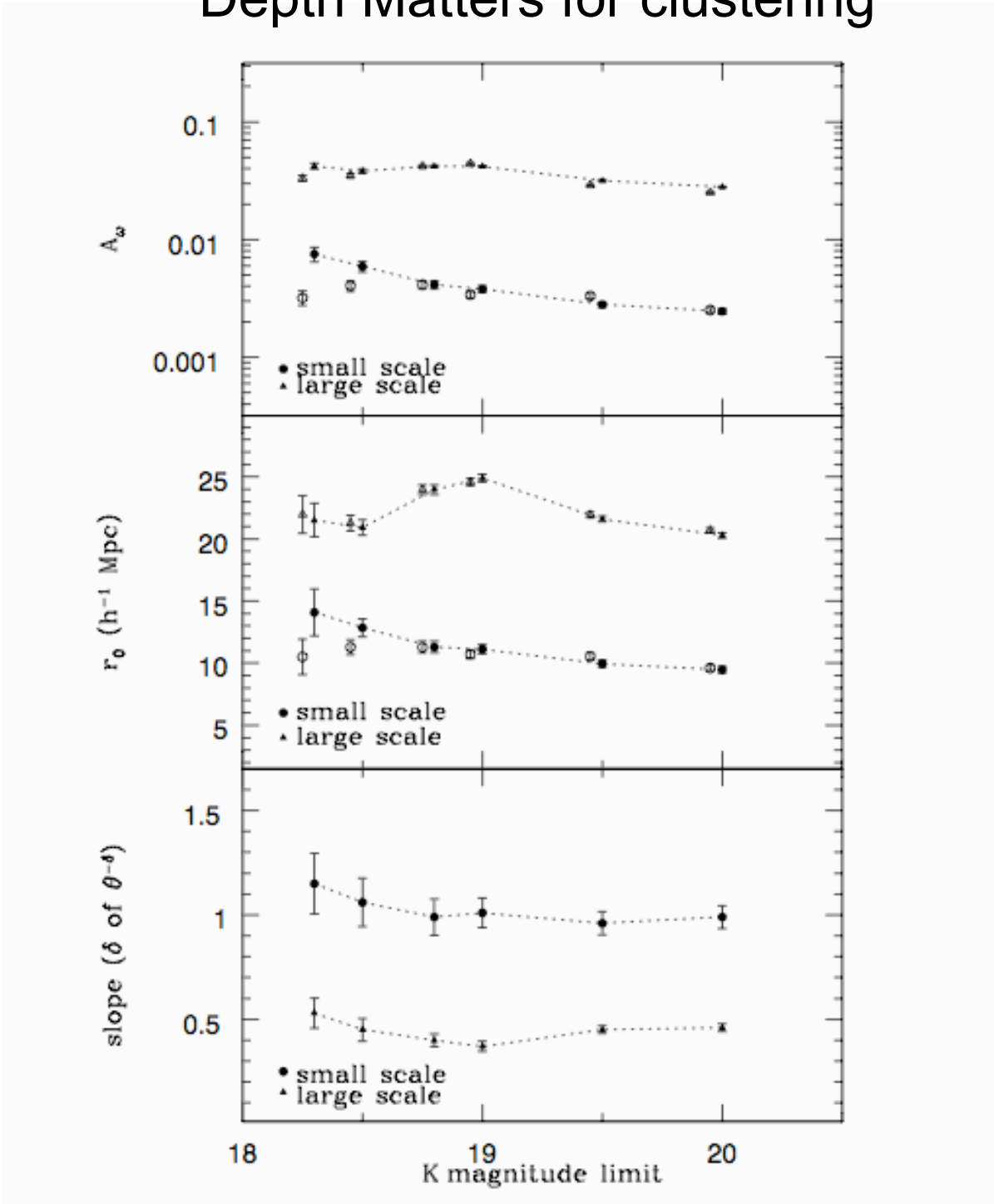



(i−K)AB>2.45 EROs
(i−K)AB>2.95 EROs
Counts/Δz(=0.1)
3000
2000
1000
0
0.5
1
1.5
2
2.5
3
zphot

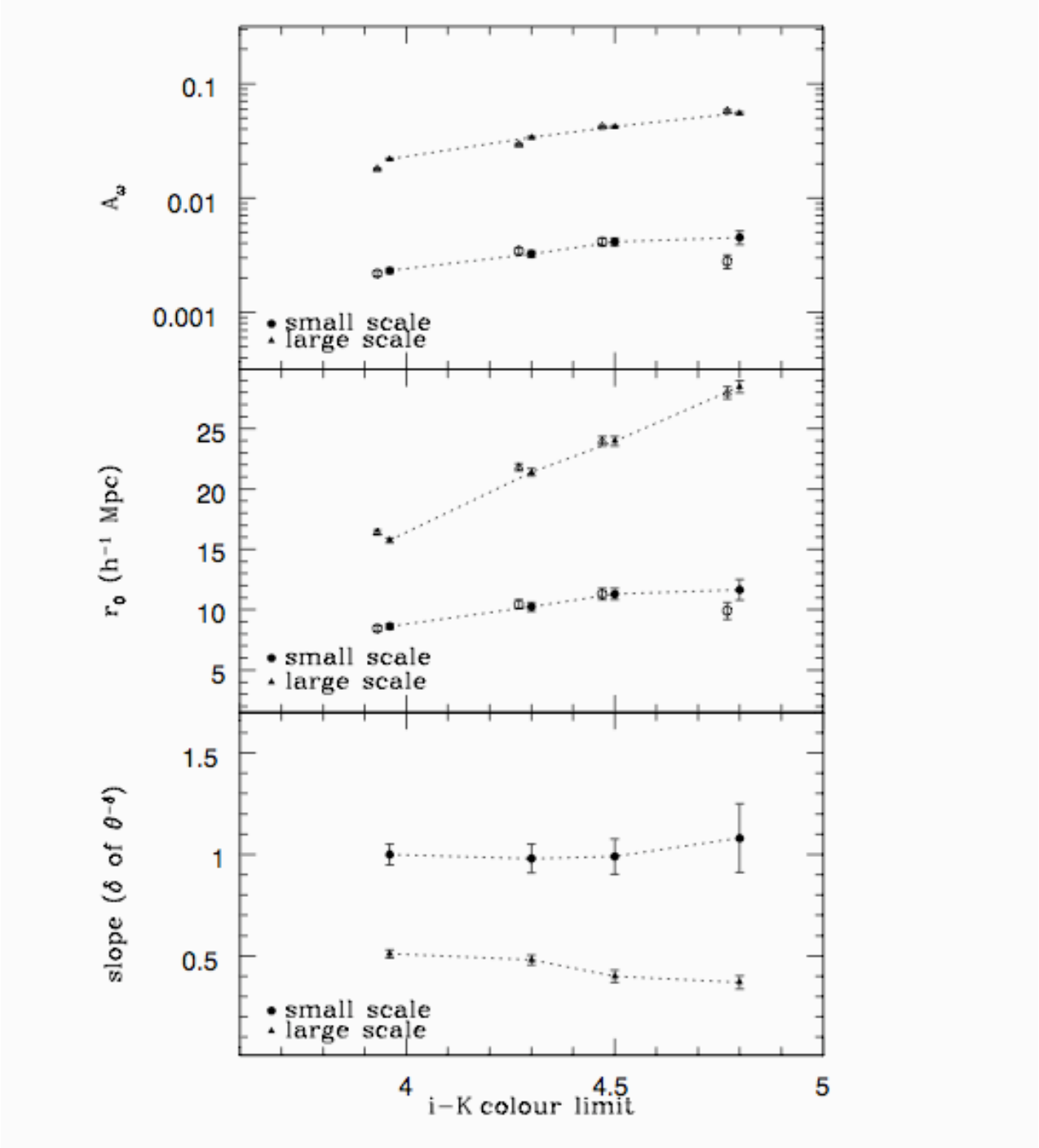

All EROs
ω(θ)=0.00245*θ^-0.99
ω(θ)=0.02800*θ^-0.40
K<18.8 EROs
ω(θ)=0.00414*θ^-0.99
ω(θ)=0.04205*θ^-0.40
K>18.8 EROs
ω(θ)=0.00135*θ^-0.99
ω(θ)=0.02214*θ^-0.40
ω(θ)
θ(deg)
10
1
0.1
0.01
0.001
0.0001
0.0001
0.001
0.01
0.1
1


All DRGs
ω(θ)=0.00019*θ^-1.38
ω(θ)=0.00730*θ^-0.47
K<18.8 DRGs
ω(θ)=0.00037*θ^-1.38
ω(θ)=0.02363*θ^-0.47
K>18.8 DRGs
ω(θ)=0.00016*θ^-1.38
ω(θ)=0.00623*θ^-0.47
ω(θ)
θ(deg)
10
1
0.1
0.01
0.001
0.0001

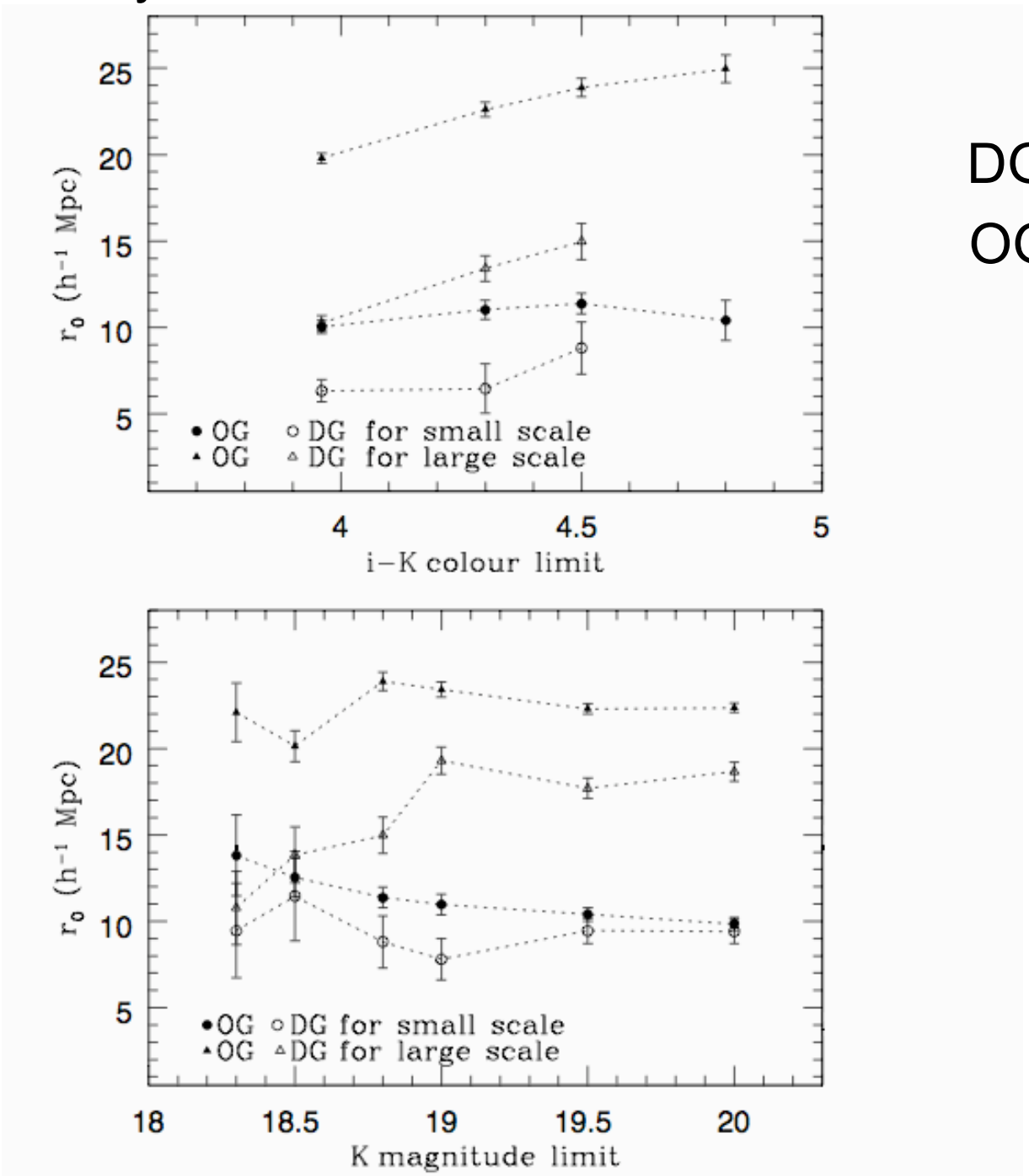
Depth Matters for clustering



So does the colour limit EROs are selected to



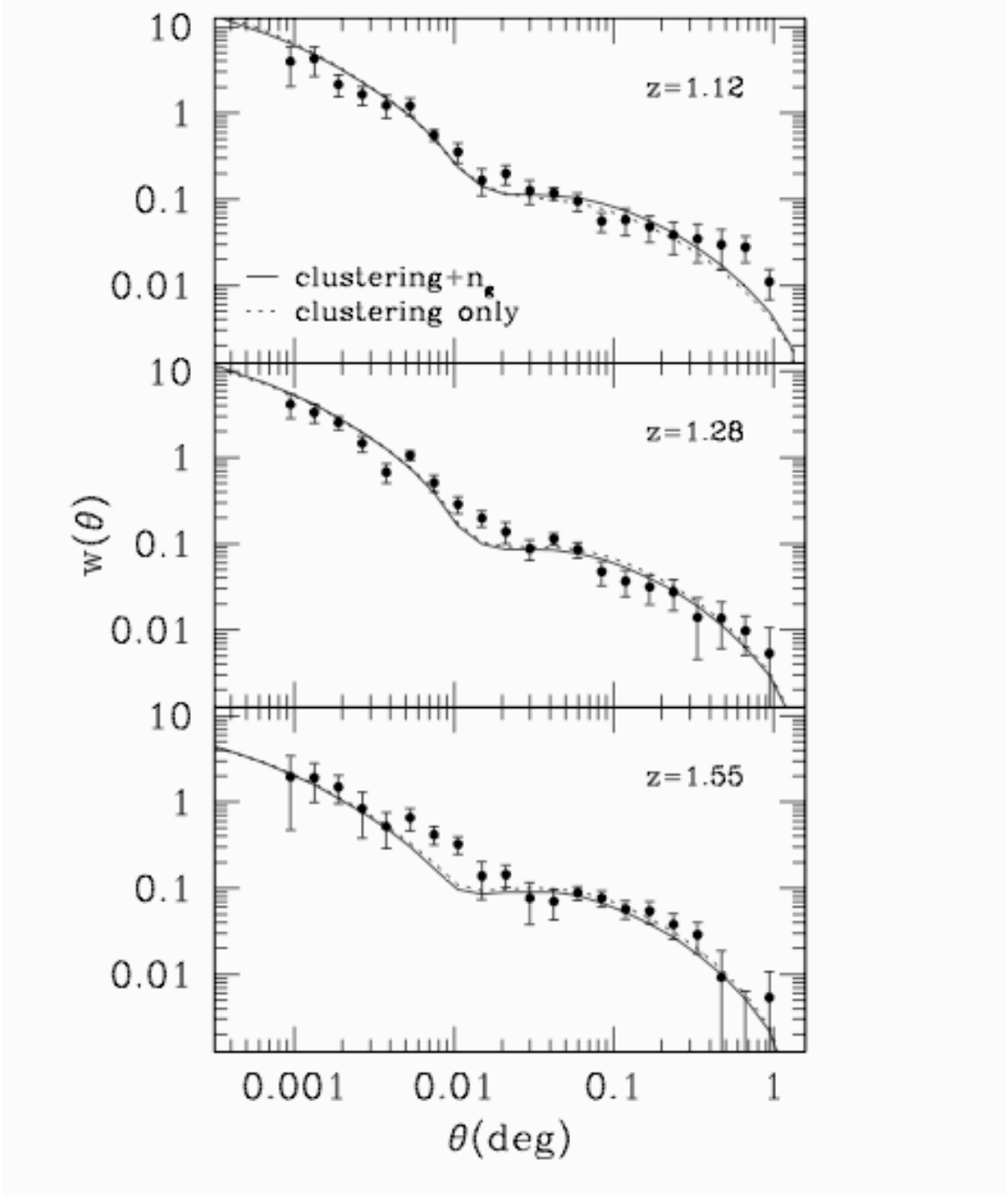
Dusty EROS are much less clustered

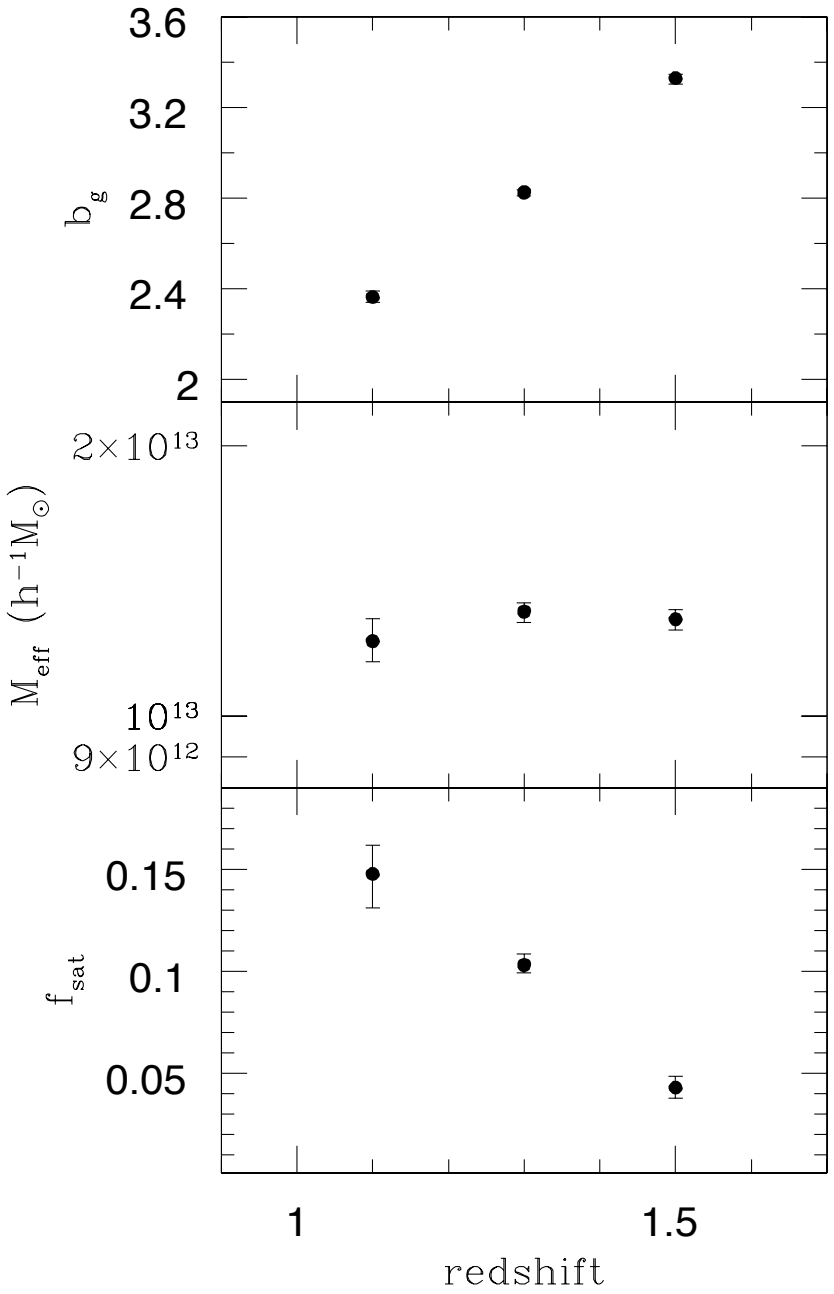


DGs J-K>~2

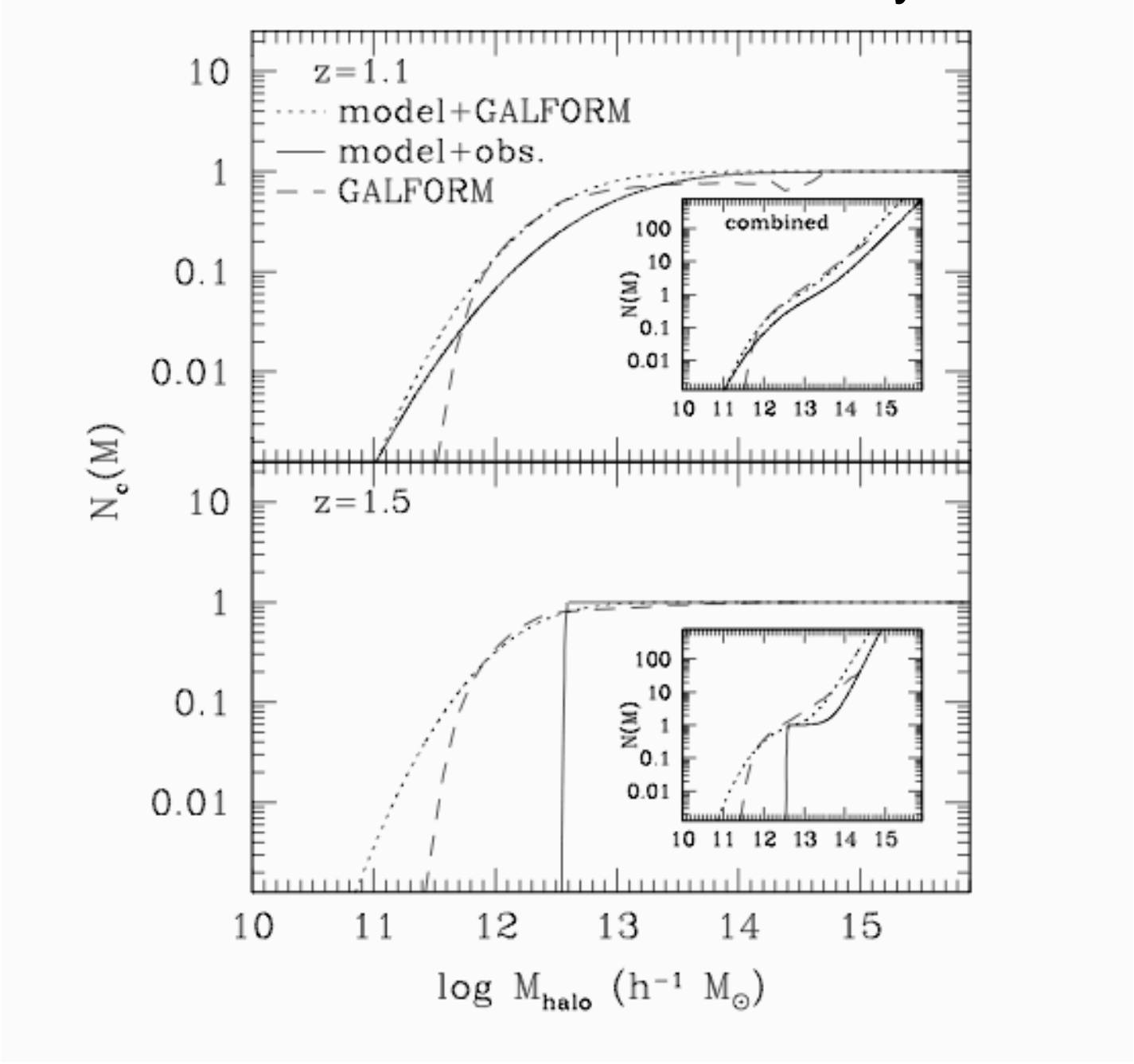
OGs J-K<~2

The clustering matches HOD model predictions




3.6
3.2
2.8
2.4
2
b_g
2×10^{13}
10^{13}
9×10^{12}
M_{eff} $(h^{-1}M_\odot)$
0.15
0.1
0.05
f_{sat}
1
1.5
redshift

And we can use them to constrain semi-analytic models



Highlights yet to come?

AMI S-Z clusters

Four full PS1 MDS + DXS fields

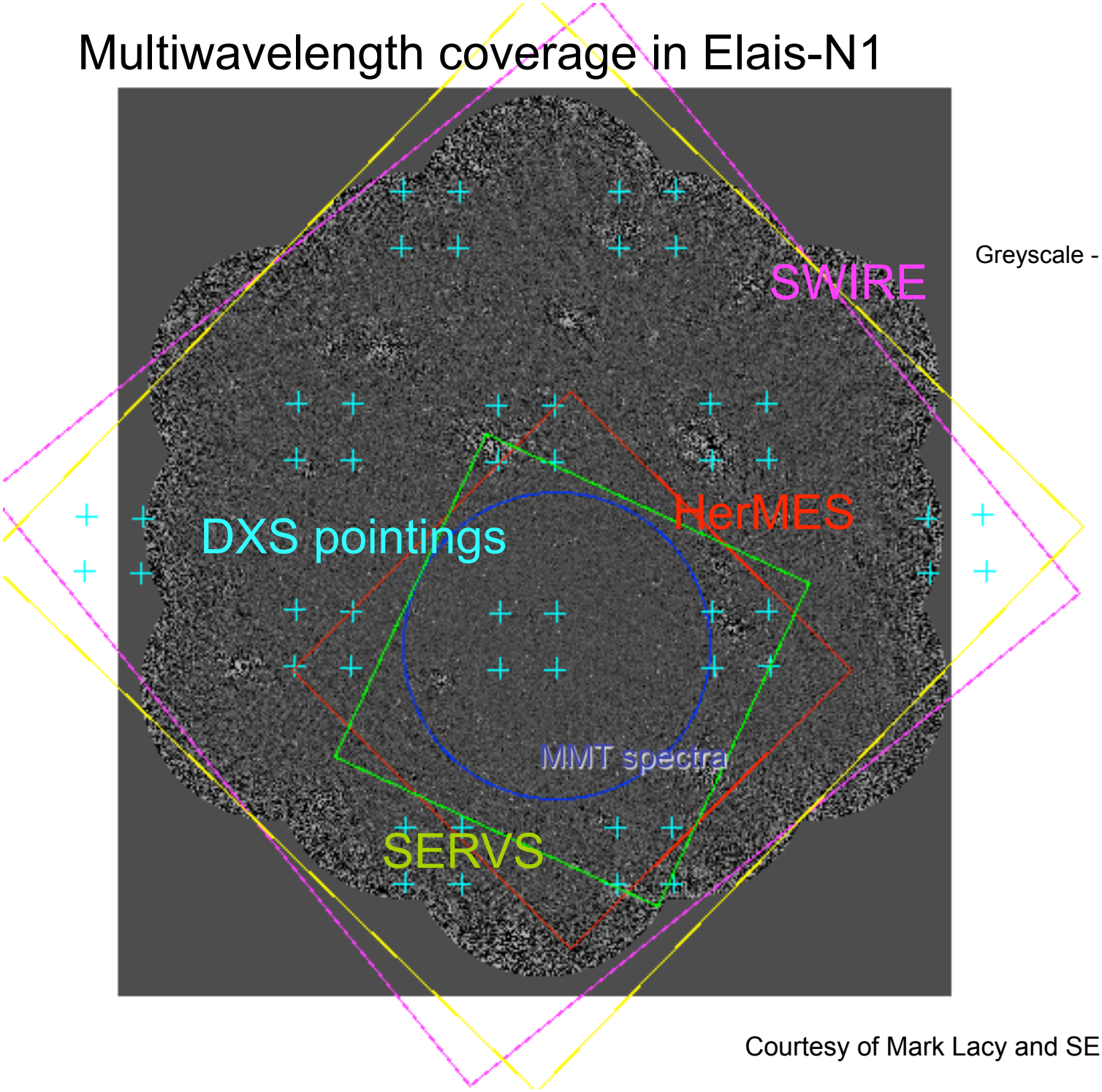
Three HyperSuprimeCam + DXS fields

SCUBA-2/HERMES/SERVS comparison

Large spectroscopic samples (FMOS/ AAOmega/KMOS/MOSFIRE)

De facto large (>1sq.deg.) survey areas

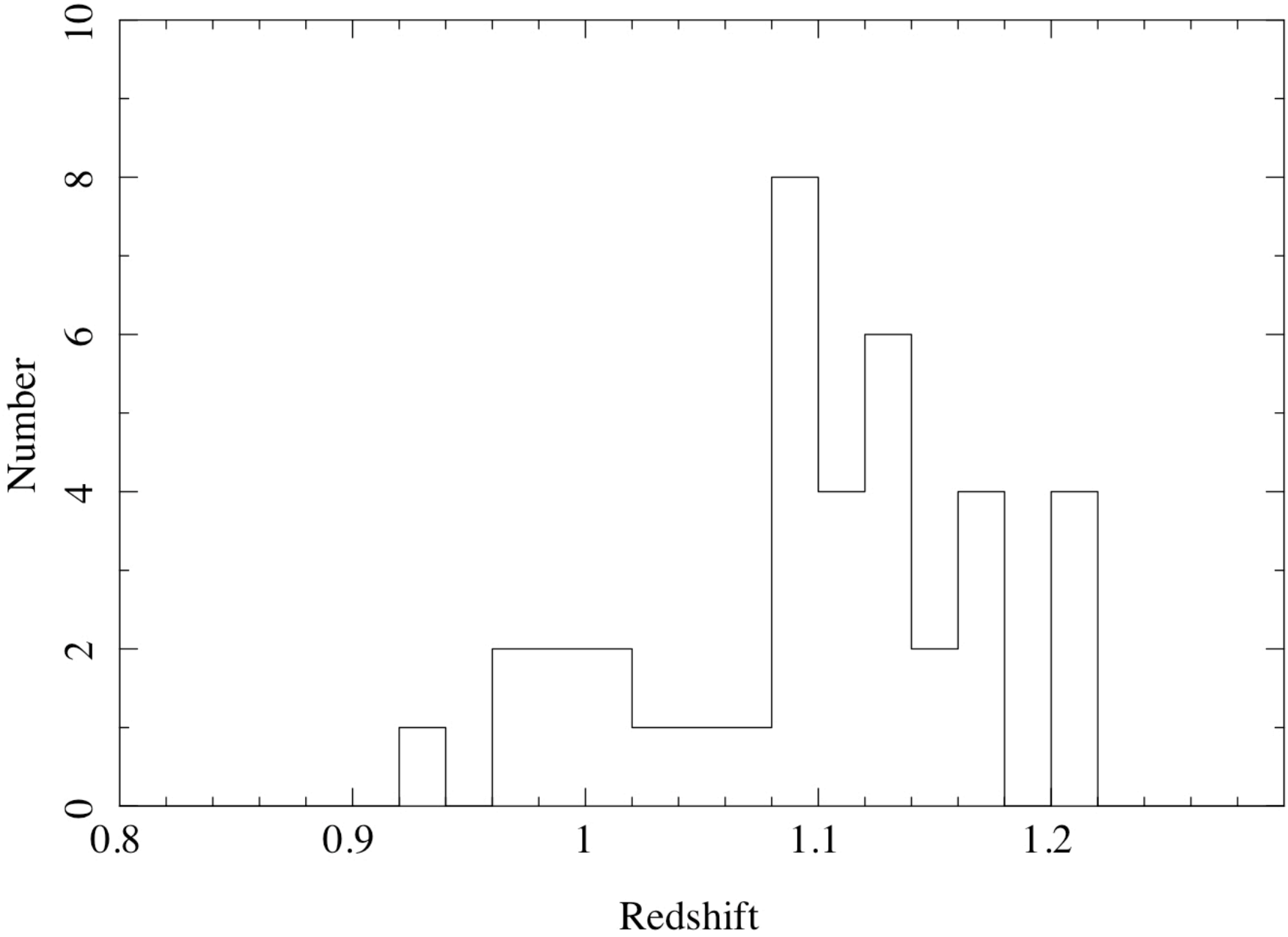
Multiwavelength coverage in Elais-N1



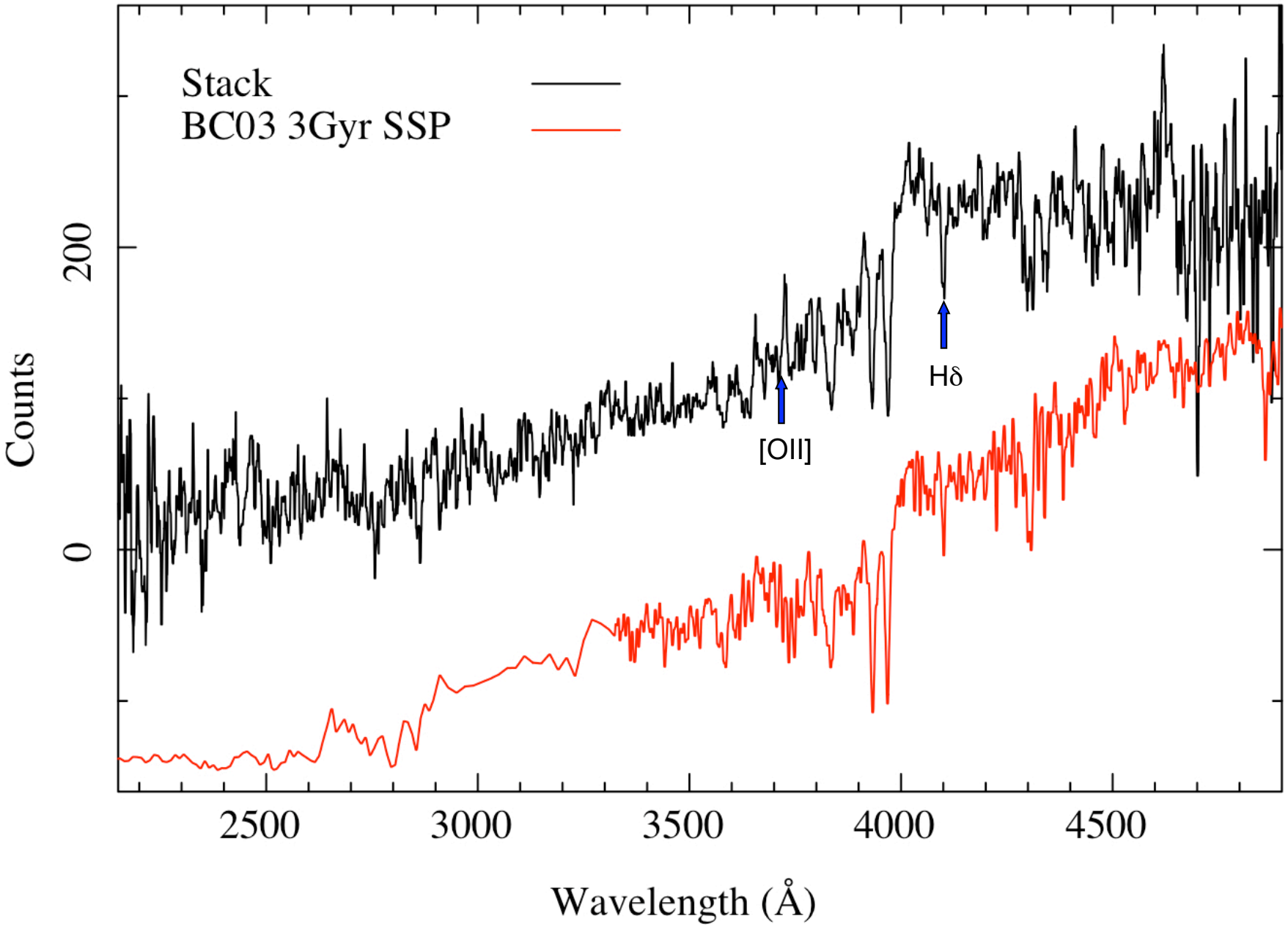
Greyscale - GMRT mosaic

Courtesy of Mark Lacy and SERVS team

Redshift histogram of LRGs in SA22



Stacked AAOmega spectrum of 38 LRGs z~1.1



NIR data in the other MDS fields

The DXS only covers four fields so there are six other MDS that we need to consider:

COSMOS (MD04) – WFCAM+WIRC data and UltraVista ~2sq.deg.

CDFS (MD02) – Vista VIDEO ~4.5sq.deg.

EGS (MD07) - AEGIS <1sq.deg.

NIR data in the other MDS fields

The DXS only covers four fields so there are six other MDS that we need to consider:

Lynx (MD03) – no NIR data

NGC4258 (MD06) – no NIR data

DEEP2-field3 (MD10) – no NIR data

NIR data in the other MDS fields

We applied to the UKIRT Board for time to observe the Lynx, EGS and DEEP2 fields in October but the small of time available meant it wasn't approved.

Vista could cover the DEEP2 field but the Lynx and EGS need some northern telescope access.

NIR data outside MDS fields

The coverage of shallower NIR surveys means that a large fraction of the 3π Survey has at least K<18 coverage from the UKIDSS LAS or Vista Hemisphere Survey.

There is also a substantial area (>800 sq.deg) of the equatorial strip that is covered to K~20 level from Vista (VIKING and a PI programme for Stripe 82).

Conclusions

The DXS is close to the original size and depth and will be a key ingredient of many future multiwavelength surveys, most of which will lean very heavily on the MDS data.

From a PS1 perspective there is a wealth of NIR data that could be exploited in the next 3 years.