Cosmic Magnification in the CFHTLS-Deep

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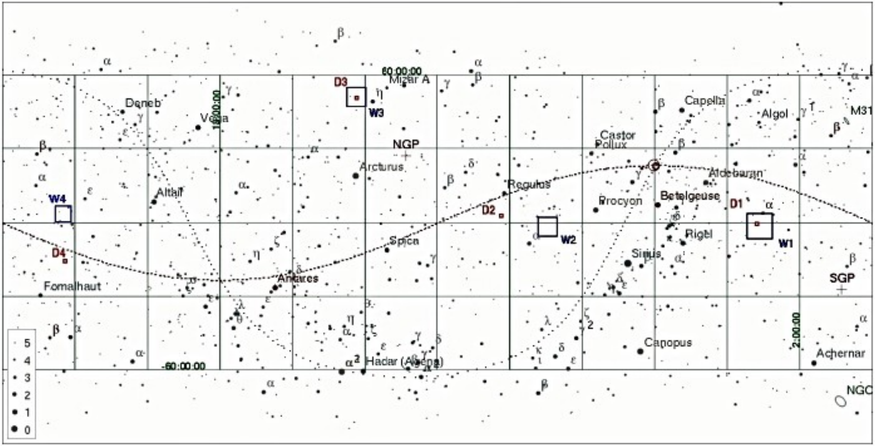
Outline

The CFHTLS-Deep Survey

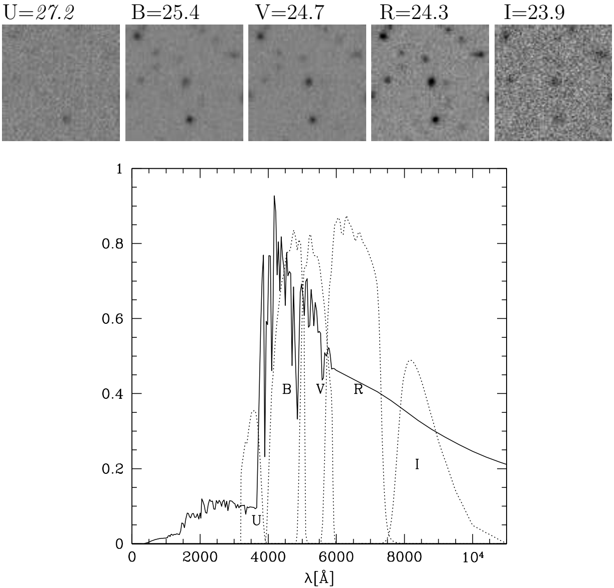


The CFHTLS-Deep Survey

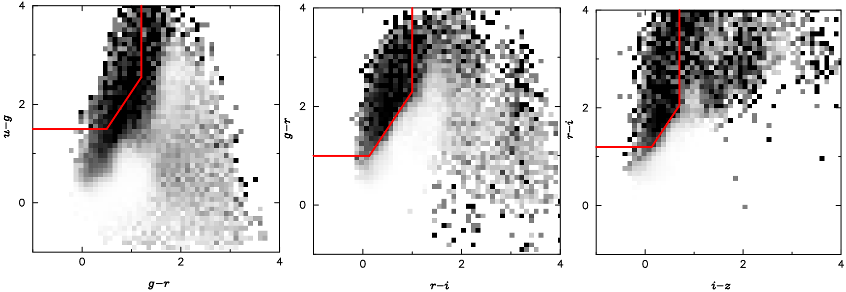
Survey Characteristics:

- MEGAPRIME@CFHT
- 4 independent fields
- 1 sq. deg. each
- imaging in *ubvri*
- seeing FWHM $0.''65 - 0.''9$
- 1-σ limits:
  $u_{\rm lim} \approx 29.3$
  $g_{\rm lim} \approx 29.7$
  $r_{\rm lim} \approx 29.6$
  $i_{\rm lim} \approx 29.4$
  $z_{\rm lim} \approx 28.2$

LBG selection



LBG selection in the CFHTLS-Deep

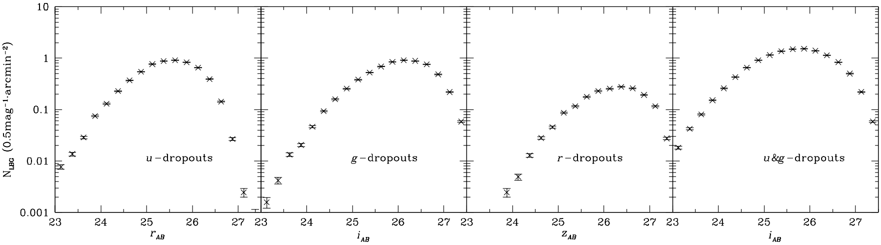


LBG numbercounts in the CFHTLS-Deep

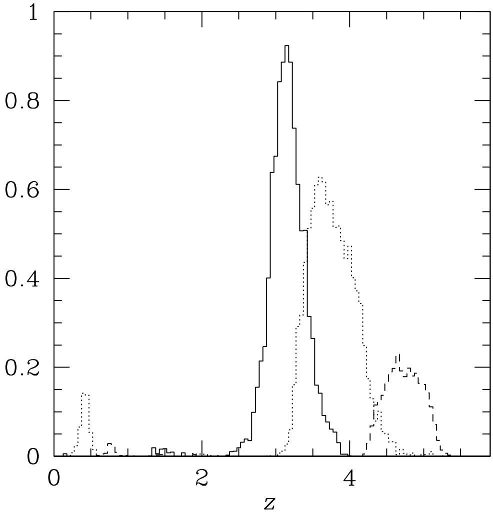
We find:

- $\sim$ 41 000 *u*-dropouts (20 000 in high-quality sample)
- $\sim$ 28 000 *g*-dropouts (14 000)
- $\sim$ 14 000 *r*-dropouts (10 000)

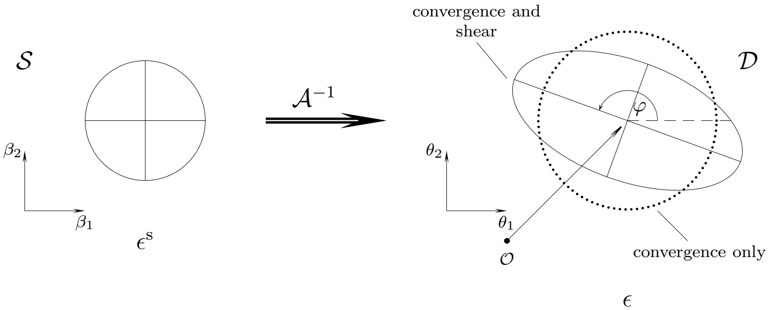
More than 80 000 high-*z* (z>2) galaxy candidates.



Redshift distributions in the CFHTLS-Deep



Lensing of a circular source



from P. Schneider, Saas Fee lecture on “Weak Gravitational Lensing”

The mechanism

Magnification

- lens magnifies objects in background
- objects that are too faint without a lens become visible
- **positive cross-correlation**

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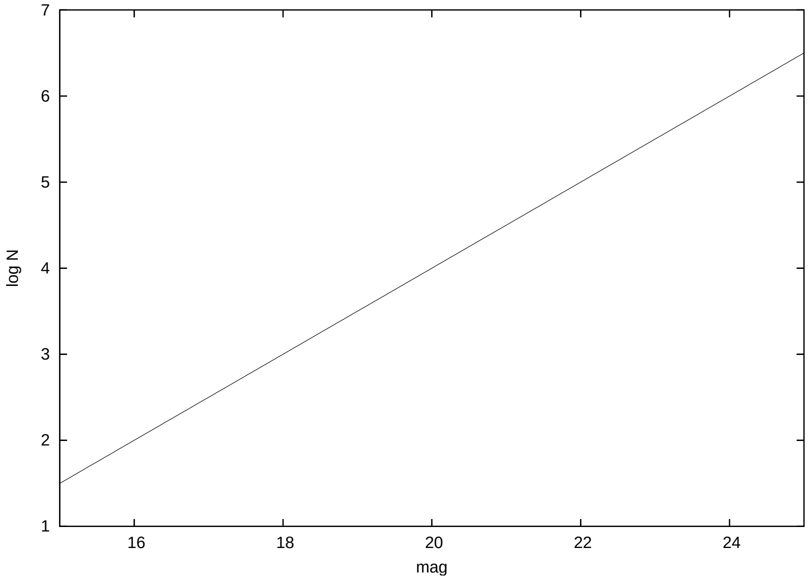
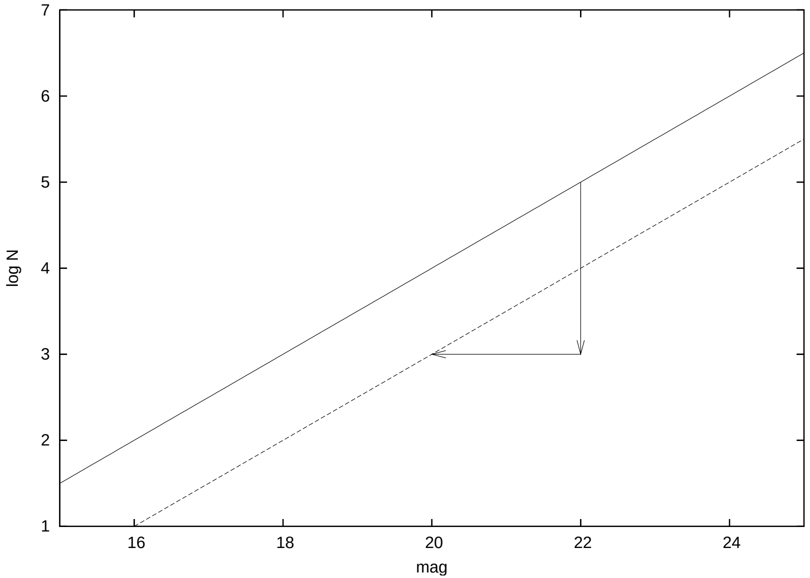
Dilution

- lens enlarges the solid angle behind it
- source density is diluted
- **negative cross-correlation**

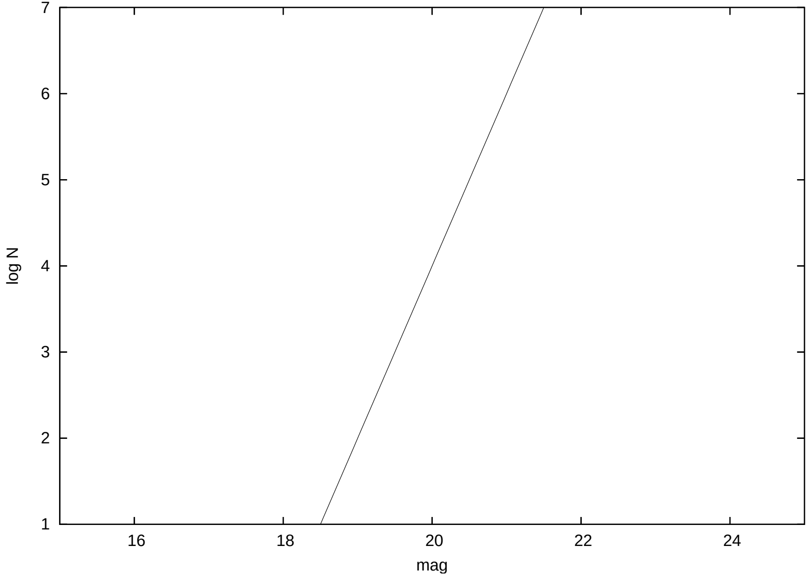
Magnitude numbercounts



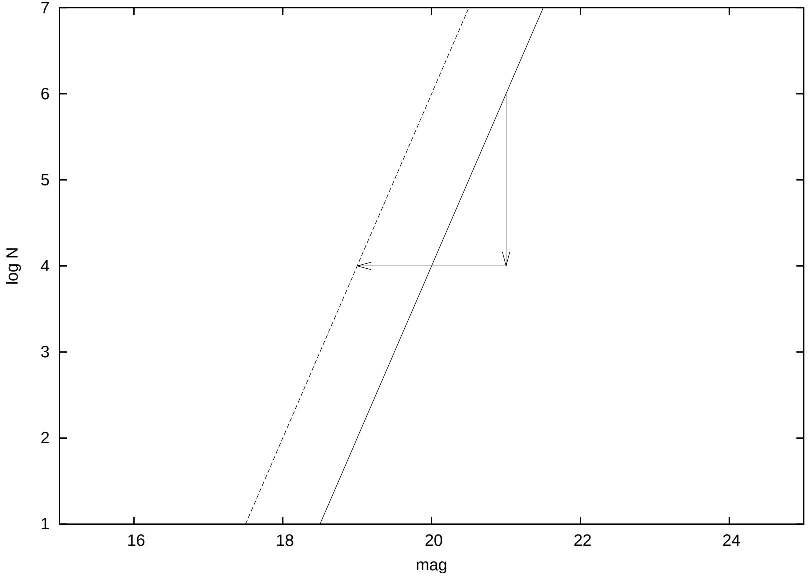
Magnitude numbercounts



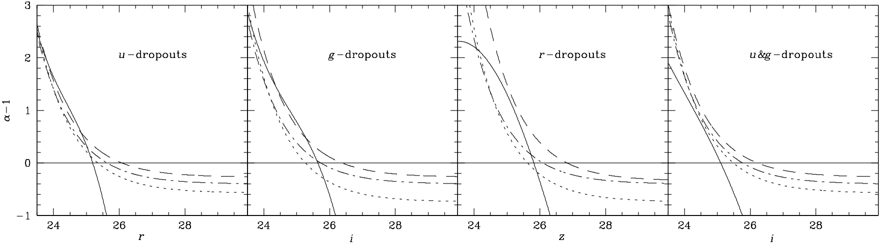
Magnitude numbercounts



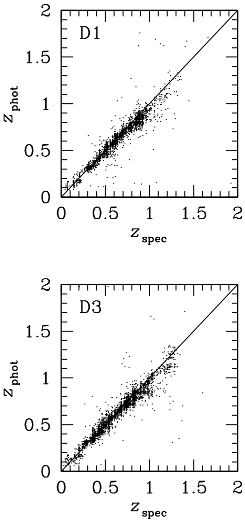
Magnitude numbercounts



Slope of the magnitude numbercounts

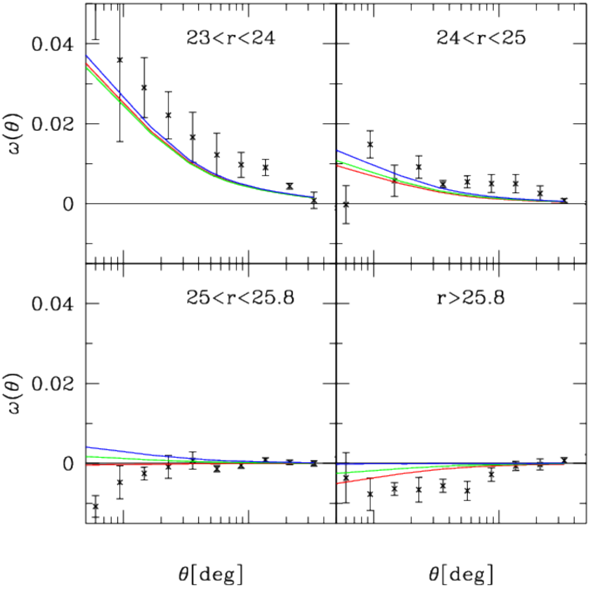


Bias-free photo-z's

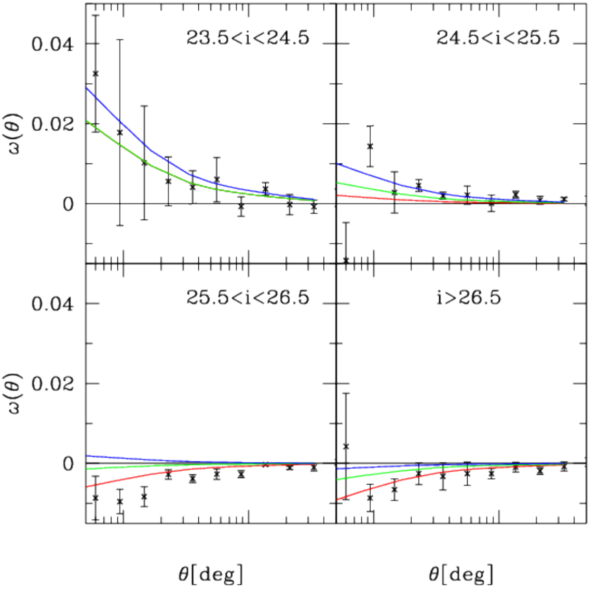


from Hildebrandt et al. 2009, accepted by A&A

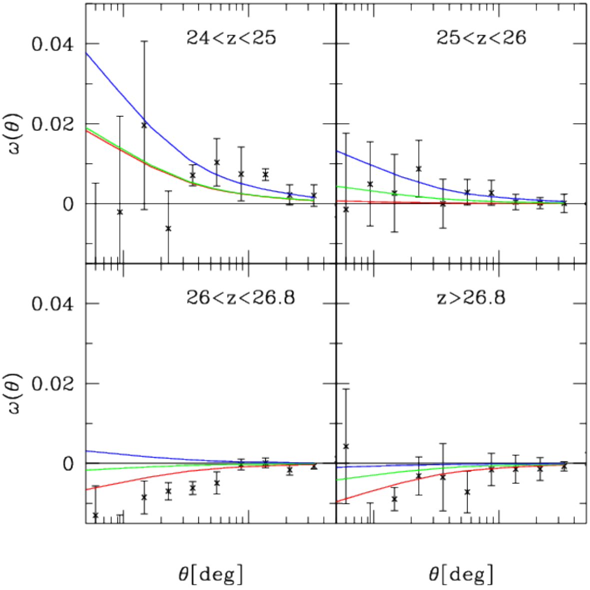
u-dropouts cross-correlated to $0.1 < z < 1.0$



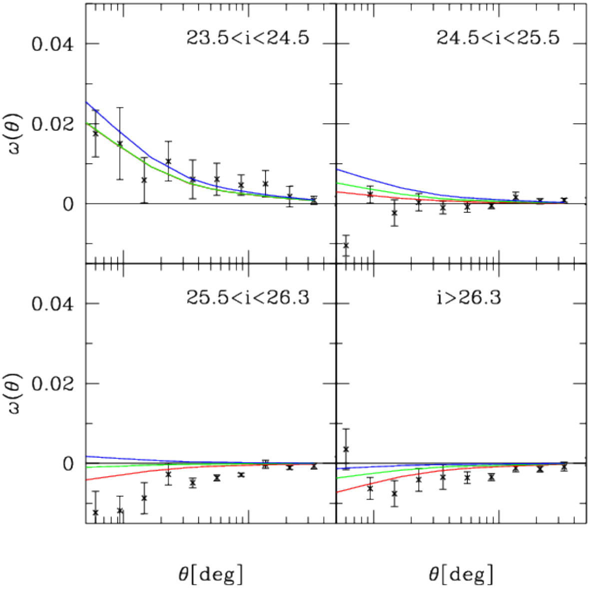
g-dropouts cross-correlated to $0.5 < z < 1.4$



r-dr. cross-correlated to $0.1 < z < 0.5 \vee 1.0 < z < 1.4$

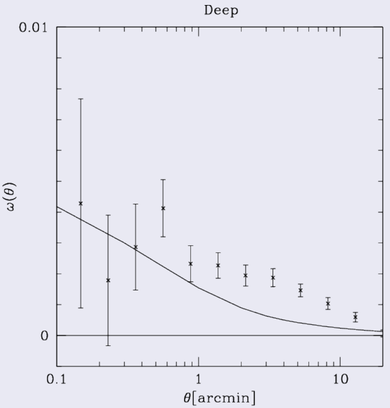


combined u- & g-dr. cross-correlated to $0.5 < z < 1.4$

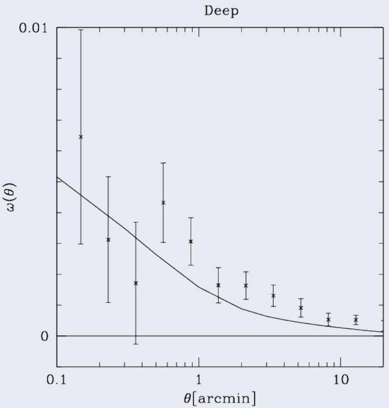


Optimal weighting

u-dropouts $\times$ $0.1 < z < 1.0$

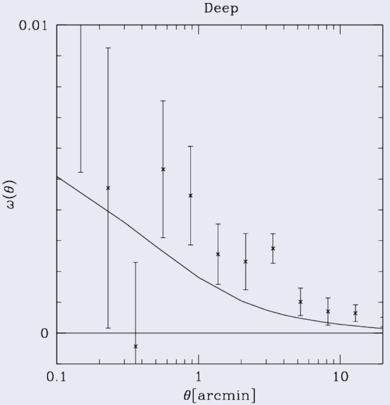


g-dropouts $\times$ $0.5 < z < 1.4$



Optimal weigthing

r-dropouts $\times$ $0.1 < z < 0.5 \vee 1.0 < z < 1.4$



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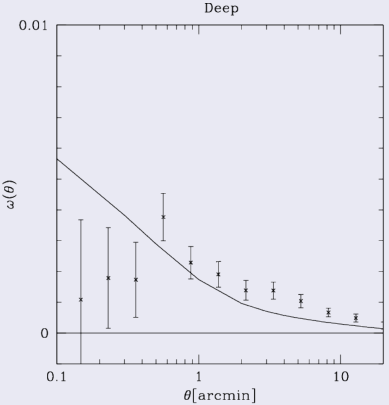

Conclusions

- LB-technique yields very large high-z samples on equisite imaging data.
- LBGs too small to measure their shapes from the ground.
- But very well-suited for magnification measurements.
- $\sim 80\,000$ LBGs from CFHTLS-Deep fields show expected magnification signals.
- In the future this technique can be used to constrain cosmology.
- Complementary to large cosmic-shear surveys.