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What can we gain from magnification bias as a complement to shear?

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Submitted

ABSTRACT
With the wealth of upcoming data from wide-field surveys such as KiDS, Pan-STARRS, DES and Euclid, it is more important than ever to understand the full range of independent probes of cosmology at our disposal. With this in mind, we motivate the use of cosmic magnification as a probe of cosmology, presenting forecasts for the improvements to cosmic shear cosmological parameter constraints when cosmic magnification is included for a KiDS-like survey. We find that when uncertainty in the galaxy bias is factored into the forecasts, cosmic magnification is less powerful that previously reported, but as it is less likely to be prone to measurement error we conclude it is a useful tool for cosmological analyses.

Key words: gravitational lensing: weak, magnification, shear – cosmology

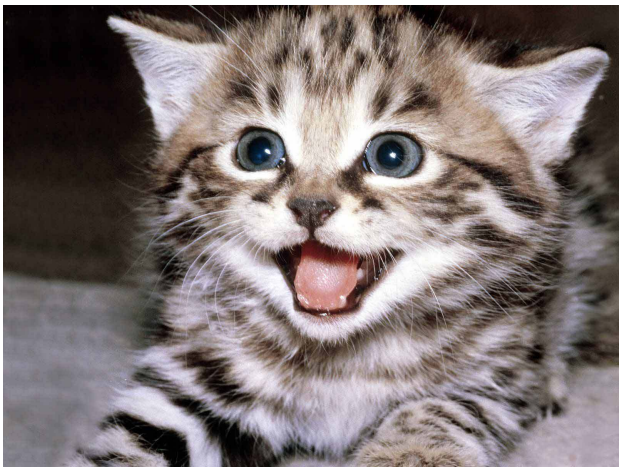

Figure 1. Contributions to the number density contrast power spectrum for a combination of redshift bins. Autocorrelation term contains Shot Noise. If possible, includes the shear PS and equivalent Shot Noise term

1 INTRODUCTION

2 TWO-POINT CORRELATIONS FROM MAGNIFICATION BIAS

2.1 Parameter Estimation

Including Figure of Merit

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3.1 Survey Modelling

3.2 Galaxy Bias

Including Priors on Galaxy Bias ref Appendix

4 DATA

Description of data
Derived Quantities

4.1 Optimisation

5 RESULTS

6 CONCLUSIONS

ACKNOWLEDGMENTS

REFERENCES

Bibliography here

APPENDIX A: ADDING A PRIOR ON GALAXY BIAS

This paper has been typeset from a TEX/ LATEX file prepared by the author.

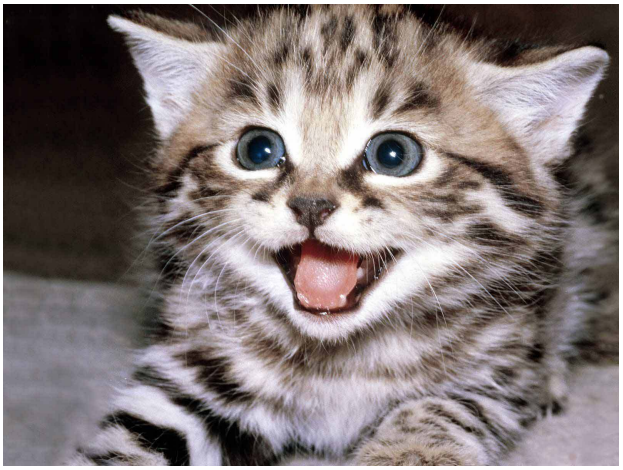

Figure 2. Galaxy Redshift distributions from CFHT data, including catastrophic redshifts for given galaxy sample selection and for all redshift bins. Should not be too busy by nature, as plots should only overlap in a small region.

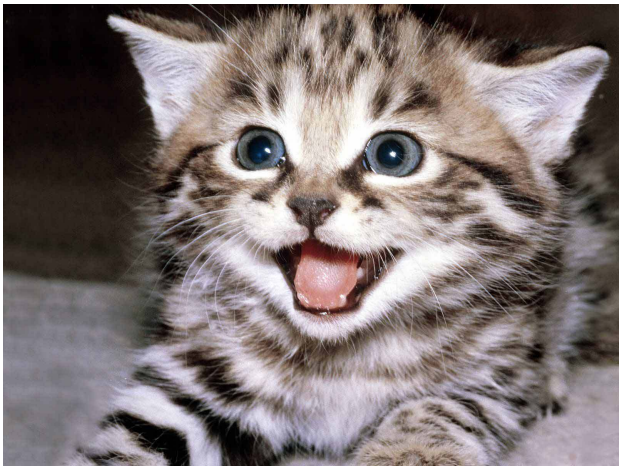

Figure 3. Shows alpha-1 as a function of magnitude for a given redshift bin/s

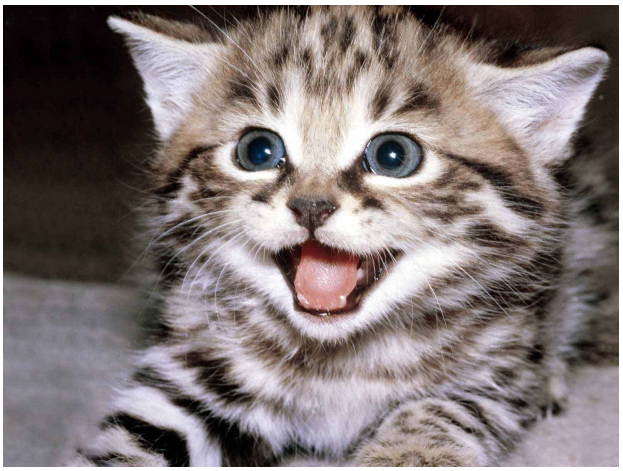

Figure 4. Cumulative number counts as a function of magnitude for a set of redshift bins, useful for discussion on level of effect when ignoring bright limit.

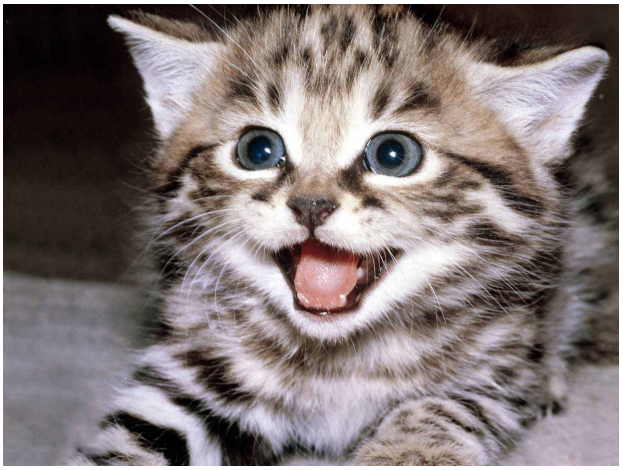

Figure 5. Signal to Noise plots for a selection of redshift bins (with errors) It is important to show these as a function of limiting magnitude to reinforce conclusion that optimisation requires deeper except in the case where limiting magnitude is in region where alpha-1 = 0.

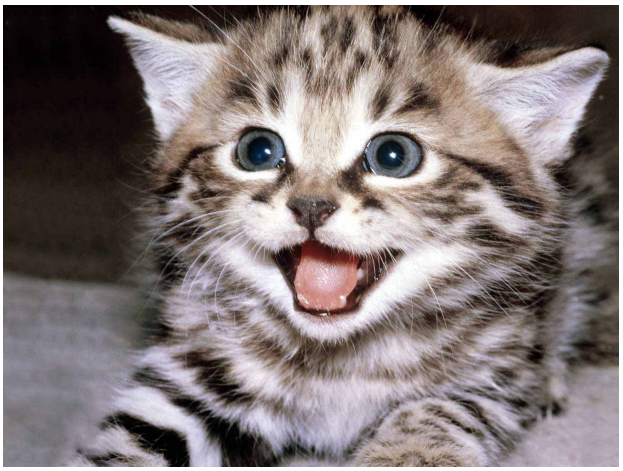

Figure 6. Alpha as a function of redshift for the redshift bins chosen, for magnitude limits motivated by previous signal to noise plot.

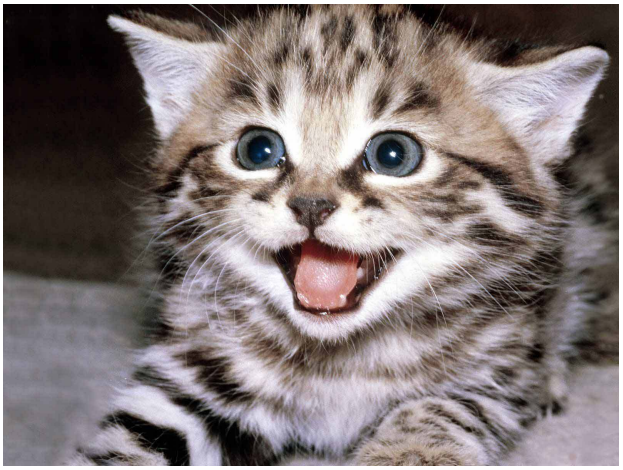

Figure 7. Contour plot for fully optimised magnifcation signal showing shear, and combined probe taking a known and fully unknown galaxy bias.

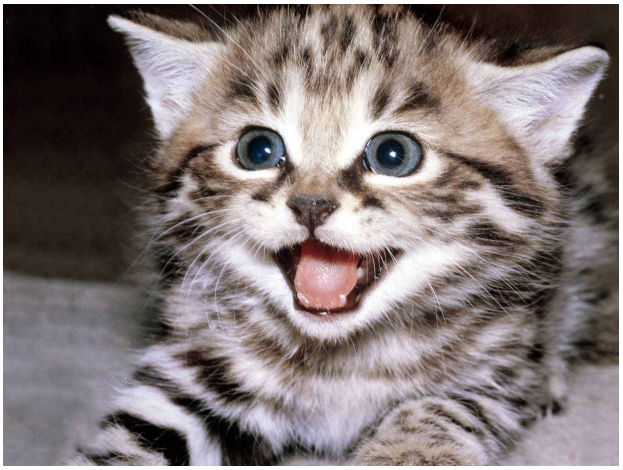

Figure 10. Contour plot showing fully optimised combined probe versus shear-only for choice of bias prior parameters with Planck Prior.

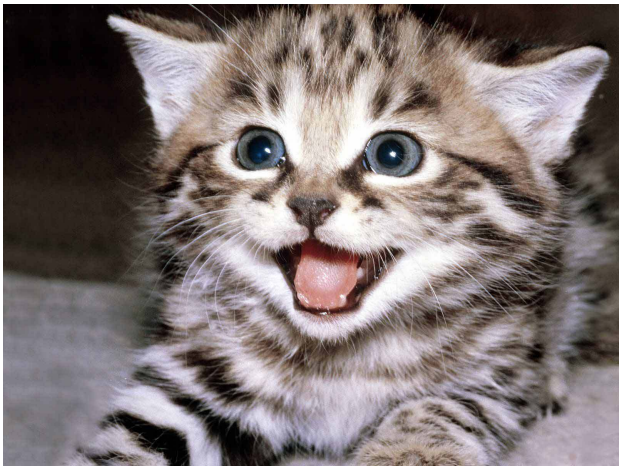

Figure 8. Contour plot showing constant-FoM contours as a function of σ and r (Uncertainty and correlation in Bias Prior). Point details choice of σ and r from external probe.

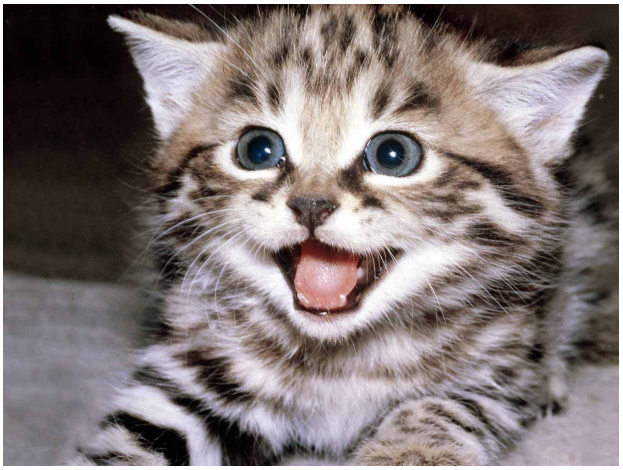

Figure 11. FoM vs number of redshift bins - gain in information by increasing redshift information - Optimisation.

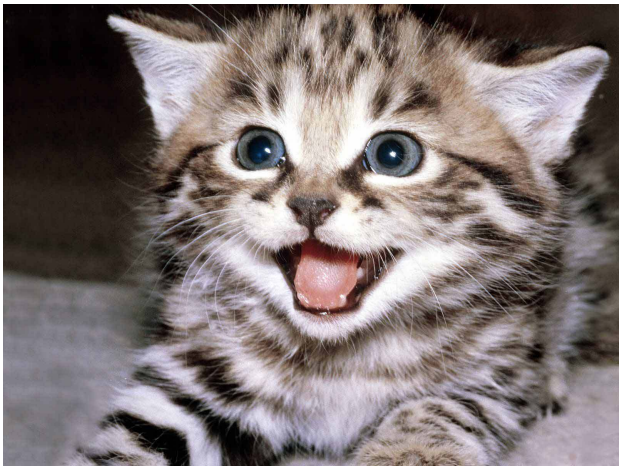

Figure 9. Contour plot showing fully optimised combined probe versus shear-only for choice of bias prior parameters.