Magnificent Magnification

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Why is this hard?

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the intrinsic shape noise is large
Is there an easier way?

Maybe.

There are other components to the distortion tensor.
The Effect of Magnification on galaxy sizes and luminosities
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The effect of Magnification on Luminosities

A heroic effort:
13.5 million galaxy lenses
225,000 quasar sources
Why shear is still much better than the alternatives:

We want a way to reduce the intrinsic scatter.
The Fundamental Plane of Early Type Galaxies

~15% intrinsic scatter

no detected variation with environment

a photometric analogue exists
The Effect of Magnification on the Photometric Plane

at fixed mass, concentration and effective radius are inversely correlated
The Effect of Magnification on the Photometric Plane

\[ \kappa = \log (R_{\text{eff}}) - f(\mu, \log \text{conc}) \]
Constructing a Sample using SDSS

60,000 Lenses:
\[ \log (\text{stellar mass}) > 11.0 \]
\[ 0.2 < z < 0.4 \]

10 million Sources:
- resolved galaxies
- early-type SEDs (35%)
Systematics: Sky Subtraction

$\theta$

redshift

$\Delta \log R_{\theta}$

$\theta$ (degrees)
Systematics: Source Clustering with Photo-z’s

\[ \theta \]

redshift

\[ \log (1+\xi) \]
Lensing Detection: Comparing to Existing Measurements

Preliminary

Graph 1: Δ(\log R_{eff}) vs. θ (degrees)

Graph 2: Σ (M/pc^2) vs. kpc
Where to go from here.

1. Port over the shear infrastructure
   (shear measurements have a big head start)
2. Use properly calibrated estimators
3. Fully account for effects of psf
4. Find and use tighter scaling relations
5. Use the blue galaxies (photometric Tully-Fisher?)
Speculation

1. Magnification not affected by g-i correlation at same order -- tidal field contamination now a signal

2. Lots of other quantities could be used to estimate radii