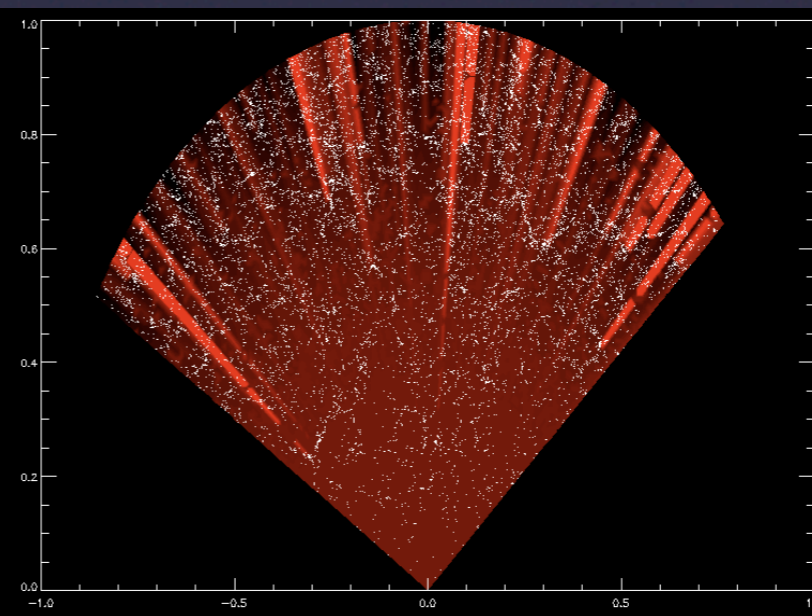
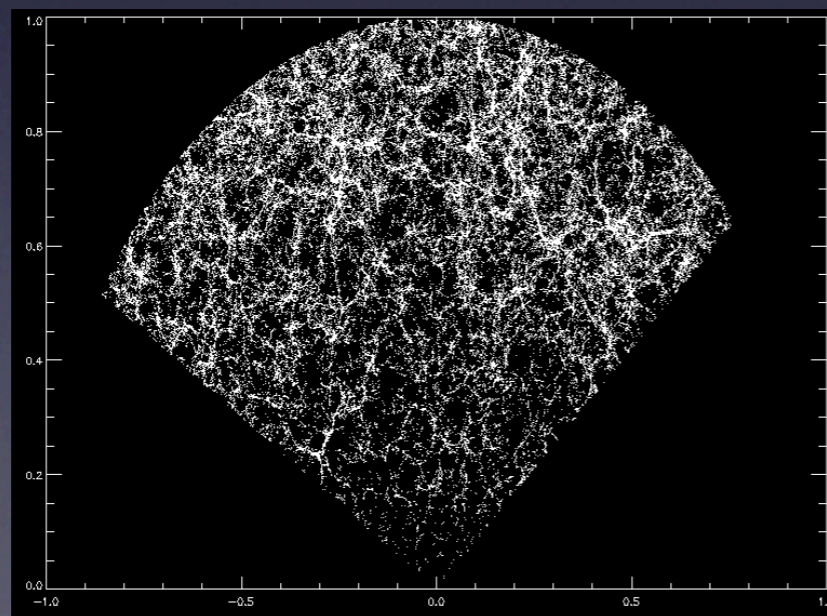
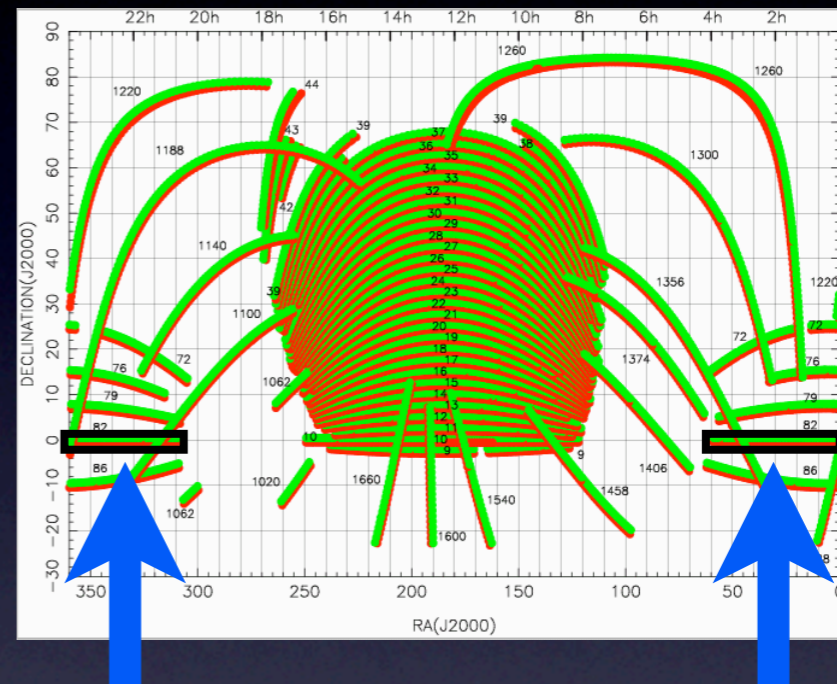
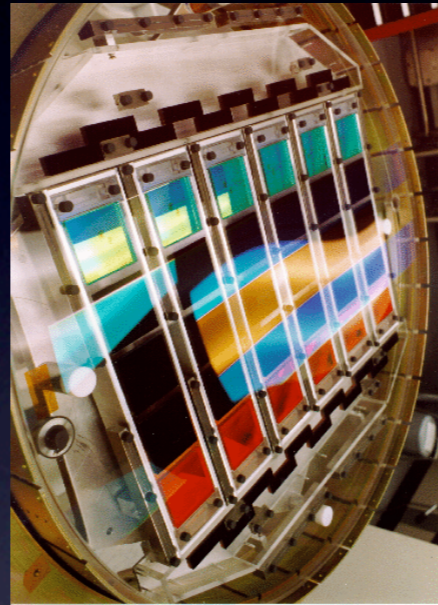


# Magnificent Magnification

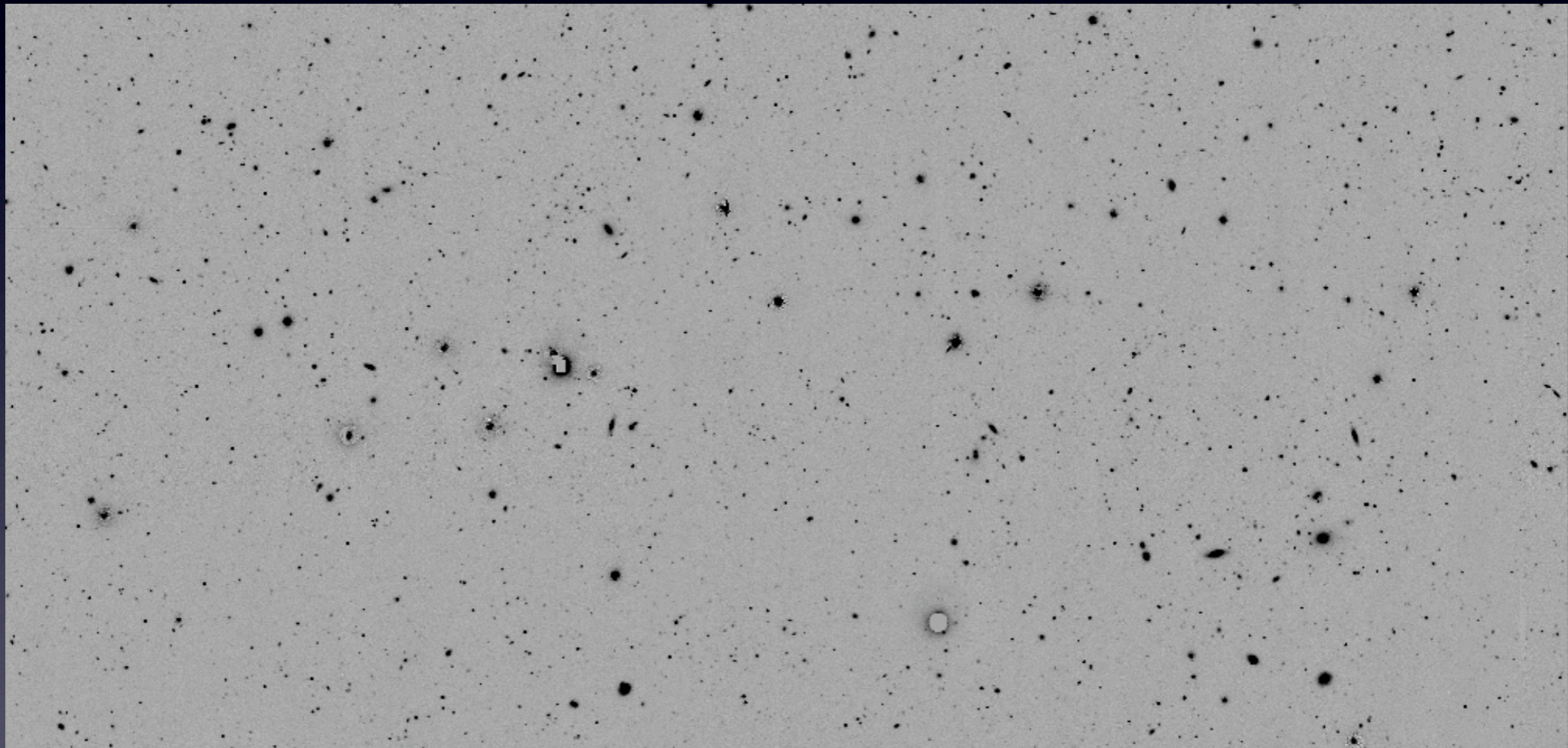
Eric Huff and Genevieve Graves

Berkeley, April 22, 2011

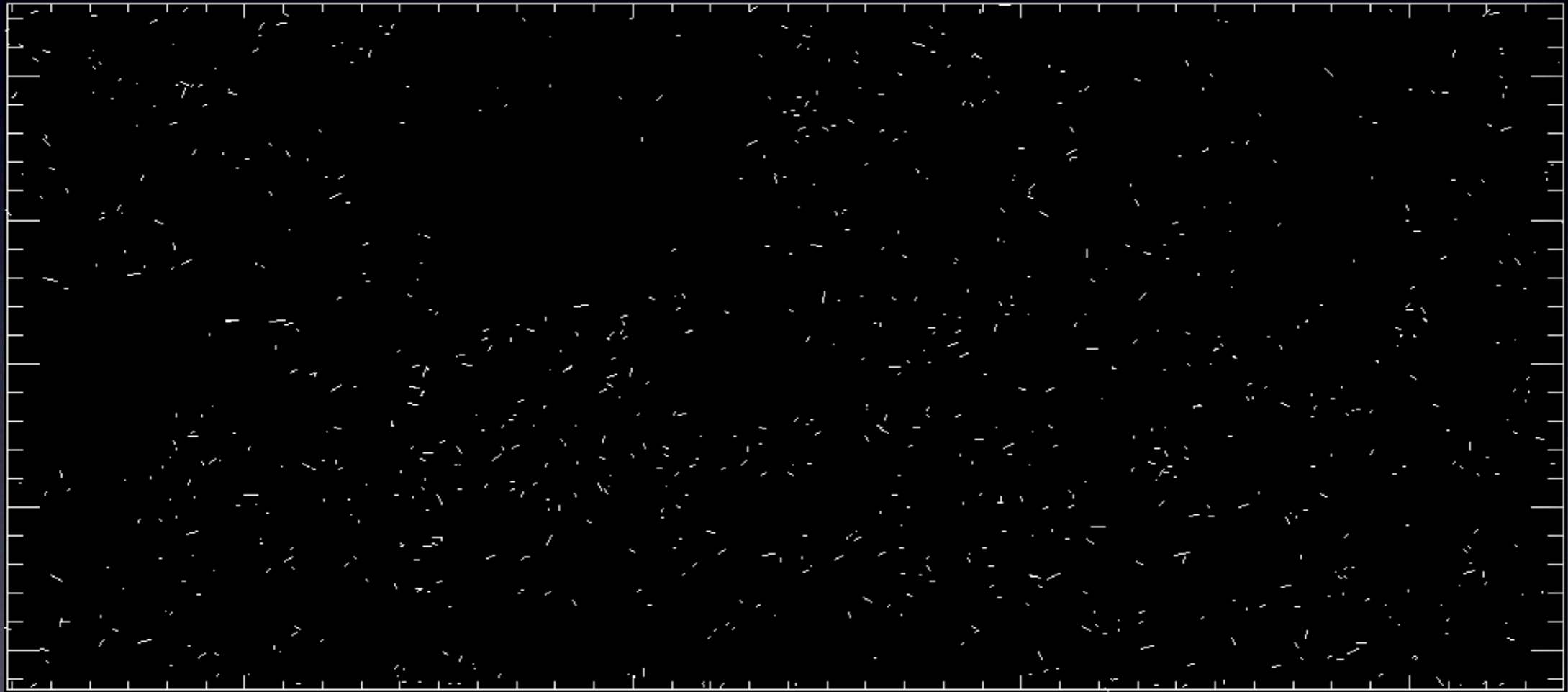
# My day job: Cosmic Shear in SDSS



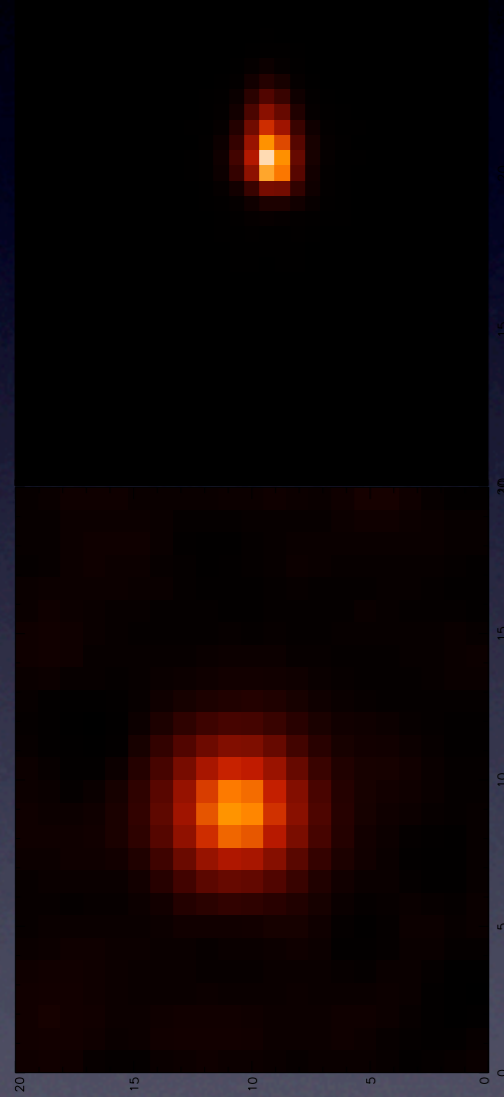
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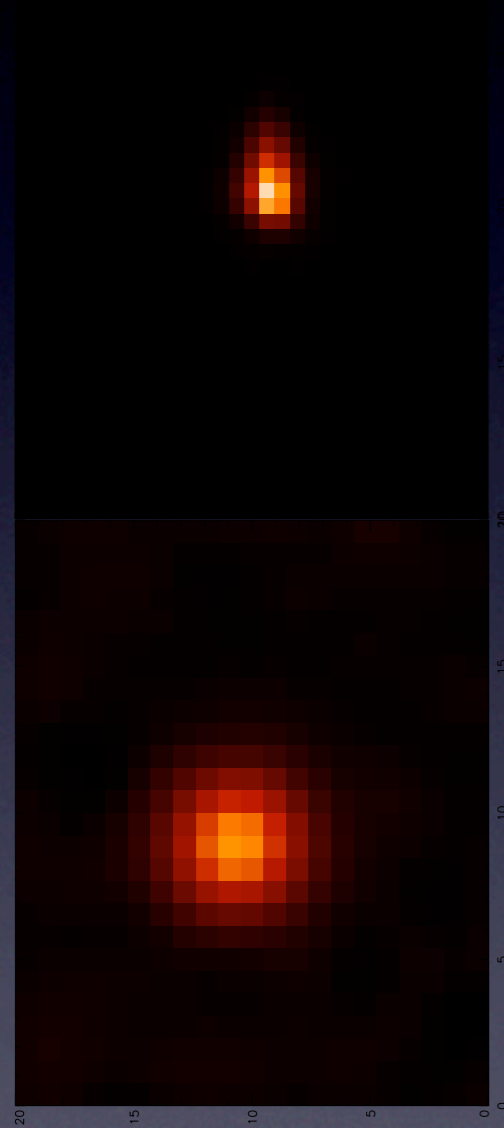


# Why is this hard?



**telescope psf distortions are large**

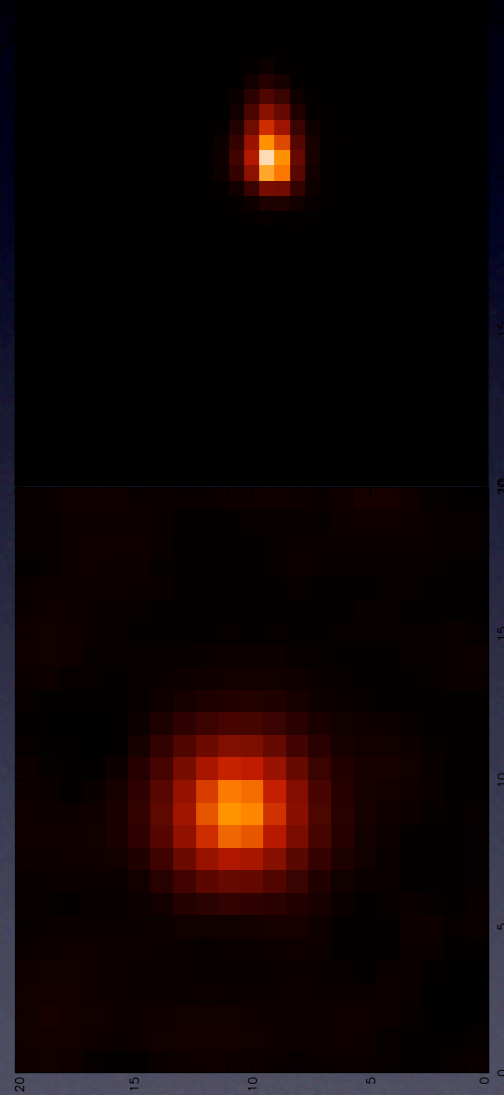
# Why is this hard?



telescope psf distortions are large

**astrophysical ‘systematics’ are  
hard to model**

# Why is this hard?



telescope psf distortions are large

astrophysical 'systematics' are hard to model

**the fluctuations are averaged over huge line-of-sight distances**

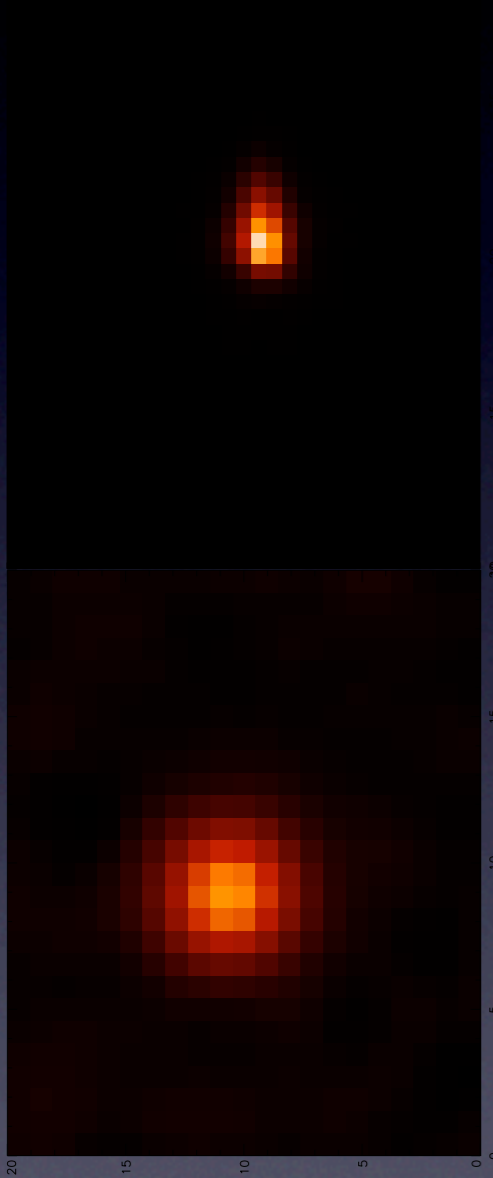
# Why is this hard?

telescope psf distortions are large

astrophysical 'systematics' are hard to model

the fluctuations are averaged over huge line-of-sight distances

**the intrinsic shape noise is large**



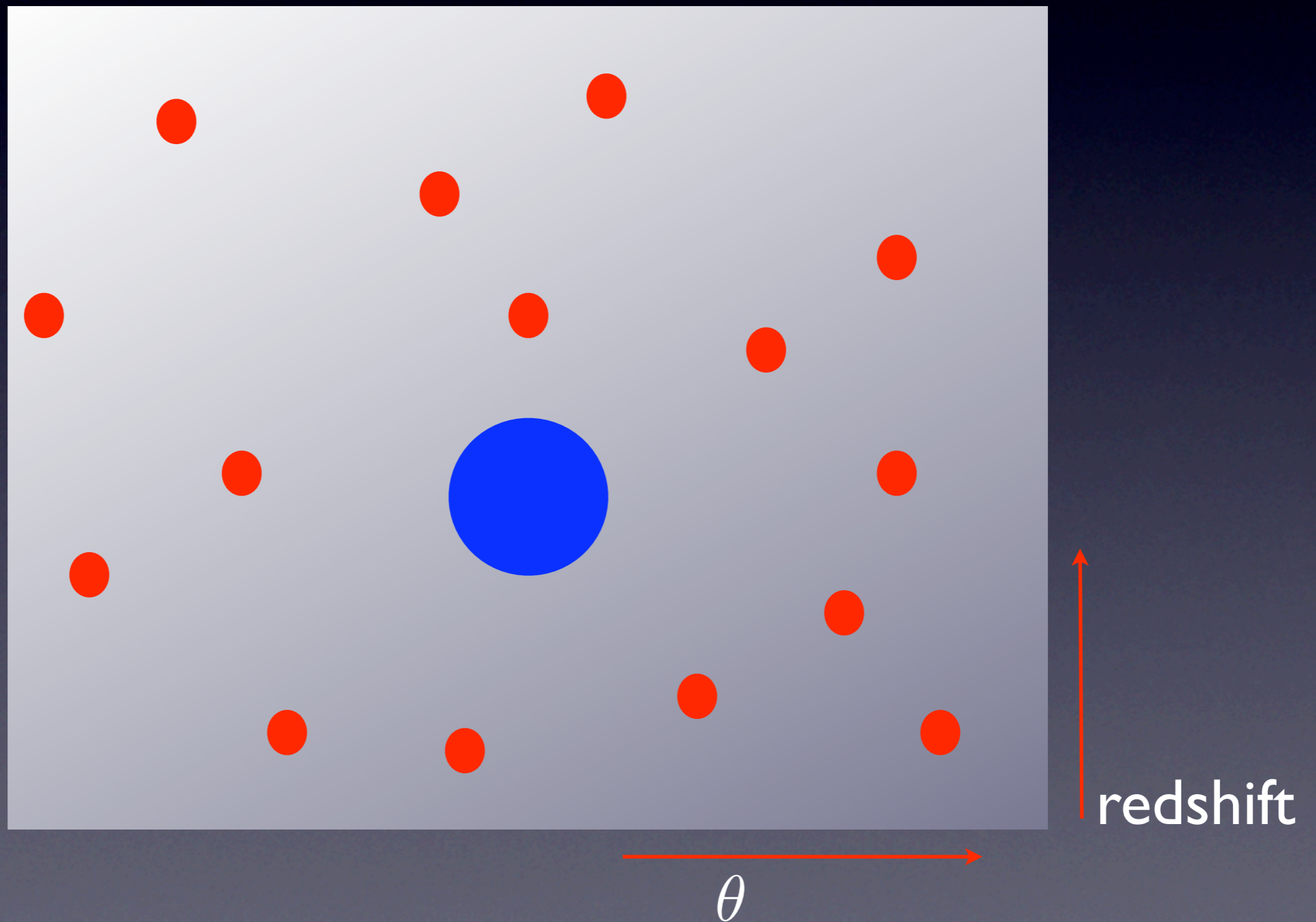


Is there an easier way?

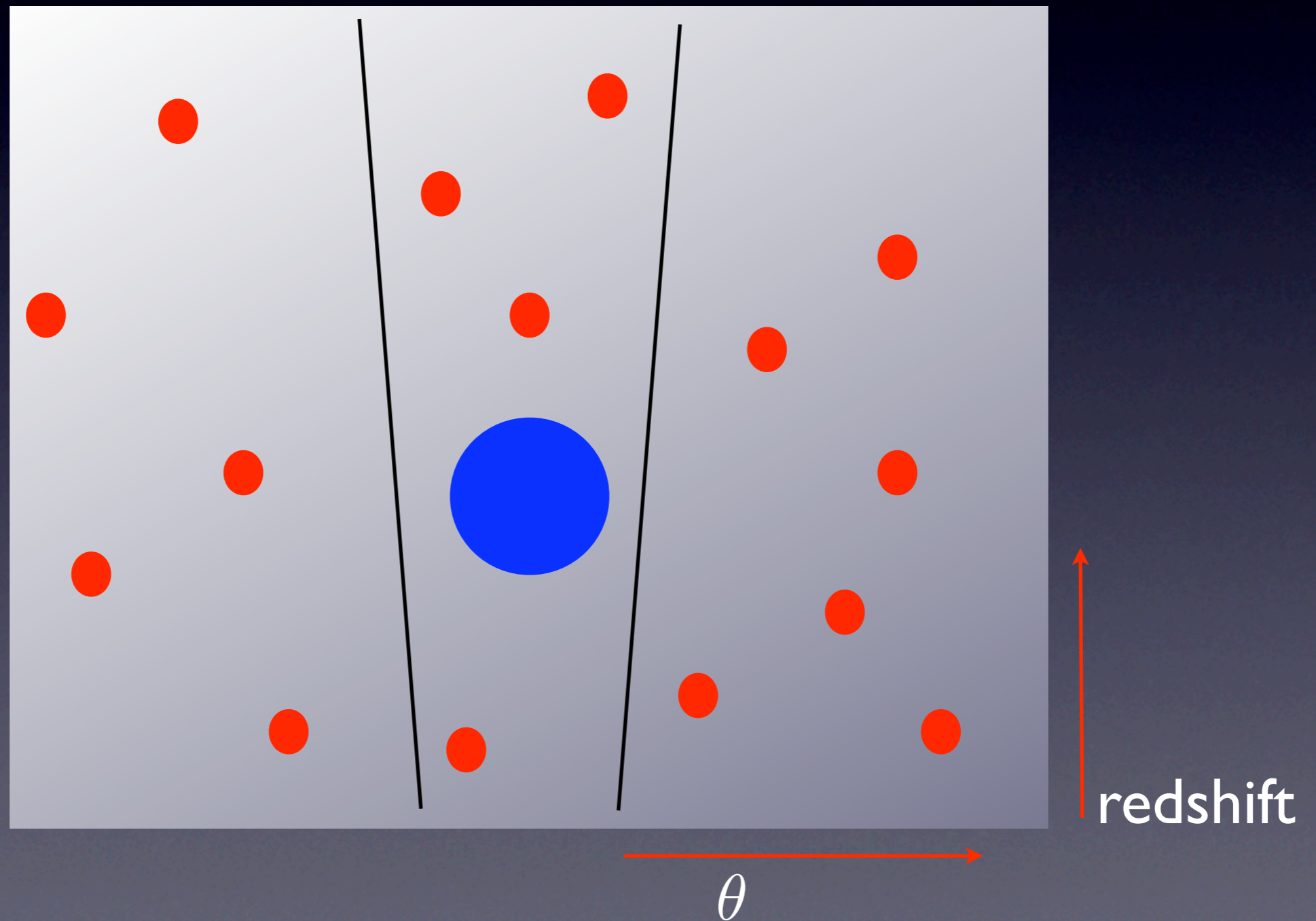
Maybe.

There are other components to  
the distortion tensor.

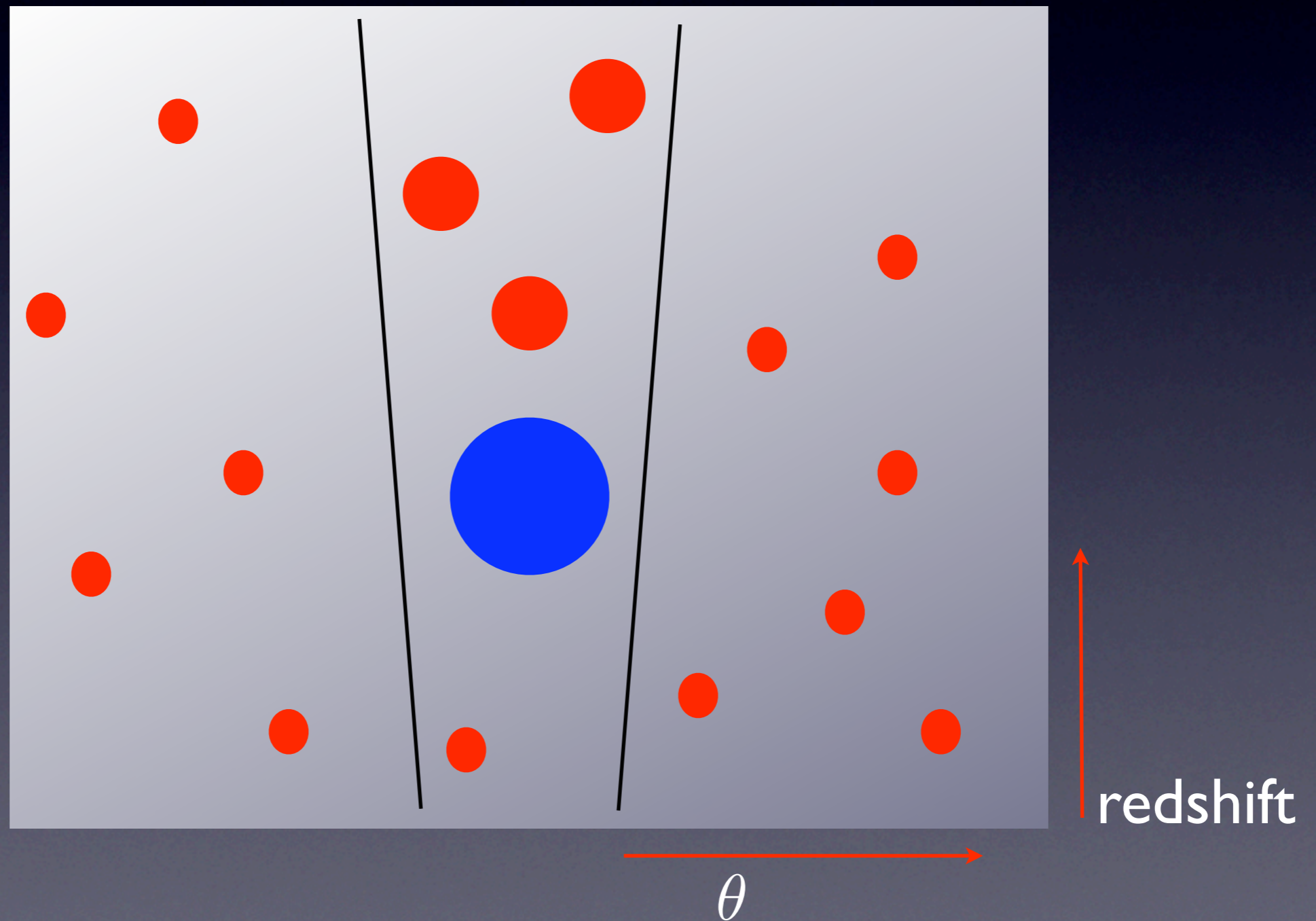
# The Effect of Magnification on galaxy sizes and luminosities



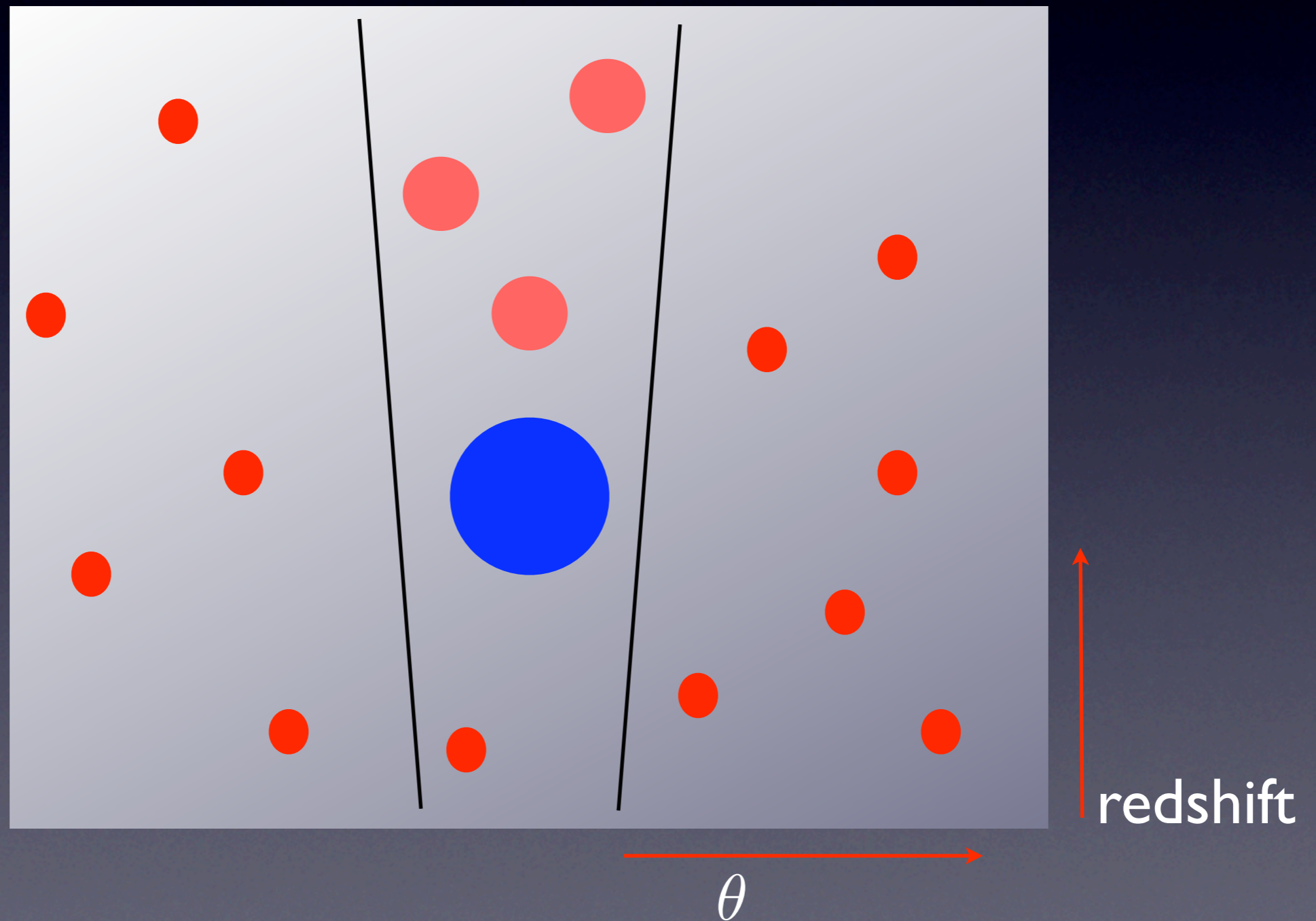
# The Effect of Magnification on galaxy sizes and luminosities



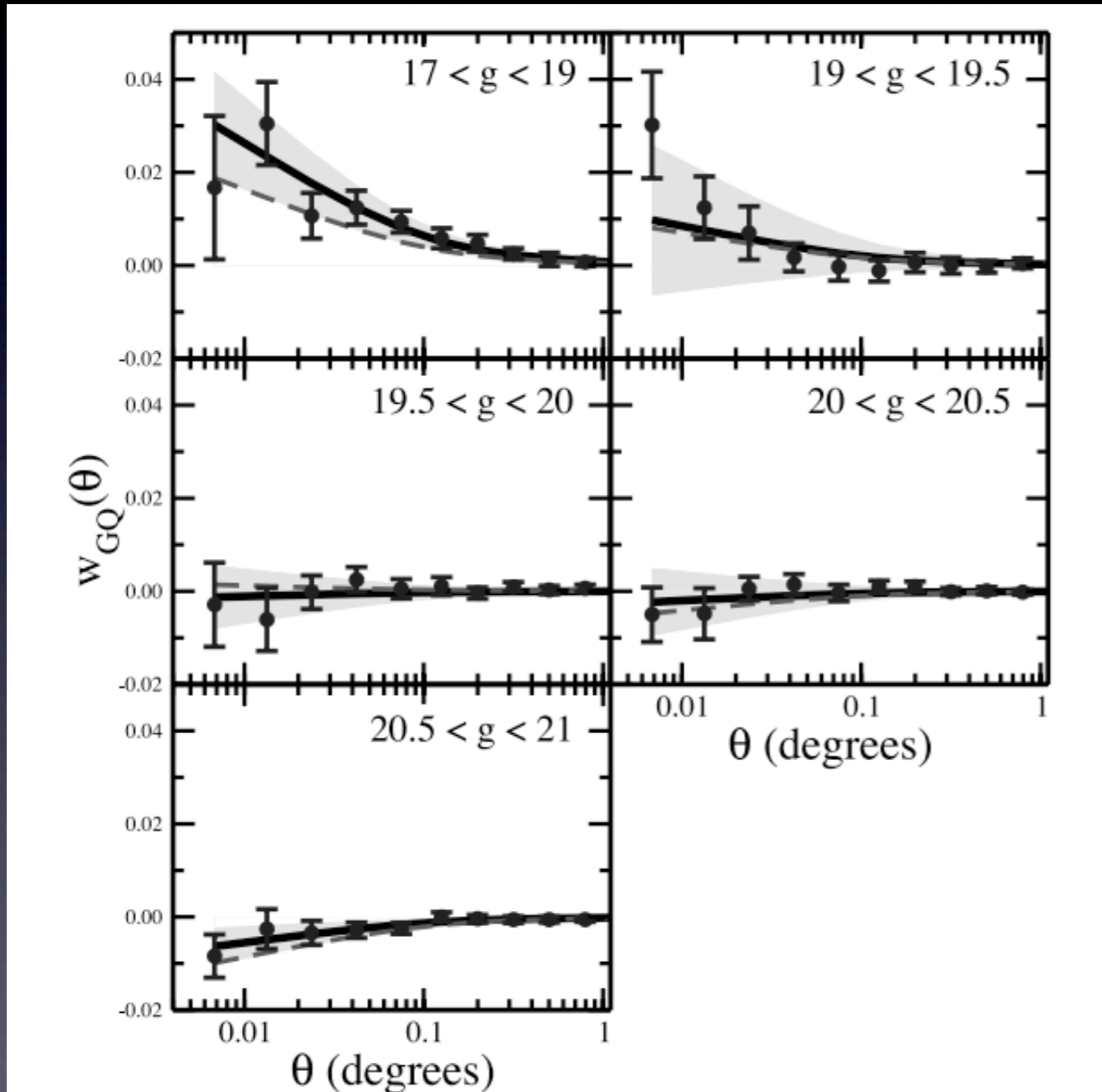
# The Effect of Magnification on galaxy sizes and luminosities



# The Effect of Magnification on galaxy sizes and luminosities

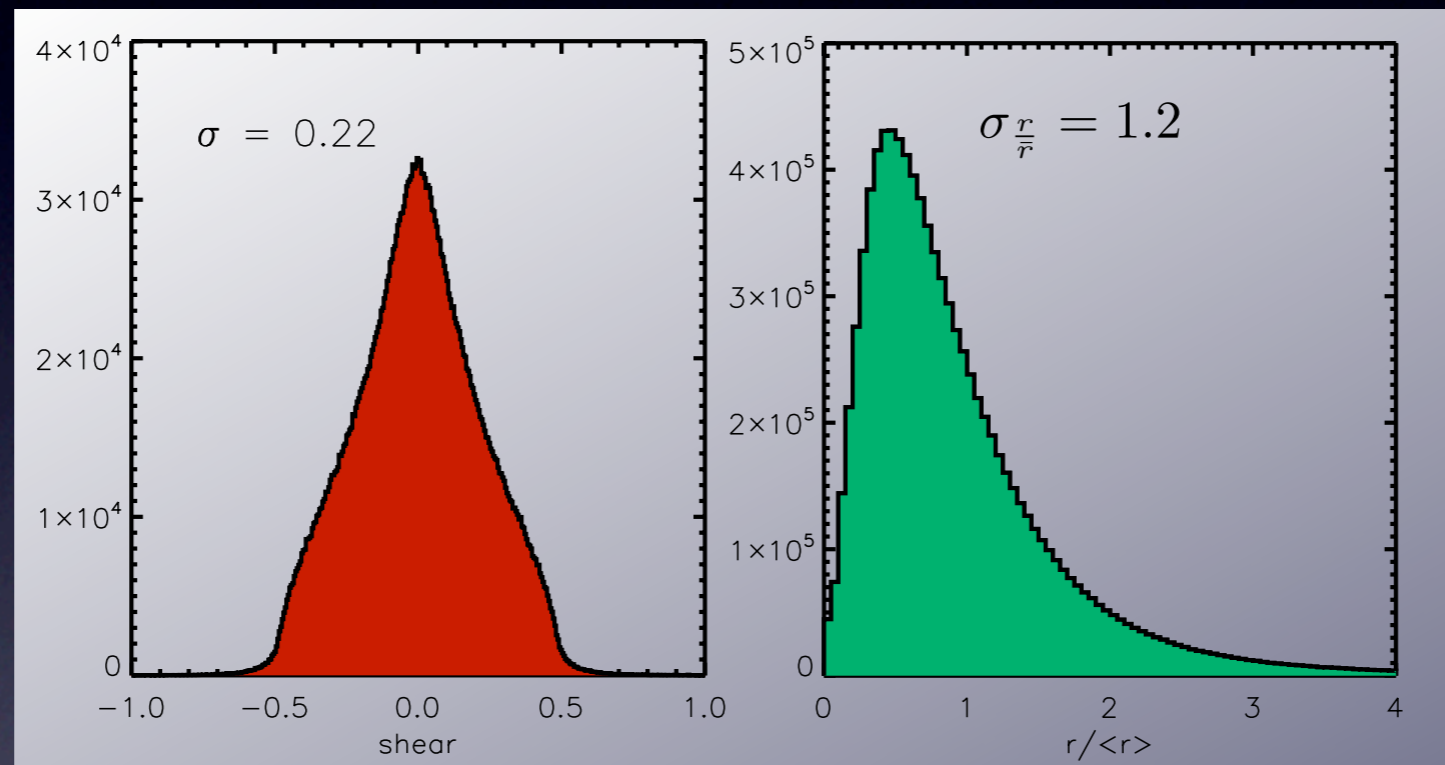


# The effect of Magnification on Luminosities



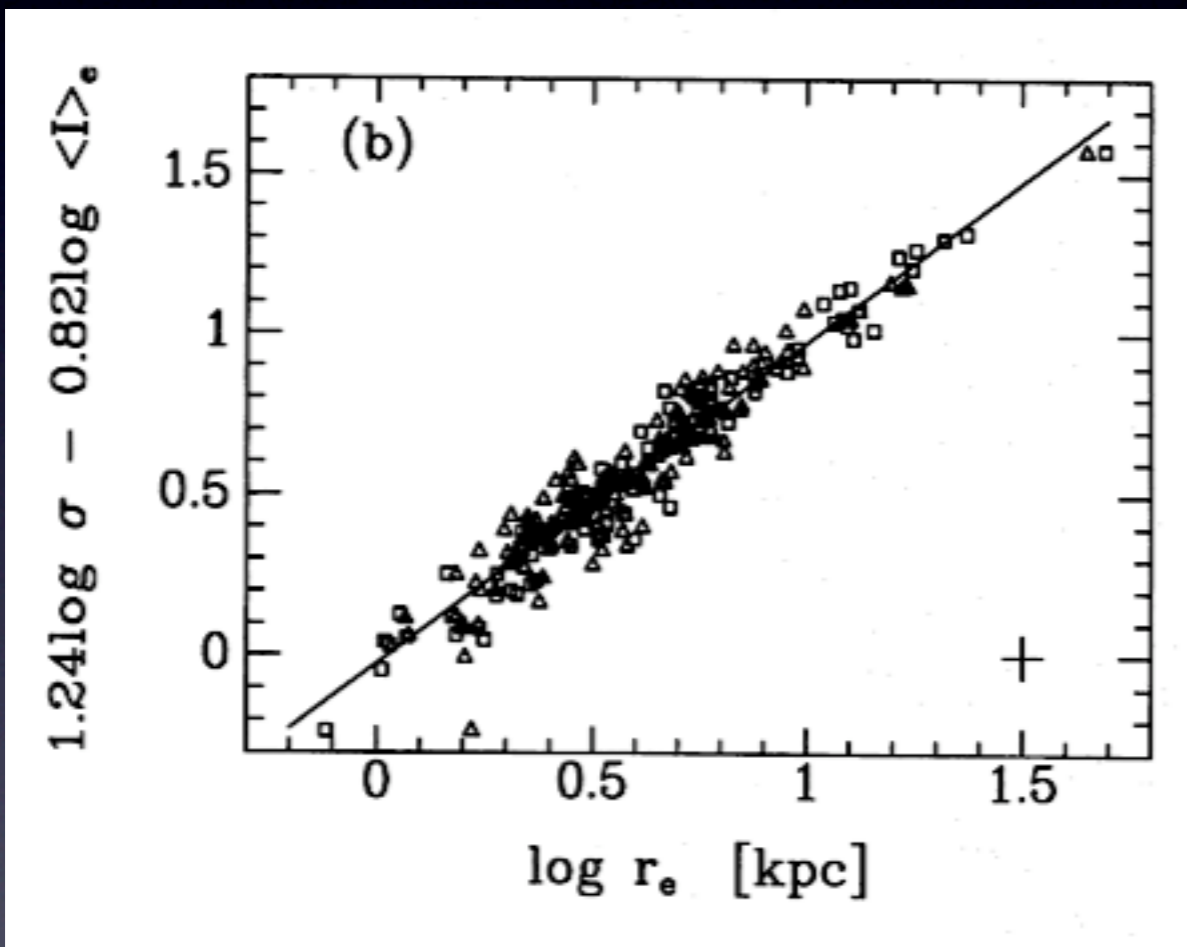
A heroic effort:  
13.5 million galaxy lenses  
225,000 quasar sources

# 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



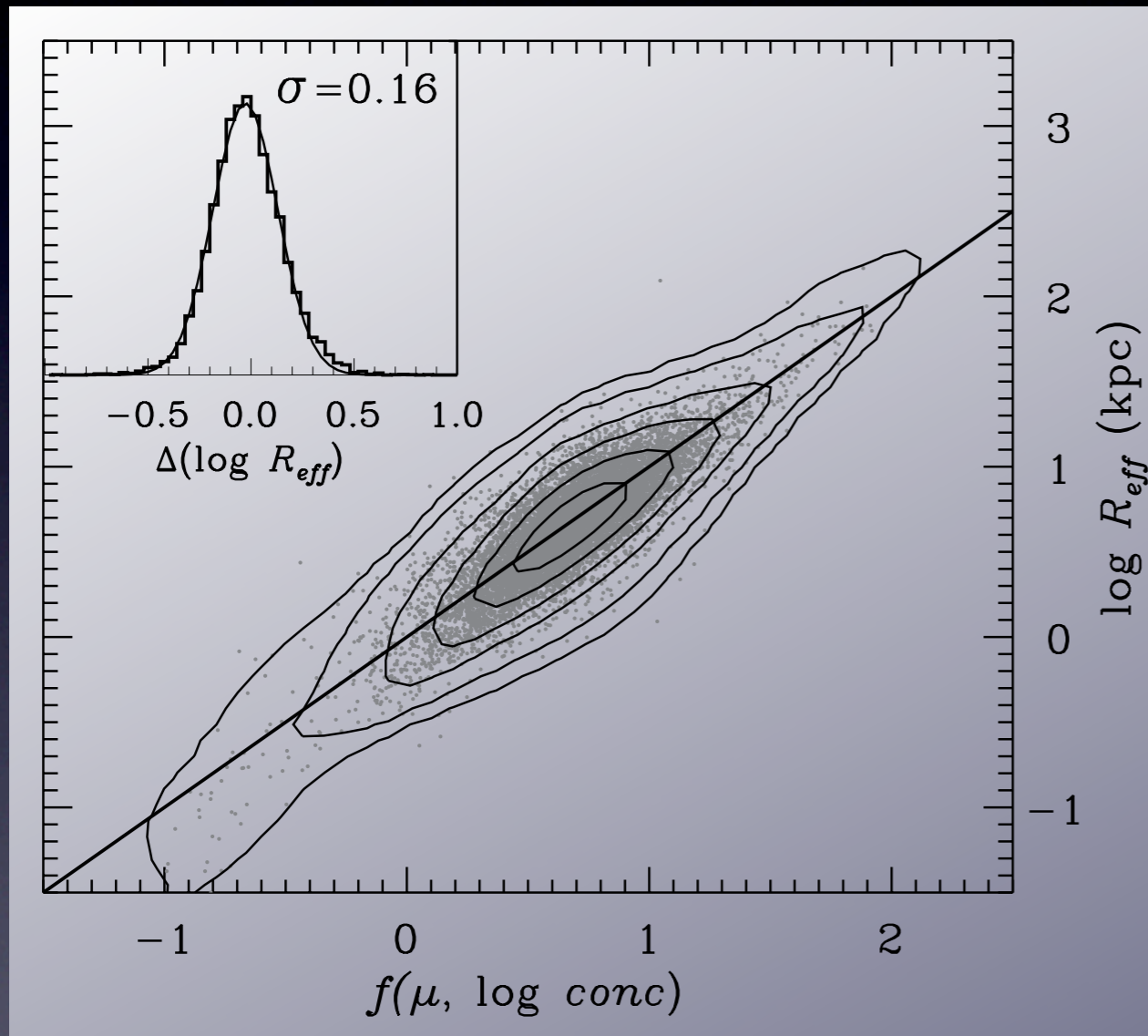
~15% intrinsic scatter

no detected variation with environment

a photometric analogue exists

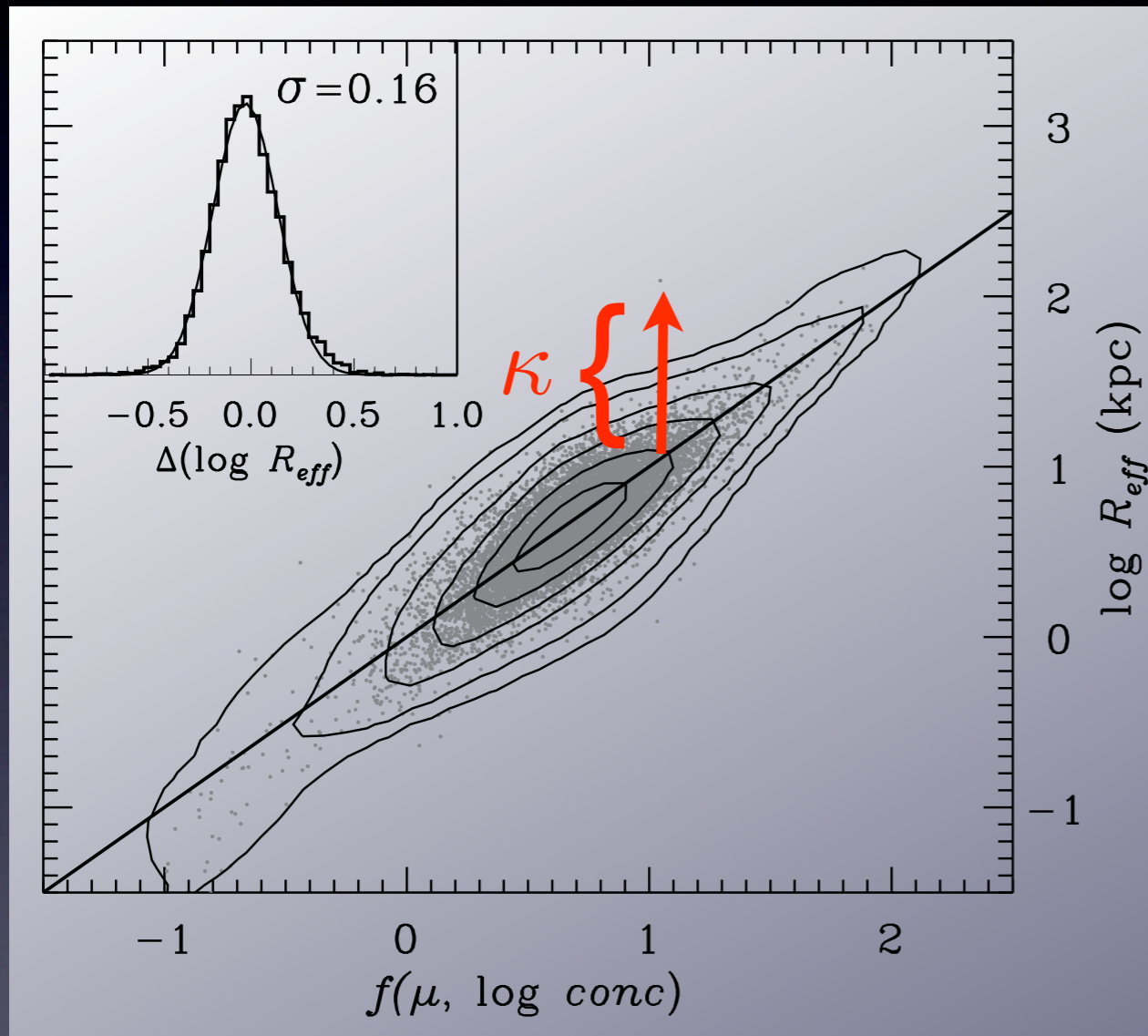


# The Effect of Magnification on the Photometric Plane



at fixed mass, concentration  
and effective radius are  
inversely correlated

# The Effect of Magnification on the Photometric Plane



$$\kappa = \log(R_{eff}) - f(\mu, \log \text{conc})$$

# Constructing a Sample using SDSS

60,000 Lenses:

$\log(\text{stellar mass}) > 11.0$

$0.2 < z < 0.4$

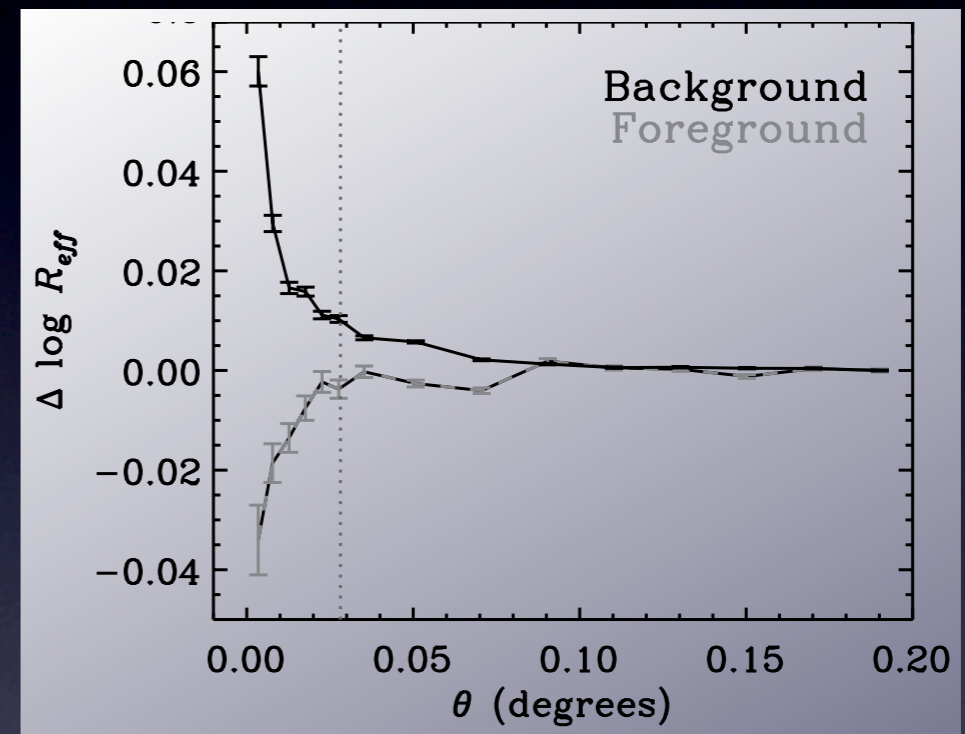
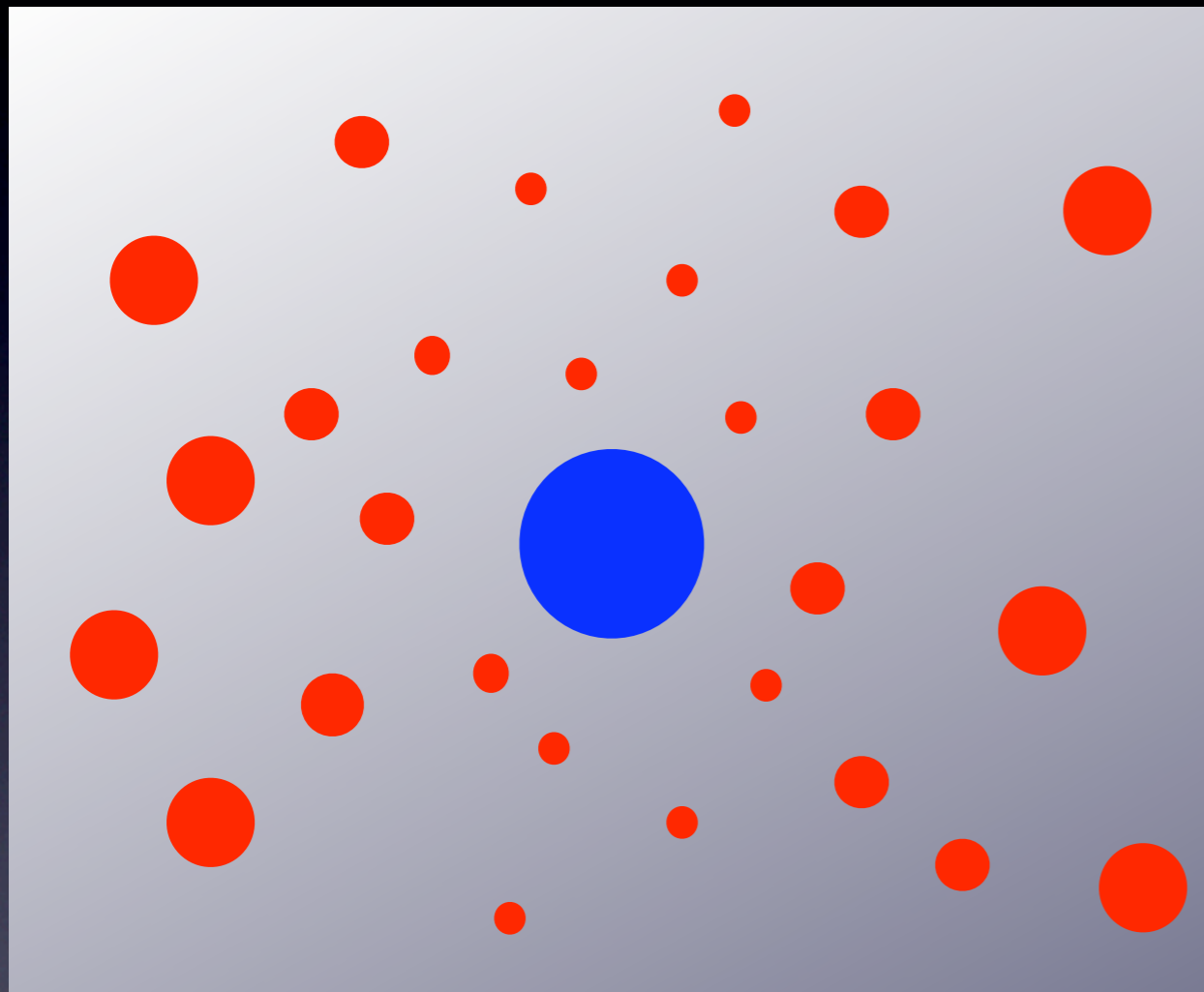
10 million Sources:

resolved galaxies

early-type SEDs (35%)



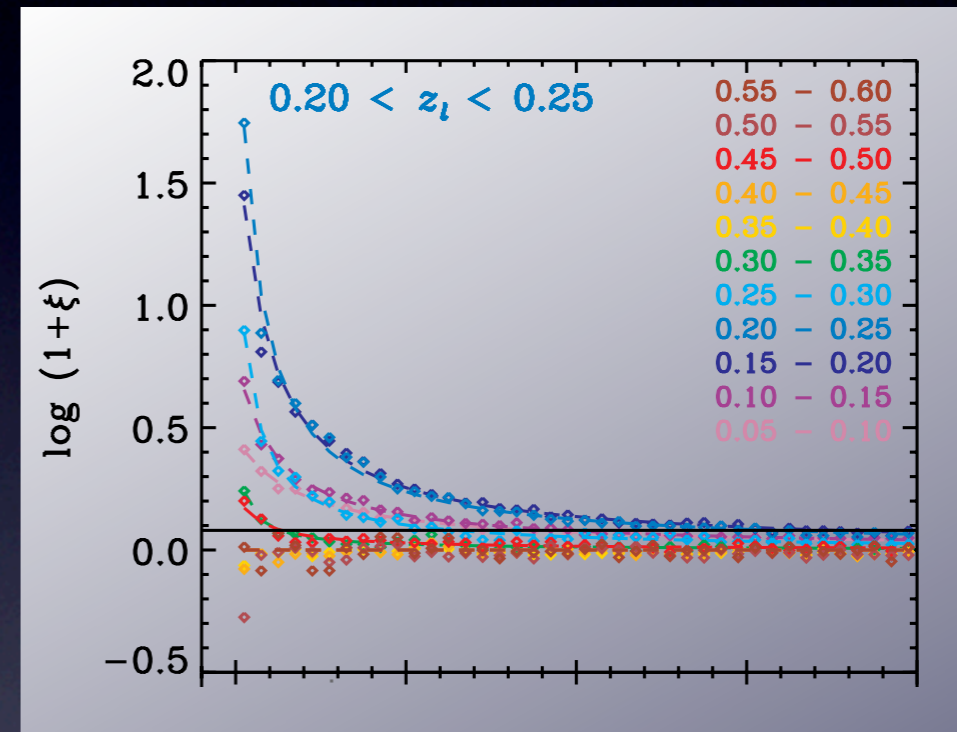
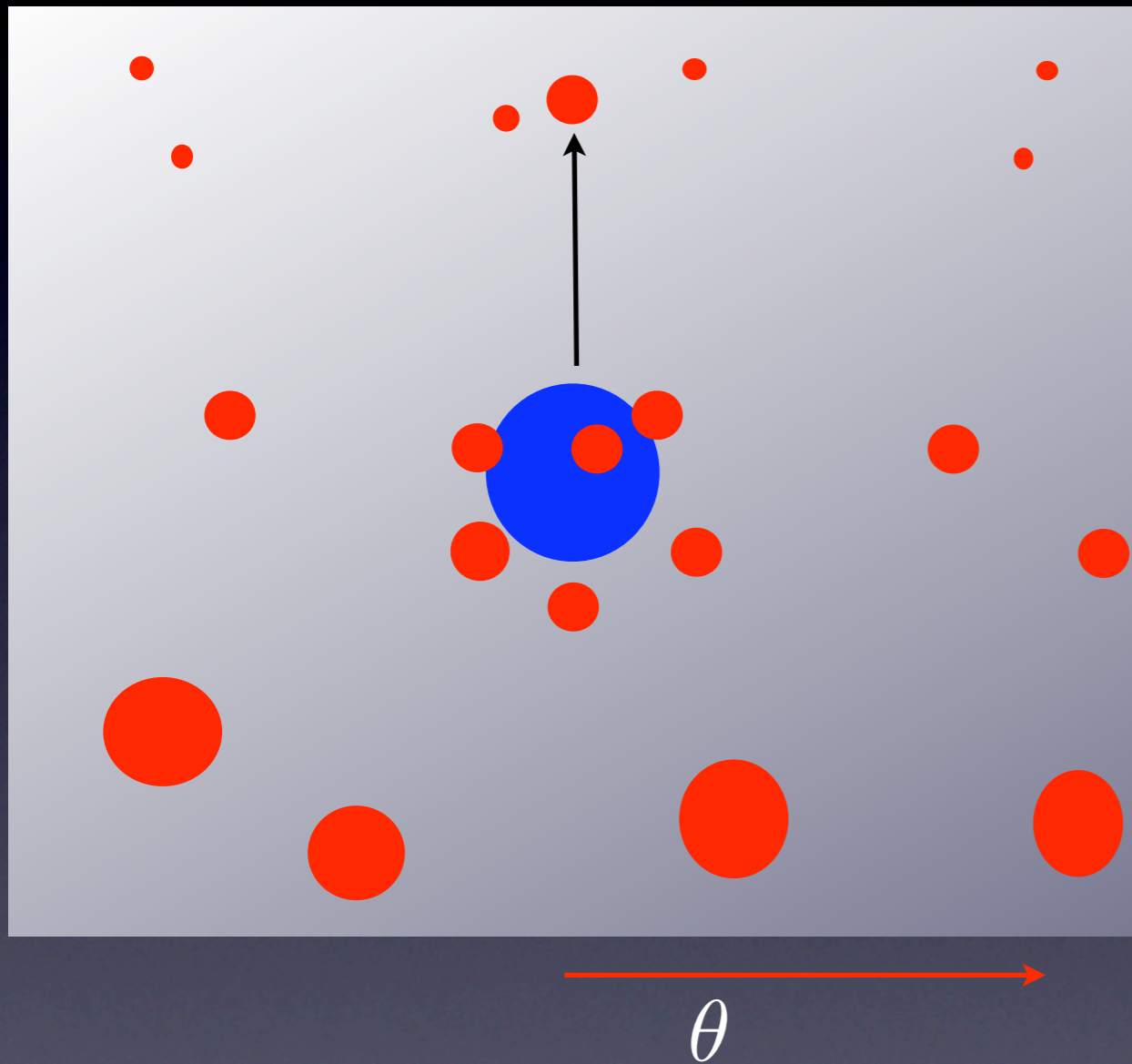
# Systematics: Sky Subtraction



redshift

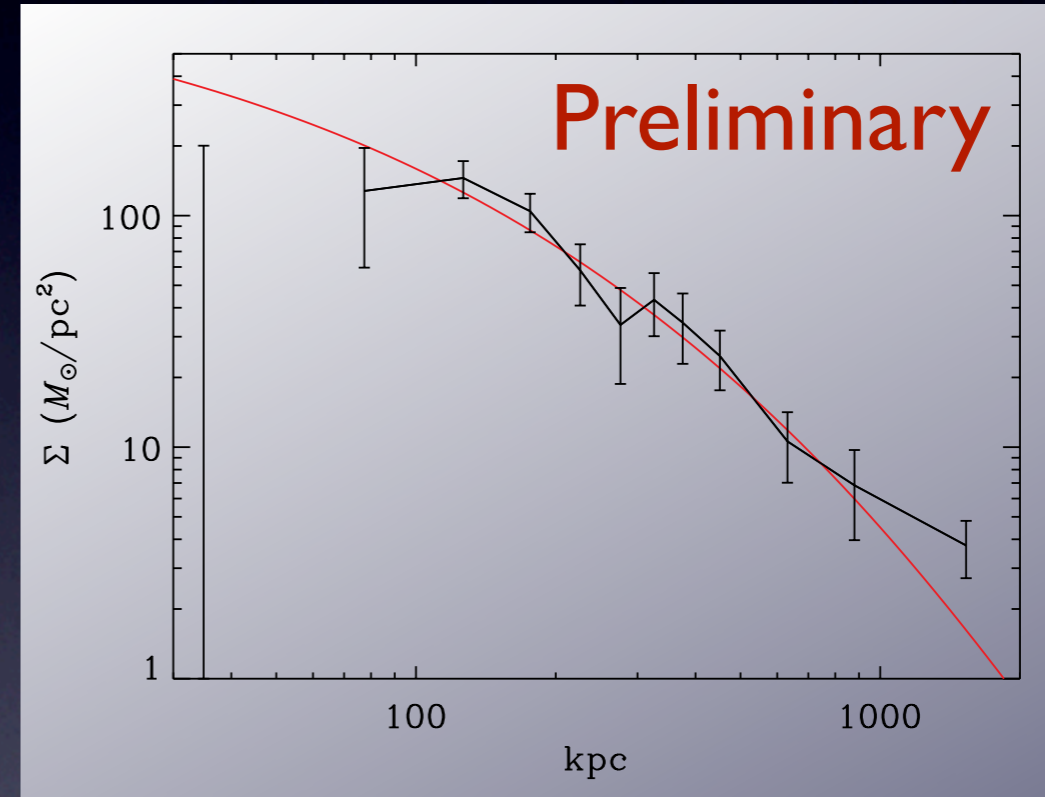
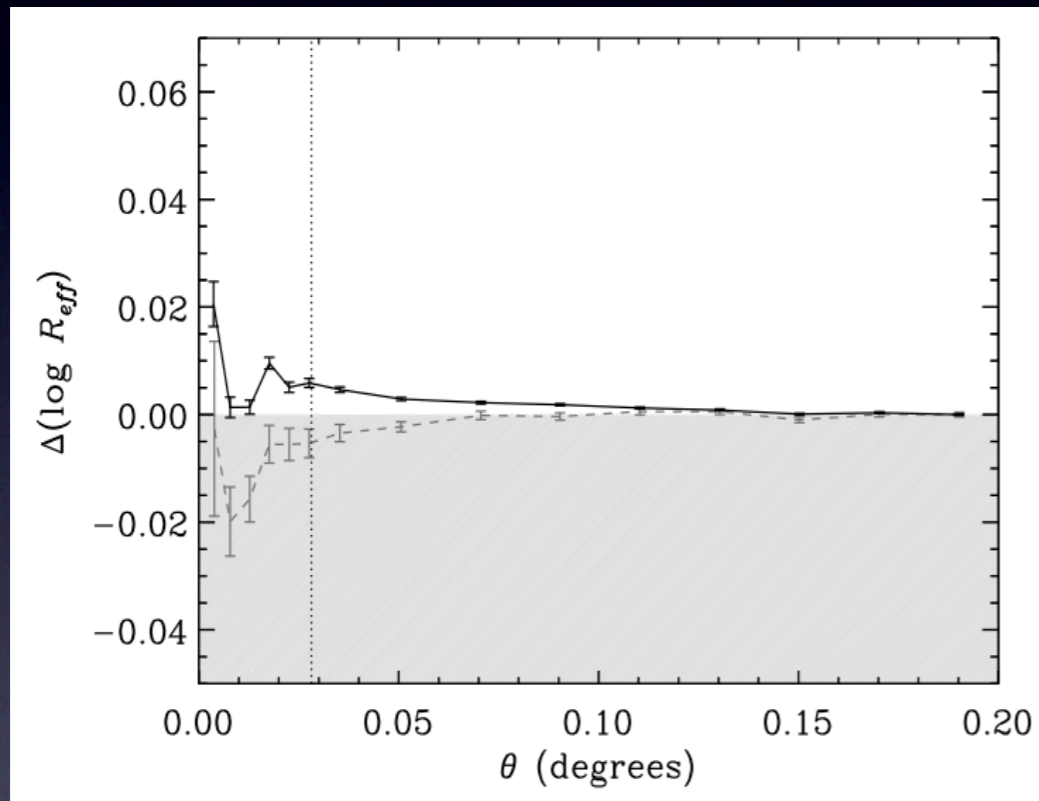
$\theta$

# Systematics: Source Clustering with Photo-z's



redshift

# Lensing Detection: Comparing to Existing Measurements



## 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