

GRAVITATIONAL LENSING AS A COSMOLOGICAL TOOL

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Results and Summary

Gravitational lensing provides good test for cosmological models:

- directly measures mass density fluctuations to very distant objects
- no assumptions concerning bias needed
- Various cosmological models predict different matter distributions
- Here we investigate strong/weak lensing properties of cosmological models numerically [Wambsganss et al. ApJ (Feb. 1998)]

First results, strong lensing [Wambsganss et al. Science 268, 274 (1995)]:

- Λ CDM ($\Omega = 1$) predicts far too many large separation lenses
- Λ CDM ($\Omega = 0.4, \Lambda = 0.6$) predicts few if any such lenses

First results, weak lensing [Wambsganss et al. ApJL 475, L81 (1997)]:

- “Standard candles” (i.e. SN Ia) get unavoidable “broadening” of luminosity function due to weak lensing by intervening matter
- Lensing induced dispersion for true standard candles in Λ CDM universe is 0.04mag (0.02 mag) at redshift $z = 1$ ($z = 0.5$)

Work in progress:

- Investigation of weak/strong lensing by clusters along line-of-sight
- Exploration of shear produced by large scale structure
- Lensing effects on microwave background