Weak-lensing: shape measurement and calibration with CFIS data

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Shape measurement with ShapePipe
Shear calibration using Metacalibration


Deconvolution with a sparsity/law-rank based software

Application of an artificial shear with spline-interpolation

Convolution and addition of simulated noise

Images for the calibration

Image for the measurement
Shear calibration using Metacalibration

- Preliminary tests on CFIS (~1700 galaxies) :
  \[ e_{\text{obs}} = e_{\text{int}} + R \gamma \]
  
  \[
  \begin{align*}
  [R_{11}, R_{22}] &= 1+m = 0.94 \pm 0.001 \\
  [R_{12}, R_{21}] &= -0.0013 \pm 0.0006 \\
  \end{align*}
  \]

- Results on simulation (1000 galaxies)
  
  \[
  \begin{align*}
  [R_{11}, R_{22}] &= 1+m = 0.94 \pm 0.007 \\
  [R_{12}, R_{21}] &= -0.009 \pm 0.006 \\
  \end{align*}
  \]

  ~1% error compared to true value.

- Also tested on CFHTLenS (500 galaxies on one field) :
  
  \[
  \begin{align*}
  [R_{11}, R_{22}] &= 1+m = 0.92 \pm 0.002 \\
  [R_{12}, R_{21}] &= -0.0017 \pm 0.0007 \\
  \end{align*}
  \]

  1% error compared to the reference (mean bias for the all survey).
Redshifts for CFIS

- Using overlap with: SDSS/BOSS, eBOSS, ...
Redshifts for CFIS

- Using cluster-z

Survey with unknown redshift

Test general relativity through $E_g$ factor

• Friedmann-Lemaître-Robertson-Walker metric with perturbation:

$$ds^2 = \left( 1 + \frac{2 \Psi}{c^2} \right) c^2 dt^2 - a^2(t) \left( 1 - \frac{2 \Phi}{c^2} \right) dl^2$$

  - Temporal part
  - Spatial part

• The distribution of galaxies describe the temporal part and the weak-lensing measurements describe both, temporal and spatial.
Test general relativity through $E_g$ factor

$$E_g = \frac{1}{\beta} \frac{\langle \delta_m \delta_g \rangle}{\langle \delta_g \delta_g \rangle}$$

- Previous studies:
  - TeVeS
  - f(R)

Blake et al. (2015), CFHTLenS+RCSLenS, WiggleZ+BOSS
Conclusion

- Quality of CFIS data is really interesting for weak-lensing (seeing \( \sim 0.6 \) arcsec).
- Overlap with spectroscopic surveys.
- Science topics:
  - General relativity test
  - Halo properties
  - Void lensing
  - Peak counts, ...