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Galaxies live inside dark matter halos





Stellar to Halo Mass Relation



Abundance Matching



Weak Lensing



Lens (foreground)





(foreground)





Overcoming shape noise



Lens (foreground)



Stellar to Halo Mass Relation



Develop and *exploit* a new high-precision weak lensing technique

Can we detect lensing though velocity fields? Can we separate noise from lensing? Can we constrain the SHMR's dispersion & shape?

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Circular shape

Circular motion



Circular shape

Circular motion





Dynamical Shape noise

,



 $\gamma^{obs} = \gamma^{true} + \frac{\sigma}{\sin(2\phi)}$



 $\gamma^{obs} = \gamma^{true} + \frac{1}{\sin(2\phi)}$

Target Selection

z < 0.15 & i < 17.5

 $\gamma_{pred} > 0.001$

3000 systems

KOALA (3.9m) + WIFES (2.3m)

Data

Observations

+30 nights

100 galaxies

Analysis

Custom Data Reduction

Vel with shear modelling

21 useful targets



b) $\gamma = 0.041 \pm 0.009$ c) $\gamma = -0.024 \pm 0.015$

Gurri et. al. 2020a





 $\langle \gamma \rangle = 0.021 \pm 0.005$

Gurri et. al. 2020a

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The Shape of Shear

$\gamma^{obs} \neq \gamma^{pred}$



The Shape of Shear

Dynamical shape noise + dispersion in SHMR vobs γ^{pred}

 $\gamma^{obs} \neq \gamma^{pred}$



The Shape of Shear



Gurri et. al. 2020b

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Dispersion in the SHMR



Dispersion in the SHMR

$\xi = 0.4 \, dex$





15

Dispersion in the SHMR



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Contribution to Research Area

1. A new methodology to do weak lensing



2. Published the first dataset of weakly lensed vel. fields 3. Opened a way to measure the dispersion in the SHMR

