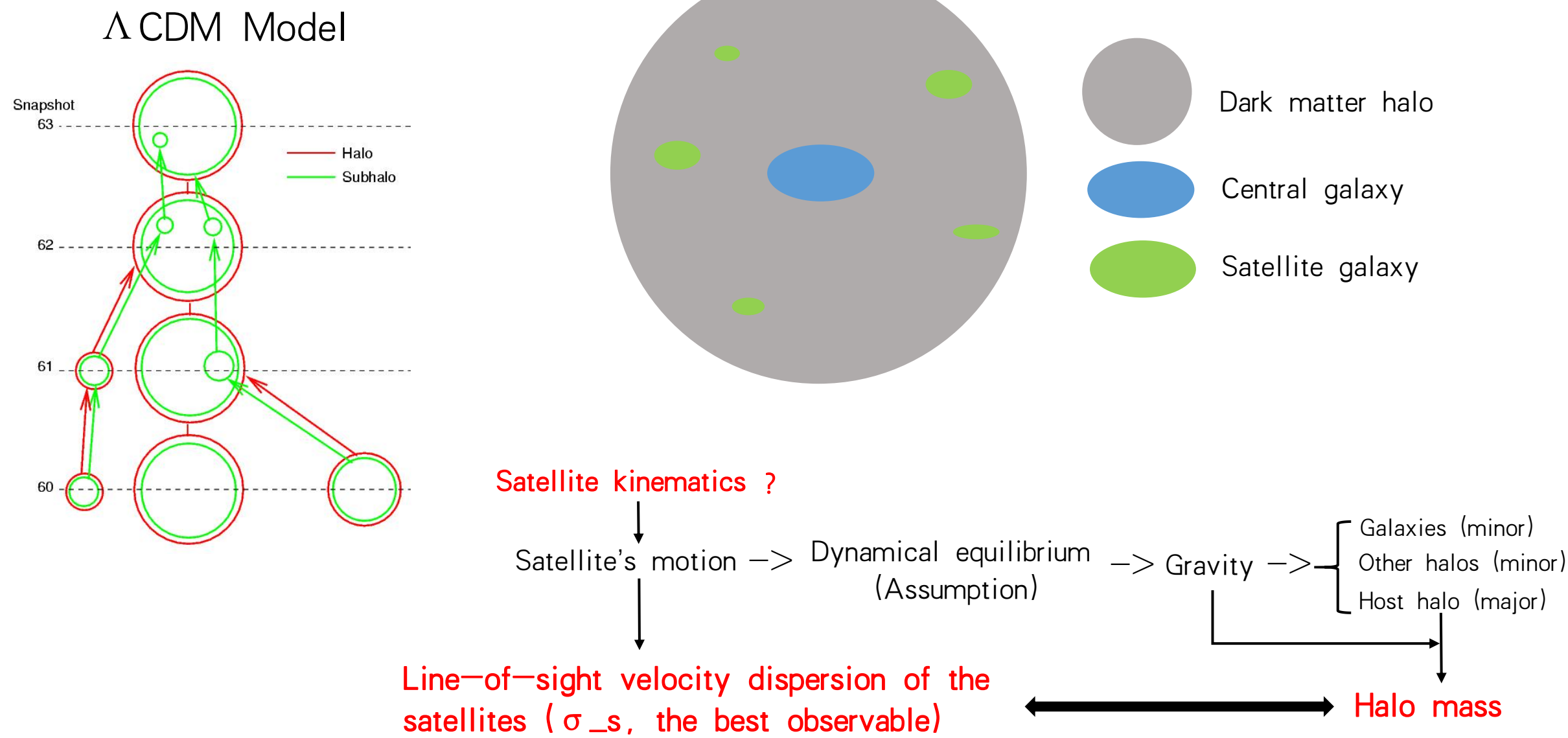


Satellite kinematics trace the gravitational potential of dark matter halos

2023—1—12

Ziwen Zhang

What is the **Satellite kinematics** ?



Why is the halo mass (M_h) – satellite velocity dispersion (σ_s) relation important?

1. The relation should be tight

Halo mass and σ_s are intrinsically correlated;

2. Halo mass estimation is complicated!

It usually requires 1. complicated data; 2. sophisticated techniques; 3. some other assumptions;

3. σ_s is easy to calculate;

Spectroscopic redshift + group member identification;

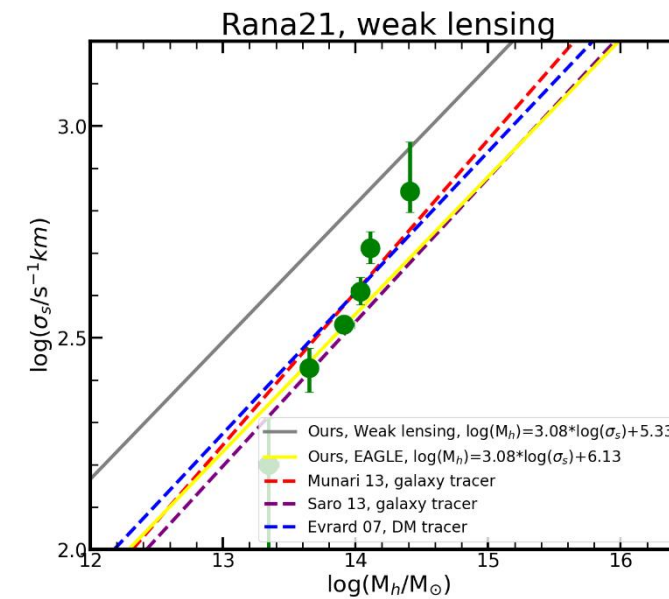
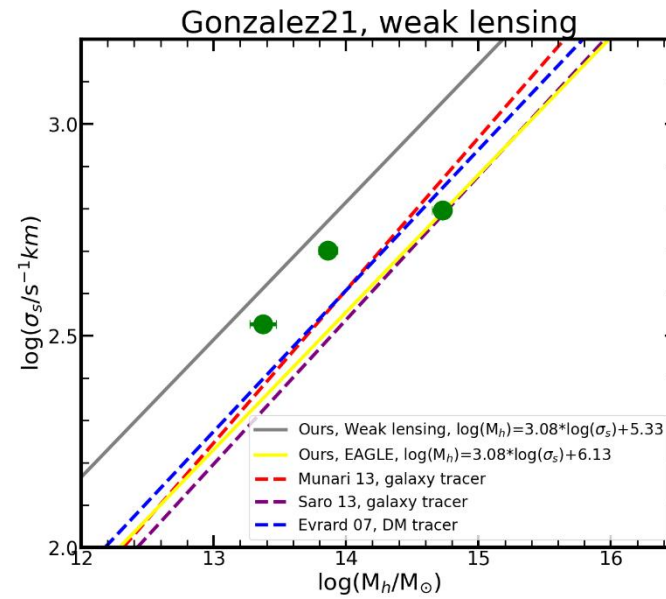
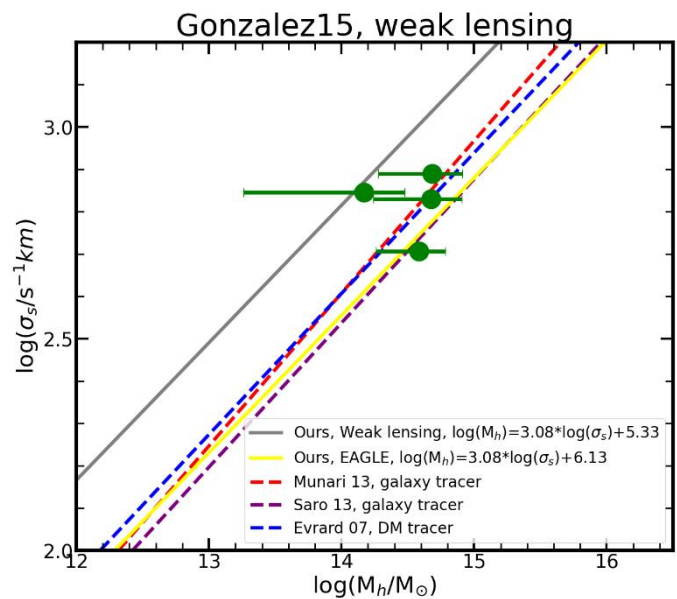
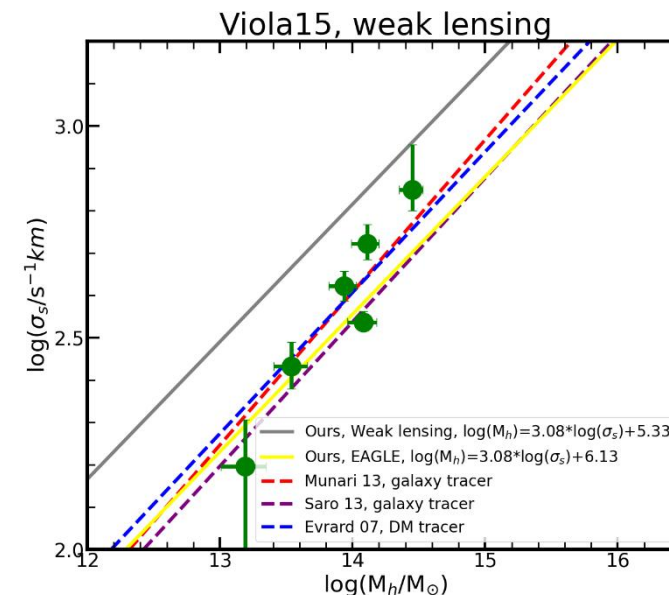
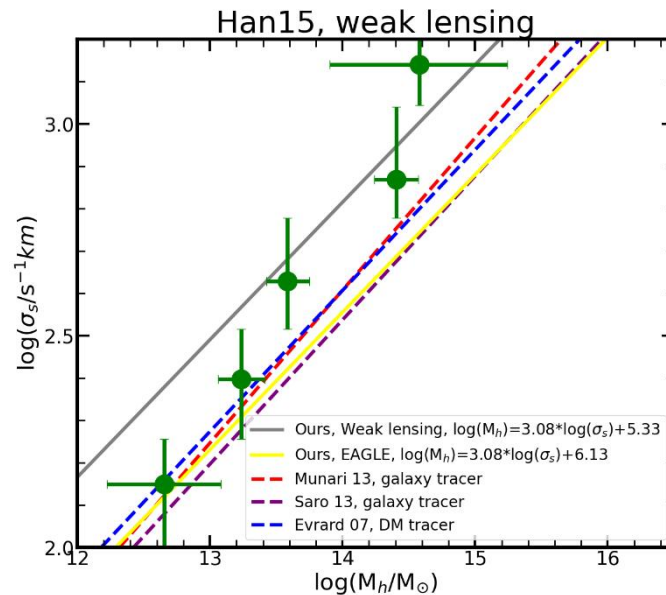
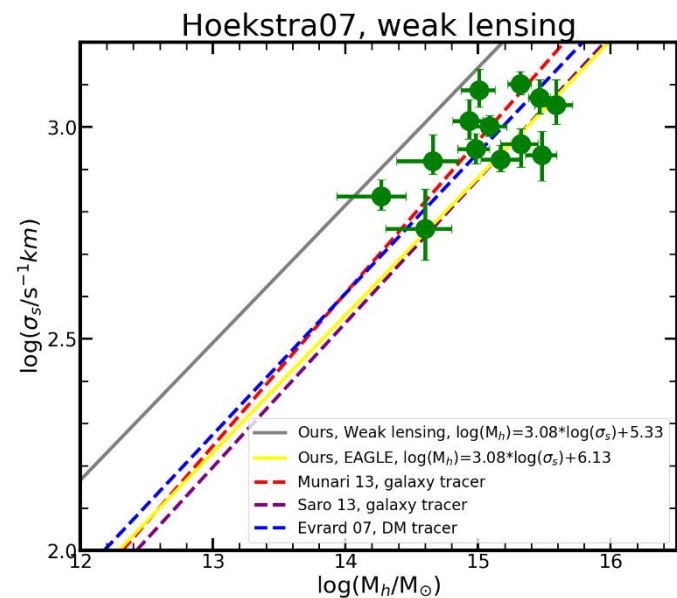
→ To infer the halo mass.

Where are we now? $M_h - \sigma_s$ relation

Simulation { Evrard et al. (2008), dark matter particle
Munari et al. (2013), satellite galaxy
Saro et al. (2013), subhalo

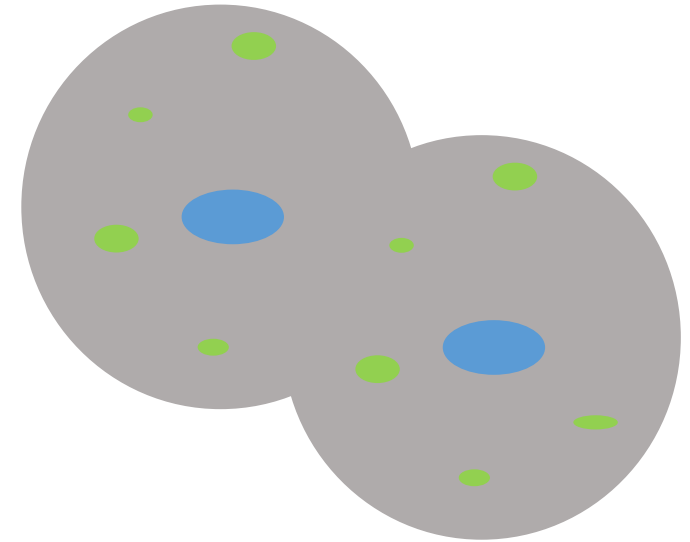
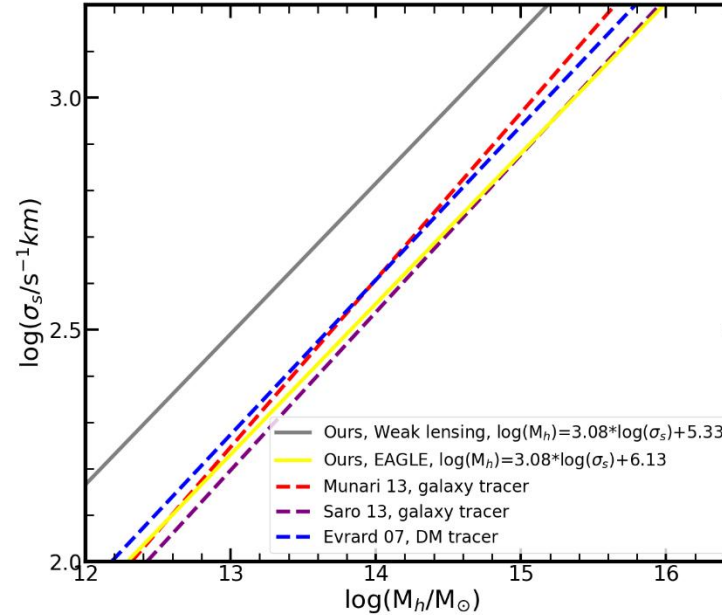
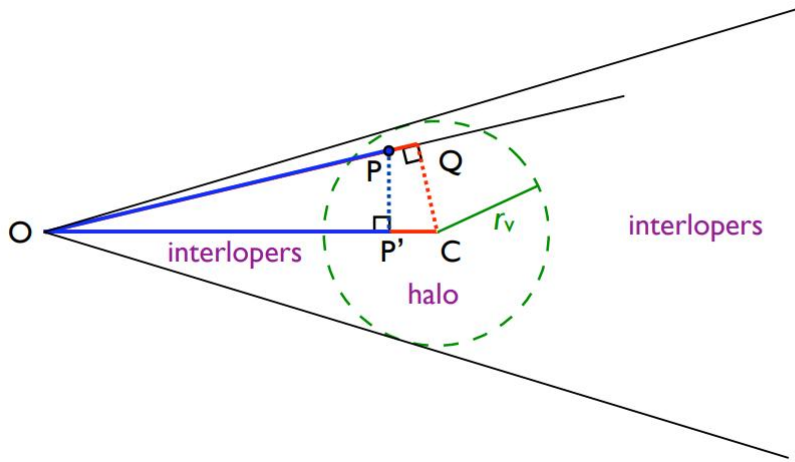
Observation
(Weak lensing) { Hoekstra et al. 2007
Han et al. 2015
Viola et al. 2015
Gonzalez et al. 2015, 2021
Rana et al. 2022
Zhang et al. 2022

Where are we now? $M_h - \sigma_s$ relation



What is wrong?

1. Sample selection bias
2. Interlopers may lead to an overestimation of σ_s ;
3. Velocity bias;
4. Merging systems violate the dynamical equilibrium assumption;



Thank you!