

# Multi-variate dependence of halo and galaxy assembly bias

Xiaoju Xu

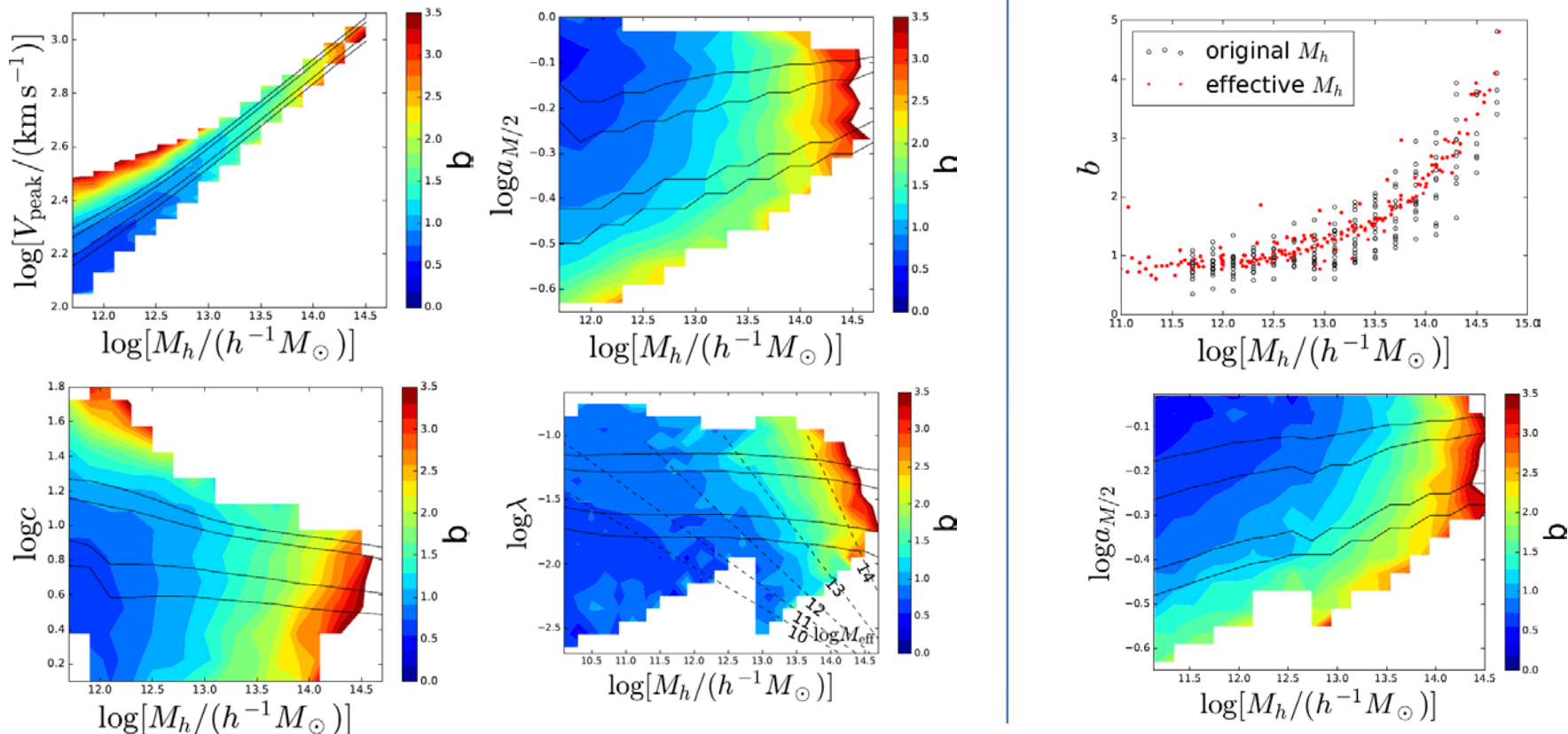
University of Utah

N-body simulation -> halo clustering, halo assembly bias

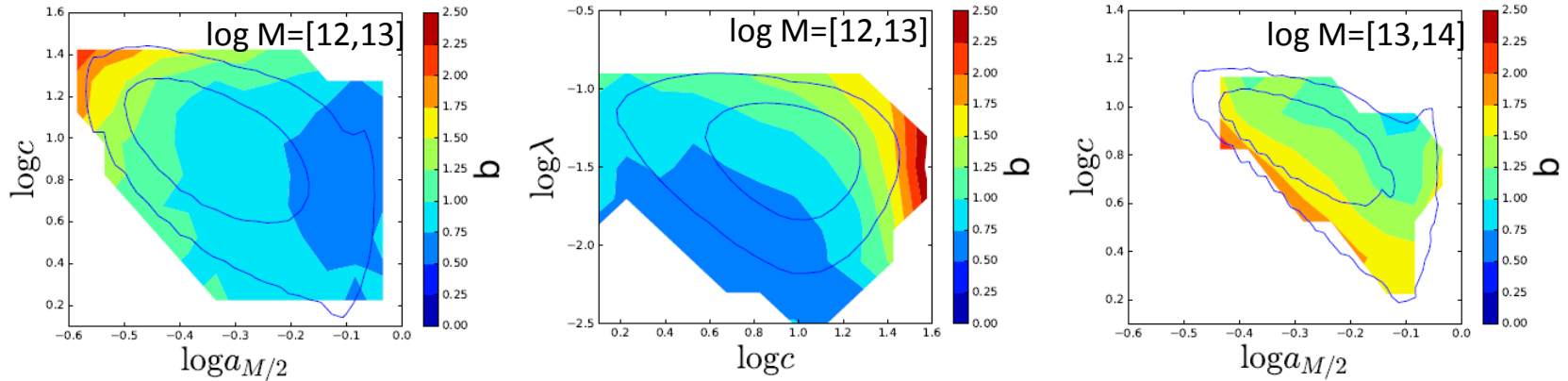
HOD/CLF: link galaxy to dark matter halo, but only depend on halo mass.

galaxy survey -> galaxy clustering, galaxy assembly bias?

a new halo variable to absorb assembly effect?



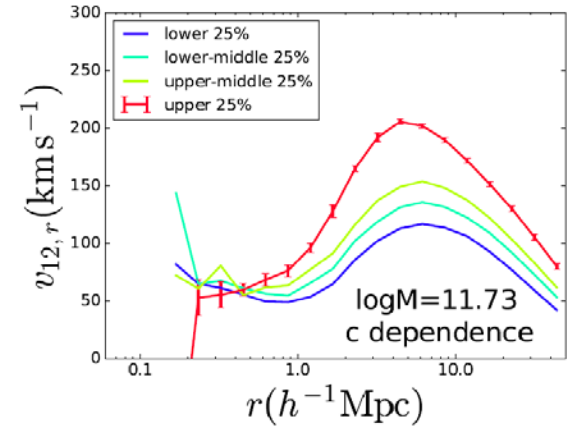
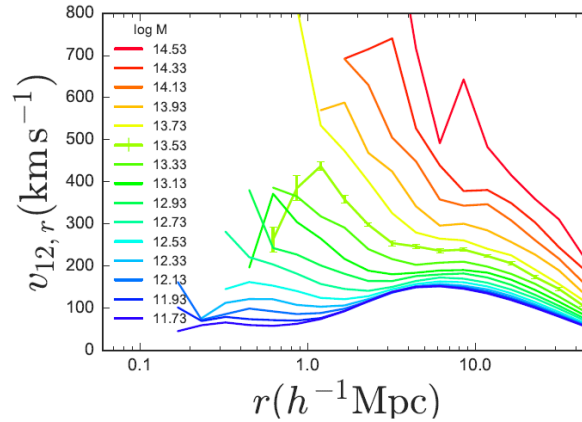
# Halo bias as function of two assembly variable



can not always infer  $b$  dependence of one variable based on  $b$  dependence of another variable and correlation between these two variables.

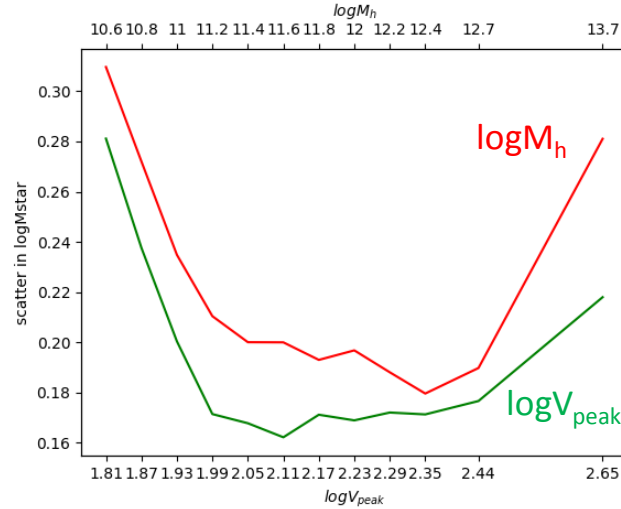
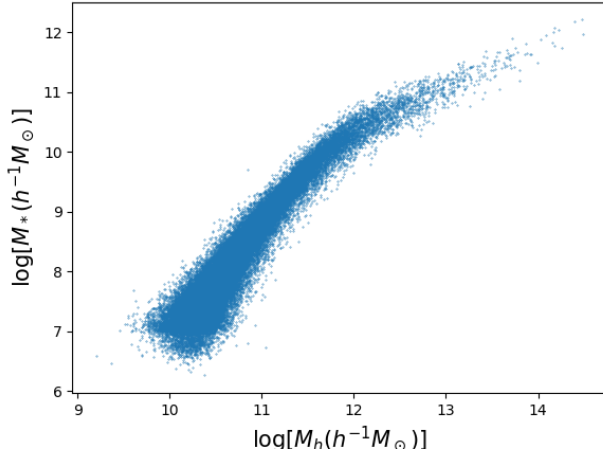
# Assembly effect in halo kinematics

$$v_{12,r} = \frac{-(\vec{v}_2 - \vec{v}_1) \cdot (\vec{r}_2 - \vec{r}_1)}{|\vec{r}_2 - \vec{r}_1|}$$



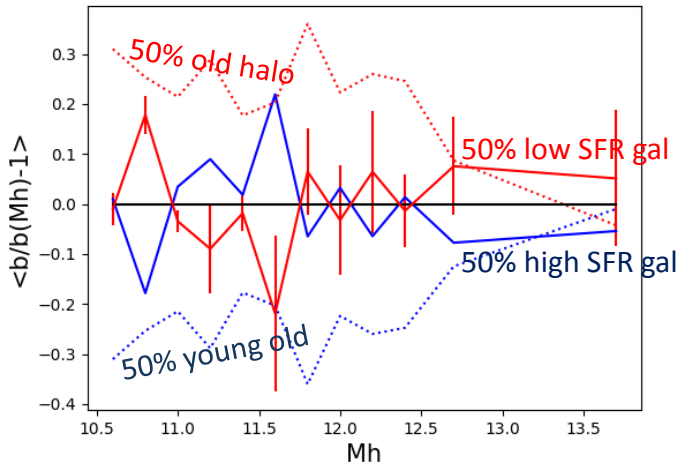
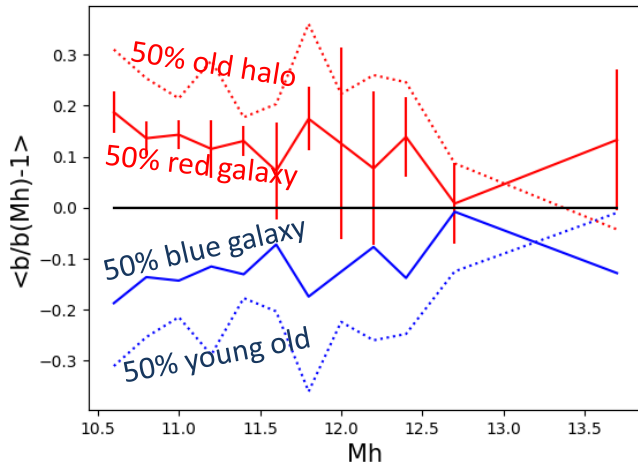
halos with higher bias also have higher pairwise velocity and dispersion.

## (central) Galaxy-halo relation



galaxy stellar mass  
correlates more with  
 $V_{\text{peak}}$  of halo

## (central) Galaxy assembly bias



$b/b(M) - 1$  of galaxy  $\approx$   
 $\rho^* (b/b(M) - 1$  of halo)