

UKIDSS – SDSS アーカイブデータで探る $z=1$ 以来の大質量銀河進化

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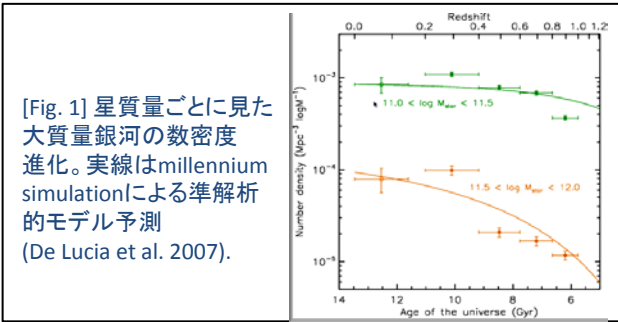
われわれは UKIDSS Large Area Survey と SDSS-II Supernova Survey のアーカイブデータを用いて、約 55 deg^2 の視野に渡る大質量 (星質量 $M_{\text{star}} > 10^{11} M_{\text{sun}}$) 銀河 $\sim 60,000$ 天体のサンプルを構築し、その $z = 1$ 以来の形成と進化を探る研究を行っている。本ポスターではこれまでに得られた結果のうち、クラスタリング測定から示唆されるホストダークハローの性質と進化について紹介する。

1. 銀河サンプル

- detected on the UKIDSS LAS⁽²⁾ near-IR images
+ originally-stacked SDSS-II SS⁽¹⁾ images
- K-band selected ($K < 17.9 \text{ mag}$)
ugriz photometry from the SDSS II SS
YJHK photometry from the UKIDSS LAS
- photo-z accuracy $\sigma_{z/(1+z)} \sim 0.04$
- stellar-mass accuracy $\sigma_{\log M_{\text{star}}} \sim 0.2$
- The present sample is nearly complete to $z=1$

Classification (symbols in Figs. 1, 3)

- (1) “massive” (green diamonds): $M_{\text{star}} = 10^{11.0-11.5} M_{\text{sun}}$
- (2) “very massive” (orange diamonds): $M_{\text{star}} = 10^{11.5-12.0} M_{\text{sun}}$
- (3) “blue” (blue diamonds):
 $M_{\text{star}} = 10^{11.0-12.0} M_{\text{sun}}$, rest-frame U-V < 1
- (4) “red” (red diamonds):
 $M_{\text{star}} = 10^{11.0-12.0} M_{\text{sun}}$, rest-frame U-V > 1



2. Halo Occupation Distributionモデル

質量 M のダークマターハロー中に存在する (観測で select された) 銀河の数予測

- central galaxies:

$$N_{\text{cen}}(M) = 0.5 \left[1 + \text{erf} \left(\frac{\log(M/M_{\text{cut}})}{\sigma_{\text{cut}}} \right) \right]$$

- satellite galaxies:

$$N_{\text{sat}}(M) = \left(\frac{M}{M_0} \right)^\beta$$

where M_{cut} , M_0 , and β are free parameters, whose values are adjusted in such a way that the HOD models reproduce the observed number densities (n_{gal}) and angular correlation functions (ACFs) of galaxies.

暗黒物質分布に対する主な仮定:

- halo mass function from Jenkins et al. (2001) model
- dark-matter halo density profile of NFW (1997)
- concentration parameter of Bullock et al. (2001)
- bias function of Sheth, Mo, & Tormen (2001)

Note (1) Sloan Digital Sky Survey II Supernova Survey
(2) UKIRT Infrared Deep Sky Survey Large Area Survey

References

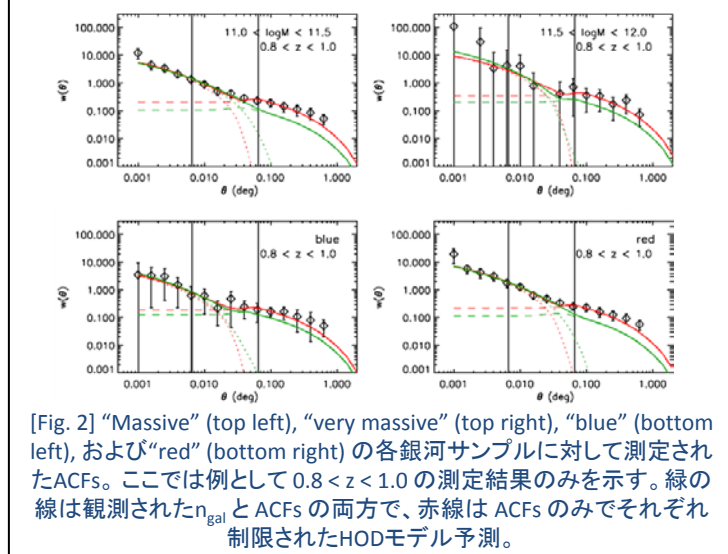
- Bullock et al., 2001, MNRAS, 321, 559
- De Lucia et al., 2007, MNRAS, 375, 2
- Jenkins et al., 2001, MNRAS, 321, 372
- Landy & Szalay, 1993, ApJ, 412, 64
- Navarro et al., 1997, ApJ, 490, 493 (NFW)
- Sheth, Mo, & Tormen, 2001, MNRAS, 323, 1

For further discussion and details, see:

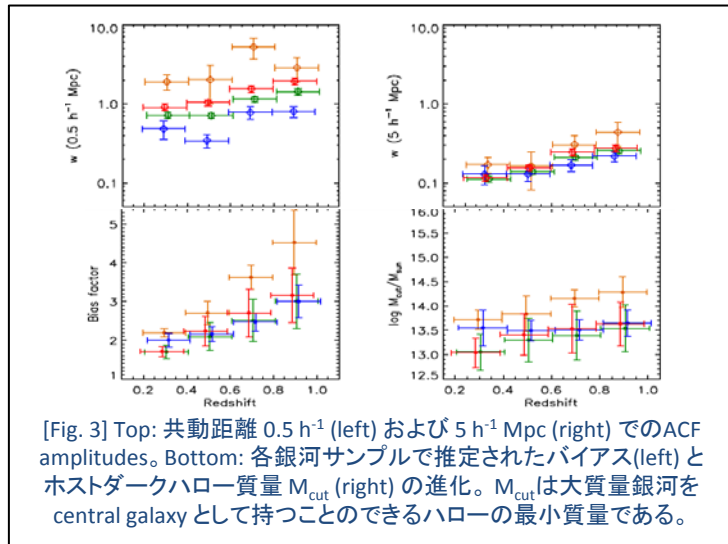
Matsuoka & Kawara, 2010, MNRAS, 405, 100
Matsuoka et al., 2010, MNRAS, in press
(arXiv:1008.0516)

3. Angular Correlation Function (ACF)

The ACFs of the observed galaxies are quantified with the Landy & Szalay (1993) estimator.



4. 結果と議論



観測された ACFs の HOD モデルによる解釈から得られた、ホストダークハローの性質と進化に関する示唆:

- (1) More mature (more massive or redder) galaxies are more clustered, which implies that the more mature galaxies have started stellar-mass assembly earlier within the highly-biased region.
- (2) The estimated bias factors and host halo masses are systematically larger for more massive stellar systems. The effective halo masses are $\sim 10^{14} M_{\text{sun}}$, which gives the stellar-mass to halo-mass ratios of ~ 0.003 regardless of the galaxy stellar mass.
- (3) The observed evolution of bias factors indicates rapid evolution of dark-matter spatial distributions relative to those traced by the massive galaxies, while the transition of host halo masses might imply that the fractional mass growth rate of halos is less than those of stellar systems.
- (4) The inferred halo masses and high fractions of central galaxies indicate that the massive galaxies in the current sample are possibly equivalent to central galaxies of galaxy clusters.