X36a Galaxy-Dark Matter Halo Connection at z=0-7 Revealed by the Subaru/Hyper Suprime-Cam and Hubble Surveys

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We present clustering analysis results from 342,395 Lyman break galaxies (LBGs) at $z \sim 4-7$, identified in the Subaru/HSC and Hubble legacy surveys. Measured angular correlation functions show a clear dependence on the UV magnitude ($M_{\rm UV}$) in a wide $M_{\rm UV}$ range ($-22 < M_{\rm UV} < -18$) at $z \sim 4-7$, with significant 1 halo terms. We fit the ACFs using halo occupation distribution models that provide an estimate of halo masses, $M_{\rm h} \sim (1-40) \times 10^{11}\ M_\odot$. We calculate stellar-to-halo mass ratios (SHMRs) of LBGs, and investigate their dependence on the halo mass and redshift. The SHMR tentatively has a peak at $M_{\rm h} \sim 10^{12}\ M_\odot$ at $z \sim 4$, which implies inefficient gas cooling and/or AGN feedback at the high mass ($M_h > 10^{12} M_\odot$) halos. By comparison with the $z \sim 0$ SHMR, we identify evolution of the SHMR from $z \sim 0$ to $z \sim 4$, and $z \sim 4$ to $z \sim 7$ at the $> 98\%$ confidence levels. The SHMR decreases by a factor of ~ 2 from $z \sim 0$ to 4, and increases by a factor of ~ 4 from $z \sim 4$ to 7 at $M_{\rm h} \sim 10^{11}\ M_\odot$. We compare our SHMRs with results of a hydrodynamic simulation and a semi-analytic model, and find that these theoretical studies do not predict the SHMR increase at $z \sim 4-7$.