

ABSTRACT

We use *Hubble Space Telescope* imaging to study the structural properties of ten of the most massive ($M \geq 10^{11.25} M_{\odot}$) quiescent galaxies (QGs) in the UKIDSS UDS at $2.5 < z < 3.0$. The low spatial density of these galaxies required targeted WFC3 H_{160} imaging, as such systems are rare in existing surveys like CANDELS. We fit Sérsic models to the 2D light profiles and find that the median half-light radius is $R_e \sim 3$ kpc, a factor of ~ 3 smaller than QGs with similar masses at $z \sim 0$. Complementing our sample with similarly massive QGs at lower redshifts, we find that the median size evolves as $R_e \propto H(z)^{-0.85 \pm 0.12}$ (or alternatively, $R_e \propto (1+z)^{-0.90 \pm 0.12}$). This rate of evolution is slower than that for lower mass QGs. When compared to low redshift QGs, the axis ratio distribution for our high redshift massive QG sample is most consistent with those in which spheroids are dominant. These observations point to earlier size growth among massive QGs that also resulted in spheroidal systems. Finally, we measured residual-corrected surface brightness profiles for our sample. These show that the Sérsic parameterization is generally representative out to several effective radii and does not miss excess low surface brightness light. The sizes inferred from the light profiles therefore confirm the compactness of these most massive high redshift QGs.

- HST/WFC3 により $2.5 < z < 3.0$ の大質量 QGs の structural properties 調査
- 半光度半径は近傍同質量 QGs の 1/3 程度で、赤方偏移進化は低質量 QGs よりもゆるやか
- spheroidal な形状をもつものがほとんど
- 大質量 QGs はより早い時代に dry minor merger により進化した可能性あり

Introduction

- 遠方の QGs は近傍のものに比べてコンパクト (半光度半径が小さい)
- サイズの赤方偏移進化の主な要因として、minor merger による外縁部での星質量獲得が考えられている
- 近傍では spheroidal、遠方では disk 的な形状を持つものが多い
- 遠方大質量 QGs はサンプルが少ない

Data&Analysis

- UKIDSS UDS catalog (DR8) から 10 個の Quiescent Galaxies
 - $2.5 < z < 3.0$ (median $z \sim 2.6$)
 - $M \geq 10^{11.25} M_{\odot}$ (median $M \sim 10^{11.28} M_{\odot}$)
- 上記 10 天体について HST/WFC3 H_{160} imaging data を取得 + vdW14 の 2 天体
- GALFIT による Sérsic model fitting で structural properties を算出
 - Half-light radius (R_e)
 - Sérsic index (n)
 - Axis ratio (q)

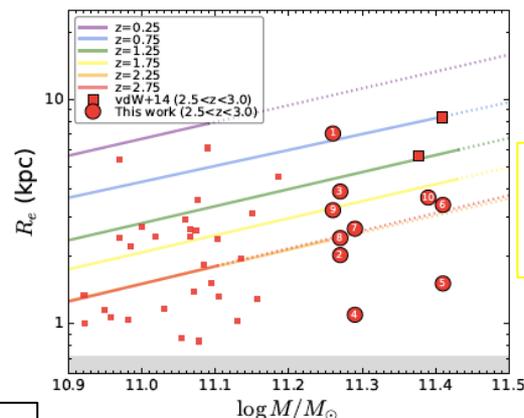


Fig. 6

各赤方偏移での size-mass relation

低質量側の size-mass relation を外挿したものよりも R_e が大きい (median で $\sim 30\%$)

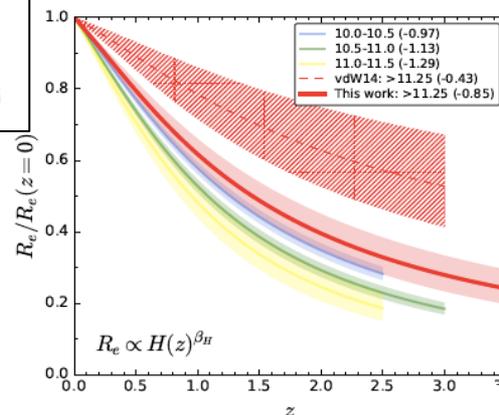


Fig. 8

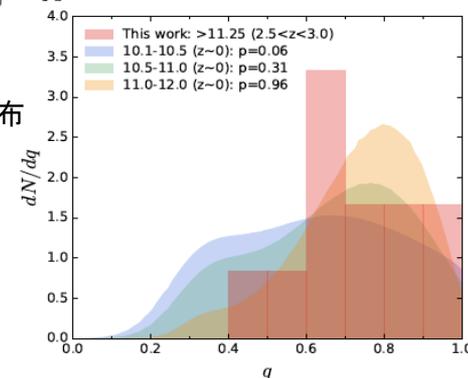
近傍 QGs との R_e 比の赤方偏移進化

低質量 QGs よりも緩やかな進化 (より high-z でサイズ成長?)

Fig. 9

軸比の分布

11/12 で q は 0.5 以上
→ spheroid dominated (平均 $q = 0.74$)



サイズ成長の主因が dry minor merger だとすれば、高密度環境の大質量 QGs はより high-z で merger を多く経験し成長したと考えることが可能