Galaxy-galaxy lensing constraints on the relation between baryons and dark matter in galaxies in the Red Sequence Cluster Survey 2

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(Submitted on 20 Jul 2011)

We present the results of a study of weak gravitational lensing by galaxies using imaging data that were obtained as part of the second Red Sequence Cluster Survey (RCS2). In order to compare to the baryonic properties of the lenses we focus here on the ~300 square degrees that overlap with the DR7 of the SDSS. The depth and image quality of the RCS2 enables us to significantly improve upon earlier work for luminous galaxies at z>=0.3. Comparison with dynamical masses from the SDSS shows a good correlation with the lensing mass for early-type galaxies. For low luminosity (stellar mass) early-type galaxies we find a satellite fraction of ~40% which rapidly decreases to <10% with increasing luminosity (stellar mass). The satellite fraction of the late-types has a value in the range 0-15%. We find that early-types in the range 10^10<L_r<10^11.5 Lsun have virial masses that are about five times higher than those of late-type galaxies and that the mass scales as M_200 \propto L^2.34 +0.09 \ -0.16. We also measure the virial mass-to-light ratio, and find for L_200<10^11 Lsun a value of M_200/L_200=42+-10 for early-types, which increases for higher luminosities to values that are consistent with those observed for groups and clusters of galaxies. For late-type galaxies we find a lower value of M_200/L_200=17+-9. Our measurements also show that early- and late-type galaxies have comparable halo masses for stellar masses M_*<10^11 Msun, whereas the virial masses of early-type galaxies are higher for higher stellar masses. Finally, we determine the efficiency with which baryons have been converted into stars. Our results for early-type galaxies suggest a variation in efficiency with a minimum of ~10% for a stellar mass M_*,200=10^12 Msun. The results for the late-type galaxies are not well constrained, but do suggest a larger value. (abridged)

Comments: 25 pages, 24 figures. Resubmitted to A&A
Subjects: **Cosmology and Extragalactic Astrophysics (astro-ph.CO)**
Cite as: **arXiv:1107.4093 [astro-ph.CO]**

Submission history

From: Edo Van Uitert [view email]

[v1] Wed, 20 Jul 2011 20:00:01 GMT (289kb)