then the galaxy will redden and its baryonic and stellar mass fractions will be smaller than those of the galaxies that were able to keep their gas reservoir (the majority), in agreement with our inferences here (Figure 5).

## 5. SUMMARY AND CONCLUSIONS

By means of the AM technique and using the central blue and red *GSMF*s, constructed from the local SDSS sample by YMB09, we have inferred the local $M_{\rm s}$–$M_{\rm h}$ (or $f_{\rm s}$–$M_{\rm h}$) relations for *central* galaxies and for the sub-samples of blue and red galaxies. To derive the relations for the sample of blue galaxies, (i) the mass function of observed groups/clusters of galaxies is subtracted from the distinct (S-T) *HMF* (blue, late-type galaxies are not observed in the centers of groups and clusters), and (ii) halos that suffered a major merger since $z = 0.8$ are excluded. For red galaxies, the *HMF* is assumed to be the complement of the "blue" one, with respect to the overall (distinct) *HMF*. We consider as sources of uncertainty in our analysis only the systematical error in assigning stellar masses to galaxies (0.25 dex) and the intrinsic statistical scatter in stellar mass at a fixed halo mass (0.16 dex). By using the observational $M_{\rm g}$–$M_{\rm s}$ relation and its scatter, we transited from $M_{\rm s}$ to $M_{\rm b}$ ($= M_{\rm s} + M_{\rm g}$) in the *GSMF* and estimated the overall blue and red *GBMF*s, which were used to obtain the corresponding baryonic $M_{\rm b}$–$M_{\rm h}$ (or $f_{\rm b}$–$M_{\rm h}$) relations using the AM technique.

The $M_{\rm s}$–$M_{\rm h}$ relation obtained here agrees rather well with previous studies (see Figure 4). The small differences found in this work can be explained mainly in terms of the different *GSMF*s used in each study, and to a lesser extent by variations in the methodology. The $1\sigma$ uncertainty in the obtained $M_{\rm s}$–$M_{\rm h}$ relation is $\approx 0.25$ dex in log $M_{\rm s}$. The $M_{\rm s}$–$M_{\rm h}$ relation of central galaxies lies below (lower $M_{\rm s}$ for a given $M_{\rm h}$) the overall one by a factor $\sim 1.6$ at $M_{\rm h} = 10^{11}\ M_\odot$ and by less than 5% for $M_{\rm h} > 10^{13}\ M_\odot$.

Our main result refers to the calculation of the *central* $M_{\rm s}$–$M_{\rm h}$ and $M_{\rm b}$–$M_{\rm h}$ relations for the two broad populations into which the galaxy sample can be divided: blue (late-type) and red (early-type) galaxies. We highlight the following results from our analysis:

• At $M_{\rm h} \gtrsim 10^{11.3}\ M_\odot$ the mean stellar mass fraction $f_{\rm s}$ of blue galaxies is smaller than that of red galaxies, the maximum difference being attained at $M_{\rm h} \approx 10^{11.7}\ M_\odot$; at this mass, the $f_{\rm s}$ of red galaxies is 1.7 times that of blue galaxies (see Figure 5). At larger masses, the difference decreases until it disappears. At $M_{\rm h} \lesssim 10^{11.3}\ M_\odot$ the trend is reversed as blue galaxies tend to have higher values of $f_{\rm s}$ than red ones. In the case of the baryonic mass fractions, $f_{\rm b}$, the same trends of the stellar relations remain but at $M_{\rm h} \gtrsim 10^{11.3}\ M_\odot$ the difference in $f_{\rm b}$ between blue and red galaxies is small, while for smaller masses, the difference increases.

• The $M_{\rm s}$–$M_{\rm h}$ and $M_{\rm b}$–$M_{\rm h}$ (or $f_{\rm s}$–$M_{\rm h}$ and $f_{\rm b}$–$M_{\rm h}$) relations of central blue and red sub-samples do not differ significantly from the respective relations of the overall central sample, and these differences are within the $1\sigma$ uncertainty of the inferences (Figure 5). For blue (red) galaxies, the maximum value of $f_{\rm s}$ is $0.021^{+0.016}_{-0.009}$ ($0.034^{+0.026}_{-0.015}$) and is attained for halos of mass $M_{\rm h} = 10^{11.98}\ M_\odot$ ($M_{\rm h} = 10^{11.87}\ M_\odot$); the corresponding stellar mass is $M_{\rm s} = 10^{10.30\pm0.25}\ M_\odot$ ($M_{\rm s} = 10^{10.40\pm0.25}\ M_\odot$), which is around 0.23 (0.30) times $M^\star$, the Schechter fit characteristic mass of the overall *GSMF* of YMB09. For smaller and larger masses, $f_{\rm s}$ significantly decreases.

• We have compared our results with the few observational inferences of the $M_{\rm s}$–$M_{\rm h}$ relation for blue (late-type) and red (early-type) galaxies that exist in the literature. Although these studies estimate halo masses using direct techniques (weak lensing and galaxy satellite kinematics), they are still limited by the stacking approach they need to apply (due to the low signal-to-noise ratio of individual galaxies) and by the large uncertainties owing to the unknown systematics. The overall differences among the different studies (including ours) amount to factors of up to 2–4 at a given mass (these factors being much smaller at other masses) for most methods (Figure 8). For blue galaxies, all methods agree reasonably well for low masses ($M_{\rm h} \lesssim 3 \times 10^{12}\ M_\odot$), but for higher masses, our inference implies larger halos for a given $M_{\rm s}$ than the results from direct techniques. For red galaxies, at high masses ($M_{\rm h} \gtrsim 3 \times 10^{12}\ M_\odot$), all methods agree reasonably well, but at lower masses, the satellite kinematics technique produces halo masses, for a given $M_{\rm s}$, larger than those obtained by other methods.

• According to our results, for $M_{\rm h} \lesssim 10^{11.3}\ M_\odot$, the intrinsic scatter of the $M_{\rm s}$–$M_{\rm h}$ relation should slightly anti-correlate with galaxy color (for a fixed $M_{\rm h}$, the bluer the galaxy, the higher its $M_{\rm s}$), while for more massive systems, the correlation should be direct (for a fixed $M_{\rm h}$, the redder the galaxy, the higher its $M_{\rm s}$). For massive blue galaxies to have had higher higher $f_{\rm s}$ values than red ones as the results from direct techniques suggest, the *HMF* halos hosting blue (red) galaxies should have been even steeper