YMB09 one (therefore its cosmic variance is more significant). On the other hand, the redshift completeness and M_s limit in YMB09 are treated with updated criteria.

In Figure 1 we also plot fits to the overall *GSMF* presented in Baldry et al. (2008, double Schechter function, solid blue line) and in Li & White (2009, triple Schechter function, dashed green line) for new SDSS releases and by using directly SPS models to estimate M_s for each galaxy. These fits agree well with the YMB09 data in the mass range $9.2 \lesssim \log(M_s/M_\odot) \lesssim 11.2$. For smaller masses, the Baldry et al. (2008) fit tends to be steeper while the Li & White (2009) fit tends to be shallower than the YMB09 data. For larger masses, both fits decrease faster with M_s than the YMB09 data. All these (small) differences are due to the different methods used to estimate M_s, as well as the different volumes and limit corrections of the samples (see Baldry et al. 2008, YMB09, and Li & White 2009 for discussions).

The split into two colors of the sample used by YMB09 is a rough approximation to the two main families of disk- and spheroid-dominated galaxies. It is well known that the morphological type correlates with the galaxy color, though with a large scatter. There is for example a non-negligible fraction of galaxies (mostly highly inclined) that are red but of disk-like type (e.g., Bernardi et al. 2010). However, given that here we consider a partition of the overall sample just in two groups, we believe that it is reasonable to assume as a first approximation that the color criterion for the partition will provide at this level a result similar to that of a morphological criterion.

For the YMB09 sample, the blue and red galaxies are ≈55% and ≈45%, respectively, for $M_s \gtrsim 3 \times 10^8\ M_\odot$. Red galaxies dominate the total *GSMF* at large masses. At $M_s \approx 2 \times 10^{10}\ M_\odot$ the abundances of red and blue galaxies are similar and at lower masses the latter are increasingly more abundant than the former as M_s is smaller. For $M_s \lesssim 10^9\ M_\odot$, the abundance of red galaxies, mainly central ones, steeply increases towards smaller masses. The existence of this peculiar population of faint central red galaxies is discussed in YMB09. Wang et al. (2009) suggested that these galaxies are hosted by small halos that have passed through their massive neighbors, and the same environmental effects that cause satellite galaxies to become red are also responsible for the red colors of such galaxies. However, as these authors showed, even if the environmental effects work, there are in any case over 30% of small halos that are completely isolated, so that these effects cannot be invoked for them.

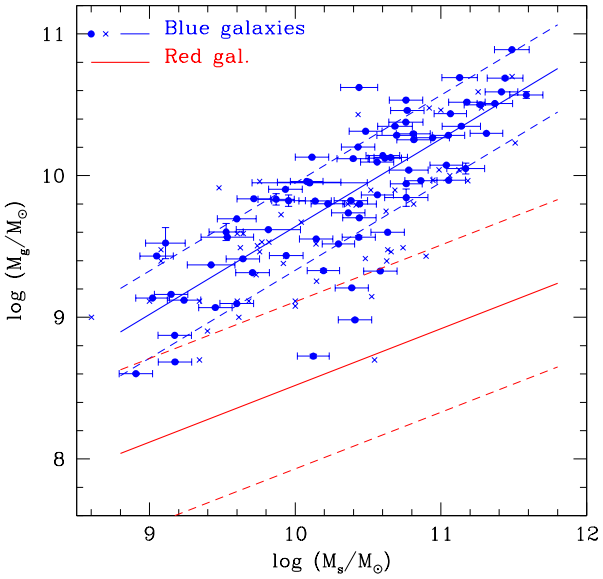

Fig. 2. Gas mass vs stellar mass for a sample of disk high and low surface brightness galaxies collected and homogenised by Avila-Reese et al. (2008, blue dots with error bars) and for a sample of disk galaxies presented by McGaugh (2005, blue crosses). The solid blue line is the orthogonal linear doubly-weighted regression to the data from the former authors and the dashed lines show an estimate of the intrinsic scatter around the fit. The solid red line is an estimate of the M_g–M_s correlation for red galaxies using our fit to blue galaxies and the ratio of blue-to-red atomic gas fraction determined in Wei et al. (2010), see text. The color figure can be viewed online.

In the YMB09 sample, around 70% of the galaxies are central. As mentioned in the § 1, the inference of the M_s–M_h relation for central-only galaxies is important for studies aimed to constrain galaxy formation and evolution in general; satellite galaxies are interesting on its own but they lack generality because their evolution and properties are affected by extra environmental processes.

In what follows, the YMB09 *GSMF* provided in tabular form and split into blue/red and central/satellite galaxies will be used for applying the AMT. Our main goal is to infer the M_s–M_h relation for central blue (late-type) and red (early-type) galaxies.

We will infer also the corresponding M_b–M_h (baryonic) relations. The blue and red *GBMF*s are estimated from the blue and red *GSMF*s, respectively, where in order to pass from M_s to M_b, the cool (atomic and molecular) gas mass, M_g, corre-