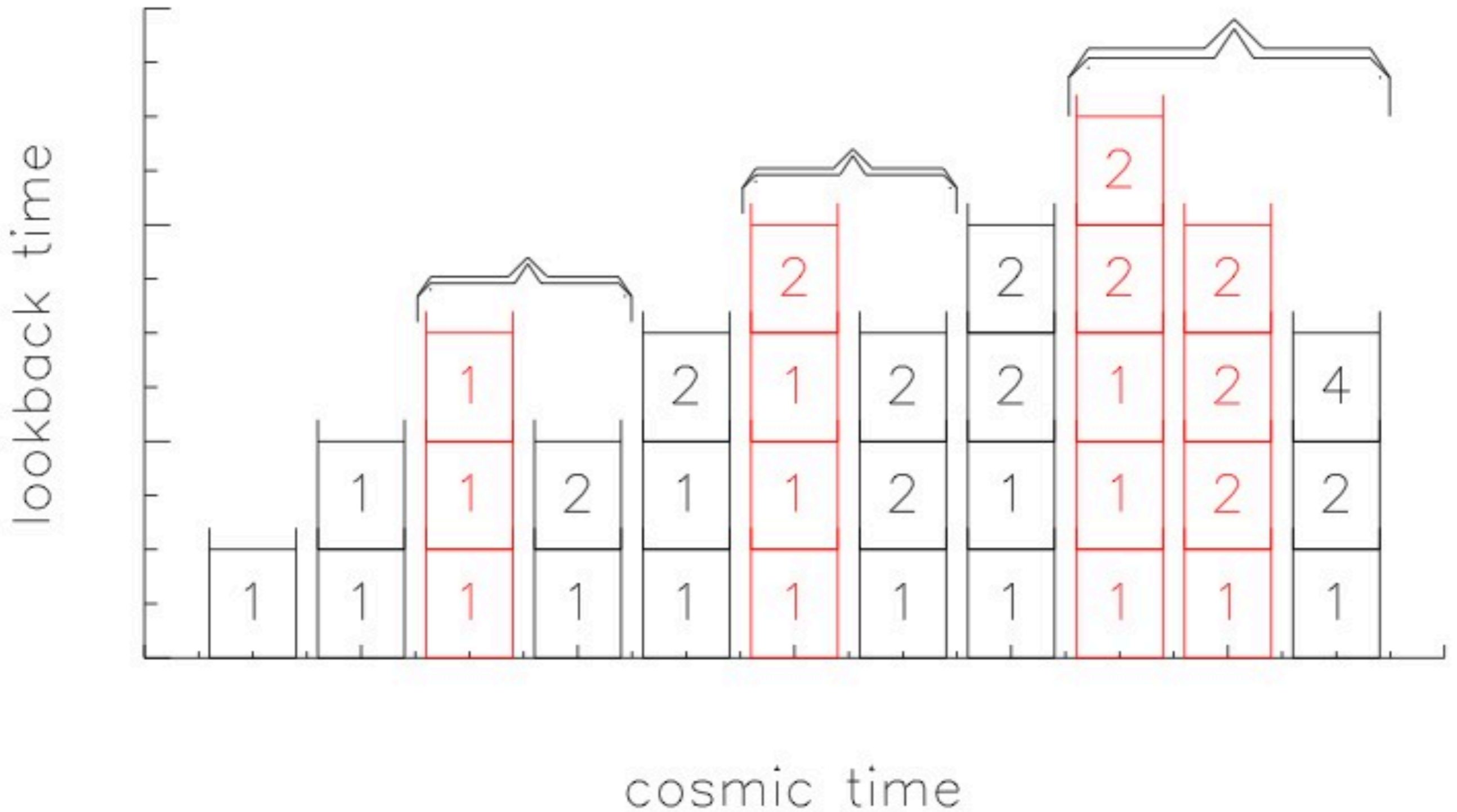# Star-formation histories

Peter Thomas
with
Sorour Shamshiri
and thanks to
Bruno Henriques
Rita Tojiero

Evolution of star-formation history bins
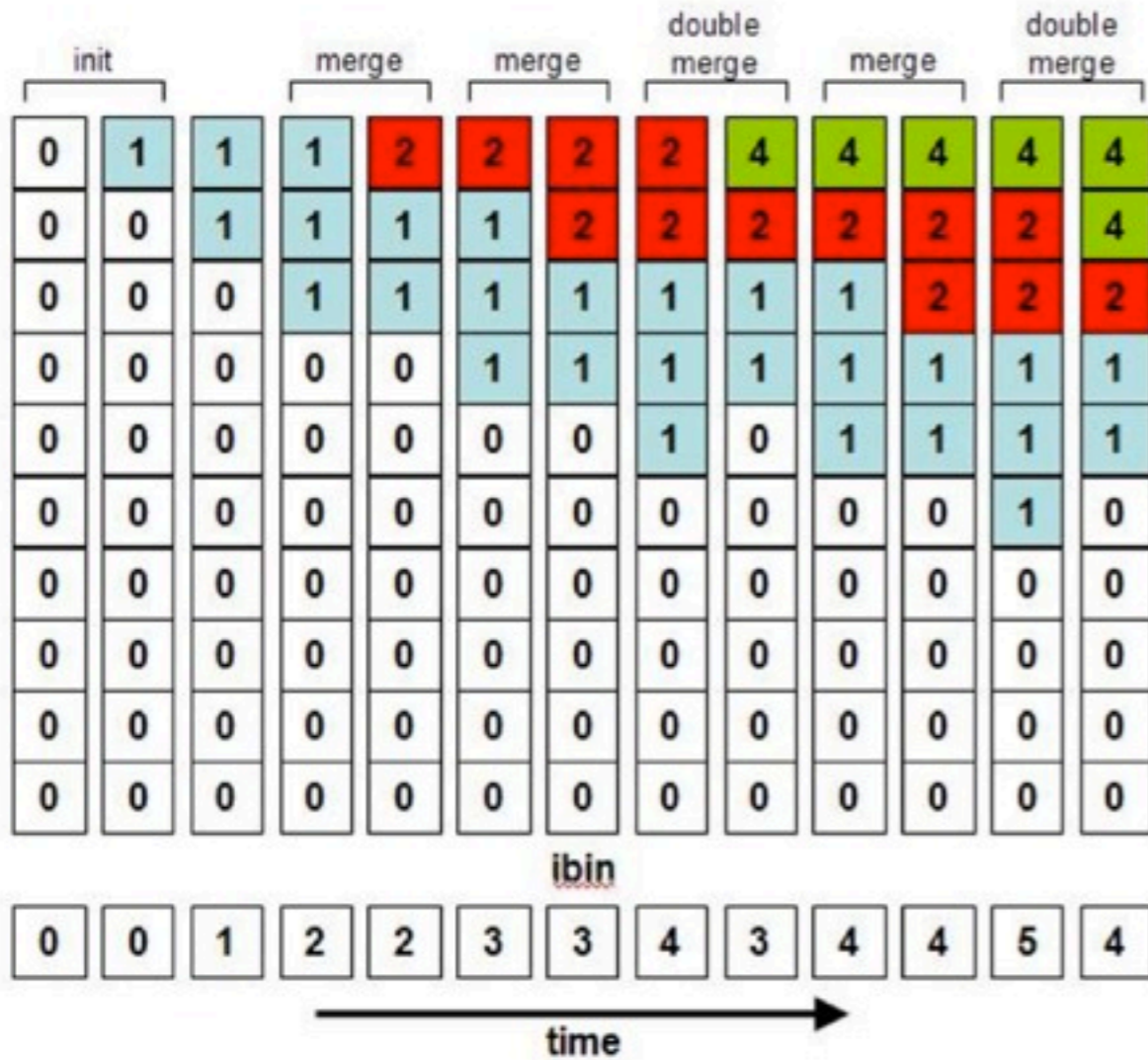
Evolution of star-formation history time-bins

Figure 1: Evolution of the sfh_dt array for a non-merging galaxy. The 'width' of each SFH bin (in units of SFH_TIME_INTERVAL) is given in each element. Coloured elements are 'active'. When three or more active elements have the same width, two of them are merged. With twenty elements, this process will fill the array just after the present day. The value entered into sfh_ibin (the index of the last active bin) is also shown.

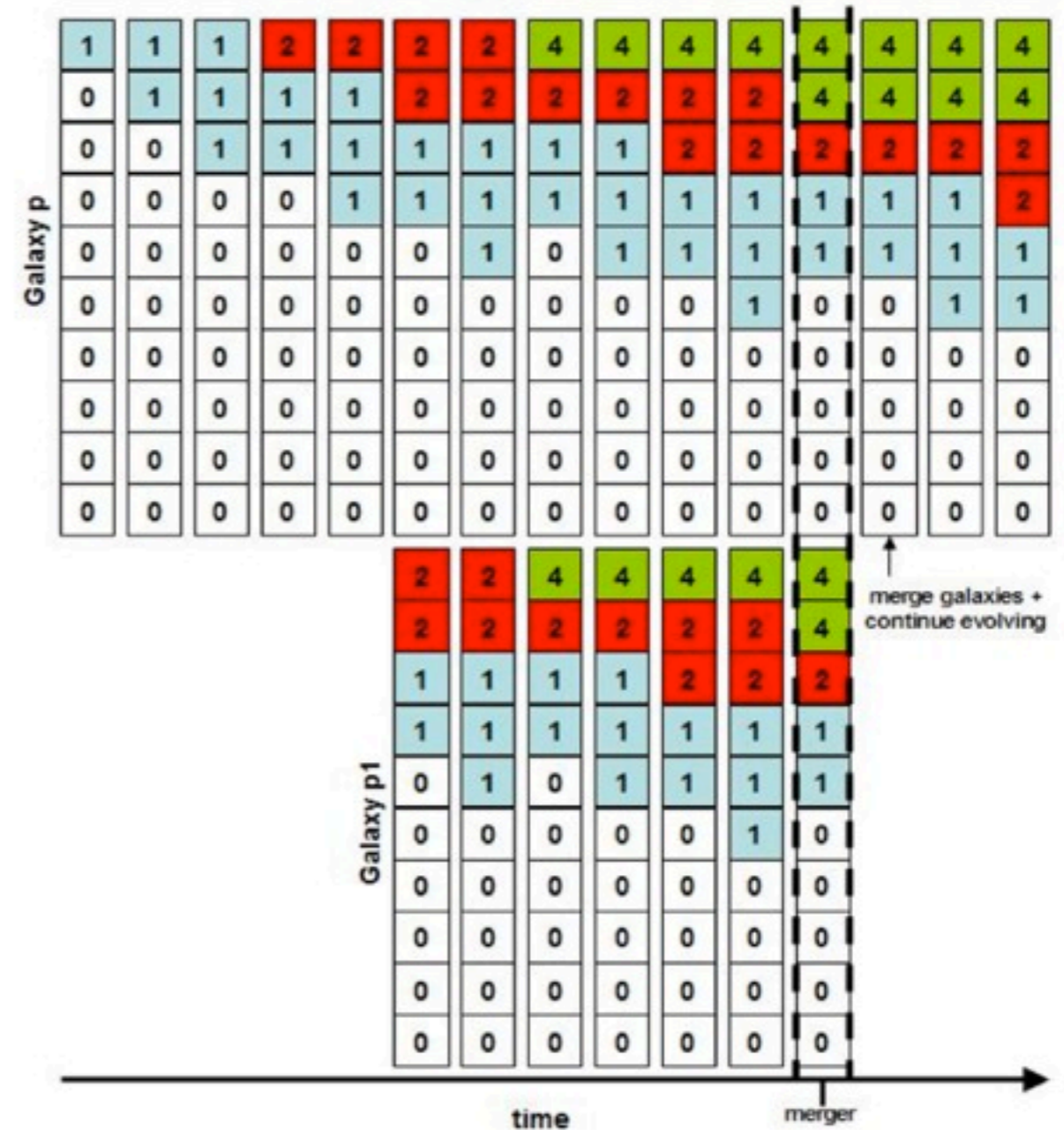Figure 2: Evolution of the sfh_dt[NBIN] array for two merging galaxies. The 'width' of each SFH bin (in units of SFH_TIME_INTERVAL) is given in each element. Coloured elements are 'active'. At the time of merger, the bin structures of the two galaxies are compared. If they're the same (should be, but depends on sfh_age, see §3), the SFH data can be merged together and the 'descendent' further evolved.
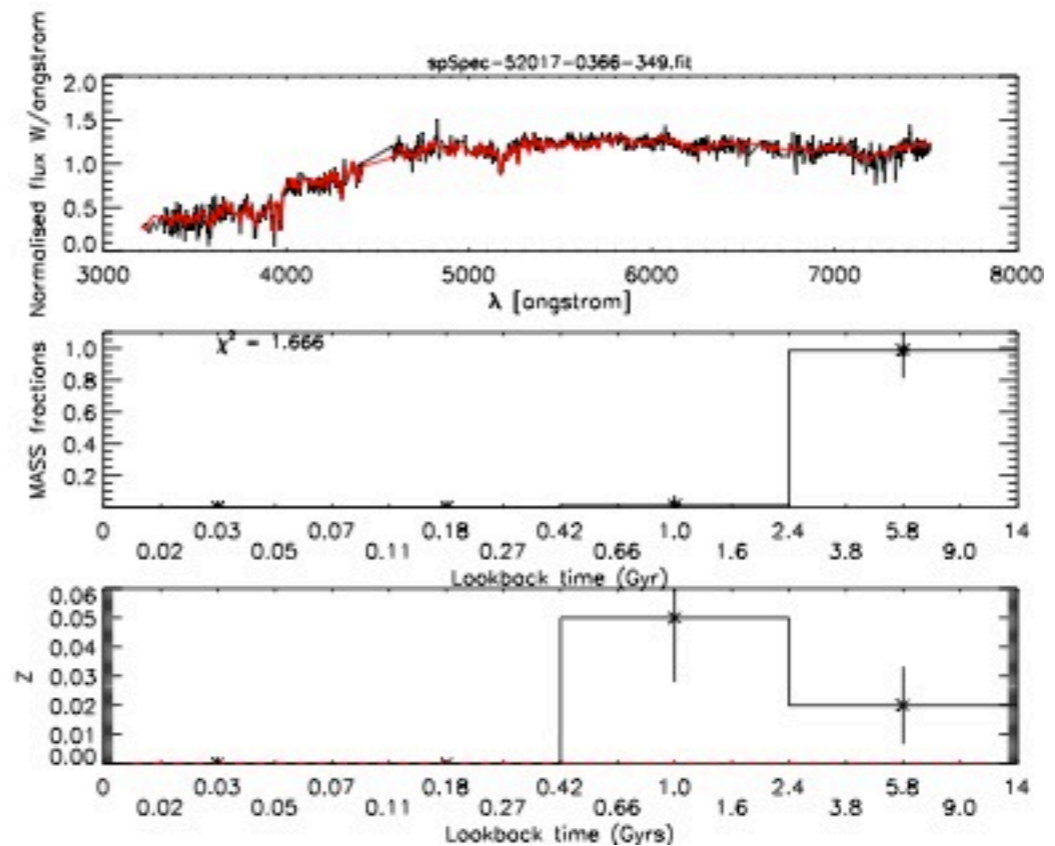
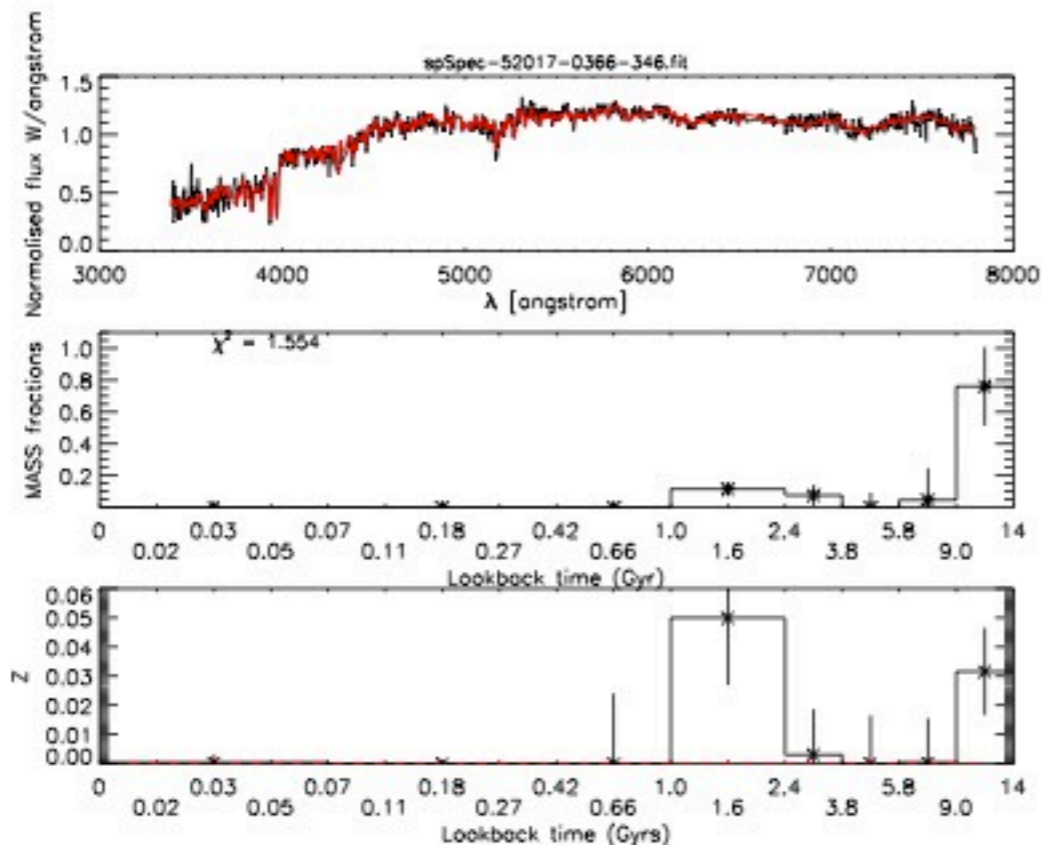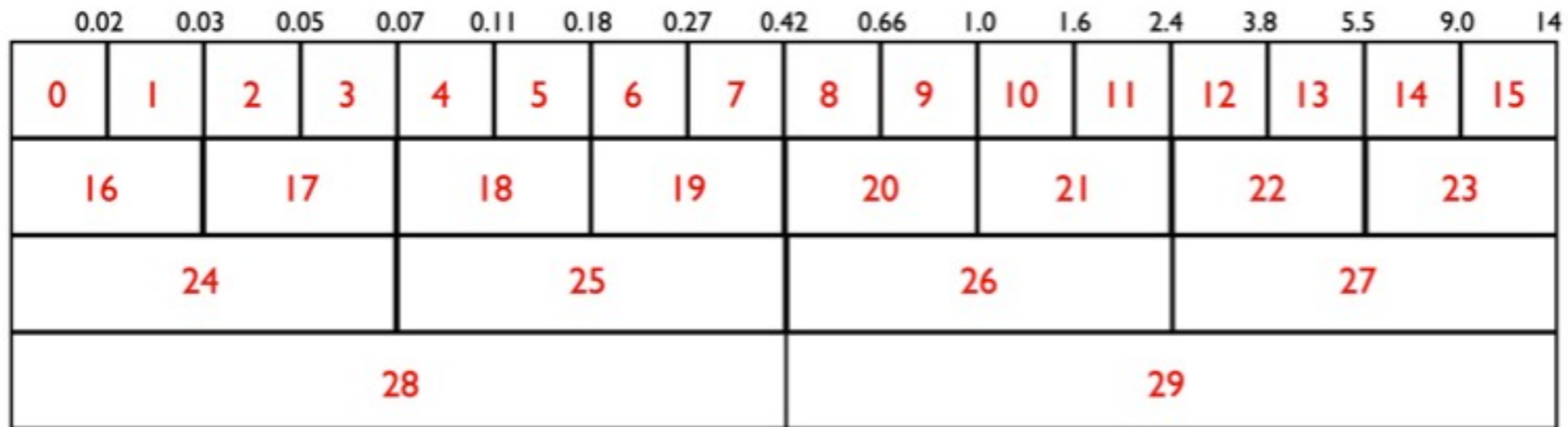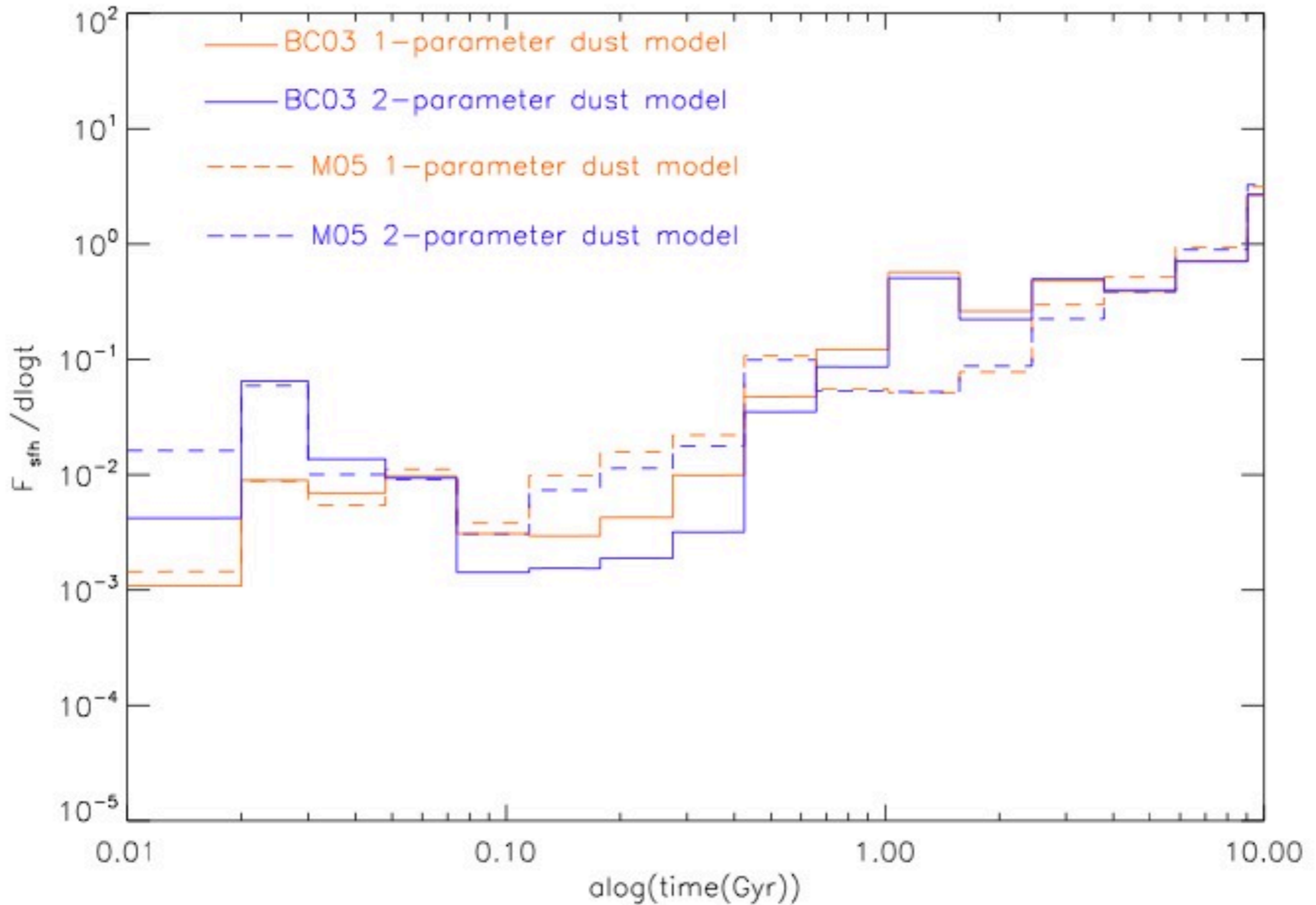# Post-processing magnitudes
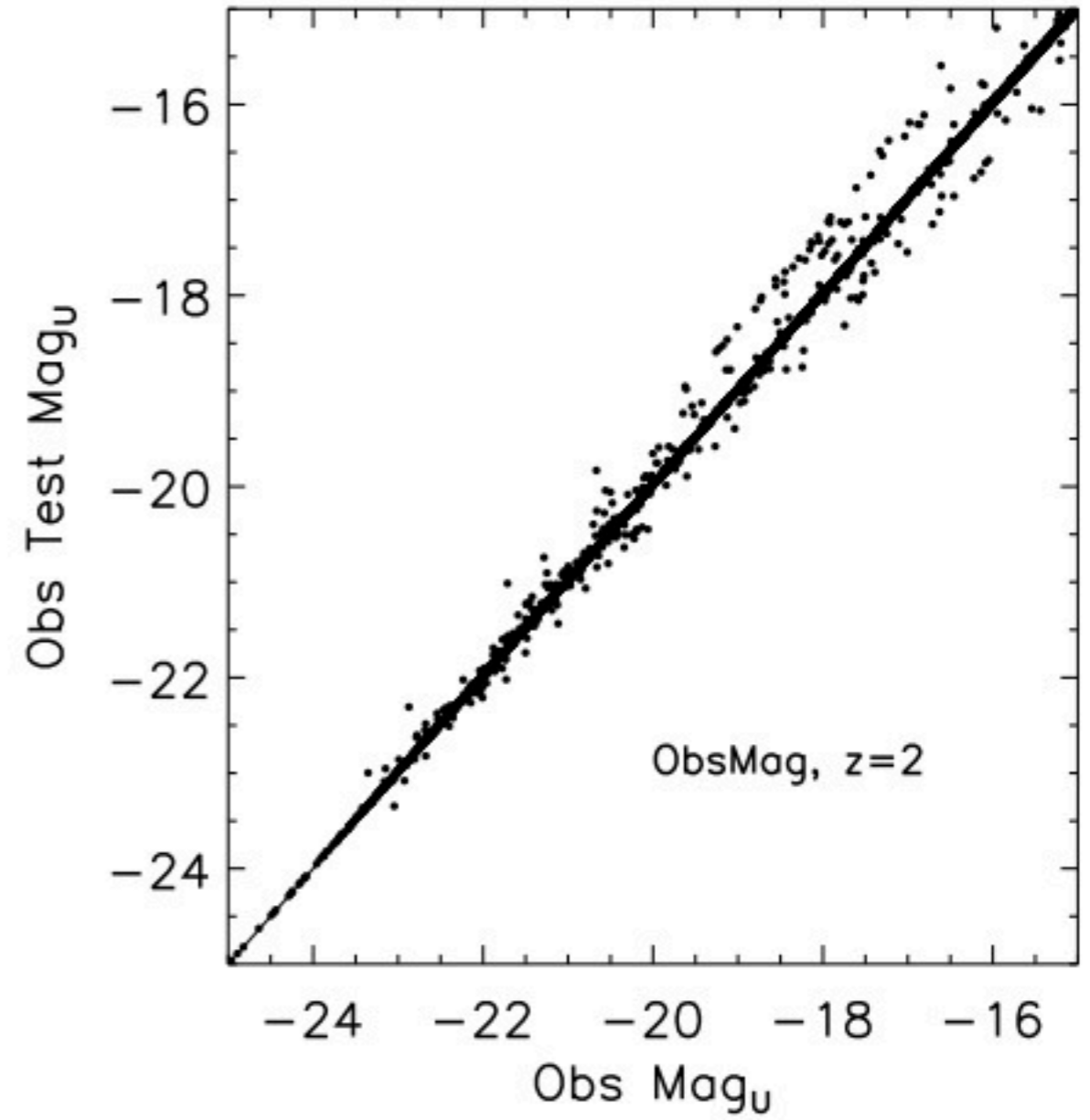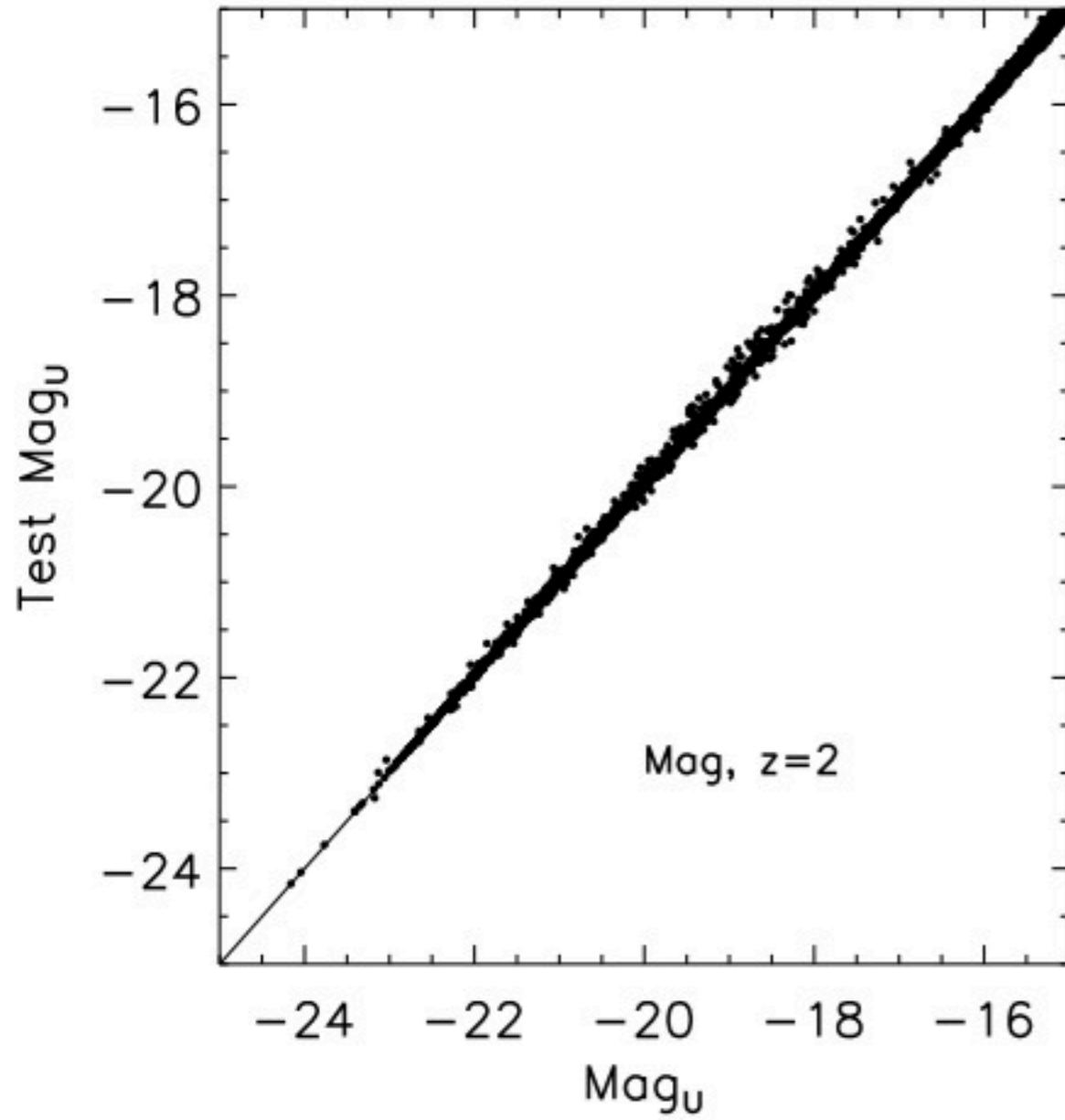
Post-processing luminosities
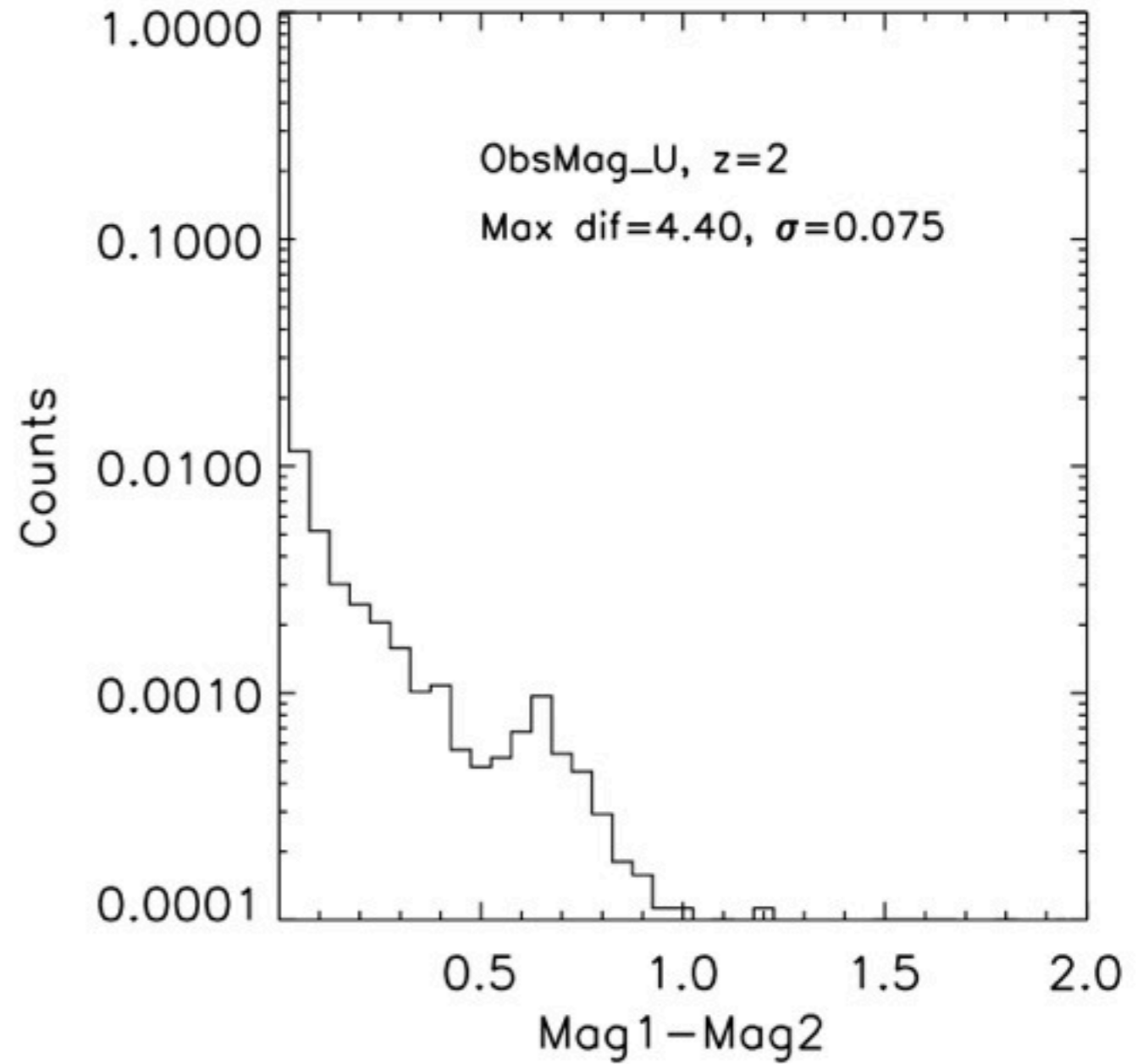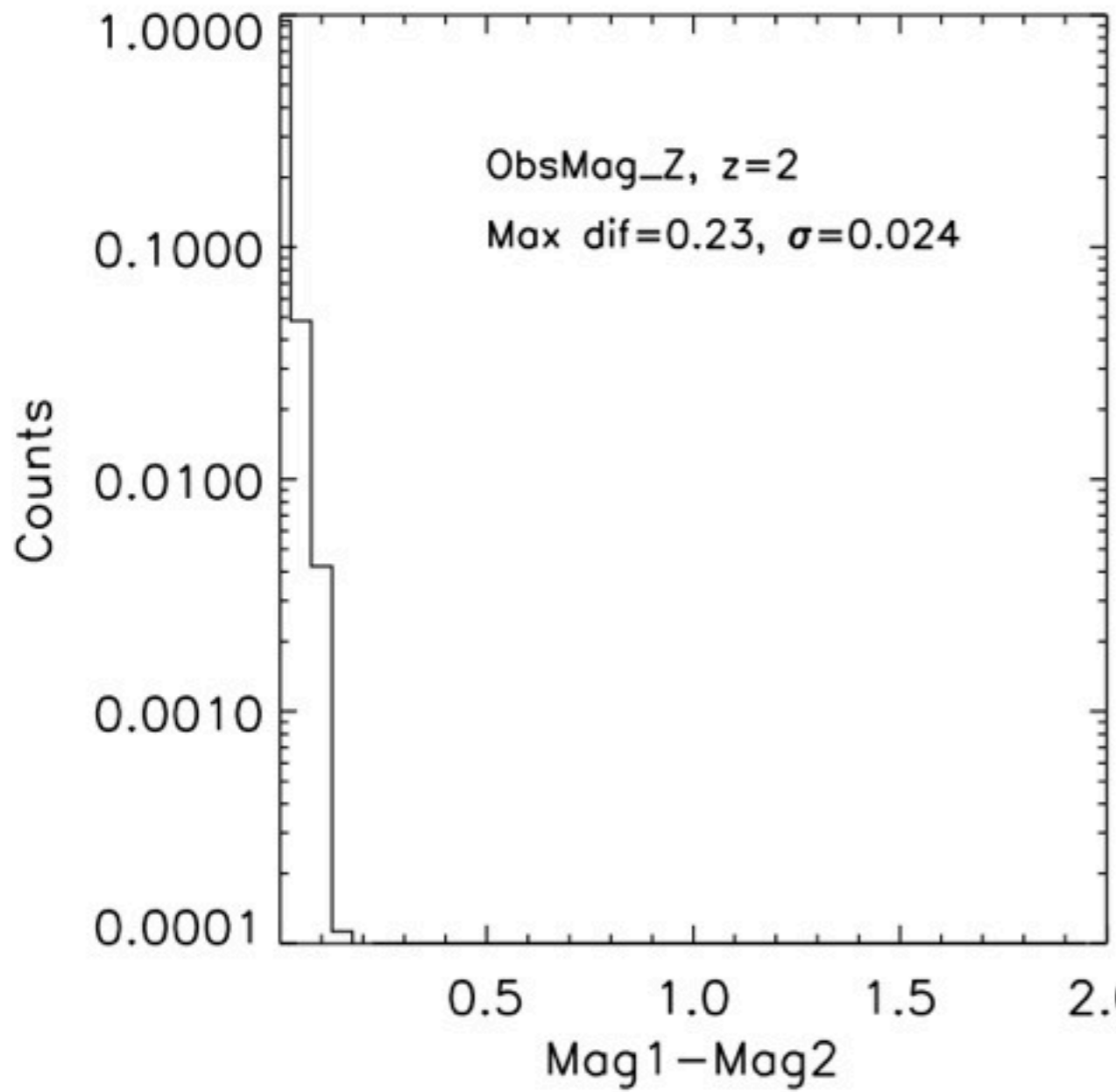
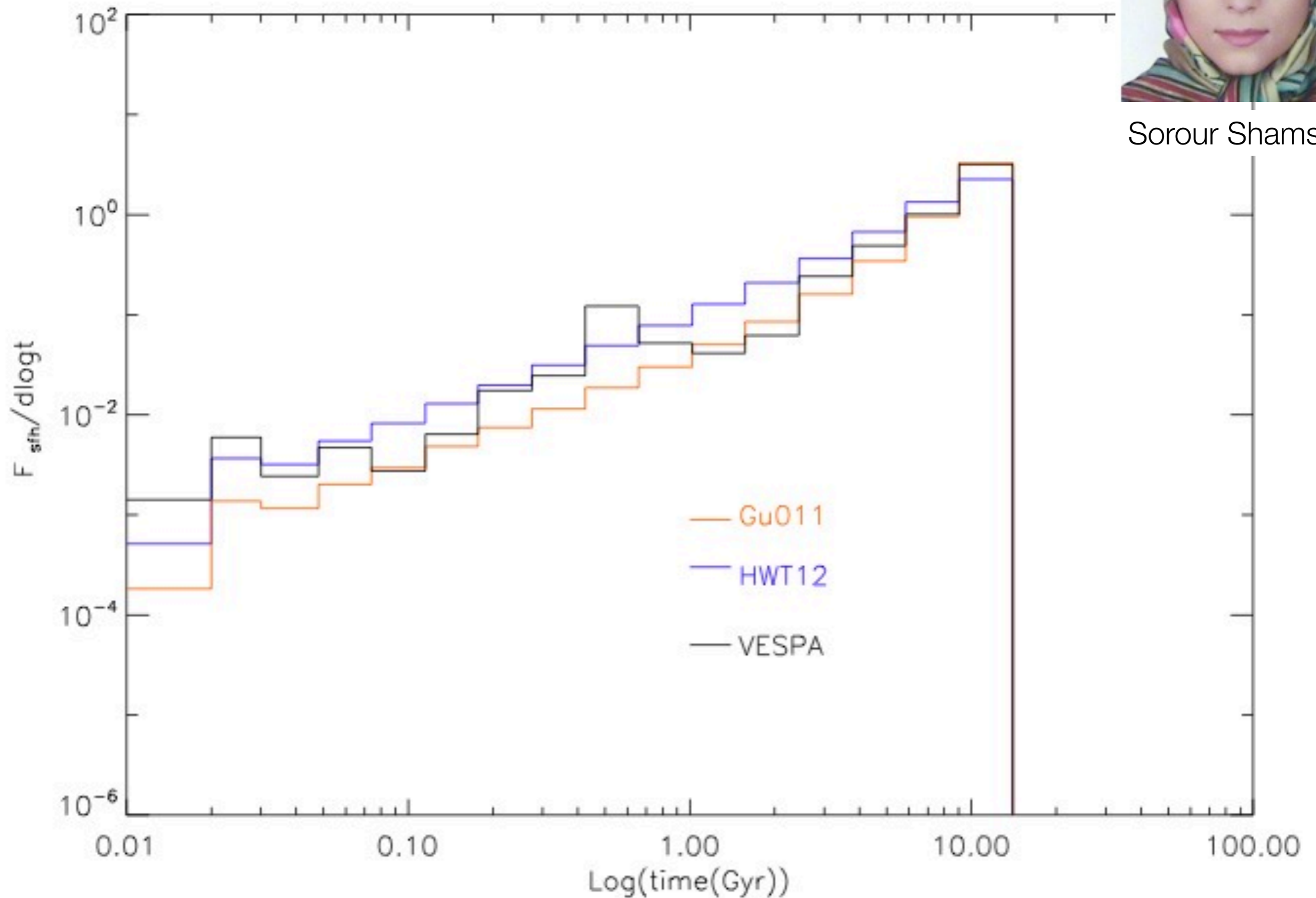# VESPA (Tojeiro etal 2009)

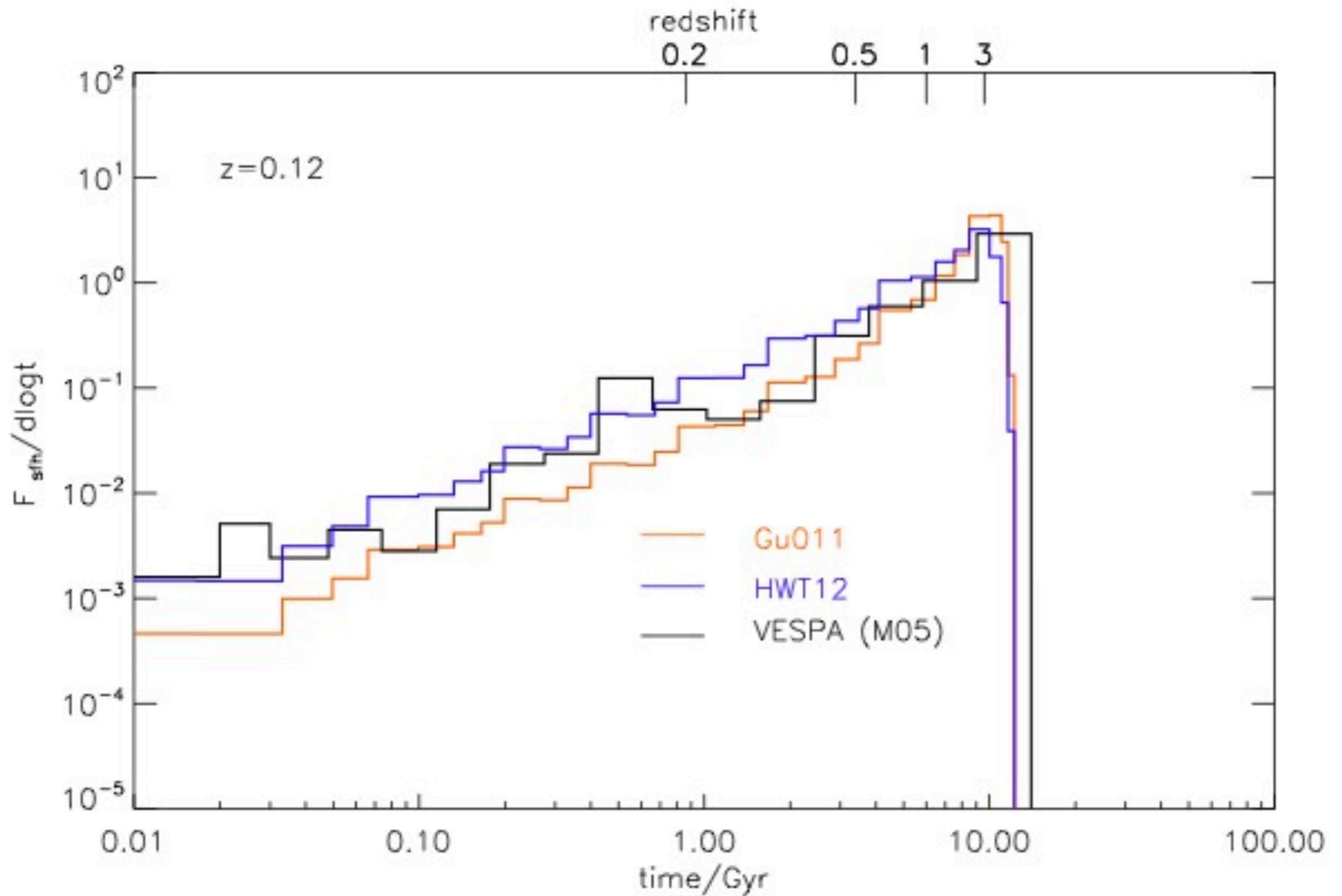# VESPA - comparison of different models

Fractional mass in stars of a given age

Sorour Shamshiri

Fraction of stars of a given age

Luminous red galaxies
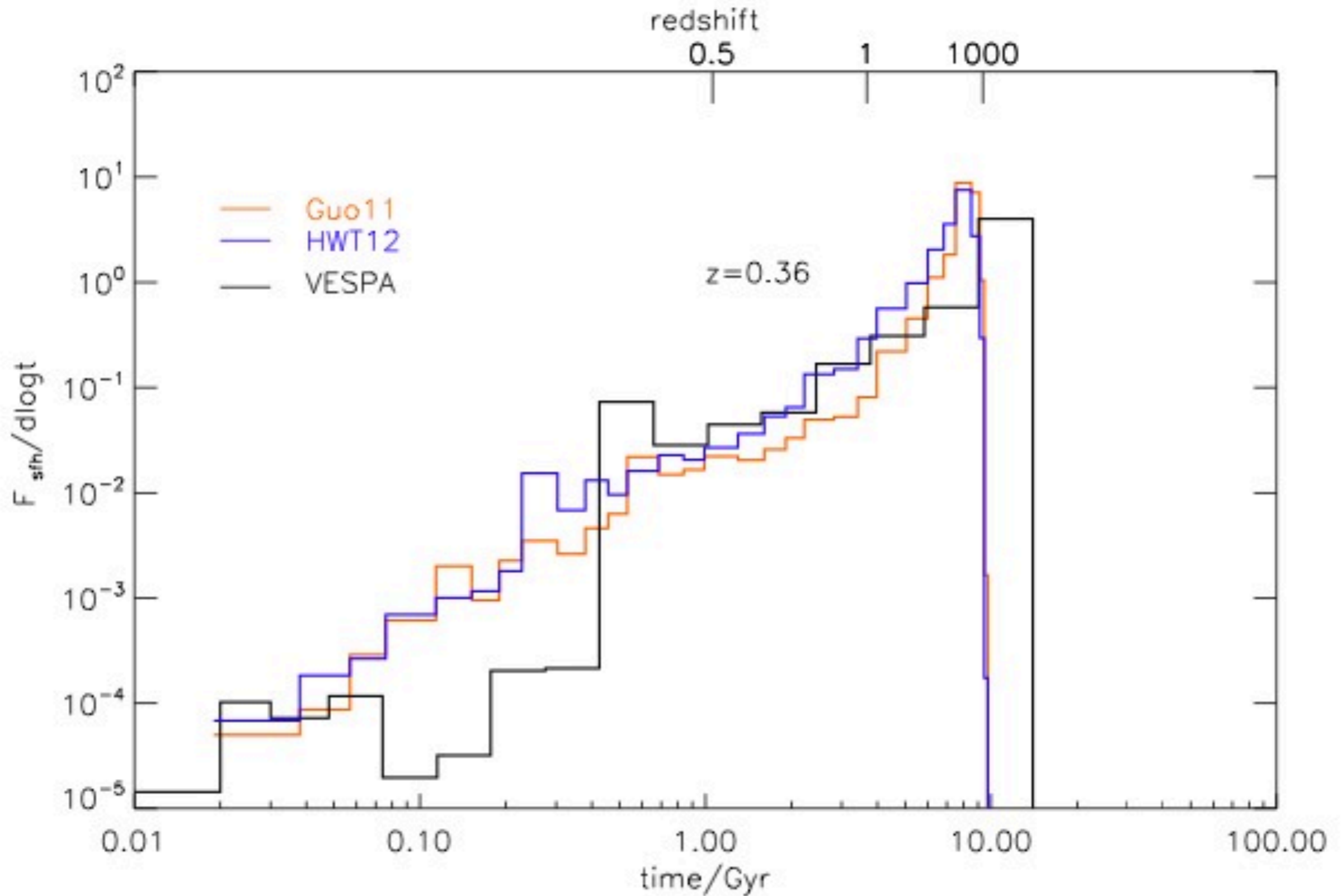
Sanity checks

```
mass_checks("deal_with_galaxy_merger #0",p);
mass_checks("deal_with_galaxy_merger #0",merger_centralgal);
mass_checks("deal_with_galaxy_merger #0",centralgal);
```

```c
void mass_checks(char string[], int igal) {

  /* Some sanity checks on the masses of different components.
   * If due to rounding error, then apply a correction;
   * otherwise print error message and exit
   */

#ifndef MASS_CHECKS
  return;
#endif

  //check if the gas mass is less than 0
...

  //check if the mass in metals is less than 0
...

  //check if the mass in metals is greater than the gas mass
...

  return;
}
```

Routines for mass transfer

```
/* t central, p satellite */
...

sfh_merge(t,p);
...

Gal[t].ColdGas += Gal[p].ColdGas;
Gal[t].MetalsColdGas += Gal[p].MetalsColdGas;
Gal[t].StellarMass += Gal[p].StellarMass;
Gal[t].MetalsStellarMass += Gal[p].MetalsStellarMass;
Gal[t].StarMerge +=Gal[p].StarMerge;
Gal[t].MergeSat +=Gal[p].StellarMass;
Gal[t].ICM += Gal[p].ICM;
Gal[t].MetalsICM +=Gal[p].MetalsICM;
...

Gal[t].HotGas += Gal[p].HotGas;
Gal[t].MetalsHotGas += Gal[p].MetalsHotGas;
Gal[t].EjectedMass += Gal[p].EjectedMass;
Gal[t].MetalsEjectedMass += Gal[p].MetalsEjectedMass;
Gal[t].BlackHoleMass += Gal[p].BlackHoleMass;
...

if(BulgeFormationInMinorMergersOn) {
    Gal[t].BulgeMass += Gal[p].StellarMass;
    Gal[t].MetalsBulgeMass += Gal[p].MetalsStellarMass;
...
}
```

```
/* t central, p satellite */
mass_checks("add_galaxies_together #0",p);
mass_checks("add_galaxies_together #0.1",t);
...

transfer_gas(t,"Cold",p,"Cold",1.);
transfer_gas(t,"Hot",p,"Hot",1.);
transfer_gas(t,"Ejected",p,"Ejected",1.); //TODO
if(BulgeFormationInMinorMergersOn)
    transfer_stars(t,"Bulge",p,"Disk",1.);
else
    transfer_stars(t,"Disk",p,"Disk",1.);
transfer_stars(t,"Bulge",p,"Bulge",1.);
transfer_stars(t,"ICM",p,"ICM",1.);
```