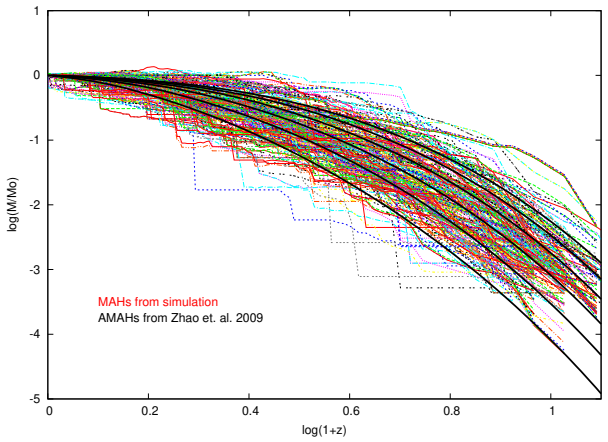

Fig. 1. Mass accretion histories from the simulation and average mass accretion histories from Zhao et al. (2009)

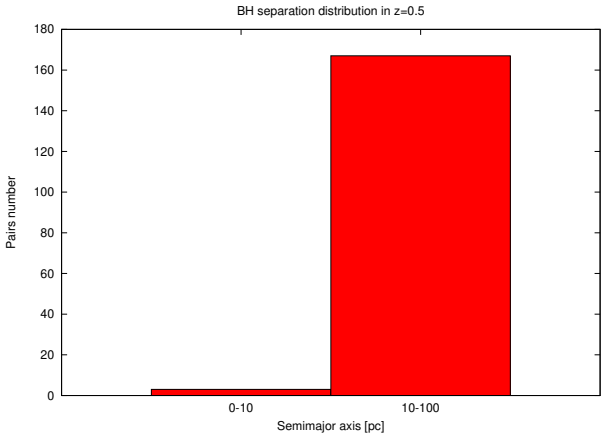

Fig. 2. Number of BH pairs with separations less than 10 pc or between 10–100 pc at $z = 1$. At this epoch few BHs mergers are expected.

the local Universe to calculate its effect on the BH pair orbital angular momentum.

We have used mass accretion histories from a numerical simulation of 64 h^{-1} Mpc with 256^3 particles with mass $m_p = 1.63 \times 10^7\ M_\odot$, that reproduces the main features that characterise the local Universe (Gottlöber et al. 2010).

2.3. *The constrained sample*

We have selected dark matter halos corresponding to merging galaxies pairs as initial conditions for our model based on the galaxies selection criteria used by Bell et al. (2006). The sample consists of $\sim$150 pairs of halos with separations $\lesssim$30 kpc and masses $M_h \gtrsim 2,5 \times 10^{10}\ M_\odot$ at $z = 1$. We have followed the evolution of the pairs in the sample mentioned above, in particular the distance evolution between BHs in pairs at different epoch (see Figure 2).

3. SUMMARY & CONCLUSIONS

BH pairs and their signatures are valuable as probes to general relativity, probes of accretion disk properties, cosmological observations and gravitational waves sources counterparts.

Constrained simulations represent a powerful tool to understand the history of the best known part of the Universe. By using them it is possible to construct a constrained sample of posible merging galaxies corresponding to any epoch of the local Universe.

Depending on the efficiency of the angular momentum transport mechanisms we are able to get the separations distribution of pairs in the local Universe. The current preliminary results suggest that disk-BH pair interaction is a mechanism by wich BH pairs can coalesce within a Hubble time and BH merger rate is small in the local Universe (see Figure 2).

Currently there is an important effort in the astronomical comunity to perform a census of the black hole pairs population at different stages. Once they are completed our study will be important to make data interpretation.

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