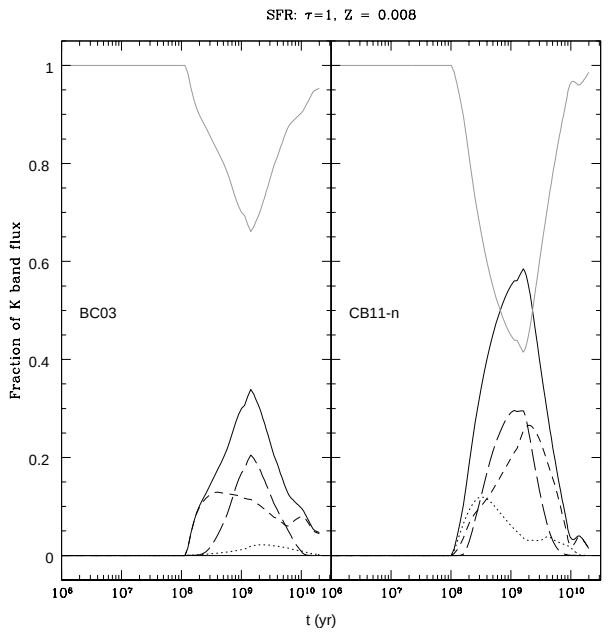

Fig. 5. Fraction of light contributed by TP-AGB stars and the "rest" of the stars (gray line) in the K-band as a function of time for the BC03 and the CB11 models. The contribution of all, the O-rich, the C-rich, and the Super Wind (SW) phase TP-AGB stars is shown as black solid, short dashed, long dashed, and dotted lines, respectively. To build these models I have assumed the Chabrier (2003) IMF, an exponentially decaying star formation rate with $\tau = 1$ Gyr, and $Z = 0.008$.

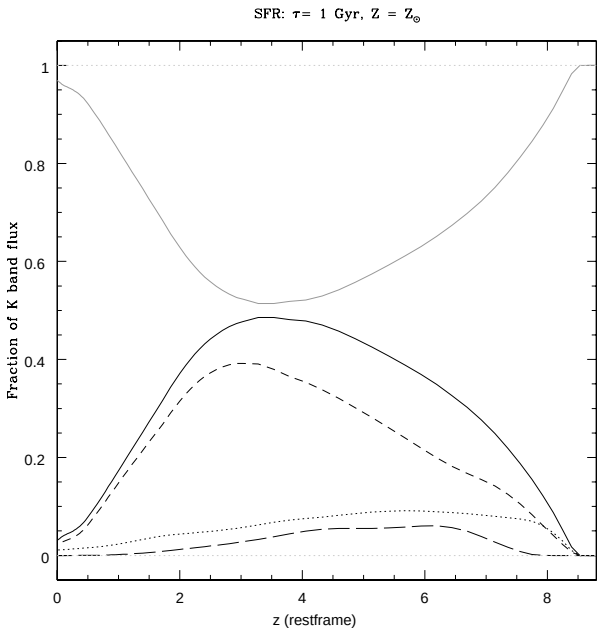

Fig. 6. Fraction of light contributed by TP-AGB stars and the "rest" of the stars (gray line) in the K-band as a function of redshift in the rest frame of the galaxy for a CB11 model built for the Chabrier (2003) IMF, an exponentially decaying star formation rate with $\tau = 1$ Gyr, and $Z = Z_{\odot}$. The contribution of all, the O-rich, the C-rich, and the Super Wind (SW) phase TP-AGB stars is shown as black solid, short dashed, long dashed, and dotted lines, respectively.

stars. Depending on the stellar metallicity, the contribution of the TP-AGB stars in the K-band reaches about 60% in the CB11 model, close to a factor of two more than in the BC03 model. In the CB11 models for $Z = Z_{\odot}$ the TP-AGB contribution is dominated by the O-rich stars. In the $Z = 0.008$ model the O-rich and C-rich stars contribute about equally. The stars in the SW phase never dominate the emission in the K band.

It is more interesting to plot the contribution of TP-AGB stars as a function of redshift z in the restframe of the galaxy instead of galaxy age. Figures 6 and 7 show that, as indicated above, these stars dominate the NIR in a wide redshift range, and it becomes clear why the physics of TP-AGB stars dominates so strongly the determination of the total mass contained in the stellar populations of galaxies. When examining the light emitted in the restframe by galaxies in the redshift range from $z = 3$ to $z = 8$, close to 60% of the light in the K-band comes from the TP-AGB stars. Thus, uncertainties in the physical properties that we assign to these stars have a direct influence in the mass that we attribute to galaxies in this redshift range.

Figures 8 and 9 show that the mass that we assign to these galaxies is inversely proportional to the galaxy luminosity. The brighter the model galaxy, the lower the mass in stars needed to produce a given galaxy luminosity.

In general, at ages around and above 1 Gyr, the galaxy masses derived from the CB07 and CB11 models are considerably lower than the BC03 masses. At early ages the galaxy masses determined from the $Z = Z_{\odot}$ CB11 model are up to 50% larger than the BC03 masses because the CB11 model is fainter than the BC03 model at these ages (cf. Figure 2). This is a consequence of the different chemical composition of the stellar models for $Z = Z_{\odot}$ in the Bertelli et al. (2008) and the Padova 1994 data sets. This effect is not seen in the $Z = 0.008$ case.

3. THE FUTURE

Progress in the field of stellar population synthesis in the next decade will certainly depend on how much time and effort is dedicated to fundamental