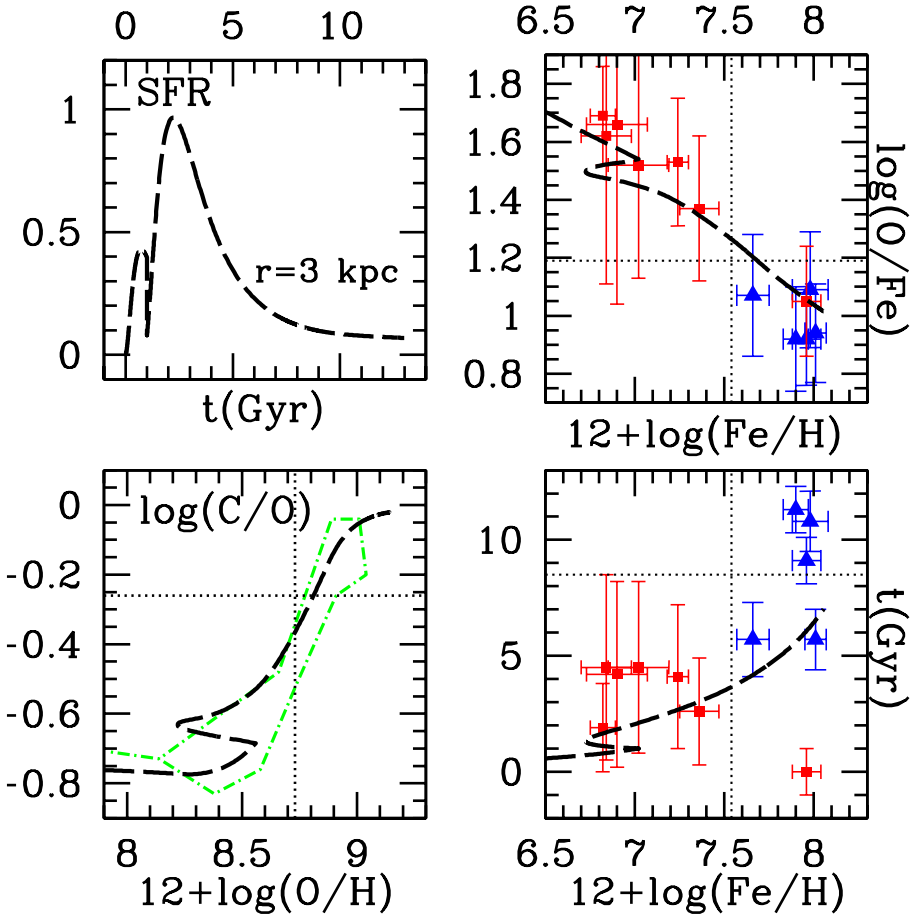

Fig. 10. Evolution for $r = 3$ kpc predicted by the IWY model (long-dashed black lines). Star formation history normalized to 70 $M_{\odot}$ pc^{-2} Gyr^{-1}. C/O-O/H, O/Fe-Fe/H, and time-Fe/H relations from 0 to 7 Gyr. Area enclosed by dot-short-dashed-green lines: Galactic bulge red giant stars presented by Cescutti et al. (2009). Filled symbols: microlensed dwarf and subgiant stars in the Galactic bulge from Bensby et al. (2010b), red squares: old stars with mean age of 9.8 ± 4.0 Gyr, blue triangles: young stars with mean age of 4.5 ± 1.6 Gyr. Ages were normalized to the age of the models (13 Gyr.) Dotted lines: protosolar values from Asplund et al. (2009). The color figure can be viewed online.

In Figure 10 we show the C/O-O/H, O/Fe-Fe/H, and Fe/H evolution obtained with the IWY model between 0 and 7 Gyr. We include the evolution from 0 to 7 Gyr and exclude the 7–13 Gyr range because at 7 Gyr the model reaches the highest Fe/H value shown by the stellar data. Moreover, in the excluded range the SFR is very low and the probability of forming stars younger than 6 Gyr (in the 7 to 13 Gyr range) is negligible.

In Figure 10 (C/O-O/H panel) we show also the area covered by the data of Cescutti et al. (2009). These authors collected [C/O] and [O/H] ratios for the Galactic bulge red giants determined by Fulbright, McWilliam, & Rich (2007) and Meléndez et al. (2008), and used the observed data to obtain the initial stellar C/H and O/H values relative to the solar abundances due to Asplund et al. (2005). In order to convert the Cescutti et al. (2009) data to abundances by number we used, only in this figure, the solar abundances by Asplund et al. (2005). For the other figures, we assumed the protosolar abundances by Asplund et al. (2009).

A description of the model in the C/O-O/H panel of Figure 10 follows. During the halo formation, the IWY model predicts an increase of 12+log(O/H) to 8.6 dex and an increase of 12+log(C/O) to −0.7 dex. After the halo formation finishes, at $t = 1$ Gyr, the O/H ratio decreases due to the dilution produced by the enormous amount of primordial gas that is accreted to form the disk. Later on, this accretion causes a rapid SFR increase, producing an O/H increase. The C/O rise from −0.7 dex to −0.5 dex