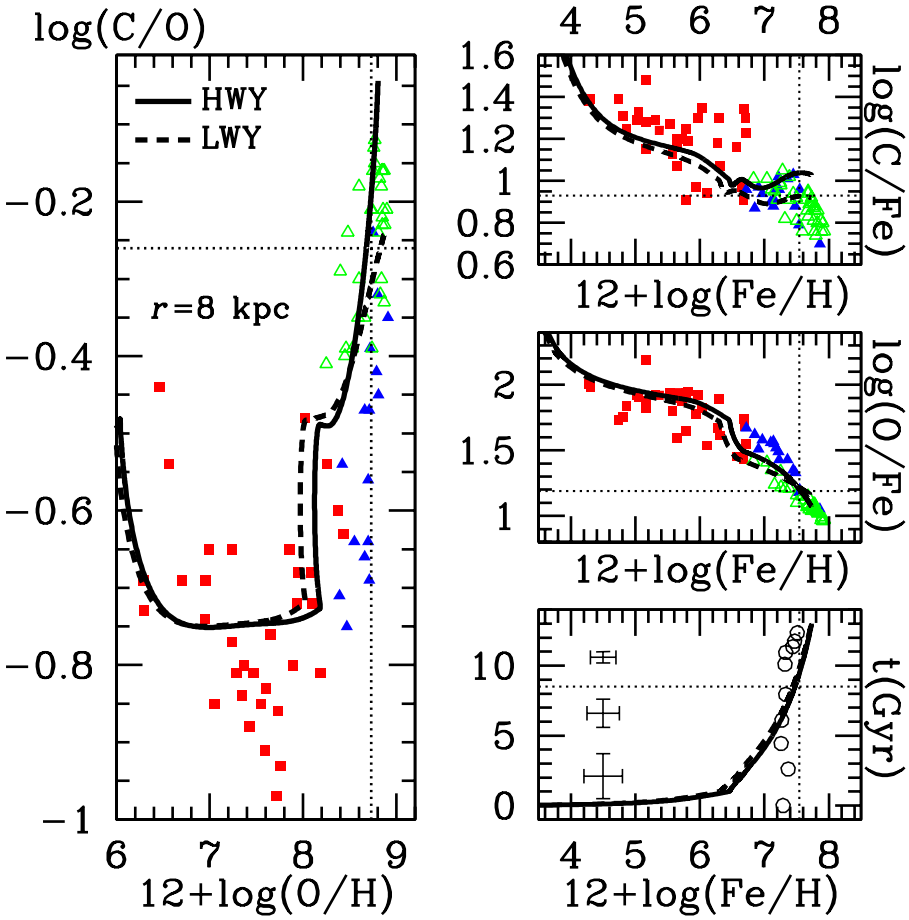

Fig. 2. Chemical evolution models for the solar vicinity (r = 8 kpc): HWY (continuous lines), LWY (dashed lines). The left panel shows the C/O evolution with O/H. The right panels show the evolution of C/Fe and O/Fe with Fe/H, and the Fe/H-time relation. Filled red squares: halo dwarf stars from Akerman et al. (2004). Filled blue and empty green triangles: thick-disk and thin-disk dwarf-stars from Bensby & Feltzing (2006). Dotted lines: protosolar values from Asplund et al. (2009). Open circles: mean ages and Fe/H values of disk stars with better determined ages from Nordström et al. (2004). Horizontal bars: internal dispersions in Fe/H shown by the sample. Vertical bars: age average errors. The color figure can be viewed online.

and $B(r) = 40\ M_\odot\ \mathrm{pc}^{-2} \times e^{-[r(\mathrm{kpc})-r_\odot]/3.5\ \mathrm{kpc}}$ are chosen to match the present-day mass density of the halo and disk components in the solar vicinity, which amount to 0.5 and 49.5 $M_\odot\ \mathrm{pc}^{-2}$, respectively, where the mass lost by the stars and the halo gas have been incorporated into the disk. Moreover, with the $A(r)$ and $B(r)$ variables the models reproduce the radial profile of the total mass in the Galaxy, $M_{\mathrm{tot}}(r) = 50\ M_\odot\ \mathrm{pc}^{-2} \times e^{-[r(\mathrm{kpc})-r_\odot]/3.5\ \mathrm{kpc}}$ (Fenner & Gibson 2003).

(vi) The models assume the initial mass function (IMF) proposed by Kroupa, Tout, & Gilmore (1993), in the mass range given by 0.08–80.0 $M_\odot$ for $Z > 10^{-5}$, and in the 9.0–80.0 $M_\odot$ mass range for $Z < 10^{-5}$. We consider that Population III does not include objects with less than 9.0 $M_\odot$ and that the change from Pop III to Pop II.5 occurs at $10^{-3.5} Z_\odot$ (Akerman et al. 2004; Bromm & Larson 2004).

(vii) The models include a star formation rate that depends on time and galactocentric distance, $\mathrm{SFR}(r,t) = \nu M_{\mathrm{gas}}^{1.4}(r,t)\ (M_{\mathrm{gas}}+M_{\mathrm{stars}})^{0.4}(r,t)$, taken from Matteucci et al. (1989) and Matteucci & Chiappini (1999), where ν is a constant in time and space. This SFR formula considers the feedback between gas and stars. In our models ν is chosen in order to reproduce the present-day radial distribution of gas surface mass density. We adopted ν values of 0.019 and 0.013 for the HWY and the LWY models, respectively. We assumed a ν value 5 times higher during the halo formation than that adopted for the