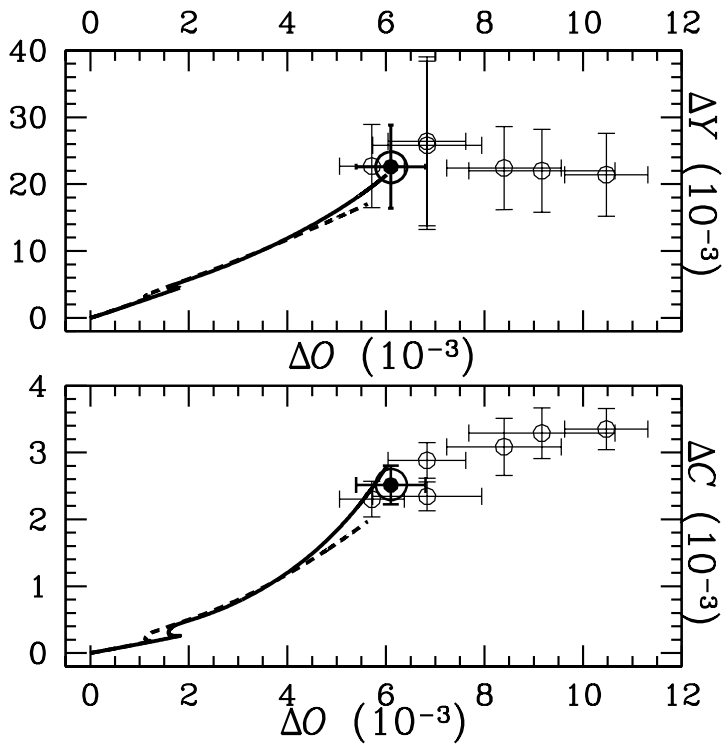

Fig. 3. ΔY vs ΔO (upper panel) and ΔC vs ΔO (lower panel) for the solar vicinity ($r = 8$ kpc). Evolution from $t = 0$ ($\Delta Y = \Delta C = \Delta O = 0$) to 8.5 Gyr (Sun-formation time) predicted by models that assume HWY (continuous lines), and LWY (dashed lines). $\odot$: Protosolar values by Asplund et al. (2009). Open circles: Protosolar values from photospheric data by different authors compiled by Asplund et al. (2009, Table 4) and corrected for gravitational settling (Asplund et al. 2009).

rates assumed by them are 2–3 smaller than those of Maeder (1992). This difference between a high and a low mass-loss rate produces opposite differences in the C and O yields. These differences occur in the pre-SN and in the SN phases. In the pre-SN phase massive stars are able to process He into C, and their stellar winds take away a lot of new C. Since the O production occurs deeper than the C production, the wind contribution to the O yield is much smaller than that to the C yield; consequently C constitutes the largest fraction of heavy elements ejected during the wind phases. While in the SN phase the contribution to the C and O total yields depends mainly on the mass of the CO core, a small fraction of C in the CO core remains unmodified and is ejected during the explosion. Alternatively the O production by the SNe is proportional to an important fraction of the mass of this core; consequently, O constitutes the largest fraction of heavy elements ejected during the SN stage. Therefore, when the initial stellar metallicity is higher, the mass loss rate is higher, the C yield is higher, the CO core is less massive, and consequently the O yield is smaller.

4. THE PROTOSOLAR AND THE PRESENT SOLAR VICINITY ABUNDANCES

To compare GCE models of Y, C, and O with observations we need to use the best abundance determinations available for these elements. We consider that the two most accurate Galactic Y, C, and O determinations are the protosolar values (Asplund et al. 2009) and the M17 H II region values (Paper I).

4.1. *Protosolar abundances*

In order to study the time-agreement with the protosolar values, we show in Figure 3 the predicted evolution of ΔY vs ΔO and ΔC vs ΔO from 0 to 8.5 Gyr (the Sun-formation time). The ΔY value for Figure 3 (and throughout this paper) is given by $\Delta Y = Y - Y_p$, where Y_p is the primordial He abundance, which amounts to 0.2477 (Peimbert et al. 2007). In this figure $\Delta O = O$, and $\Delta C = C$ because at the time of the primordial nucleosynthesis O and C are not produced. For $t = 0$ the models start at ΔY, ΔO, and ΔC equal to zero, and in this figure the evolution of the models stops at $t = 8.5$ Gyr, the time the Sun was formed. Also,