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Simulation of the surface δ^{18}O of the ocean under warm climate conditions : implications for the reconstruction of paleotemperatures

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The oxygen isotope ratio of biominerals has been widely used for the reconstruction of paleotemperatures. However, this technique requires some assumptions on the δ^{18}O of the marine surface waters, which can introduce significant uncertainties in the calculation of temperatures (Price et al., 1996; Crowley and Zachos, 2000). The problem is particularly crucial for the reconstruction of latitudinal temperature gradients, as the δ^{18}O in surface waters varies with latitude, due to changes in evaporation and precipitation. To adjust for latitudinal variations in the surface water δ^{18}O, the modern distribution is often used (Zachos et al., 1994; Bice and Norris, 2002). However, the assumption of a $\delta^{18}O_{sw}$ gradient similar to that of present-day may be inappropriate for greenhouse periods because of a likely stronger hydrologic cycle and lower meridional temperature gradients (White et al., 2001).
An Earth System Model of Intermediate Complexity (EMIC), CLIMBER-2, in the version including the oxygen water isotopes is here used to simulate changes in the surface oxygen-18 of the oceanic water masses under warm climatic conditions, for different climate states. "Classical" simulation like 4*CO_2 are compared to the already available ones, whereas simulation for much warmer conditions are also discussed and put in relation with results from palaeodata.

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