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# The new EDC3 time scale for the EPICA Dome C ice core

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For the climatic interpretation of ice core records from Dome Concordia (central East Antarctica), a precise chronology is required. At low accumulation sites such as Dome C, the annual layer counting is not feasible and therefore we developed a glaciological method, combining an ice flow model, an accumulation model based on isotope measurements in the ice and a firn densication model evaluating the ice/gas bubbles depth difference. An inverse method is used to constrain poorly known parameters of the dating model, so that the resulting chronology could be in optimal agreement with independent age markers along the core. We describe the values reconstructed for these glaciological parameters: velocity profile, basal melting and sliding, isotope-accumulation relationship. We also reconstruct the total thinning of the ice as a function of the depth in the drilling. The glaciological dating model is however unable to fit the age markers within their confidence interval for two depth intervals. The first one is at the end of the Holocene, where the accumulation rate at Dome C seems decoupled with respect to the isotopic composition of the ice. The second one is between Marine Isotope Stages 12 and 15, where anomalies in the ice flow seem to be the most realistic explanation. We apply corrections to the glaciological model so that 1) it fits the age markers in these two intervals and 2) it is synchronised back to 45 kyr with the NGRIP layer counting chronology GICC05 and 3) it fits exactly with several historically dated volcanoes for the last millenium. We then compare our new time scale with the LR04 time scale derived for a stack marine curve.

Finally, we propose a new method to construct an common and optimal chronology for different ice cores, taking into account 1) the stratigraphic links between the ice cores both in the ice and in the gas records 2) the information coming from the glaciological dating models and 3) the information coming from independent age markers situated along the ice cores.