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Toward an integrated ice core chronology using relative and orbital tie-points

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Precise ice cores chronologies are essential to better understand the mechanisms linking climate change to orbital and greenhouse gases concentration forcing. A tool for ice core dating (DATICE [developed by Lemieux-Dudon et al., 2010] permits to generate a common time-scale integrating relative and absolute dating constraints on different ice cores, using an inverse method. Nevertheless, this method has only been applied for a 4-ice cores scenario and for the 0-50 kyr time period. Here, we present the bases for an extension of this work back to 800 ka using (1) a compilation of published and new relative and orbital tie-points obtained from measurements of air trapped in ice cores and (2) an adaptation of the DATICE inputs to 5 ice cores for the last 800 ka.
We first present new measurements of $\delta^{18}O_{atm}$ and $\delta O_2/N_2$ on the Talos Dome and EPICA Dome C (EDC) ice cores with a particular focus on Marine Isotopic Stages (MIS) 5, and 11. Then, we show two tie-points compilations. The first one is based on new and published CH_4 and $\delta^{18}O_{atm}$ measurements on 5 ice cores (NorthGRIP, EPICA Dronning Maud Land, EDC, Talos Dome and Vostok) in order to produce a table of relative gas tie-points over the last 400 ka. The second one is based on new and published records of $\delta O_2/N_2$, $\delta^{18}O_{atm}$ and air content to provide a table of orbital tie-points over the last 800 ka. Finally, we integrate the different dating constraints presented above in the DATICE tool adapted to 5 ice cores to cover the last 800 ka and show how these constraints compare with the established gas chronologies of each ice core.