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Constraining the carbon budget challenge: New stable carbon isotope ratio data of CO2 from Dome C ice over the last deglaciation: experimentation and interpretation

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The analysis of air bubbles trapped in polar ice permits the reconstruction of past atmospheric evolution of major greenhouse gases over various timescales. Carbon dioxide is the most important human-induced greenhouse gas. The information on the evolution of its concentration in different environments in parallel with its stable carbon isotope composition allows to better constrain the global carbon cycle, as the contribution of the various processes in separate reservoirs can be distinguished due to their different isotopic signatures.

The LGGE method of gas extraction from ice was used in combination with a new instrumental setup to investigate the CO2 mixing ratio and its stable carbon isotope composition (delta13CO2) in air from the last deglaciation at the EPICA Dome Concordia site (Antarctica). The resolution of our results (250 years in average) allows us to divide Termination I into four sub-periods, each representing an independent climatic event/period (e.g.: Heinrich I, Bölling/Alleröd, Antarctic Cold Reversal, Younger Dryas).

Our results show a 77.25 (stdev 1.1) ppmv CO2 increase between Last Glacial Maximun and Early Holocene, which is coherent with previously published studies. The delta13CO2 oscillates between -7.03 and -6.38 (stdev 0.10) per mil, showing clear trends during the different sub-periods of the last deglaciation. Several scenarii can ex-

plain the abrupt CO2 increase, but there is presently no consensus on the exact causes and their respective role. Still, it is presumed that the ocean reservoir contributes the most.

In order to evaluate the importance of the various processes that influence climatic events, giving emphasis on the role of oceanic circulation, we use an ocean box model developed at LSCE interacting with the atmosphere and biosphere single boxes. This allows a preliminary data interpretation for the CO2 and delta13CO2 changes observed throughout Termination I.