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A detailed atmospheric carbon isotopic constraint on the causes of the deglacial CO2 increase

A. Lourantou (1), J. V. Lavric; (1), P. Köhler (2), J.-M. Barnola (1), E. Michel (3), D. Paillard (3), D. Raynaud (1) and J. Chappellaz (1)

(1) Laboratoire de Glaciologie et Géophysique de l'Environnement -CNRS-UJF, Grenoble, France, (2) Alfred-Wegener Institute for Polar and Marine Research, Bremerhaven, Germany , (3) Laboratoire des Sciences du Climat et de l'Environnement (IPSL/CEA-CNRS-University of Versailles-St Quentin), Gif-Sur-Yvette, France (lourantou@lgge.obs.ujf-grenoble.fr)

The causes of the ˜80 ppmv increase of atmospheric carbon dioxide mixing ratio (CO2) during the last glacial-interglacial climatic transition remain highly debated. Using the EPICA Dome C ice core drilled in Antarctica, we analysed in detail the concomitant evolution of the CO2 and its stable carbon isotopic ratio (delta13CO2) in the atmosphere. The record agrees well with the existing record from the Taylor Dome ice core ; its higher resolution allows us to reveal two negative excursions, at the Heinrich 1 event and during the Younger Dryas.

Comparing the output of two different carbon cycle box models with our data as well as with paleoceanic records, we conclude that these excursions were most probably caused by oceanic circulation changes; the CO2 rise/delta13CO2 decrease during the first stage of the deglaciation is equally attributed to the ocean (Southern Ocean stratification breakdown and marine productivity decline). In addition, a positive excursion is observed during the Bølling/Ållerød warm period, that we interpret as the effect of rapid and concomitant vegetation buildup on the continents.