Synchronous change of atmospheric CO$_2$ and Antarctic temperature during the last deglacial warming

Frédéric Parrenin (1), Valérie Masson-Delmotte (2), Peter Köhler (3), Dominique Raynaud (1), Didier Paillard (2), Jakob Schwander (4), Carlo Barbante (5), Amaëlle Landais (2), Anna Wegner (3), and Jean Jouzel (2)

(1) CNRS/LGGE, St Martin d’Hères, France (parrenin@ujf-grenoble.fr, 00 33 476824201), (2) Laboratoire des Sciences du Climat et de l’Environnement (CEA/CNRS/UVSQ-IPSL)2, Gif-sur-Yvette, France., (3) Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany., (4) Physics Institute, University of Bern, Bern, Switzerland., (5) Department of Environmental Sciences, University of Venice, Venice, Italy.

Understanding the role of atmospheric CO$_2$ concentration (hereafter aCO$_2$) during past climate warmings requires clear knowledge of how it varies in time relative to temperature. Antarctic ice cores preserve highly resolved records of aCO$_2$ and Antarctic temperature (AT) for the last 800 kyr. Here we propose a revised relative age scale between aCO$_2$ and AT for the last deglacial warming (Termination I, TI) using data from 5 Antarctic ice cores. We infer the phasing between aCO$_2$ and AT at four times when their trends change abruptly. We find no significant lead/lag, with a 1σ accuracy ranging from 160 yr to 90 yr, indicating that aCO$_2$ did not begin to rise hundreds of years after Antarctic temperature, as has been suggested by earlier studies.