Geophysical Research Abstracts
Vol. 17, EGU2015-9747-2, 2015
EGU General Assembly 2015

Atmospheric CO_2 and d13C-CO_2 reconstruction of the Little Ice Age from Antarctic ice cores.

Mauro Rubino (1), Etheridge David (2), Cathy Trudinger (2), Colin Allison (2), Peter Rayner (3), Robert Mulvaney (4), Paul Steele (2), Ray Langenfeld (2), William Sturges (5), Mark Curran (6), and Andrew Smith (7)

(1) Second University of Naples, Department of Maths and Physics, Caserta, Italy (mauro.rubino@unina2.it), (2) CSIRO Oceans and Atmosphere Flagship, Aspendale, Victoria, Australia, (3) School of Earth Sciences, University of Melbourne, 3010, Victoria, Australia, (4) British Antarctic Survey, Madingley Road, Cambridge CB3 0ET, UK, (5) School of Environmental Sciences, University of East Anglia, Norwich, Norfolk NR4 7TJ, UK, (6) Department of the Environment and Heritage, Australian Antarctic Division, Antarctic Climate and Ecosystem Cooperative Research Center, Hobart, Tasmania, Australia, (7) Physics Division, Australian Nuclear Science and Technology Oraganisation (ANSTO), PMB 1, Menai, NSW 2234, Australia

The decrease of atmospheric CO_2 concentration recorded in Antarctic ice around 1600 AD is one of the most significant atmospheric changes to have occurred during the last millennia, before the onset of the industrial period. Together with the temperature decrease, the CO_2 drop has been used to derive the sensitivity of carbon stores to climate. However, the cause of it is still under debate because models are not yet able to reproduce either its magnitude, or its timing. Here we present new measurements of the CO_2 concentration decrease recorded in an ice core from a medium accumulation rate site in Antarctica (DML). We show that the new record is compatible (differences <2 ppm) with the CO_2 record from the high accumulation rate DSS site on Law Dome (East Antarctica), when the different age distributions are taken into account. We have also measured the d13C-CO_2 change in DML ice, filling a gap around 1600 AD in the DSS d13C record. We use a double deconvolution of the CO_2 and d13C records together to provide quantitative evidence that the CO_2 decrease was caused by a change in the net flux to the terrestrial biosphere. Finally, we provide a new interpretation of a published record showing increasing atmospheric carbonyl sulphide during the CO_2 decrease, suggesting that cooler LIA climate affected terrestrial biospheric fluxes. Altogether our findings support the hypothesis that reduced soil heterotrophic respiration is likely to have given the most significant contribution to the LIA CO_2 decrease implying a positive CO_2-climate feedback.