MODELLING OCEAN-ATMOSPHERE CARBON BUDGETS DURING THE LAST GLACIAL MAXIMUM HEINRICH-1 MELTWATER EVENT - BOELLING TRANSITION, A POSSIBLE ANALOG TOMODERN MAN-MADE CO2 CHANGES?

1SCHULZ,M. 1SARNTHEIN,M., 2SEIDOV,D. and 1STATTEGGER,K. 1Institut fuer Geowissenschaften, Univ. Kiel, Kiel, FRG; 2ESSC, Penn State Univ., Univ. Park, USA

Benthic carbon isotope data indicate that the rate of North Atlantic Deep Water (NADW) formation and the mode of oceanic thermohaline circulation (THC) varied considerably across the transition from the Last Glacial Maximum (LGM) to the Heinrich 1 meltwater event (MWE) and subsequently, to the Boelling warm period. We simulate changes in the ocean-atmosphere carbon cycle linked to these oceanic fluctuations by a carbon cycle box model. The output from an ocean general circulation model (OGCM) serves to constrain the physical parameters of the carbon cycle model. The OGCM depicts three modes of Atlantic THC: an interglacial mode with vigorous NADW formation, a glacial mode with active, although weaker (-65 %) NADW formation and an MWE mode characterized by the complete lack of NADW formation. The glacial circulation mode accounts for approximately half of the observed glacial reduction in atmospheric CO2 partial pressure (pCO2). The MWE circulation mode has only a small effect on atmospheric pCO2 but goes along with a massive redistribution of carbon from the Indo-Pacific and Southern Oceans to the Atlantic Ocean, which stores 85 Gt excess carbon during the MWE. The onset of NADW formation after a meltwater event, has the potential to release 81 GtC from the model ocean to the atmosphere, corresponding to an atmospheric pCO2 increase by 38 uatm. Since this amount is equivalent to approximately half of the modern man-made pCO2 load, this transition may provide a natural analog for the anthropogenic atmospheric pCO2 perturbation.