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TRANSIENT CHANGES IN THE GLOBAL CARBON CYCLE DURING THE LAST GLACIAL/INTERGLACIAL TRANSITION

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The global carbon cycle plays a significant role in glacial/interglacial transitions. On one hand because carbon reservoirs and exchange rates are subject to external climate conditions, on the other hand because changes in pCO_2 lead to amplification and mediation of regional climate variations. Time slice experiments were so far unable to unambiguously explain the driving forces of the glacial/interglacial change in atmospheric pCO_2 of about 100 ppmv. Additional information can be gained from the temporal evolution of the carbon cycle using transient model runs. Here we used a coupled atmosphere/biosphere/ocean box model of the global carbon cycle to quantify changes in pCO_2 and $\delta^{13}CO_2$ observed in Antarctic ice core records. To this end the model is transiently driven by various proxy records (including most published records from EPICA Dome C) over the last glacial/interglacial transition ($20 - 10$ kyr BP). The results show that a breakdown in Southern Ocean stratification triggered by Southern hemispheric warming might explain the initial drop in atmospheric $\delta^{13}CO_2$ by 0.5 ‰. In addition, a significant role of the biosphere on changes in the isotopic composition of atmospheric pCO_2 during the second half of the termination is supported. Carbonate compensation as further process need to be considered to fully explain the observed increase in pCO_2.