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Southern Westerly Wind belt and Carbon dioxide changes during the Antarctic Cold Reversal

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During the last glacial period, the SWW belt was north of 41°S and shifted poleward from the last deglaciation to the Holocene. However, there is no clear evidence for the timing and amplitude of the SWW belt latitudinal shift during the deglaciation and a better understanding of the links between CO_2 and the Southern Hemisphere atmospheric circulation during deglaciation may then help us infer the consequences of the recent changes in the winds on future atmospheric CO_2. Deglacial pollen record from the marine core MD07-3088 located in southern Chilean coast shows for the first time at 46°S a prominent cold-wet period highlighted by the abrupt expansion of Magellanic moorland vegetation synchronous with the ACR. This cold-wet period illustrates an interruption of the deglacial southward shift of the SWW belt that slightly re-expanded northwards. This crucial result "a northward return of SWW belt during the ACR" imposes a rapid southward shift of the SWW belt at the onset of the deglaciation. Such a rapid southward shift is strengthened by a glacial to deglacial climate simulation showing an abrupt response of the Southern Hemisphere atmospheric circulation to a progressive collapse of the Atlantic Meridional Overturning Circulation. Thus the SWW belt changes during the last deglaciation support rapid transfer mechanisms from the North Atlantic to the Southern Hemisphere through a coupled ocean-atmosphere system. A hold or northward return of the SWW belt during the ACR, could be responsible of a decrease in the Southern Ocean upwelling and thus a reduced outgassing of deep water-water CO_2 as shown by the deglacial CO_2 plateau measured in Antarctic ice-cores. Such observations represent important inputs to better understand the links between CO_2 and the Southern Hemisphere atmospheric circulation and their potential outcome for the future.