



Patagonian Ice Sheet melting over the last deglaciation and possible impact on the oceanic circulation off Chile

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During the last glacial period, southernmost South America was covered by the Patagonian Ice Sheet (PIS). While nowadays two main icecaps are centered on the higher parts of the Andes (the North and South Patagonian ice-fields), the PIS extended up to ~1800 km along the axis of the Andes between ~38°S and 56°S during the last glacial maximum with an estimated ice volume approaching 500000 km³. Modeling studies of the PIS suggest a close relationship between the ice-sheet fluctuations and the offshore sea surface temperatures (SST). Particularly the northwestern limb of the ice-sheet appears to have been very sensitive to small climate changes. Recent paleo-environmental reconstructions off southern Chile (ODP Site 1233; 41°S) have confirmed the modeling results by showing a close relationship at millennial timescales between the expansion of the PIS and the offshore SST over the last 70 kyr. Here, based on two new, high resolution sea-surface salinity (SSS) reconstructions at 41°S (ODP Site 1233) and 30°S (core GeOB 7139-2) off Chile, we can show that the melting of the PIS over the last deglaciation was a major event in the Southeast Pacific in terms of oceanic circulation changes. The sea-surface salinity (SSS) record at 41°S suggests three main freshwater inputs linked to the melting of the PIS at ~17.5, 13 and 12 kyr BP. The first and main event at ~17.5 kyr BP occurred shortly after the last glacier advance as reconstructed on the adjacent land. The timing of the second event agrees well with the recently suggested drainage of a huge, ice-dammed lake into the Pacific Ocean linked to the separation of the North and South Patagonian ice-fields. The third PIS melting event is probably related to the final melting phase of the PIS due to a 2°C SST warming during the Younger Dryas interval. Furthermore, the records of SSS and

$\delta^{15}\text{N}$ changes at 30°S off Chile suggest that the first PIS melting event at ~ 17.5 kyr BP caused a ventilation collapse of the Southeast Pacific Oxygen Minimum Zone. Finally, an increase of the SSS since 22 kyr BP at 30°S may result from the input of relatively warm and salty waters from the low latitudes at the beginning of the last deglaciation.