Glacial northward shifts of the South Westerlies altered dust sources to the Atlantic Southern Ocean

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The position and strength of the South Westerlies play a crucial role in Earth's climate since they control both the Southern Ocean vertical stratification and dust inputs to the area. The latter moderate the biological carbon pump north of the Polar Front by supplying iron, a limiting micronutrient. Both mechanisms are of key importance to ocean-atmosphere CO_2 exchange. However, meridional and intensity shifts in the South Westerlies during the Quaternary, and their ensuing climatic effects, still remain poorly quantified [1].

We reconstruct meridional shifts in the South Westerlies over the last 165 ka using radiogenic isotopes (Pb, Nd and Sr) measured on the <63μm detrital fraction of core ODP1090 as tracers of dust provenance to the Atlantic Southern Ocean. Dust flux increases recorded in ODP1090 and Antarctican ice, during MIS 2, MIS 4 and at the end of MIS 6, are associated with systematic shifts in radiogenic isotopic composition, documenting that dust sources changed concomitantly with flux. In $^{208}Pb/^{204}Pb$ *vs.* $^{206}Pb/^{204}Pb$ space, the ODP1090 data form a single linear array that can be interpreted as mixing of two main dust sources, consistent with the Sr-Nd isotope dataset. Shifts in dust provenance is synchronous with cold and warm periods.

Potential dust source areas were defined based on both literature data and new measurements on moraines and river sediments located between 37° and 52°S on the eastern side of the Andes. Patagonia is potentially the unradiogenic Pb dust source endmember, contributing more during the main dust peaks. The other dominant dust source, altough less clearly defined, is located further north within the Puna-Altiplano region, likely within the south Central Volcanic Zone (22-27.5°S) [2]. We interpret these provenance changes in terms of a northward shift of the South Westerlies during cold periods, deflating more erodable material from the Patagonian plains east of the Andes. Our data would also be consistent with subtle alternations between dust sources within the Puna-Altiplano area during climatic cycles.

[1] Kohfeld *et al.* (2013) *Quat. Sci. Rev.* **68**, 76-95. [2] Pichat *et al.* (2014) *Earth Planet. Sci. Lett.* **388**, 293-305.