The response of the Subantarctic Pacific to climate change: Reconstructing dust flux and biological productivity during the last glacial cycle

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The scarcity of iron limits marine productivity in about a quarter of the global ocean. Of these high nutrient low chlorophyll (HNLC) regions, the Southern Ocean is the region where variations in iron availability can have the largest effect on Earth's carbon cycle through its fertilizing effect on marine ecosystems, both in the modern and in the past.

Whereas recent work in the Subantarctic South Atlantic (Martínez-Garcia et al., 2009, 2014, Anderson et al., 2014) suggests that dust-driven iron fertilization lowered atmospheric CO_2 by up to 40 ppm in the latter half of glacial cycles of the late Pleistocene, the other sectors of the Southern Ocean remain poorly constrained, including the Pacific Sector, that accounts for the largest surface area of the Subantarctic Southern Ocean.

Here we report records of dust deposition, iron supply and export production (using opal, excess Ba, TOC fluxes) from a set of cores from the Subantarctic Pacific (PS75, Lamy et al 2014). We test how tightly dust and biological productivity are coupled over glacial/interglacial and millennial timescales in the Subantarctic Pacific and explore controls on productivity and potential impacts on the carbon cycle.