Dust in the Southern Hemisphere – from Source to Sink

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Mineral aerosoles (dust) are thought to play a critical role in Earth' climate system. Dust may affect climate, both directly by altering the radiation budget of the atmosphere and indirectly by influencing the efficiency of the ocean's biological pump. Specifically, it has been suggested that the greater supply of iron-bearing dust to the high-nutrient low chlorophyll regions of the Southern Ocean during the ice ages stimulated phytoplankton blooms that, by sinking from the surface to the deep ocean, sequestered climatically relevant amounts of carbon and contributed to lowering atmospheric CO_2 during ice ages [1]. In addition, wind-blown dust provides the only direct evidence for tracing past atmospheric circulation patterns, through the ability to link the chemical and isotopic fingerprints of dust deposited in climate archives with their source regions.

Polar ice core records provide some of our most valuable information on dust and climate in the past. Records from Antarctic ice cores indicate that glacial dust deposition at high latitudes was as much as a factor of 25 higher than during interglacial periods [2], while recent work from marine sediment cores from the Southern Ocean points to 3-4 times higher glacial dust fluxes [3]. However, understanding the regional pattern of variable dust input, mechanisms driving glacial/interglacial and shorter-term atmospheric CO_2 changes, and using the information to validate model output, requires knowledge of dust provenance.

Here we present an integrated perspective of Southern Hemisphere dust transport and its potential link to glacial-interglacial cycles. To this end, we combine dust flux and provenance data from Southern Ocean sediment cores and Antarctic ice cores, respectively, including new Sr-Nd-Pb isotope based provenance data from the Byrd (and WAIS Divide) ice cores from West Antarctica.

[1] Martin (1990) *Paleoceanography* **5**, 1-13. [2] Lambert (2008) *Nature* **452**, 616-619 [3] Lamy (2014) *Science* **343**, 403-407.