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The importance of the atmospheric cleansing for the long-range transport of the dust: the evidence from deep Antarctic ice cores records.

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Model simulations have difficulties to reproduce the 50-to-70 fold dust enhancement observed from polar ice core records over the last glacial period. For the southern hemisphere and Antarctica large changes in dust source have been suggested, but not supported by recent South Atlantic marine records. A semi-empirical model has been developed to reproduce the large glacial-interglacial changes of Antarctic dust concentrations. The model assumes that dry deposition is the dominant process in impurity fallout over Antarctica and uses a life-time parameter that depends on atmospheric temperature (stable isotope content of ice) and that applies to conceptual pathways for aerosols.

The model reproduces most of the increase in dust concentration during cold periods with respect to Holocene climate, as observed in Epica Dome C and Vostok ice records, on the basis of synergetic changes of three main factors associated with temperature. These are the glacial/interglacial change of accumulation rate in Antarctica, accounting for an increase by a factor of up to 2, the atmospheric life-time of aerosols, accounting for an increase by a factor of $\sim$4, and an "Apparent Source Efficiency Factor" accounting for an increase by a factor of 3 to 5, this later value consistent to observations. Up to 80% of the signal variance is explained and dust concentrations can be reproduced to within a factor of 2 on the average.

From the dust behaviour with respect to temperature as it becomes colder, climate couplings between Antarctica and troposphere over the Southern Ocean would operate below a first temperature threshold, and then below a second threshold, would encompass southern South America enduring growing aeolian deflation as sea ice is expanding over the South Atlantic Ocean. Our model suggests a $\sim$4°C glacial–interglacial temperature change over the southern Ocean that is also consistent with other estimation. With respect to previous approaches, the hydrological cycle would affect significantly the aerosols life-time and the overall efficiency of the long range transported dust .