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Magnetization of antartic ice as a measure of aerosol concentration; preliminary results

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We made initial estimates of the concentration of magnetic particles in ice samples from the Vostok ice core from East Antarctica by low-temperature (77K) IRM analysis. Ice samples were taken from different intervals, spanning from the Holocene to the Last Glacial Maximum. The IRM acquisition curves, and thus the coercivity spectra, of the glacial and interglacial ice do not differ significantly, suggesting that the dust has the same provenance. IRM acquisition curves of the ice do not saturate at the maximum available field of 0.8T and show a relatively broad coercivity, which is compatible with a mixture of maghemite or magnetite plus a high coercivity phase such as hematite. The IRM results were compared with available literature values of mass concentration of aerosol dust in nearby samples. Compared to Greenland (NorthGRIP) ice [Lanci et al. 2004 JGR], the Antarctic ice aerosol is more magnetic and the mean IRM intensity of the ice varies by a larger factor (˜ 8) from interglacial to glacial stages, although still being lower during interglacials. Comparison of the IRM intensity and total dust mass at Vostok shows a good correlation, but also reveals a large uncorrelated magnetization, which is essentially constant over the different climatic stages and is responsible for a smaller glacial-to-interglacial variance of the magnetization. The magnitude of the uncorrelated magnetization from Vostok ice is smaller than that measured in NorthGRIP ice but is still substantial. IRM acquisition suggests that the dust properties are independent of the uncorrelated signal, and thus the resulting dust magnetization is constant over different climatic intervals and comparable to typical sedimentary rocks. Highly magnetic interplanetary dust particles and micrometeorites are unlikely to be responsible for this background because of their different magnetic properties. An alternative explanation is that there is a fraction of dust (pos-

sibly of very small size) which is undetected by standard measurements, and which constitutes a relatively large fraction of the total dust during interglacial times.