Magnetic differentiation of atmospheric dusts


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Although several magnetic separation methods have been used to provide some initial subdivision and characterization of the particulate emission products of fossil-fuel combustion1–5, only recently has there been any attempt to use magnetic properties to distinguish between different emission types6,7 and atmospheric particulate sources8. In the present study, we use several concentration-independent magnetic parameters and ratios to characterize dusts from different source types. Non-destructive measurements of saturation isothermal remanence, anhysteretic remanence and frequency-dependent susceptibility differentiate atmospheric dusts into groups characterized by distinctive magnetic mineral and grain size assemblages. These assemblages can be related to the source of the dusts as they reflect differences in the conditions under which the magnetic oxides developed. The magnetic parameters are sensitive to differences between dusts arising from fossil-fuel combustion and from other industrial processes, and those derived from soil erosion. Within the set of soil-derived dusts, the magnetic parameters distinguish between the weathering regimes operating in different source areas.