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The palaeoclimatic record provided by aeolian dust in the deep sea: proxies and problems

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The aeolian dust component in deep-sea sedimentary records is widely used as a tool for the reconstruction of atmospheric circulation patterns and terrestrial climate variability in the geological past. Many proxies have been suggested to be useful to recognize and quantify the dust component with emphasis on mineralogical, chemical (e.g., elemental, isotopic) and physical (e.g., grain size, magnetic) bulk sediment properties. In this paper we would like to evaluate existing proxies and make recommendations for the recognition, characterization, and quantification of the aeolian component in deep-sea sediments.

We show several bulk grain-size records from various ocean basins which have been decomposed into a set of sedimentary components with the end-member modelling algorithm EMMA. Our results indicate that the spatio-temporal changes in deep-sea sediment composition are in many cases related to variable mixing coefficients of aeolian dust and various other sediment types (e.g., hemipelagic mud, turbidites). An implication of these results is that studies which apply the before-mentioned bulk sediment proportions as climate proxies potentially fail to recognize the true palaeoclimatic significance of their favourite ‘proxy’.