



The U-Th isotopic composition of Australian aeolian deposits: implications for weathering and sediment transport timescales

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In order to quantify how fast a landscape responds to tectonic, climatic and human factors, accurate weathering rates and soil and/or sediment ages are required. The uranium-series (U-series) isotopes are a valuable tool for deriving the timescales of weathering and erosion processes. The impact of dust on calculated U-series isotope residence timescales of soil and fluvial sediment has received little attention to date, despite the fact that the typical grain size of aeolian material overlaps with that of interest in such studies, particularly for the comminution approach (<50 microns). The potential of aeolian material to modify bulk soil or fluvial U-series signatures will depend on its U-series isotopic ratios and its volume percentage contribution to the deposit. We have determined the U-series isotopic ratios of dust from the 2009 Sydney dust storm and of several aeolian deposits in Australia. We show that there is significant isotopic disequilibria in the samples, which are characterised by ($^{230}\text{Th}/^{238}\text{U}$) activity ratios > 1 and ($^{234}\text{U}/^{238}\text{U}$) activity ratios < 1. The finer-grained fractions (<5 microns) have higher ($^{230}\text{Th}/^{238}\text{U}$) but comparable ($^{234}\text{U}/^{238}\text{U}$) to the coarser-grained fractions (5-53 microns) of the same samples. This study shows that the aeolian component cannot be assumed to be in isotopic equilibrium and needs to be considered when calculating weathering and erosion timescales.