K/Ar geochronology as a tool for tracing dust provenance in the Southern Hemisphere

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Determining the sources of dust in the past can provide a better understanding of former atmospheric circulation and climate patterns. While the neodymium (Nd) and strontium (Sr) radiogenic isotope systems have been established as powerful tracers, they are not sufficient to distinguish all possible source areas, especially in the Southern Hemisphere. The K/Ar chronometer has the potential to improve on our ability to infer dust provenance because it can discriminate between sources that have similar crustal residence ages as determined by Nd isotopes but different subsequent tectonothermal histories. In order to assess K/Ar geochronology as a provenance tool, we obtained K/Ar ages of samples from potential dust sources such as glacial moraines in Patagonia and New Zealand, and tested an application of the tool in determining sources of sediment to core TN057-6 in the southeast Atlantic Ocean. Ages for Patagonia clustered around 70 Ma with a range from 33.2 ± 0.4 Ma to 120 ± 3 Ma, and ages for New Zealand clustered around 160 Ma with a range from 125 ± 1 Ma to 191 ± 2 Ma, indicating that K/Ar geochronology can discriminate between these two source areas and improve upon previous provenance studies. K/Ar ages were also able to show that the <5μm terrigenous material transported to the southeast Atlantic Ocean and deposited in core TN057-6 is a mixture of multiple sources, with Patagonia as a likely endmember and Africa-derived sediments carried by the Agulhas current as another endmember, consistent with Sr-Nd data. Further studies aim to expand the characterization of potential source areas of dust in the Southern Hemisphere using K/Ar ages.