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21Ne, 10Be and 26Al cosmogenic burial ages of near-surface eolian sand from the Packard Dune field, McMurdo Dry Valleys, Antarctica.

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The McMurdo Dry Valleys, Antarctica, have been ice-free for at least 10 Ma. In Victoria Valley, the largest of the Dry Valleys, permafrosted yet still actively migrating dune-fields, occupy an area of ∼8 km2 with dune thicknesses varying from ∼5 to 70 meters. High-resolution ground penetrating radar (GPR) imaging of selected dunes reveal numerous unconformities and complex stratigraphy inferring cycles of sand accretion and deflation from westerly katabatic winter winds sourced from the East Antarctic Ice Sheet and anabatic summer winds sourced from the Ross Sea. Samples above permafrost depth were taken for OSL and cosmogenic 26Al/10Be burial ages. OSL ages from shallow (<1m) pits range from modern to ∼1.3ka suggesting that deposition/reworking of the dunes is on-going and their present configuration is a late Holocene feature. The same 7 samples gave a mean 26Al/10Be = 4.53 +/- 5% with an average apparent continuous 10Be surface exposure age of 525 +/- 25 ka surprisingly indicating a common pre-history independent of depth. Correcting for minor post-burial production based on OSL ages, the minimum (integrated) burial period for these sand grains is 0.51+/- 0.12 Ma which represents the burial age at the time of arrival at the dune. A possible explanation is that this common burial signal reflects recycling episodes of exposure, deposition, burial and deflation, sufficiently frequent to move all grains towards a common pre-dune deposition history. However, it is unclear over what length of time this processes has been active and fraction of time the sand has been buried. Consequently we also analysed purified quartz aliquots of the same samples for a third and stable nuclide, 21Ne, to determine the total surface and burial exposure periods. Using the 21Ne/10Be system we obtain burial ages of 1.10 +/- 0.10 Ma. Further coring below permafrost is planned for austral summer 2015.