Unravelling The Landscape Evolution Process Of Sedimentary Sand Sheets And Stony Deserts In Australia With In-Situ Cosmogenic Nuclide Depth Profiles.

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Measurement of in-situ cosmogenic ^{10}Be and ^{26}Al in depth profiles and local eroding surface bedrock can be used to determine long term accumulation rates of sedimentary sandstone environments and formation process of stony deserts. The Keep River sand-sheets in NW Australia, are low-elevation, ancient landscapes, with a semi-arid climate. Accumulation rates based on in-situ cosmogenic isotope profiles in cores ranging from 2 to 6 meters were compared to the mean age-depth curve from available TL and OSL data. The luminescence data support a process of a gradually increasing accumulation rate, from about 5 cm/ka in the late Pleistocene, to over 20 cm/ka during the Holocene. Long-term accumulation rates based on the cosmogenic data range from ~2-5 cm/ka over the past few hundred thousand years, consistent with the general TL picture for the deeper deposits but suggest, perhaps, lower rates. Escarpment bedrock erosion rates are consistent with other studies and range from 4-7 mm/ka.

Stony deserts of the Australian mainland are characterised by buried stone zones under a deep (~1-2 m), stone-free, loam soil capped by a surface pavement of silcrete and quartz stones termed 'gibbers'. The formation process of this landscape is in debate. One hypothesis is aeolian parna deposition over an existing stone pavement with subsequent transport and deposition of surface stones from an outcrop source. Or alternatively, upward displacement or creep through the soil profile after burial of the stone zone. The current study at Fowlers Gap, central New South Wales, uses in-situ produced ^{10}Be and ^{26}Al in bedrock outcrops and both buried and surface capping stones to identify exposure times, burial times and soil accumulation rates. Our preliminary interpretation appears to be a complex exposure of stones in outcrop formation, prior to transport, and in-situ, with subsequent parna accumulation and concurrent upward displacement of some stones riding on the accumulating soil mantle. Moreover the in-situ cosmogenic concentrations give a far older time scale, on the order of a few hundred thousand years, for the evolution of the parna and stone layers in contrast to the presumed formation during the Last Glacial Maximum.