The Spatial and Temporal Geomorphology and Surficial Sedimentology
of the Gurra Gurra Crescentic Dunes, Strzelecki Desert, South Australia

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Abstract

The Strzelecki Desert's crescentic dunes of north-eastern South Australia (29° 01' S, 140° 02' E) dominate an approximate 2400 m x 320 m area, originating from the crestal zone of a quartz-sand linear ridge at a site known as Gura Gura waterhole. The interaction of linear and crescentic crestal morphologies place the linear dune in the complex class-type, however, in part, the identity of the linear morphology is nebulous. Parasitic erosion of the linear dune-form results in contemporaneous re-deposition of the sediment into crescentic dunes, which move sub-parallel to the longitudinal axis of the underlying linear form.

The intricate natures of dune morphology and surficial sedimentology for the Gura Gura crescentic dunes are responses to site specific sand sources in a semi-closed geomorphic system, topographic enhancement and seasonal periodicity of less dominant secondary and tertiary wind directions, strengths and durations, as well as other climatic and vegetative influences. The principal influences of multi-directional winds and the upslope-amplification of shear velocities, cause dune form to be in continual transition between the dynamic end-members of equilibrium and quasi-equilibrium. Dimensional equilibrium is a transient feature at Gura Gura waterhole and is not characteristic of this dunescap.

The surficial sedimentology of the crescentic dunes is one of medium-to-fine quartz-rich sands with a unimodal, positively skewed and leptokurtic distribution. Analysis has shown that finer mean grain-sizes correlate with better sorting, a less positive skewness and lower kurtosis. The signatures of the sedimentological distributions across the dunes, and in different seasons, are subtle contrasts that are attributed to either the removal or accumulation of the fine tail of the distributions. Seasonal variation is gradual and transitional between each season, while greatest differences are found between the upper and lower micro-geomorphic positions of the dunes.

Through the integration of qualitative and quantitative process-geomorphology, it has been shown that the Strzelecki-Gura Gura dunescap portrays a microcosm of aeolian features, and processes, that are not dissimilar to many in the immense areal deserts of Earth and Mars.