The influence of complex mountainous topography on aeolian landform development

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Introduction

Aeolian geomorphology is a discipline concerned with investigating how wind flow drives physical processes within the landscape. In many areas of the world, notably the basin and range topography of the SW USA, mountainous topography impedes on the wind-driven transportation of sand through the landscape. Topography influences wind flow, guiding the direction of the wind and promoting sediment deposition – often creating characteristic landforms which are collectively termed topographic dunes. There exists great uncertainty regarding the effect of a complex mountainous topography on the operation of aeolian sand transport systems including whether characteristic landforms will develop, whether the sediments can be trapped if the topography is large enough and, if so, whether these stores of sediment are temporary or (effectively) permanent in their duration.

Method

- The contemporary distribution of sand within a mountain block was mapped based upon remote sensing data and field observations.
- This distribution was then related to the mountain topography.
- Attempt was made to delimit the sand cover into discrete landforms.

Results and Discussion

The distribution of sand deposits can be related to topographic shape, being more common in topographic lows and forming planar slopes against topographic obstacles. But any relationship is not simple when investigated in closer detail. Much of the mountain block supports deposits which surround and cover the topography like a complex apron which varies from thick wedges of sand to thin veneers of sand. Consequently, across much of the mountain block discrete landforms are not immediately apparent as the form of the sedimentary deposits is highly variable and the boundaries between any landforms are highly ambiguous. At only two sites can discrete wedges of sediments be delimited.

Conclusions

- The distribution of sand cover can be related to the topographic shape of the mountain block, being disproportionately present at topographic low points and/or as planar slopes against topographic obstacles.
- Aeolian deposits do not form a patchwork of discrete landforms owing to their lack of distinct boundaries.
- A revised chronology spanning >80ka indicates consistent activity barring a hiatus at 30-11ka, concurrent with the last Lake Manix high stand as well as soil development in some locations.
- The interworking of aeolian and hillslope sediments shows the complex relationship between geomorphic process and climate, rather than a simple arid-humid model.

References