Geophysical Research Abstracts
Vol. 18, EGU2016-13972-3, 2016
EGU General Assembly 2016


# Dynamic monitoring of avalanches and barchan dune morphology change at different timescales

Joanna Nield (1), Giles Wiggs (2), Matthew Baddock (3), and Martin Hipondoka (4)

(1) University of Southampton, Geography and Environment, Southampton, United Kingdom (j.nield@soton.ac.uk), (2) University of Oxford, School of Geography and the Environment, Oxford, United Kingdom, (3) Loughborough University, Department of Geography, Loughborough, United Kingdom, (4) University of Namibia, Department of Geography, Windhoek, Namibia

Aeolian dune morphology responds dynamically to changing wind conditions. The lee slope avalanche dynamics of dunes are particularly sensitive to prior morphological conditions as well as the varying intensity and duration characteristics of sand transport events. Here we use terrestrial laser scanning (TLS) to measure dune surface change over minutes, hours, a week and a year during conditions of variable approach flow resulting in considerable lee slope reworking. Several different avalanche patterns are recognised that can be related to slope characteristics, wind direction and slope reworking. We find that during oblique winds, horn reworking can reduce the lee slope angle. When the dominant, formative winds of the barchan return, the reworked lee slope, perpendicular to the prior oblique wind, takes longer to start avalanching. In the central region of the dune, avalanche frequency and the extent of lee slope reworking depends on wind speed. Under high winds from the dominant direction, there is continual erosion near the dune brink central area, due to the exceedance of a critical angle of repose, whilst under weaker winds the frequency of grainfall sedimentation and avalanches diminishes and net deposition in the brink area is more common. During the week of measurements, changes to the crest-brink area and lee slope form are considerable, based on the reworking of the slope by avalanche events, and this ultimately influences the dune migration rate. Over the course of a year, we demonstrate that the shape of the barchan stoss and lee slopes can change significantly, whilst the overall dune size and general planform is maintained. Our findings help elucidate dune mobility mechanics and pattern modifications at the wind storm event scale.