Geophysical Research Abstracts, Vol. 9, 03576, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-03576

Aeolian Sand Transport by Boundary Layer Turbulence

A.C.W. Baas

Environmental Monitoring and Modelling Research Group, Department of Geography, King's College London (andreas.baas@kcl.ac.uk)

The erratic and intermittent nature of wind-driven sand transport challenges our current transport models, which lack physical mechanisms for explaining and taking into account this spatio-temporal variability.

This paper presents a collective overview of results from investigations into the nature of spatio-temporal variability in sand transport generally, and the formation and behaviour of aeolian streamers specifically. This includes three principal studies. First, the results of field investigations into the formation and behaviour of aeolian streamers in coastal and desert environments, where spatio-temporal transport variability and associated turbulence characteristics were assessed with an extensive instrument array. Streamers were measured with a transverse array of Safires, while the wind field and associated turbulent structures were monitored with cup-anemometry and a rake of hot-film probes. Second, these field data were used to assess the statistical trends in transport variability as a function of spanwise scale of measurement and the temporal scale of time-averaging transport rates. Third, spectral wavelet analysis of high-frequency collocated wind speed (hot-film probes) and transport flux (Safires) time-series revealed distinct forcing-response regimes at different temporal scales. The transitions between these regimes and their ranges compare favourably with physically meaningful scales, such as the minimum temporal scale of saltation response to wind speed fluctuations, and the integral time-scale of the observed internal boundary layer turbulence dynamics.

The paper concludes with a tentative conceptual framework that attempts to integrate the results and insights from these studies towards an improved understanding of aeolian sediment transport processes.