Abstract Submitted
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Aerodynamic surface stress intermittency and conditionally averaged turbulence statistics[1] WILLIAM ANDERSON, DAVID LANIGAN, UT Dallas — Aeolian erosion is induced by aerodynamic stress imposed by atmospheric winds. Erosion models prescribe that sediment flux, Q, scales with aerodynamic stress raised to exponent, n, where $n > 1$. Since stress (in fully rough, inertia-dominated flows) scales with incoming velocity squared, u^2, it follows that $q \sim u^{2n}$ (where u is some relevant component of the flow). Thus, even small (turbulent) deviations of u from its time-mean may be important for aeolian activity. This rationale is augmented given that surface layer turbulence exhibits maximum Reynolds stresses in the fluid immediately above the landscape. To illustrate the importance of stress intermittency, we have used conditional averaging predicated on stress during large-eddy simulation of atmospheric boundary layer flow over an arid, bare landscape. Conditional averaging provides an ensemble-mean visualization of flow structures responsible for erosion 'events. Preliminary evidence indicates that surface stress peaks are associated with the passage of inclined, high-momentum regions flanked by adjacent low-momentum regions. We characterize geometric attributes of such structures and explore streamwise and vertical vorticity distribution within the conditionally averaged flow field.

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William Anderson
UT Dallas

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