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**Numerical study of turbulent flow over stages of interacting barchan dunes: sediment scour and vorticity dynamics.** CHAO WANG, WILLIAM ANDERSON, UT Dallas — Large-eddy simulation (LES) results of unidirectional turbulent flow over interacting barchan dunes are presented. A series of interacting barchan dune topographies have been considered wherein a small dune is positioned at locations upflow of a relatively larger dune, and at a slight spanwise offset. The smaller dune is geometrically similar, but one-eighth the volume of the larger dune, thus replicating instantaneous realizations during actual dune interactions. We report that flow channeling in the interdune space induces a mean flow heterogeneity – termed "wake veering" – in which the location of maximum momentum deficit in the dune wake is spanwise-displaced. The probability density functions of streamwise velocity fluctuation in the interdune space showed wide variability, and were used to select low-frequency, high-magnitude thresholds for conditional sampling. Conditionally- and Reynolds-averaged iso-contours of Q-criterion and differential helicity revealed a persistent roller in interdune space, which strengthened asymmetric sediment erosion via scouring. We assess terms in the Reynolds-averaged streamwise vorticity transport, and show that the roller is primarily sustained by stretching. Finally, we present results of joint time-frequency analysis using wavelet decomposition, which shows that the dune geometry imparts a distinct influence on the local flow.

William Anderson
UT Dallas

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