Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Turbulent flow structure associated with interacting barchan dunes[1] NATHANIEL BRISTOW, GIANLUCA BLOIS, University of Notre Dame, JAMES BEST, University of Illinois at Urbana-Champaign, KENNETH CHRISTENSEN, University of Notre Dame — Barchan dunes are 3D, crescent-shaped bedforms, and while most commonly associated with aeolian environments, recent observations have shown them to form in subaqueous and extraterrestrial environments as well. As barchans migrate in the direction of the flow, they interact with their neighbors, typically by way of a collision. The morphodynamics of such collision processes are complex, where the role of the turbulent flow structure is strongly coupled to that of the sediment transport and morphological change. Here we study the flow structure in a decoupled manner through measurements of the turbulent flow over fixed-bed models of barchan dunes in various configurations involved in a barchan collision process. Particle image velocimetry is used to measure the flow in a refractive-index matched flume environment that enables uninhibited access to the whole flow field around these geometrically complex bedforms. Presented herein are results from temporally resolved stereo-PIV measurements showing the dynamics of turbulent flow structure in the cross-plane. Aspects of the flow turbulence with implications for sediment transport are analyzed in terms of the impulses of sweeps and ejections, which are further explained in terms of reconstructed vortex structure and wavelet analysis.

[1]This work was supported by the National Science Foundation through collaborative grants CBET-1603211 (Notre Dame) and CBET-1604155 (Illinois).

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Date submitted: 01 Aug 2020 Electronic form version 1.4