Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Cross-plane Stereo-PIV measurements in a refractive index matched flume of to elucidate the turbulent flow structure over 3D bedforms[1] NATHANIEL BRISTOW, GIANLUCA BLOIS, Univ of Notre Dame, JAMES BEST, University of Illinois at Urbana-Champaign, KENNETH CHRISTENSEN, Univ of Notre Dame — Barchan dunes are three-dimensional, crescent-shaped bedforms found in regions of unidirectional flow and limited sediment supply, and while most commonly associated with aeolian environments, recent observations have shown them to exist in river beds, along continental shelves, and on the surfaces of Mars and Titan. 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 stereo PIV measurements showing, for the first time experimentally, the turbulent flow structure in the cross-plane behind the horns of a barchan undergoing a collision with a larger, downstream barchan.

[1]NSF Grant CBET 1603211

Nathaniel Bristow
Univ of Notre Dame

Date submitted: 28 Jul 2017 Electronic form version 1.4