Abstract Submitted
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Flow over interacting barchan dunes studied in a refractive-index-matched environment Z. TANG, N. JIANG, Tianjin University, G. BLOIS, J.M. BARROS, J.L. BEST, K.T. CHRISTENSEN, Univ. of Illinois — Barchan dunes are three-dimensional topographic features characterized by a crescentic shape. Very common on Earth's surface, barchans are produced by unidirectional flows in regions of sediment starvation and are characterized by migration rates that are a function of their volume. This results in complex dune-to-dune interaction mechanisms that are poorly understood. In order to quantify the flow structure produced by interacting barchans, PIV measurements were made wherein the dune models were immersed in a flowing fluid that was refractive-index-matched to the dune material. Doing so provided full optical access to the obstructed regions of flow and eliminated reflections from the liquid-solid boundaries, allowing near-wall data to be collected. Clear barchan models with different volumetric ratios were arranged in tandem, and flow-field measurements were made in multiple streamwise–wall-normal and streamwise–spanwise planes. Ensemble-averaged flow fields and Reynolds stresses were obtained for different barchan spacings and compared to the reference case of an isolated barchan. Proper orthogonal decomposition analysis was employed to study the spatial characteristics of the energy distribution both between and downstream of the aligned dunes.

Kenneth Christensen
Univ. of Illinois

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