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**A numerical study of turbulent flow over complex aeolian dune fields: the White Sands National Monument** WILLIAM ANDERSON, Baylor University, MARCELO CHAMECKI, Penn State University, GARY KOCUREK, DAVID MOHRIG, The University of Texas at Austin — The structure and dynamics of fully-developed turbulent flows responding to aeolian dune fields are studied using large-eddy simulation with an immersed boundary method. An aspect of particular importance in these flows is the downwind migration of coherent motions associated with Kelvin-Helmholtz instabilities which originate at the dune crests. These instabilities are responsible for enhanced downward transport of high momentum fluid via the so-called turbulent sweep mechanism. However, the presence of such structures and their role in determining the bulk characteristics of fully developed dune field sublayer aerodynamics has received relatively limited attention. Moreover, many existing studies address mostly symmetric or mildly asymmetric dune forms. The White Sands National Monument is a field of aeolian gypsum sand dunes in southern New Mexico. In the dune field sublayer, the flow statistics resemble a mixing layer: at approximately the dune crest height, vertical profiles of streamwise velocity exhibit an inflection and turbulent Reynolds stresses are maximum; below this, the streamwise and vertical velocity fluctuations are positively and negatively skewed, respectively. We evaluate the spatial structure of Kelvin-Helmholtz instabilities present in the dune field sublayer – shear length, Ls, and vortex spacing, Lambda_x – and show that Ls = m Lambda_x, where m is approximately 8 in the different sections considered.

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