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**Direct Numerical Simulation of Turbulent Flow over Sandy Rippled Beds** ALLISON PENKO, JOSEPH CALANTONI, Marine Geosciences Division, Naval Research Laboratory, DONALD SLINN, Dept. of Civil and Coastal Engineering, University of Florida — The presence of ripples on the seafloor affects the turbulent dynamics of bottom boundary layer (BBL) flow. The difference in the roughness length scales of a planar and rippled sand bed produces quantifiable differences in the turbulent BBL. A complete understanding of the effect of suspended sediment concentration on turbulence modulation is currently unknown. We use mixture theory to implement a three-dimensional BBL model that simulates the coupled interaction between the fluid and sediment. The mixture theory approach treats the fluid-sediment mixture as a single continuum with effective properties that parametrize the fluid-sediment and sediment-sediment interactions. We compare two-dimensional and three-dimensional simulations with existing laboratory measurements of fluid velocity and sediment concentration over rippled sand beds. We find that the vortex dynamics over sand ripples are highly three-dimensional. Two-dimensional flow simulations are inadequate for the numerical modeling of turbulent flow over sand ripples. We also find that suspended sediment concentration influences the production of turbulence; therefore, accurate simulation of turbulent flow over sandy beds must include an adequate description of fluid-sediment interactions.

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