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Direct numerical simulations of bedload transport over inclined particle beds[1] NADIM ZGHEIB, Lebanese American University, LIHENG GUAN, J. S. SALINAS, S. BALACHANDAR, University of Florida — We present results from open-channel, Euler-Lagrange direct numerical simulations of turbulent flow over an erodible particle bed. A total of 31 simulations are conducted. The shear Reynolds number is kept fixed at $Re_\tau = 180$, while the Shields to critical Shields ratio θ/θ_{cr} and the bed inclination angle β varied in the range 1.32 to 4.04 and -30° to 30°, respectively. For the $\beta = 0$ cases, we find our results to be in good agreement with the Wong Parker (WP) (2006) correction of Meyer-Peter and Müller (1948) bedload transport relation. Consequently, we use the sediment flux values from the non-horizontal simulations to propose a correction to the WP model so as to extend it to non-horizontal beds. Additionally, we compute the critical adverse bed inclination angle β_{cr} for all θ/θ_{cr} considered values. β_{cr} represents the angle beyond which the sediment flux points in the direction opposite to the flow. Finally, we extract the streamwise velocity component at the sediment surface and use it to propose an improved Dirichlet boundary condition for Euler-Euler turbulent flow simulations over inclined sediment beds.

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