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On The Large Fluctuations Of The Local Particle Flux For Bedload Dominated Transport[1] LIHENG GUAN, J. S. SALINAS, University of Florida, NADIM ZGHEIB, Lebanese American University, S. BALACHANDAR, University of Florida — We present results from open-channel, Euler-Lagrange direct numerical simulations of turbulent flow over an erodible particle bed consisting of 1.3 million particles. All simulations are carried out at the same shear Reynolds number of $Re_\tau = 180$. The particle Reynolds number Re_p and the ratio of Shields number to the critical Shields number θ/θ_{cr} varied in the range 11.4 to 29.8 and 1.32 to 5.98, respectively. From a global perspective, our simulations correctly reproduce the Wong & Parker (2006) (WP) correction of Meyer-Peter & Muller bedload transport relation with a similar trend in the scatter. On the other hand, from a local and instantaneous perspective, our simulations show that the sediment flux could differ by a few orders of magnitude from WP. We use the resolved flow field and swirling strength λ_{ci} to show that, comparing with the particle bed arrangement, the turbulent fluctuations coupled with particle inertia are more responsible for this large scatter. We further extract the bed-tangential and bed-normal components of velocity at the surface of the particle bed. These velocity components, which are essential to the modelling of sediment transport, also demonstrate large variations at the local and instantaneous level.

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