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Large Eddy Simulation of Dilute Sediment Suspension in an Open Channel Flow GETNET AGEGNEHU, HEATHER D. SMITH, Department of Civil and Environmental Engineering, Louisiana State University — Flow and suspended sediment transport in fully developed turbulent open channel flow has been investigated using Large Eddy Simulation. We used a three-dimensional, non-hydrostatic model, OpenFOAM for this study. Pre-evaluation of three existing turbulence closure schemes is performed by comparing the mean flow and turbulent quantities with the direct numerical simulation results of Moser et al. (1999). It is found that the Dynamic Mixed Smagorinsky model underestimates the wall shear stress compared to the Dynamic Smagorinsky and one equation Eddy Viscosity schemes. Moreover, the Dynamic Smagorinsky scheme gives relatively better results in both the mean and turbulent quantities. The advection-diffusion equation is solved for suspended sediment transport and the effect of sediment roughness is included in the momentum equation based on the rough wall formulation proposed by Cebeci and Bradshaw (1977). A pick up function based on van Rijn (1984) is used to determine the sediment erosion. The settling process is taken into account with a settling velocity appearing in the concentration equation. Sediment and flow quantities are validated by comparing with the experimental data of Lyn (1988). The coupled hydrodynamics results are in good agreement with the experimental data.

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