



Surface roughness effect on near bed Turbulent Kinetic Energy in a large stormwater detention basin

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ABSTRACT

The effect of surface roughness on near bed turbulence is of great importance for sediments deposition and entrainment in stormwater detention basin. In this paper, effects of surface roughness in sedimentation processes have been investigated by means of RANS approach (CFD technique based on Reynolds Averaged Navier Stokes equations). Previous work has showed the ability of CFD modelling to allow the identification of the preferential deposition zones in a large detention basin. The new boundary condition on the bottom was based on the interaction between near bed turbulence and particle settling characteristics such as V_{80} settling velocity. In order to further clearly understand the effects of surface roughness on sedimentation, simulations with different surface roughness have been carried out and measurements of sediment thickness and distribution have been performed in the Django Reinhardt large stormwater detention basin in Chassieu (close to Lyon, France). Analysis of simulated results compared to measurement data reveals that the contour of preferential deposition zones linked to near-bed turbulent kinetic energy distribution is sensitive to surface roughness. The maximum value of the near-bed turbulent kinetic energy distribution in deposition zones is sensitive to surface roughness and is lower than V_{80}^2 .

KEYWORDS

Detention basin, surface roughness, turbulent kinetic energy, sediment distribution