World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Study of the Relationship between the Roughness Configuration of Channel Bottom and the Creation of Vortices at the Rough Area: Numerical Modelling

Authors : Youb Said, Fourar Ali

Abstract : To describe the influence of bottom roughness on the free surface flows by numerical modeling, a two-dimensional model was developed. The equations of continuity and momentum (Naviers Stokes equations) are solved by the finite volume method. We considered a turbulent flow in an open channel with a bottom roughness. For our simulations, the K-ε model was used. After setting the initial and boundary conditions and solve the equations set, we were able to achieve the following results: vortex forming in the hollow causing substantial energy dissipation in the obstacle areas that form the bottom roughness. The comparison of our results with experimental ones shows a good agreement in terms of the results in the rough area. However, in other areas, differences were more or less important. These differences are in areas far from the bottom, especially the free surface area just after the bottom. These disagreements are probably due to experimental constants used by the k-ε model.

Keywords : modeling, free surface flow, turbulence, bottom roughness, finite volume, K-ε model, energy dissipation
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020