Effect of Boundary Conditions and turbulence model on wake of a 3D underwater obstacle

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Abstract :

In this project the effect of wake of an underwater obstacle due to different boundary conditions (No slip and Hybrid) as well as different turbulence models available in OpenFOAM is studied. Generally, turbulence modelling is very computationally expensive as it involves capturing small scale eddies. However, in this project the difference in the results for low resolution grids to that of very fine mesh used for LES models are being studied. The results of two different turbulence models: k-ε model and Smagorinsky SGS model are compared with each other and experimental data. In addition to this the same turbulence model and flow conditions are applied to a square pyramidal object and results are compared for both the cases.

Domain of Study :

[1]
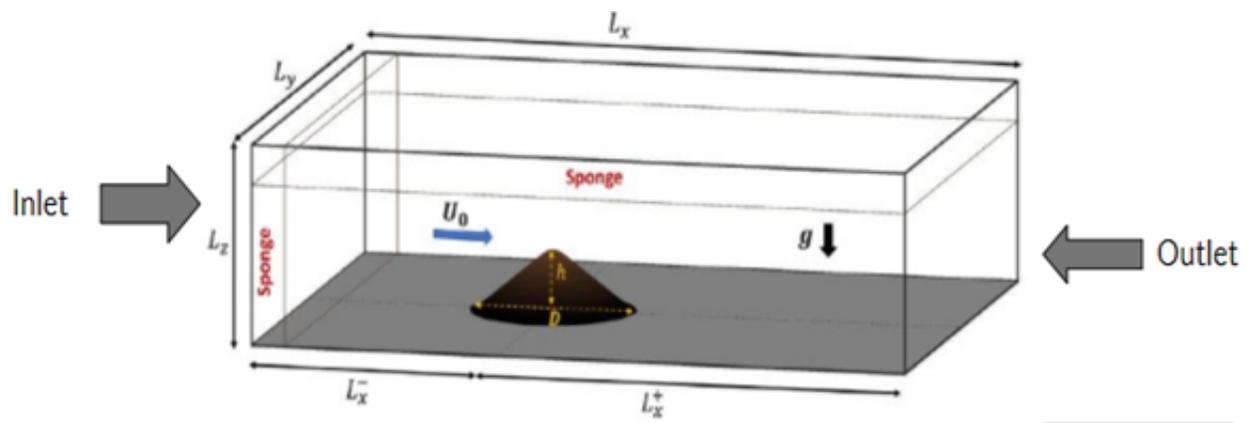
Here D and h are reference dimensions, whereas Lx^+, Lx^-, Ly and Lz are functions of D and h. Reynolds number for this system is set as 15000 and viscosity is taken as 10^{-6}. The obstacle is kept at origin. Fluid enters the system from inlet at a constant velocity (U_o ,0 ,0).

Reference : P. Puthan, M. Jalali, J.L. Ortiz-Tarin et al., *The wake of a three-dimensional underwater obstacle: Effect of bottom boundary conditions,* Ocean Modelling 149 (2020) 101611

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[1] Taken from Puthan et.Al.