Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Scale resolving computation of submerged wall jets on flat wall with different roughness heights[1] JOONGCHEOL PAIK, Gangneung-Wonju National University, FABIAN BOMBARDELLI, University of California, Davis —
Scale-adaptive simulation is used to investigate the response of velocity and turbulence in submerged wall jets to abrupt changes from smooth to rough beds. The submerged wall jets were experimentally investigated by Dey and Sarkar [JFM, V. 556, p. 337, 2006] at the Reynolds number of 17500 the Froude number of 4.09 and the submergence ratio of 1.12 on different rough beds that were generated by uniform sediments of different median diameters The SAS is carried out by means of a second-order-accurate finite volume method in space and time and the effect of bottom roughness is treated by the approach of Cebeci (2004). The evolution of free surface is captured by employing the two-phase volume of fluid (VOF) technique. The numerical results obtained by the SAS approach, incorporated with the VOF and the rough wall treatment, are in good agreement with the experimental measurements. The computed turbulent boundary layer grows more quickly and the depression of the free surface is more increased on the rough wall than those on smooth wall. The size of the fully developed zone shrinks and the decay rate of maximum streamwise velocity and Reynolds stress components are faster with increase in the wall roughness.

[1]Supported by NSF and NRF of Korea

Joongcheol Paik
Gangneung-Wonju National University

Date submitted: 02 Aug 2014 Electronic form version 1.4