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Computational investigation of hydrokinetic turbine arrays in an open channel using an actuator disk-LES model[1] SEOKKOO KANG, XIAOLEI YANG, FOTIS SOTIROPOULOS, University of Minnesota — While a considerable amount of work has focused on studying the effects and performance of wind farms, very little is known about the performance of hydrokinetic turbine arrays in open channels. Unlike large wind farms, where the vertical fluxes of momentum and energy from the atmospheric boundary layer comprise the main transport mechanisms, the presence of free surface in hydrokinetic turbine arrays inhibits vertical transport. To explore this fundamental difference between wind and hydrokinetic turbine arrays, we carry out LES with the actuator disk model to systematically investigate various layouts of hydrokinetic turbine arrays mounted on the bed of a straight open channel with fully-developed turbulent flow fed at the channel inlet. Mean flow quantities and turbulence statistics within and downstream of the arrays will be analyzed and the effect of the turbine arrays as means for increasing the effective roughness of the channel bed will be extensively discussed.

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