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Experimental investigation on axial-flow turbine arrays in erodible and non-erodible channels: Performance, flow-field, and bathymetric interactions[1] CRAIG HILL, FOTIS SOTIROPOULOS, MICHELE GUALA, University of Minnesota — Natural channels ideal for hydrokinetic turbine installations present complex environments containing asymmetric flow, regions of high shear and turbulent eddies that impact turbine performance. To understand the impacts caused by variable topography, baseline conditions in a laboratory flume are compared to turbine performance, flow characteristics, and channel topography measurements from two additional experiments with small-scale and large-scale bathymetric features. Both aligned and staggered multi-turbine configurations were investigated. Small-scale axial-flow rotors attached to miniature DC motors provided measurements of turbine performance and response to i) complex topographic features and ii) flow features induced by upstream turbines. Discussion will focus on optimal streamwise and lateral spacing for axial-flow devices, turbine-topography interactions within arrays and inter-array flow-field measurements. Primary focus will center on results from turbines separated by a streamwise distance of 7dT. Additionally, results indicate possible control strategies for turbines installed in complex natural environments.

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