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Parametrization of Hydrodynamics of Mangrove Root-Inspired Model for Coastline Protection Energy Harvesting JULIO LEBRON FELICIANO, Universidad del Turabo, AMIRKHOSRO KAZEMI, Florida Atlantic University, GERARDO CARBAJAL, Universidad del Turabo, MURAT TUTKUN, IFE Institute for Energy Technology, HUMBERTO BOCANEGRA EVANS, Texas Tech University, OSCAR CURET, Florida Atlantic University, LUCIANO CASTILLO, Purdue University — Mangroves are tropical and subtropical trees that aid in protecting coastlines by dissipating the energy carried by tidal flows. These trees attenuate the devastating effects of powerful natural disasters such as hurricanes. Their roots form complex networks extending out of the waters surface and interacting with the tidal flow in estuaries, deltas, and other inter-tidal areas. This study focuses on the parametrization of the hydrodynamics of mangrove root-like geometries and the effect of the mangrove patch porosity and flexural stiffness. A multivariable non-dimensional empirical correlation is proposed to obtain a self-similar solution that describes the hydrodynamics. We introduced an effective-diameter length scale based on the wake signature of the mangrove root models. It was found that in this new dimensionless parameter, based on the Reynolds number and porosity, was able to characterize the drag coefficient. This analysis is complemented with high-resolution PIV experiments performed in a water tank under various flow and porosity conditions. Furthermore, we analyzed the Vortex-Induced Vibrations (VIVs) of the flexible mangrove patch that produce oscillating energy as a potential source for energy harvesting.

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