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The effect of porosity and flexibility on the hydrodynamics behind a mangrove-like root model AMIRKHOSRO KAZEMI, Florida Atlantic Univ, SAMANTHA PARRY, Ocean and Mechanical Engineering, Florida Atlantic University, KEITH VAN DE RIET, School of Architecture, Florida Atlantic University, OSCAR CURET, Ocean and Mechanical Engineering, Florida Atlantic University
— Mangroves play a prominent role in coastal areas in subtropics regions. Mangrove forests are of special interest to protect shorelines against storm surges, hurricane winds, sea-level rise and tsunamis. In addition, mangroves play a critical role in filtering water and providing habitat to different organisms. In this work we study the complex interaction of water flow and mangrove roots which were modeled with a circular array of cylinders with different spacing between them as well as different configurations. In addition, we modeled the flexibility of the roots by attaching rigid cylinders to torsional connectors. The models were tested in a water tunnel for a range of Reynolds number from 2200 to 12000. In a series of experiments we measured the drag force, instant and mean velocity behind the models. We also performed 2D flow visualization for the models in a flowing soap film setup. The results show that the minimum velocity of the wake is highly dependent on the porosity and flexibility of the roots. We observed that there is a small-scale turbulent region. This turbulence is recombined downstream in a larger vortex structure eventually forming a von Karman vortex street wake. We compare the results from rigid cylinder and the flexible counterpart.

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