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Volumetric PIV behind mangrove-type root models AMIRKHOSRO KAZEMI, Ocean and Mechanical Engineering, Florida Atlantic University, Boca raton, FL, KEITH VAN DE RIET, School of Architecture and Design, University of Kansas, Lawrence, KS, OSCAR M. CURET, Ocean and Mechanical Engineering, Florida Atlantic University, Boca raton, FL — Mangrove trees form dense networks of prop roots in coastal intertidal zones. The interaction of mangroves with the tidal flow is fundamental in estuaries and shoreline by providing water filtration, protection against erosion and habitat for aquatic animals. In this work, we modeled the mangrove prop roots with a cluster of rigid circular cylinders (patch) to investigate its hydrodynamics. We conducted 2-D PIV and V3V in the near- and far-wake in the recirculating water channel. Two models were considered: (1) a rigid patch, and (2) a flexible patch modeled as rigid cylinders with a flexible hinge. We found that Strouhal number changes with porosity while the patch diameter is constant. Based on the wake signature, we defined an effective diameter length scale. The volumetric flow measurements revealed a regular shedding forming von Kármán vortices for the rigid patch while the flexible patch produced a less uniform wake where vortices were substantially distorted. We compare the wake structure between that 2-D PIV and V3V. This analysis of the hydrodynamics of mangrove-root like models can also be extended to understand other complex flows including bio-inspired coastal infrastructures, damping-wave systems, and energy harvesting devices.

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