Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Wind tunnel testing for hydrodynamic load characterization of icosahedron-shaped coral reef arks MOHAMED AMINE ABASSI, CHRISTOPHER GAYON, XIAOFENG LIU, FOREST ROHWER, JOSE CASTILLO, San Diego State University — Coral reefs play an important role in the balance of the marine ecosystem. They provide shelters to marine species, protect coastlines from the damaging effects of waves and tropical storms, serve as a source of nitrogen and other nutrients for marine food chains. An artificial structure named coral reef arks with the shape of icosahedron is being proposed. Their diameter are 3 meters and need to withstand ocean currents ranging from 0.5 to 2.0 m/s. Wind tunnel force measurements for one solid and one hollow icosahedron models are conducted at three different free stream tunnel speeds to investigate the hydrodynamic characteristics of the structures. Based on the model diameter of 0.152m, the tunnel speeds give rise to Reynolds numbers of 0.26, 0.37 and 0.45 million, which correspond to ocean current speeds of 0.10, 0.14 and 0.17 m/s. Results show that the drag force coefficient is reduced from 0.46 to 0.37 when the test model is changing from solid to hollow icosahedron. The dominant frequencies at Strouhal numbers of 0.24 and 0.50 for the solid icosahedron model are reduced to Strouhal numbers of 0.16 and 0.19 for the hollow model. The "pinging test" clarifies that these dominant Strouhal numbers are induced by the flow rather than the natural frequencies of the structure.

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Date submitted: 01 Aug 2019 Electronic form version 1.4