1155-76-620 **MD MONIR HOSSAIN*** (mdmoh81@vt.edu) and **Anne Staples** (staplesa@vt.edu).
Evaluating canopy flow closure models for coral reefs using fully resolved 3d flow field data.

Much research has been performed to understand the hydrodynamics of coral reefs above the canopy, but detailed flow dynamics inside the reef have largely remained unexplored. To make the analysis tractable, the Navier-Stokes equations are double-averaged (in space and time), resulting in a canopy flow model. The momentum equation obtained by the averaging approach generates spatially averaged Reynolds and dispersive stresses that require closure modeling. Most of these closure models are developed for simple homogenous geometries. In addition, we still depend on analytical models or semi-empirical data for prediction of the drag force on the coral reef. To determine these parameters directly, three-dimensional simulations of the flow-through a P. meandrina colony were performed using the immersed boundary method implemented in the large eddy simulation framework. The same methods were then used to perform the first simulation of the flow inside a model coral reef consisting of 24 P. Meandrina colonies. In this talk we will show how obtaining this fully resolved internal flow field will allow us to i) evaluate existing closure models used in the canopy flow theory, and ii) quantify the exact drag force that develops on the individual reef elements for the first time. (Received January 21, 2020)