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Effects of branching morphology on flow for a single coral colony

MD MONIR HOSSAIN, ANNE STAPLES, Virginia Tech — Coral colony growth, morphology, and mass transfer all strongly depend on the local hydrodynamics. But the intra-colony hydrodynamics also strongly depends on the colony morphology. To understand these interdependent effects, three dimensional immersed boundary method simulations were performed in the LES framework for realistic Reynolds numbers between 5,000 and 15,000 for both densely (*Pocillopora*) and loosely (*Montipora*) branched coral colonies. The loosely branched corals (LBC) allow more flow penetration through their sparser branches than do densely branched corals (DBC). In contrast, DBCs present higher resistance to flow and divert more flow around the colony. In both cases, the front of the coral experiences higher velocity than the back, while the flow decreases rapidly along the coral for DBCs in comparison to LBCs. Furthermore, it has been observed that for high Reynolds number regimes, LBCs roughen their branch surfaces with protrusions to increase the thickness of boundary layer and reduce the incidence of breakage. To understand this phenomenon, models of LBCs were simulated with and without protrusions distributed on the branch surface.

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