

Graduate Student Research Day 2010

Florida Atlantic University

COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

Dissipation and Eddy Mixing Associated with Flow Past an Underwater Turbine.

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The plan to install many ocean current turbines has led to questions regarding the large scale impact of the turbines on the Gulf Stream. The extracted energy by these turbines in terms of dissipation and eddy viscosity will be calculated and a method to represent the energy loss in a large scale is to be developed. The findings will help in estimation of the effects such as the reduction of stream velocity which is detrimental for the preservation of the Gulf Stream's movement pattern. A full three-dimensional RANS approach is adopted in a moving reference frame and used for modeling the turbine by means of periodicity. A turbine is meshed and simulated in a CFD solver - Fluent. The method is being validated against a previously done experimental study by making the parameters non-dimensional. On achieving a significant amount of accuracy, the modeled turbine will be run in different stream velocities, uniform and shearing flows, for varying Tip Speed Ratios (TSR). The energy dissipated will be calculated for each case. Mesh of sufficiently good quality has been generated. Preliminary simulations are completed. Validation of the model is being done. The research can be extended to find effects of fluctuations in the free stream on the energy extracted.