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The Role of Wakes in Modelling Tidal Current Turbines

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The eventual proper development of arrays of Tidal Current Turbines (TCT) will require a balance which maximizes power extraction while minimizing environmental impacts. Idealized analytical analogues and simple 2-D models are useful tools for investigating questions of a general nature but do not represent a practical tool for application to realistic cases. Some form of 3-D numerical simulations will be required for such applications and the current project is designed to develop a numerical decision-making tool for use in planning large scale TCT projects. The project is predicated on the use of an existing regional ocean modelling framework (the Regional Ocean Modelling System - ROMS) which is modified to enable the user to account for the effects of TCTs. In such a framework where mixing processes are highly parametrized, the fidelity of the quantitative results is critically dependent on the parameter values utilized. In light of the early stage of TCT development and the lack of field scale measurements, the calibration of such a model is problematic. In the absence of explicit calibration data sets, the device wake structure has been identified as an efficient feature for model calibration. This presentation will discuss efforts to design an appropriate calibration scheme which focuses on wake decay and the motivation for this approach, techniques applied, validation results from simple test cases and limitations shall be presented.