## On the coastal ocean modelling assessment of tidal stream and range energy resources

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Tidal energy can be practically exploited from sites with either high velocity currents or high elevation range. This is accomplished through the deployment of technologies that harness the available kinetic (i.e. tidal stream turbine arrays) or potential (i.e. tidal barrages or lagoons) energy respectively. In particular, the UK features several amplifying coastal characteristics that present viable opportunities for both forms of energy. Even though the rationale for harnessing the energy is fundamentally different, progress has been made on the assessment of prospective schemes using coastal ocean modelling and optimisation methods. As part of the methods developed, we discuss the representation of each of these technologies in the coastal ocean model *Thetis* for several UK-based applications. *Thetis* is an unstructured-mesh, finite-element model that solves both the depth-averaged, as well as the three-dimensional equations with primary applications aimed at the coastal and estuarine zones. It is based on *Firedrake* which is a finite element framework, that automatically derives highly optimised code from a high-level-abstraction description of the finite element equations. Through several UK-based case studies, we present the insight and limitations of the coastal ocean modelling approaches, and highlight specific considerations of the hydrodynamics developed at tidal stream and range sites respectively.

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