Modelling the interaction of tidal energy converter (TEC) farms with the natural coastal hydro-morphodynamic environment

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The tidal energy sector attracts developers' interest worldwide. For potential tidal energy deployment sites, numerous factors will impact decision making process related to siting and size of the tidal energy converter (TEC) farms. A key factor is the effect that TECs may have on the natural coastal hydrodynamic and morpho-dynamic environment. In this paper a Delft3D hydro-morphodynamic model was used to investigate potential impacts of TEC deployment on coastal morphology. The Inner Sound channel in Pentland Firth located between the Scottish Mainland and the Island of Stroma (UK), a site licensed for a large marine energy development, was used as a test site. The proposed tidal farm lies in close proximity to three large sandbanks located in the Inner Sound channel. This study investigates the impacts of tidal energy extraction from a TEC farm on the morphodynamics of these sandbanks. A range of hypothetical energy extraction scenarios was modelled to understand sandbanks morphodynamic response to each level of extraction from a hypothetical TEC array. This is an extremely useful technique to gain preliminary insights into the impacts of large-scale tidal energy extraction since field or large-scale laboratory investigations are hardly possible to investigate impacts of TECs on coastal morphodynamics. Same modelling techniques can be adopted and applied to undertake similar studies worldwide where tidal energy resource exploitation is possible.