2022_17_Civil Eng_Karmpadakis: ReX-COAST: Re-defining extreme coastal wave events

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The number of extreme events damaging coastal areas has been continuously rising for many years. Such events include coastal flooding, violent wave overtopping, island breaches, coastal erosion and resonance in harbour oscillations. In turn, all these lead to significant environmental, financial and social impacts on coastal areas and communities. The factors causing these events are typically linked to extreme weather conditions, and particularly extreme wave events. Climate change effects, such as sea-level rise and increased storminess, act to worsen the magnitude and/or frequency of the extreme coastal events. It is, therefore, clear that an accurate prediction of extreme coastal events is necessary. Such predictions are required to provide information to decision makers regarding adaptation strategies for coastal communities and engineers regarding protection solutions.

The purpose of this project is to build upon recent knowledge of coastal processes and climate change modelling to develop tools that can define the new extremes. More specifically, well established numerical tools and newly developed algorithms at Imperial College will be employed to simulate key processes in the coastal zone. Advanced statistical methods, including machine learning techniques and big data analytics, will be used to explore long-term effects and uncertainty. Taken together a coupled approach that incorporates key physical knowledge with stochastic modelling is the main characteristic of this project.

The ideal candidate will have a degree in Engineering, Computing, Mathematics, Physics or Earth Sciences; strong analytical skills; advanced computational/programming skills; and a great deal of enthusiasm about applying state-of-the-art techniques for greater good. Prior engagement with wave mechanics or coastal engineering is a plus.

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