Postdoc – ERC Advanced Grant HIGHWAVE

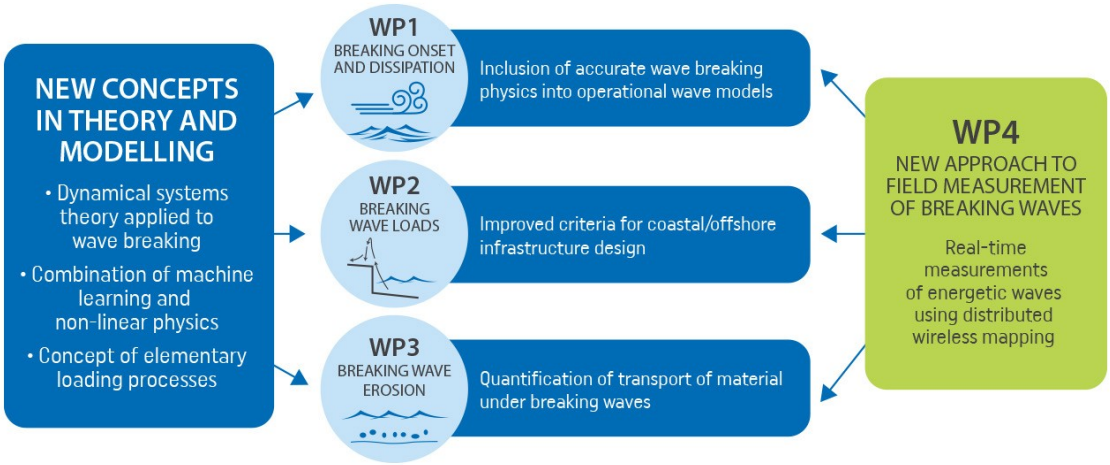
Wave breaking

Host: ENS Paris-Saclay (Frédéric Dias)
Co-supervision: Nicolas Vayatis

HIGHWAVE (2019-2024) covers simultaneously past, present and future energetic ocean waves. The project research, associated with sustainable environmental science and technology, will help future generations to improve environmental practice. HIGHWAVE is a cutting-edge mathematical project that uses real-time raw data harvested in situ by the project team to develop new models and new algorithms. These new models will provide information about air and water exchange in oceanic environments, boulder deposits, erosion and structural damage.

The postdoc will be based in Centre Borelli of ENS Paris-Saclay. Its wave group (8 PhD students, 5 postdocs, 1 engineer) has an international reputation in the study of waves, computational fluid mechanics and statistics. It is split over University College Dublin, Ireland and ENS Paris-Saclay. The research station is based on the Aran Islands, west coast of Ireland.

The work packages (WPs) of the project are summarized below:



The present postdoc position deals with WP4.

The key task of WP4, namely the design of a novel tool to forecast the emergence of breaking waves, builds on three unique features: the wireless approach allows data to be obtained in real time, the distributed network design allows for measurement over an extended area of the ocean and Machine Learning tools allow the development of algorithms to forecast the sea state at other locations and in future.

Several measurement campaigns have allowed: (i) to optimise the measurement system; (ii) to develop the required analysis software; (iii) to accumulate a large data set for breaking statistics as function of wind speed, wave age and wave direction.

Even though WP4 is focusing on the new field measurement tool and the forecasting algorithms, comparison with other measurement techniques will be required to validate the new technology. The second key task of WP4 is to apply Machine Learning classification

methods on large stereo video & radar datasets to extract patterns of breaking and broken waves that will be used to check the new breaking threshold developed in WP1. Breaking waves will be decomposed into elementary patterns and it will be checked how these patterns relate to the breaking strength.

The key goals expected from this postdoctoral position include:
• Development of the algorithms to clean the raw data and to provide the real-time data at 1-minute intervals from the raw data
• Development of the Machine Learning algorithms to forecast waves, and to detect breaking and broken waves
• Comparison of the data obtained from the new concept with data obtained from other concepts such as radar, stereo video, airborne LiDAR.

The annual salary will be between €37,223 and €43,029. The expected duration of the postdoc is 2 years.

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