9th MEFT workshop



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Numerical simulation of wave dynamics over a multifunctional artificial reef (MFAR)

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A multifunctional artificial reef (MFAR) is an artificial reef structure, typically submerged during most tides, which is designed to tackle a variety of objectives such as coastal protection, ecological habitat enhancement, and improved surfing amenity. For instance, detached submerged breakwaters are a major example of a MFAR. Even though they are primarily used to secure the coastal profile against erosion, a careful optimization of the breakwater design can unlock a broader spectrum of applications, such as important enhancement of wave surfing conditions. This dissertation project aims to conduct numerical simulations of wave dynamics using the COULWAVE and OpenFOAM numerical models, focusing on a feasibility case study of a detached breakwater located in front of Vagueira's Beach in Aveiro, Portugal. Initially, simple cases, similar to the examples provided with COULWAVE, will be examined, and comparable results are anticipated to be reproduced using OpenFOAM. Subsequently, the focus will shift towards improving wave breaking and overall surf amenity at Vagueira's Beach. This will involve calibrating the models using physical model data obtained by Mendonc, a et al. (2022), who conducted tests to evaluate wave breaking conditions at Vagueira's Beach in various scenarios. The objective is not only to replicate these results but also to consider new design configurations for the breakwater, such as different profiles, angles, or a V-shaped reef, to assess their potential for enhancing surf conditions at Vagueira's Beach.

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