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COMPUTATION OF DYNAMIC LOADS EXERTED BY REGULAR AND FOCUSED WATER WAVE GROUPS ON A VERTICAL CYLINDER

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Abstract. The accurate estimation of the loads exerted by water waves on the pile of an offshore wind turbine is relevant in the design and verification of such machines. A very well-known procedure to calculate these loads is using the Morison equation, which considers both the inertia and drag forces. The computation of these forces requires in turn the estimation of the inertia and drag coefficients which are obtained from experimental correlations. On the other hand, the use of computational fluid dynamics techniques allows to calculate the dynamic forces for a wider range of water wave conditions than the Morison equation, as long as appropriate tools are available to generate these water waves in a controlled fashion. In this work, the capabilities provided by OpenFOAM regarding wave generation and wave absorption are exploited to analyze the dynamic loads on a rigid vertical cylinder placed in a water channel by the impingement of regular waves in the first place, and then by a focused wave group. The validation of the simulation results is performed by comparison with the Morison equation estimations, when applicable, and with those obtained by other authors both numerically and experimentally.

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