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Internal forces and moments on hull girder due to parametric roll development

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The accurate prediction of wave-induced forces and moments on a hull operating in severe weather conditions plays an important role in assessing ship structural strength.

For ships prone to large variation of the submerged hull in wave, wave-induced loads could be influenced by the development of parametric roll. This concept is based on the evidence that the combination of all the ship rigid body motions could lead to larger loads on the hull, (such as inertial, restoring and Froude-Krylov loads), and thus to unexpected internal forces and moments on the hull structures.

In this paper, we aim at a fair assessment of the variation of the internal loads in waves of ships, in presence of parametric roll resonance. A numerical model is developed and applied to simulate ship dynamics in wave and estimate the correspondent wave-induced loads on ship structure. Particular attention is given to the horizontal bending moment and to the torsional moment.

The applications are meant to disclose the accuracy of the developed method. Comparison with reference design loads are presented, aiming at disclosing the severity of parametric roll phenomenon on the ship structures.

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