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Title: Breakwaters on Containerships: Case Study to Estimate Loads and Strength

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Authors: Leon Adegeest, Bart Hoogerbrugge, Marcus Schiere

Contact: leon.adegeest@amarcon.com

Abstract: A case study was carried out of the failure of a breakwater onboard a container vessel. The particular interest was to identify possible measures to avoid new failures in the future. The investigation was done for a ship crossing the North Atlantic in heavy weather in which it suffered severe breakwater damage. After the storm, the breakwater was found bent afterwards by about 20 degrees. The analysis involved linear and nonlinear seakeeping theory and a green water load calculation by adopting a 2D slamming theory developed for wedges. The breakwater was modelled in a nonlinear FEM program, and pressures were applied to see when failure occurs. In general, good accordance with rules was found concerning calculated water pressures. Furthermore, the FEM calculations confirmed the experienced failure of the breakwater when subjected to the calculated pressures. Several studies of breakwater constructions and possible configurations were carried out. Finally, it has been demonstrated that the criterion for breakwater damage could be implemented in an onboard seakeeping advisory system with the objective to reduce the risk for breakwater damage.

Keywords: seakeeping, Finite Element Method, breakwaters, greenwater, onboard advisory system