Maël Moreau

Title

Hydrodynamic study of roll motion of offshore vessels in operation

Short project description

The roll damping is crucial for the vessel performance. Since the damping is dominated by viscous loads due to flow separation from bilge keels or other appendages, state-of-the art industry codes based on potential flow theory cannot predict this, and rely on empirical methods. Empirical methods have been developed for conventional type of hulls with bilge keels for several decades, and good empirical methods (e.g. Ikeda 1976 to 1978) exist. 2D roll damping coefficients for mid-ship sections are found (in still water), and applied in a strip-wise manner along the ship. However, for other variations of the hull form than the conventional, Ikeda's formulas are not applicable. This applies particularly to novel designs of vessels used in offshore operations that deviate strongly from conventional hull.

Further, how to apply the formulas (roll damping coefficients) in a stochastic sea is not well-established, even for conventional hulls.

A main research task will be to design a method to predict roll damping (coefficients) for non-standard hull types, while another will be to investigate the applicability of the (still water) hydrodynamic coefficients when the ship is freely floating in waves. A 2D type of study will be conducted, including experiments and numerical work.

Industrial goals

- Provide a better understanding of the physics, and reliable estimations of the roll motion of offshore ships in operation.
- Provide a better prediction of the roll response to irregular waves in view of defining an appropriate weather window.

Scientific questions

- How to predict the roll damping accurately for unconventional hulls
- How to extend the equation of motion in still water to irregular sea states

Innovations

Propose a method of estimating the hydrodynamic coefficients that is adapted for the study of the roll motion of offshore vessels.

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