seanergy
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Poster n°9

Boat docking at a wind turbine, for actual sea state & real hull shape

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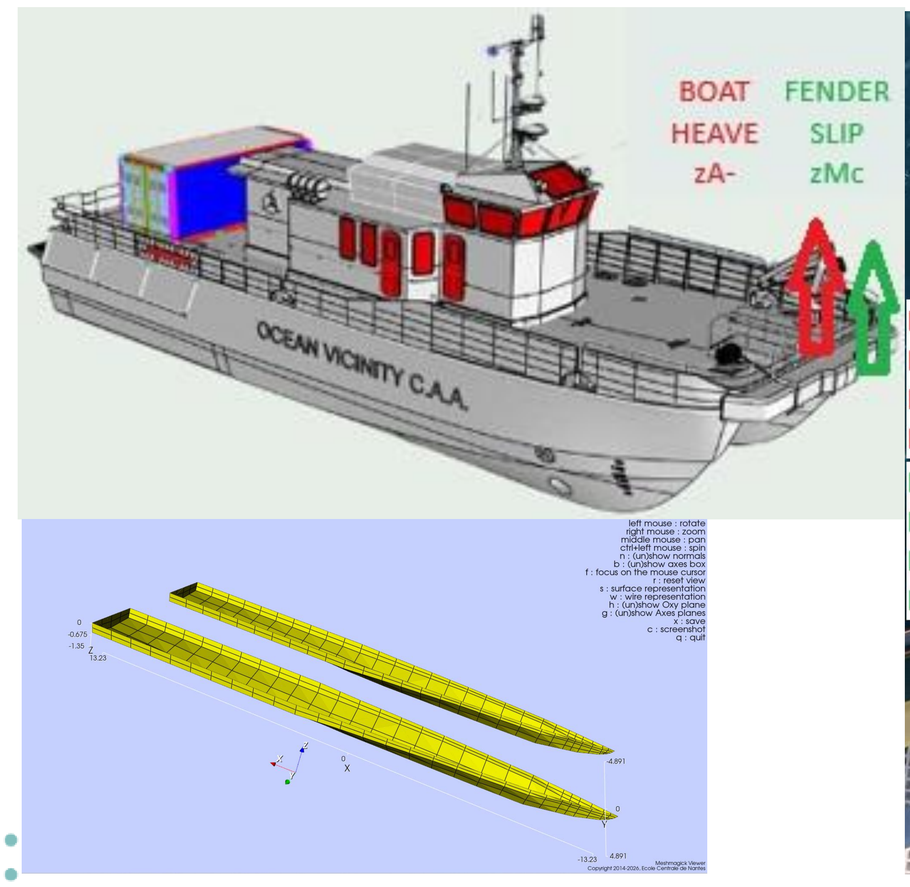
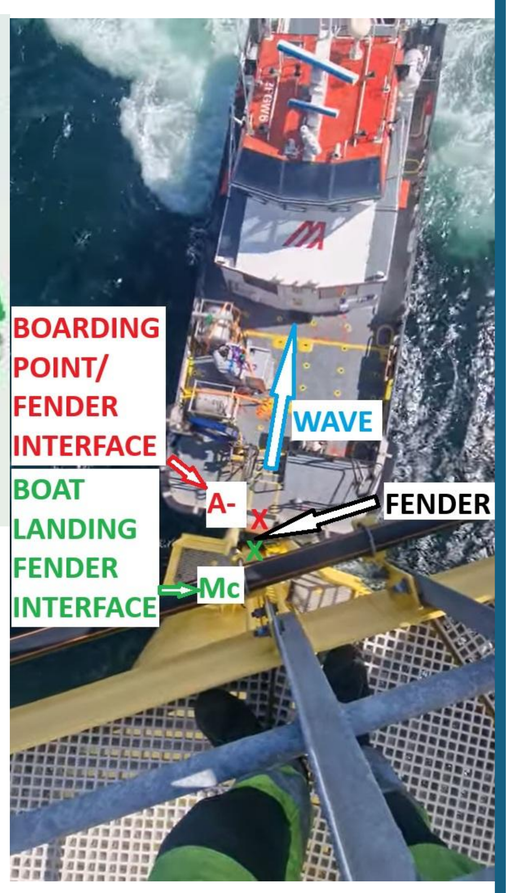
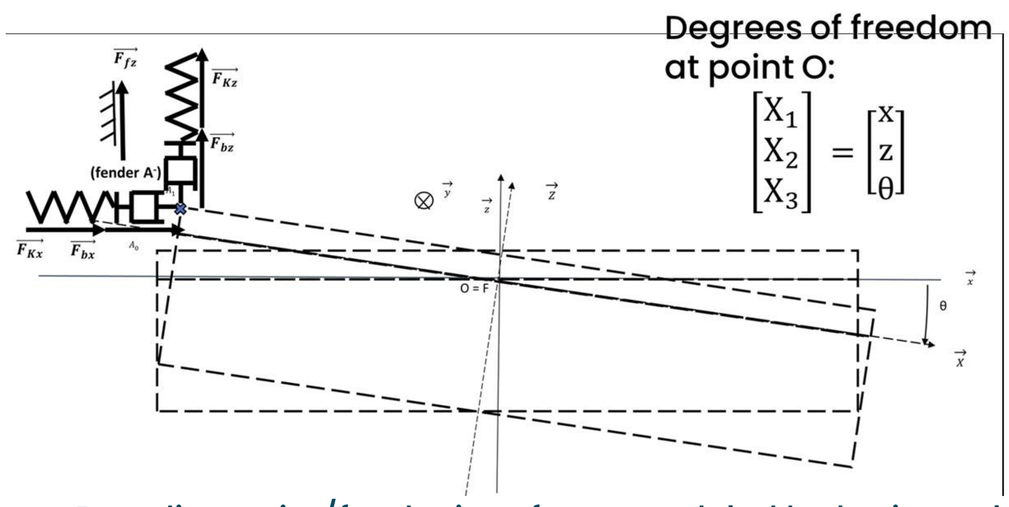
Introduction





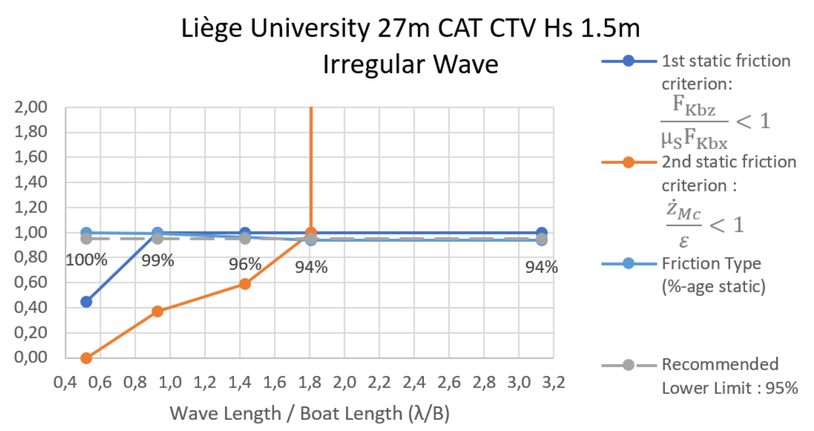
Actual sea state : irregular wave [1]. Real boat shape : meshed from hull plans [2].

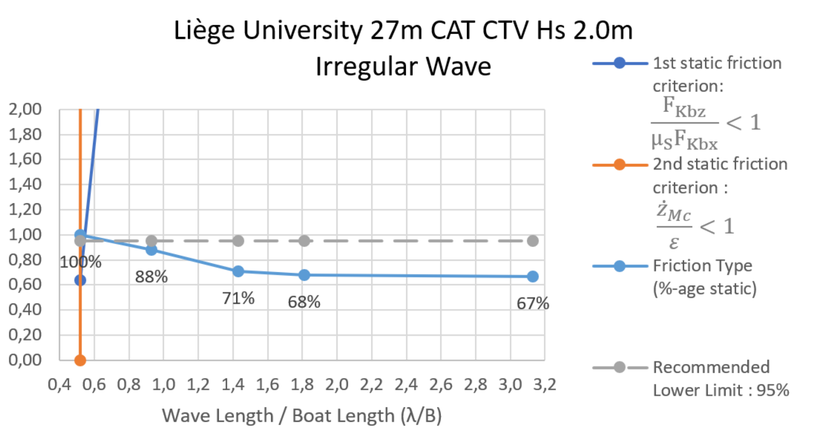
Method



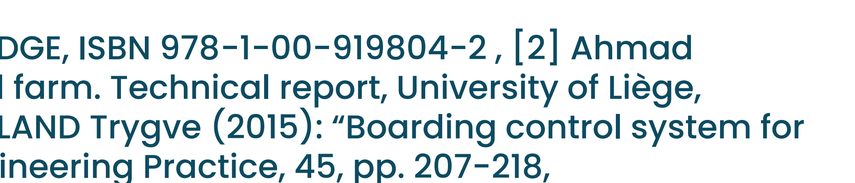
- Boarding point/fender interface : modeled by horizontal, vertical springs and dampers. $F_{Kbx(z)} = F_{Kx(z)} + F_{bx(z)}$
- Boat landing/fender interface : modeled by a vertical friction.
- 2 boarding acceptance criteria [3] : $\frac{F_{Kbz}}{\mu_S F_{Kbx}} < 1$ and $\frac{\dot{z}_{Mc}}{\varepsilon} < 1$

Results





Benchmark for boarding acceptance [4] :



Compared with benchmark, calc. finds boarding:

- Possible for Hs 1.5m and any λ.
- Impossible for Hs 2m & λ/B<50/24 = 1.85

Conclusion

- Fender modelling with springs & dampers is insufficient.
- Investigate fender non-linear stress-strain law.
- Future outcomes : boat propeller thrust control system for optimising fuel consumption.

References: [1] Bernard Molin (2023), Offshore Structure Hydrodynamics, CAMBRIDGE, ISBN 978-1-00-919804-2 , [2] Ahmad Hassan; Yung-Chang Chan; Zulqarnain Ali. Crew transfer vessel for offshore wind farm. Technical report, University of Liège, 2024.[3] AUESTAD Oyvind, GRAVDAHL Jan, PEREZ Tristan, SORENSEN Asgeir, & ESPELAND Trygve (2015): "Boarding control system for improved accessibility to off-shore wind turbines: Full-scale testing", Control Engineering Practice, 45, pp. 207-218, https://eprints.qut.edu.au/95577/ , [4] Nere G. Skomedal and Trygve Halvorsen Espeland (2017) Cost-effective Surface Effect Ships for Offshore Wind, FAST 2017 conference, Nantes, France. ESNA AS, KRISTIANSAND S, NORWAY, 7.