

Wavebox: A novel framework for floater modelling in accelerated frames

XII Marine Energy
Conference

PhD supervisors:

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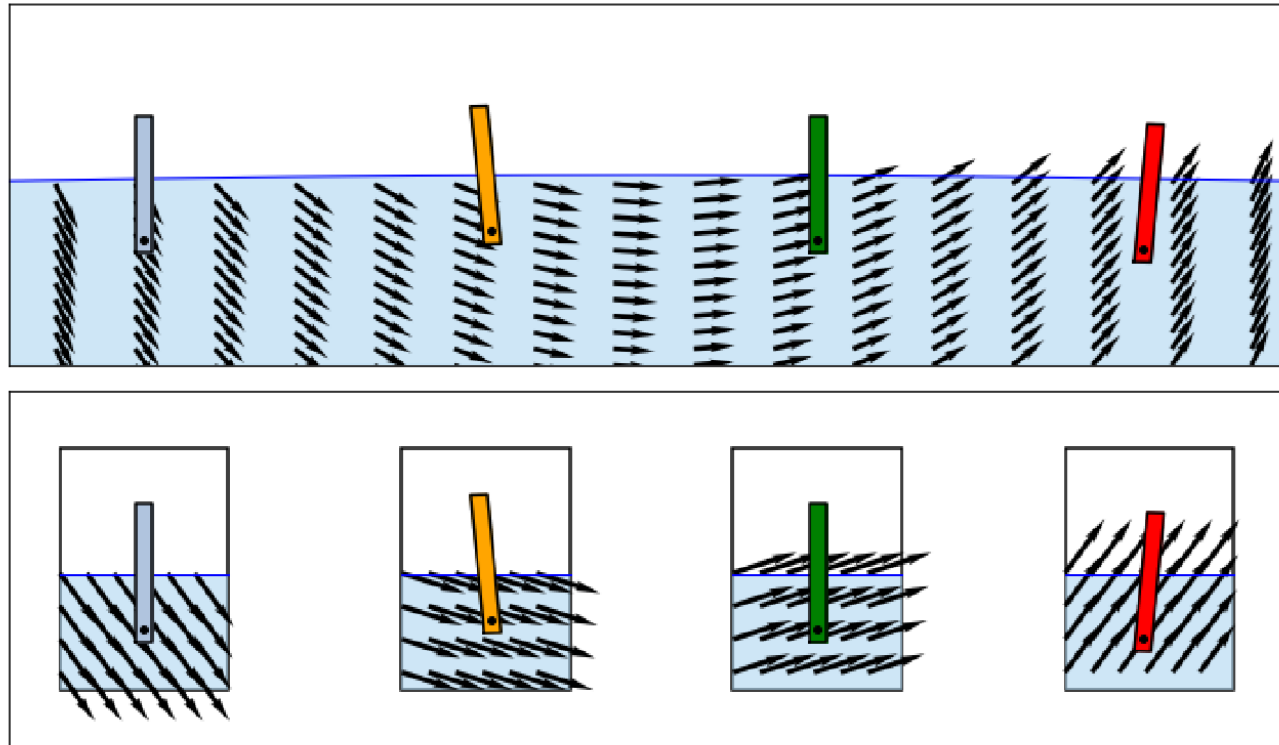


Universidad
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The Wavebox Concept: Mimicking Wave Forces via Tank Motion



Idealized dynamic equivalence of the Wavebox concept and a wave tank.

This is not a novel idea but was studied by Keulegan and Carpenter for Morison Forces estimation.

4. Characteristics of the Experimental Waves

The region under the nodal area of a standing wave that may be realized in a rectangular vessel furnishes a velocity field of simple harmonic motion in the velocity component U . This circumstance is not seriously modified even when the surges are moderately high.

Taking the x -axis in the plane surface of the undisturbed water, the z -axis vertical and upwards and the origin at one end of the basin, (see fig. 2), the surface elevation as reckoned from the undisturbed level, according to the second-approximation theory, from Miche [16], is

$$h = a \cos kx \sin \sigma t + a \frac{ak}{4} N_1 \cos 2kx - a \frac{ak}{4} N_2 \cos 2kx \cos 2\sigma t, \quad (36)$$

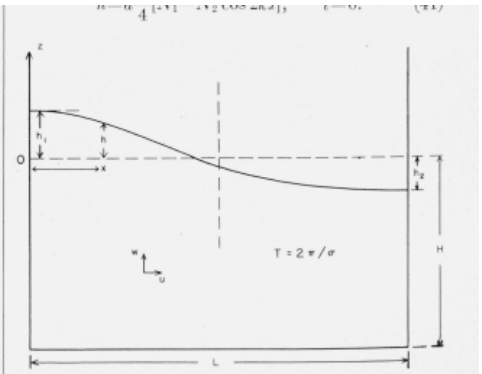


FIGURE 2. Notation diagram for wave profile.

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Joint collaboration with Uppsala University: Technical Visit and Experimental Planning

- *A collaboration with the electrical engineering department at the Uppsala university was done for the experimental testing with the Wavebox concept.*
- *We worked extensively in heave mode.*
- *A short stay is due in June, in a couple of week to validate the numerical model with Morison Forces estimation the plan is to validate and write a Morison force paper.*

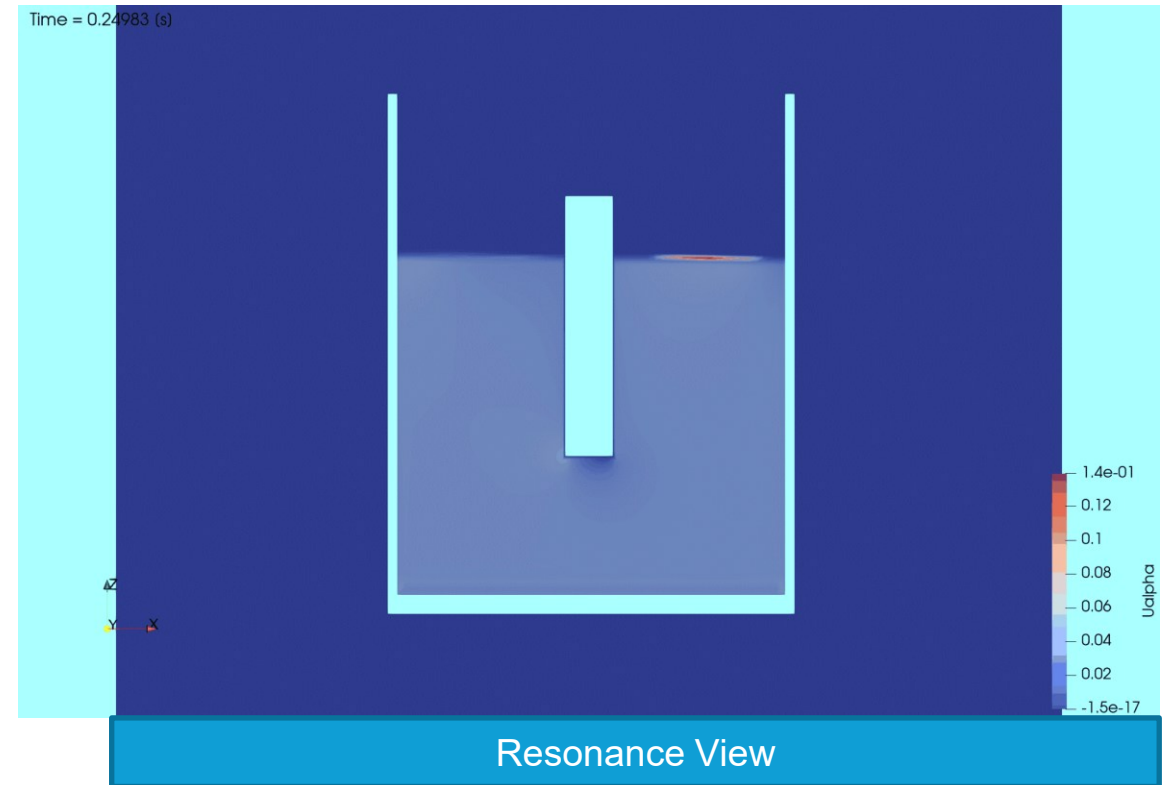
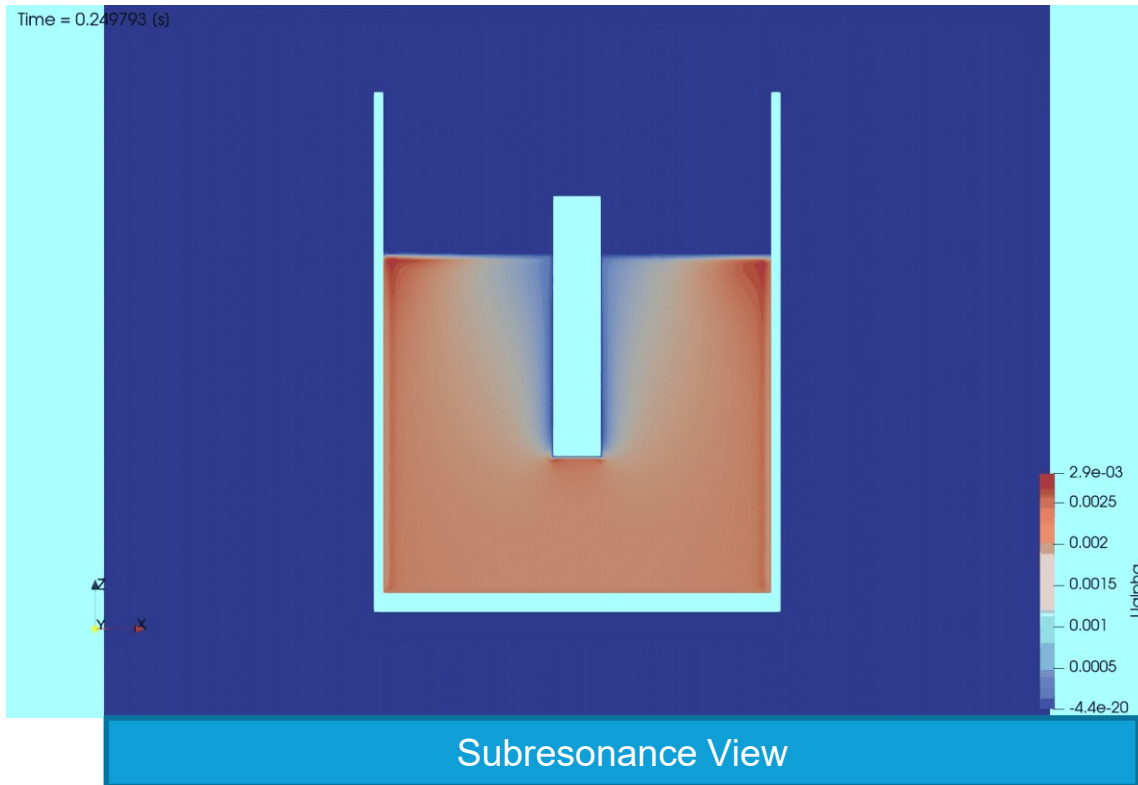


ABB robot used for the experimental testing.

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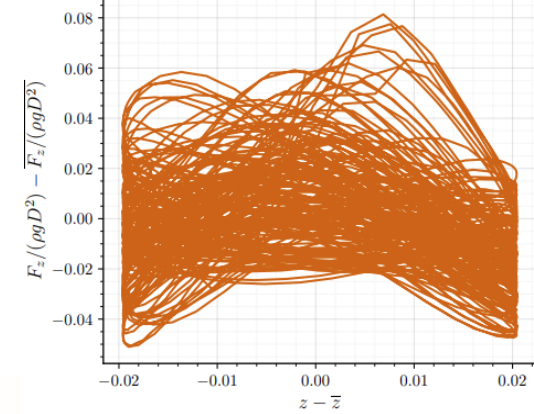
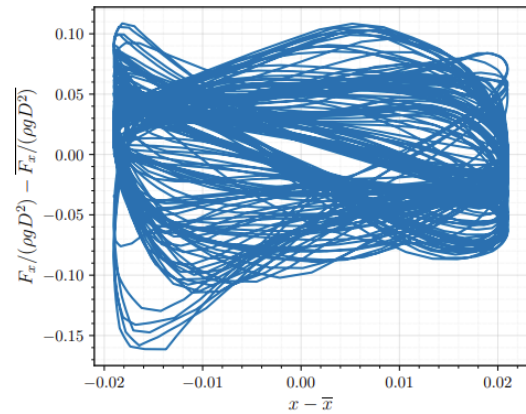
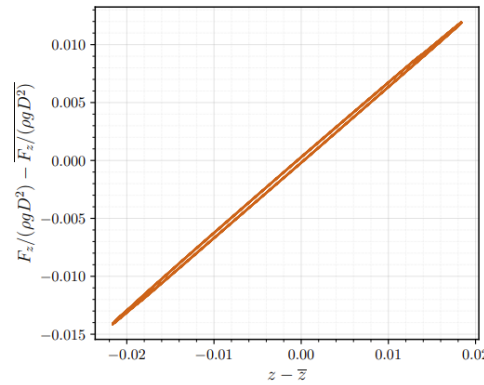
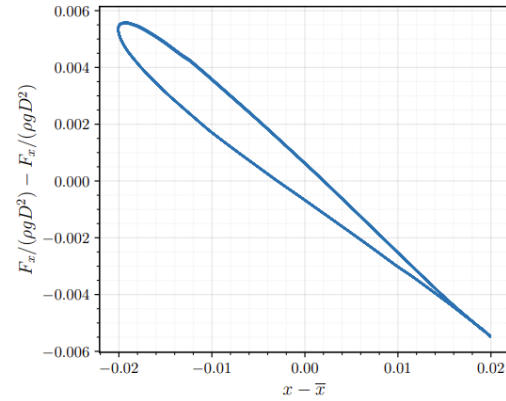
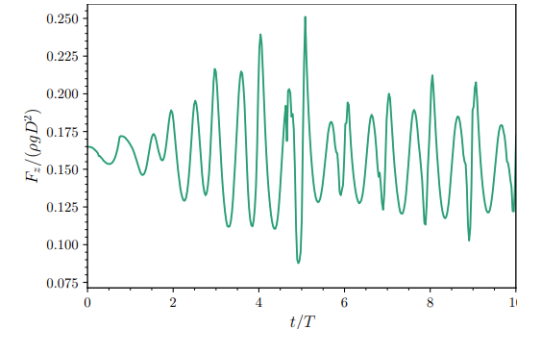
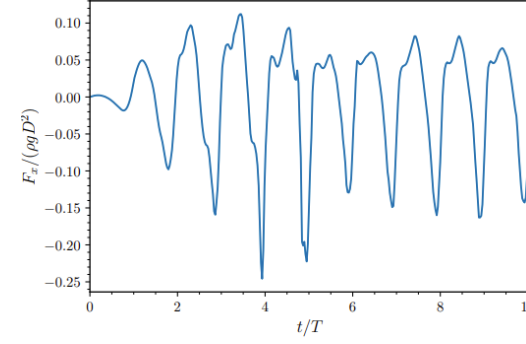
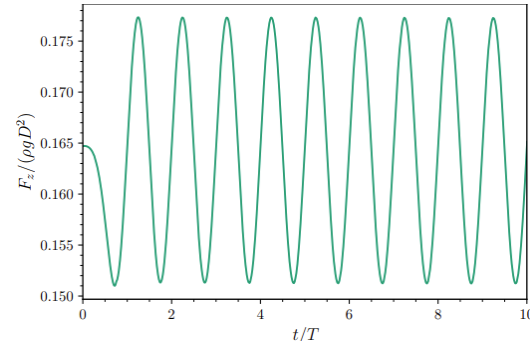
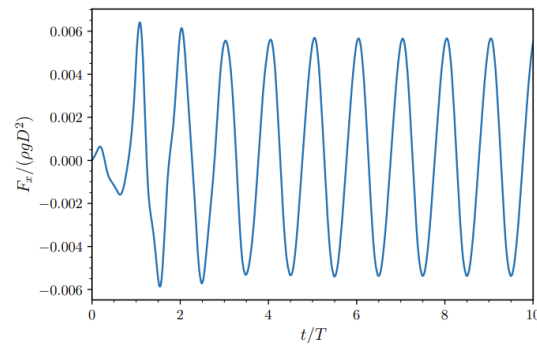
Numerical Simulations: Velocity Field view



Wavebox dynamics

Subresonance View

Resonance View



Publications

- Experimental and numerical investigation of a Wavebox system in heave mode I. Zárate, D. Salar, J. Berque, E. Hultman, J. M. Blanco and I. Mendikoa (EWTEC 2025-MADEIRA)
- A new type of wave tank: prototype and proof of concept J. Berque, I. Zárate, J. M. Blanco, I. Bidaguren, I. Touzon, J. M. Blanco and L. Fernández (EWTEC 2023-Bilbao).
- Oncoming publication of Sloshing categorization surge, combined DOF (Orbital Motion), and Morison Force