Discussion Sheet

IWWWFB
International Workshop on Water Waves and Floating Bodies

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Broadband absorption of wave energy by graded arrays of heaving buoys in 3D

Authors: Westcott, A.R., Bennetts, L.G., Sergiienko, N.Y., Cazzolato, B.S., Peter, M.A.

Discusser: Harry Bingham

Question(s) / Comment(s):

Can you comment on how the negative stiffness will be generated in practice? Has the power required for this (if any) been included in your calculation ?

Reply: Unfortunately not. We based our parameter on CorPower Ocean's device. The mechanism is described in more detail in Todalshaug et al. Tank testing of an inherently phase-controlled wave energy converter. In the J. Marine Energy (2016), I do not take into account the power required to create negative stiffness.

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Discusser: Mike Meylan

Question(s) / Comment(s):

For a finite time wave packet would your results be different ?

Reply: I haven't looked at a time packet in the 3D problem, but I do not expect them to change much, based on results for the 2D problem. I would expect a slight reduction as the interactions change a bit, and I expect the buoy amplitudes would decrease as well, but overall, I would expect similar levels of absorption. So long as the assumption of linearity remains valid, we can take a superposition of frequency domain solutions to construct the packet, and so the strategies should remain effective.

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Discusser: Ying Gou

Question(s) / Comment(s):

The multiple scattered waves from the other cylinders are considered to improve the efficiency. This results correspond to a stable state which need time to reach stability. In the real ocean, the wave is irregular and instantaneous, the efficiency of the arrays will be smaller than the results.

Reply: Our assumption is one of linearity, rather than a steady state. Assuming linearity, we capture high proportions of the energy over the target interval (broad in both frequency and direction), such that the incident wave field can be irregular and/or transient. The array will maintain high efficiency, since the solutions are constructed from a superposition of the frequency domain solutions.

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Discusser: Bin Teng

Question(s) / Comment(s):

Did you made the analysis on the cost and effectiveness? How is the ratio between the captured energy and the number of buoys ?

Reply: We have constructed arrays to give broadband capture rather than optimal capture per device added (within same constraints). The rainbows absorbing design allows lower frequency wave energy in the target intend to reach the bash rows, so that high power capture is measured by all buoys over broad frequency and directional bands. This is achieved using as few as ZV buoys. An economic analysis would not be appropriate for our study, and would be inaccurate with the current stage of model development. However, we rule that arrays of buoys will benefit from economics of scale, shared infrastructure, operating and maintenance costs, etc.

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Paper: On natural modes in the dock of a ship

Authors: Li, M.X., Zhang, X.S., Molin, B., Beck, R.F.

Discusser: Yonghwan Kim

Question(s) / Comment(s):

If my understanding is correct, the standing mode is assumed in the approximation. For a standing wave, we can write $\phi \sim \cos(kx)e^{i\omega t}$. In your approximation, $\phi = 0$ is assumed, then the opening boundary is where $\cos(kx) = 0$. Is it right?

Reply: Yes, your understanding is correct. We assert $\phi = 0$ at the opening boundary ($x = l$). This requires $\cos(kl) = 0$, yielding $k = \frac{2m-1}{2l}\pi$. As a result, $\phi(x, y, z, t) = \cos(\frac{2m-1}{2l}x)\cos(\frac{n\pi}{b}y)\cosh(k_{mn}(z+d))e^{-i\omega t}$

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Authors: Li, M.X., Zhang, X.S., Molin, B., Beck, R.F.

Discusser: Shuai Li

Question(s) / Comment(s):

Do you have any idea how to do the experiments to obtain the natural modes and compare it between your model WAMIT and experimental data.

Reply: Thank you for your question. We can place multiple wave gauges (array) in the dock. Generate incident waves at the estimated natural frequencies or nearby. Then, we can analyze the free surface elevation measured from the wave gauges and find out the natural modes.

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Authors: Li, M.X., Zhang, X.S., Molin, B., Beck, R.F.

Discusser: Simone Michele

Question(s) / Comment(s):

The boundary condition $\phi = 0$ is not valid for short length "l". If "l" is large you can use asymptotic approximations and find edge wave-like solutions or trapped modes having exponential decay from the vertical wall. Then these modes can be resonated linearly or nonlinearly (e.g. subharmonic resonance)

Reply: Thank you for your thoughtful question. It is for sure that $\phi = 0$ may be less precise when the length of the dock "l" is small. However, with reference to the actual scale of the dock in our paper, we believe $\phi = 0$ can still provide a relatively accurate depiction of the velocity potential at the entrance.

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Authors: Li, M.X., Zhang, X.S., Molin, B., Beck, R.F.

Discusser: Yuxiang Ma

Question(s) / Comment(s):

(1) The structure is movable or fixed? (2) There are many experiments in harbor oscillating in Coastal Engineering.

Reply: Thank you for your valuable comments! (1) Both fixed and free-floating conditions are studied. By comparing the results under both conditions, we found that the value of natural frequencies exhibits no significant change, especially at high order resonances. (2) We sincerely appreciate your suggestion. A comprehensive verification will be conducted by comparing with the experimental data.

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Paper: On natural modes in the dock of a ship

Authors: Li, M.X., Zhang, X.S., Molin, B., Beck, R.F.

Discusser: Mike Meylan

Question(s) / Comment(s):

(1) Did you perform a full simulation with WAMIT or your $\phi = 0$ approximation? (2) How did you extracts modes from WAMIT?

Reply: Thank you for your question! (1) We performed full simulations with WAMIT. The assumption of $\phi = 0$ at the entrance of the dock was only used for the theoretical model we proposed. (2) If you are referring to the specific modal shapes, we used an array of numerical wave gauges, ensuring that sufficient number of gauges are positioned within one wave length to depict the profile of free surface inside dock. A few incident wave frequencies were tested and we can find the natural frequencies based on the maximum of the free surface elevation. Then, we can plot the natural modes of the surface elevation at the natural frequencies.

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Authors: Li, M.X., Zhang, X.S., Molin, B., Beck, R.F.

Discusser: Aleksandr Korobkin

Question(s) / Comment(s):

your problem is similar to that studied by John Grue for a box with its upper side slightly under the water surface. Grue introduced the "inner" region at the edge of the box and solved the problem by matching solutions in different parts of the flow domain. He desired the "entrance condition". I do not remember how it looks like. However, the analysis by Grue may help to justify your $\phi = 0$ condition.

Reply: Thank you for your thoughtful question and for directing our attention to Prof. John Grue's work. We deeply appreciate this insight. After the conference, we will thoroughly study his paper to better understand its relevance to the problem we studied. Your suggestion is very much appreciated.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Experimental and Theoretical Investigation of Hydrodynamic Drag Loads on Flexible Side-by-Side Blades

Authors: Wei, Z.L., Kristiansen, T., Kristiansen, D., Shao, Y.L.

Discusser: Yonghwan Kim

Question(s) / Comment(s):

I wonder if we need any parameter to observe the oscillating flow cases. The effects of viscous drag/effect in unsteady flow field, we can define Keulegan-Carpenter number or Strouhal number for unsteadiness, Don't we need to define such nondimensional parameter?

Reply: Yes. Now we have $\alpha = U_m/\omega l$, which is equivalent to KC, but we don't have the Strouhal number. We also believe that the flutter frequency should be somehow related to the Strouhal number. It would be interesting to study both the flutter frequency and the flutter wavelength on the structure, so called post-critical behavior.

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Paper: Experimental and Theoretical Investigation of Hydrodynamic Drag Loads on Flexible Side-by-Side Blades

Authors: Wei, Z.L., Kristiansen, T., Kristiansen, D., Shao, Y.L.

Discusser: Siming Zheng

Question(s) / Comment(s):

For some special scenarios, e.g. when the current speed is large, those blades may not oscillate in a same manner. Did you consider the hydrodynamic interaction between the blades? The present numerical is 2D. Is it possible to extend it to 3D in the future.

Reply: No, not really. We have simplified the physical pattern a lot using so called equivalent thickness and equivalent bending stiffness. In this way, we could use one single leads to model an aggregated of leads. In the future, it might be possible to develop a 3D model.

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Authors: Wei, Z.L., Kristiansen, T., Kristiansen, D., Shao, Y.L.

Discusser: Takuji Waseda

Question(s) / Comment(s):

(1) Have you confirmed that the testing condition of flow is uniform flow in the flame? (2) What happened if the flow is a shearing current?

Reply: Yes. The lab staff did and the boundary effects from tank bottom or walls are minimal. The flow was quite uniform and steady. In a shear flow, at high speed, I believe the blade will reside in a layer of the same speed. Using local velocity for the non-dimensional parameters will not change our conclusions.

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Authors: Wei, Z.L., Kristiansen, T., Kristiansen, D., Shao, Y.L.

Discusser: Zhiming Yuan

Question(s) / Comment(s):

In your mathematical model, the upper boundary is treated as fixed one. In your test, the kelps are fix to a rigid struct. These are different from the reality when kelps are fixed to ropes, which are elastic. In such case, are the elastic effects important? If important, how can we implement elastic effects into the mathematical model?

Reply: We acknowledge that we have simplified the problem a lot and neither our experiments nor our numerical model fully represents the physics. To be honest, we are not sure how much it matters regarding the flexible ropes. In order to include this effect into the numerical model, I am afraid that we may have to develop a 3D model, which allows the deformation of the ropes.

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40th International Workshop on Water Waves and Floating Bodies

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Paper: Nonlinear Wave Loading on a Vertical Cylinder in Wave Groups with Diverse Spreading

Authors: Ding, H.Y., Zang, J., Taylor, P.H., Adcock, T.A.A., Dai, S.S., Ning, D.Z. Chen, L.F., Li, J.X.

Discusser: Bin Teng

Question(s) / Comment(s):

What is the breaking wave effect. Does the model also work for this topic.

Reply: Tried a group of breaking wave test, this doesn't influence the FOWT design. We will do more model testing next year.

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Discusser: Alistair G.L. Borthwick

Question(s) / Comment(s):

Thank you for an inspiring presentation. Please could you comment on whether there was any effect from second-order subharmonic error wave generated at the piston paddles (which presumably were first order). I imagine the water depth were sufficient for this to be a rather small effect.

Reply: Thank you for your nice comment and the important question. We need the wave measured at the cylinder to represent the incoming wave condition and the comparison with the input signal seems quite well, reproduced the target wave accurately.

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40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Six boundary-integral representations of the flow created by a ship that steadily advances in calm water

Authors: Noblesse, F.

Discusser: Young-Myung Choi

Question(s) / Comment(s):

It looks like that there exists a numerical difficulty in treating C_Γ numerically since it is integrated of free surface Green function with forward speed. It has a natural singularity for a large wave number.

Reply: Thank you for your question, Young-Myung. The function C_Γ does not involve the flow potential, which only needs to be evaluated at the ship-hull surface strictly below the ship waterline in the NN boundary-integral equation. This means that one has exponential convergence, i.e. one has exp(kz) with $z < 0$, in a low-order panel implementation of the NN integral equation.

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Paper: Six boundary-integral representations of the flow created by a ship that steadily advances in calm water

Authors: Noblesse, F.

Discusser: Aleksandr Korobkin

Question(s) / Comment(s):

You said that potential at the water line may singular or behaves strangely. I think, we should know this local behaviors before solving this problem numerically. What do you think?

Reply: Thank you for your question, Sasha. It certainly would be very nice if we could know the behavior of the flow potential at the ship waterline. However, this is a very difficult issue that has not been elucidated as far as I know. So, the singular behavior of the flow potential at the ship waterline does not seem to be understood.

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Paper: Diffraction and radiation problems of a floating barge in front of a partial reflecting wall

Authors: Teng, B., Li, Z.Q., Gou, Y., Shi, H.Y., Li, Y.N.

Discusser: Hui Liang

Question(s) / Comment(s):

If your study is motivated by wave loads on a body in proximity to a perforated wall, there will be energy dissipation by perforated structures. My question is how to quantify the energy dissipation?

Reply: Our interesting is on the ship motion and the wave loads on it. The partial structure can be different. Such as a cassion with the perforated front wall, or a group of piles. Some of nwaves may dissipate inside the structures, or pass through the structure.

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Discusser: Aleksandr Korobkin

Question(s) / Comment(s):

Please explain the physical meaning of the coefficient R.

Reply: R is the reflecting coefficient of the vertical wall. In coastal engineering, several kinds of partial reflecting structures are used, such as a caisson with perforated front wall, or a group of piles. when incident waves meet the structure, only a portion of wave will be reflected back. Some propagate through, some dissipated.

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Discusser: Yanlin Shao

Question(s) / Comment(s):

In the gap resonance problem, the fluid is modeled as a box with a non-zero draft. Do the results change if different drafts are used? And thus the results, as an approximation to the physical problem (gap resonance), can be non-unique? Note: In WAMIT, we use zero-draft lid on $z = 0$.

Reply: My method is assume the water inside the gap only move vertically. When the barge is long and not very shallow, the method can give good approximation. We take all water inside the gap as a rigid body. This way uses less mesh, and make computation quickly. For body with inclined wall, we will use the same strategy as WIT.

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Discusser: Siming Zheng

Question(s) / Comment(s):

A more general case is to set up the reflection coefficient complex, in which the imaginary part be related to the inertial effect of the reflecting wall.

Why $R_1 = R_2$? Is it OK to set up $R_1 \neq R_2$?

Reply: (1) The R is a complex coefficient in the derivation. But for simplification in the numerical example we only selected Real R. (2) The boundary conditions at the wall are from strict derivation, but from model test. We prefer to make it simple for use. In addition, if we let $R_2 \neq R_1$, I wonder if we can find consistent solution, even for incident waves.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Surface integration of ship-motion Green function

Authors: Chen, X.B., Choi, Y.M., Nguyen, M.Q., Wuillaume, P.Y.

Discusser: Peter Wellens

Question(s) / Comment(s):

(1) What is the essential difficulty of forward speed in combination with Green's Function? (2) What is the limit for the magnitude of the Froude number in this approach? (PS: your answer included numerical evaluation. That confused me a bit, because you also showed a numerical challenge for special case.)

Reply: (1) There are several critical challenges in the seakeeping solution with forward speed by using the free-surface Green function method (GFM), which are thought to be the reasons why most works have been oriented to the Rankine panel method (RPM). First, we have an additional integral equation over the free surface in the vicinity of ship if we linearise the unsteady problem over the double-body flow. The point Green function has a complex singularity and high oscillations for a field point located close to the track of source. Its integration on ship hull and on the free surface is not accurate, if not impossible, by using Gauss-Legendre quadrature. The linear system associated with the boundary integral equation is ill-conditioned due to irregular wavenumbers effects. Finally, the missing restoring term due to steady flow, and numerical ways to evaluate the gradient of velocity potential are additional ones. All these issues are treated in [6] and satisfactory solutions have been obtained. (2) The present linear theory is based on the assumption that the Froude number (Fr) is moderate since some terms associated with that of order $O(Fr^2)$ or higher are ignored. This method of SGF covers all typical Fr cases of ships, and can be well applied to the zero-speed case. The issue for zero-speed case is linked with the high frequency in the application of ship springing. Indeed, the usual way based on encounter-frequency approximation in zero-speed solution fails due to the inaccuracy by Gauss-Legendre quadrature of zero-speed Green function at high encounter frequency, as shown in my presentation. In this case, the present method based on Super Green function (SGF) works well thanks to the analytical surface integration.

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Paper: Three alternative linear free-surface boundary conditions for flows around ships

Authors: He, J.Y., Noblesse, F.

Discusser: Aleksandr Korobkin

Question(s) / Comment(s):

In the limit, the derivatives of the velocity of the flow are simpular at the waterline.

Reply: We thank Prof. Korobkin for his valuable comment which we agree fully. This 2D analysis suggests that linearization based on both the infinite-gravity double-body flow and the zero-gravity flow is evidence that troublesome at the ship waterline. This is another evidence that supports the Kelvin-Michell linearization advocated by the authors.

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Paper: Three alternative linear free-surface boundary conditions for flows around ships

Authors: He, J.Y., Noblesse, F.

Discusser: Alistair Borthwick

Question(s) / Comment(s):

Thank you for a fascinating presentation. Please comment on the order of accuracy of your discretization scheme (e.g. 1st order background difference of vertical velocity component) and the order of precision (i.e. number of significant figures). If sufficient computer were available, would the problem be treated by a customized version of clean numerical simulation (as developed by Prof. Liao Shijun at Shanghai Jiao Tong University)

Reply: Both methods to compute the vertical and horizonal velocities are first order. We found that the absolute errors are proportional to the moderate step size used in the numerical differentiation. However, for the evaluation of the derivatives of the velocities, the error due to the input flow potential, which is proportional to inverse of square of the step size can lead to significant numerical inaccuracies. In practice, one can not achieve as many significant figures as one wants in the solution of a boundary integral equation. Thus, the input error of the flow potential cannot be avoided. That is one reason why we think linearization based on the double-body flow which requires numerical differentiation of the flow velocity is no better justified than the classical Kelvin- Michell linearization.

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40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Wave propagation through periodic arrays of freely floating rectangular floes

Authors: Dafydd, L., Porter, R.

Discusser: Koushik Kanti Barman

Question(s) / Comment(s):

(1) Reason for choosing the Bloch wavenumber in the form (Mathematical intution behind it). (2) The gap is small. What in the order of ϵ or physical definition for ϵ?

Reply: (1) The original dispersion relation can derived from homogenous, linear fluid principals. The Blech-Floquet boundary condition applied has allow us to extend the problem to include gaps. (2) $\epsilon = l/d$ where l is the gap length and d is the ice submergence. The effects the gap has on the dispersion relation is an $O(\epsilon)$ effect.

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Authors: Dafydd, L., Porter, R.

Discusser: Mike Meylan

Question(s) / Comment(s):

How would this model be extended to the case of attenuation and related to this question in the MIZ context

Reply: Applying the desired analytic, asymptotic dispersion relation to a scattering model (e.g. ODE) will allow changes in both depth, ρd, and gap, ϵ, from which attenuation could be derived from the eigenvalues of the transfer matrix.

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Paper: Wave propagation through periodic arrays of freely floating rectangular floes

Authors: Dafydd, L., Porter, R.

Discusser: Baoyu Ni

Question(s) / Comment(s):

(1) As the gap is very small, is the collision of ice floes possible? If so, how can this work consider it? (Is it possible to consider it?) (2) As the title of the abstract is about wave propagation, it will be more interesting to provide the change of the wave; for example, the attenuation of wave height through the ice floes.

Reply: (1) Surge models in this problem tend to be approximately in phase. Additionally, amplitude is assumed to be small enough to present possible collision, which this model can not currently account for. (2) Previous work shows in the small-gap limit of this problem that over a sampling of random coverings, $< k_i > \approx \frac{\sqrt{T_1}}{\alpha} k_0^4 \wedge \sigma^2 e^{-k\alpha^2 \wedge^2}$ where k_0 is the mean wavenumber, $\wedge$ the correlation length and σ^2 the RMS of the random surface.

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Paper: Wave propagation through periodic arrays of freely floating rectangular floes

Authors: Dafydd, L., Porter, R.

Discusser: Tatyana Khabakhpasheva

Question(s) / Comment(s):

(1) Could you please explain lines on dispersional curves more carefully. (2) Is a some limit of dispersional occurs. if a length of the floes turn to infinity.

Reply: (1) Effectively it is K against the Blech wavenumber k. RGB photo have been used where red-heave, green-surge, blue-yaw, e.g. the circular motion is yellow because their normalized vector gives. (2) We expect this model to only work when the wavelength is much larger than the floe length and through no intuition about infinite-length floes.

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40th International Workshop on Water Waves and Floating Bodies

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Paper: Improved Prediction of Wave Excitation Forces Using Small-Body Based Correction

Authors: Kurniawan, A., Wolgamot, H., Orszaghova, J.

Discusser: Masoud Hayatdavoodi

Question(s) / Comment(s):

Thank you for the presentation. Can you explain the mathematical background for your assumption of the form of the wave force. Is this arbitrary, or did you try various form and arrived to this proposed form.

Reply: The linear form of the small-body approximation is standard and is derived by assuming that if the body is small relative to the wavelength, then the fluid acceleration is approximately constant over the body. This leads, for example, to the inertial term in the Morison equation. The proposed form follows the same general form.

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Paper: Improved Prediction of Wave Excitation Forces Using Small-Body Based Correction

Authors: Kurniawan, A., Wolgamot, H., Orszaghova, J.

Discusser: Yonghwan Kim

Question(s) / Comment(s):

I think that the important term is for u^2, i.e. 2nd order component. In the case of linear or FK terms, the difference with linear solution is not big. But R12 is not. Therefore, we need to check each component and check the contribution if possible. (yes, it is simple.)

Reply: Thank you for the suggestion of checking the contribution of each term. The issue with the velocity squared terms is that they all involve the diffracted velocity, which a user may not have access to, In the particular case considered in the abstract, second-order contribution from the product of η and the fluid acceleration turns out to be equally, if not more, important, There is also a third-order contribution that is important as wall. Both of these are associated with the incident potential alone, so are FK terms.

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Paper: Improved Prediction of Wave Excitation Forces Using Small-Body Based Correction

Authors: Kurniawan, A., Wolgamot, H., Orszaghova, J.

Discusser: R. Cengiz Ertekin

Question(s) / Comment(s):

What is the definition of a “small body”. Do you imply a “slender” body. If so, why not use Morison’s equation which contains drag force as well?

Reply: Yes, Morison equation arises from “small body” or “long-wavelength” assumptions. Morison equation without the drag is what “small-body” approximation leads to.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

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Paper: Theoretical and experimental analysis of a floating flexible circular disk

Authors: Michele, S., Zheng, S., Borthwick, A.G.L., Greaves, D.M.

Discusser: Mike Meylan

Question(s) / Comment(s):

How did you calculated hydrostatic matrix? Did you evaluated wet natural frequencies?

Reply: I applied the orthogonality property on natural modes for the solution of the dynamic equation. Wet frequencies can be found by equating to zero the determinant of the real part of the coefficient matrix (inertia).

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

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Paper: Small is Beautiful? Weakly-Nonlinear Simulations of a Compact WEC for Ocean Monitoring

Authors: Bingham, H., Read, R.

Discusser: Bin Teng

Question(s) / Comment(s):

Under the action of current, wind, and drift force, the cable must be inclined. At this situation, will the WEC generate more electricity or less? How to define the β when surge motion is considered?

Reply: Our F-D model currently ignores the cable forces in the surge direction, but they are included in the T-D model. We have not considered current and wave drift loads yet but we should do that in the future. My guess is that this will mainly just increase the cable pre-tension and have a minimal effect on power absorption.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Small is Beautiful? Weakly-Nonlinear Simulations of a Compact WEC for Ocean Monitoring

Authors: Bingham, H., Read, R.

Discusser: Simone Michele

Question(s) / Comment(s):

(1) Is the turbulent boundary layer important? It could be because the thickness of the boundary layer can be comparable with the body dimensions (2) I think increasing the number of cables can increase efficiency, We found similar results in Michele et al. 2024 "Hydroelastic theory for offshore floating plates of variable flexural rigidity" where the authors analyzed a similar system.

Reply: (1) It's a good question. I think that currents may be a more important influence than the background turbulence, but that is just a guess. (2) Thank you for that.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Wave interaction and turbulent dissipation of a highly-porous periodic breakwater

Authors: Arcondoulis, E.J.G., Porter, R.

Discusser: Xinshu Zhang

Question(s) / Comment(s):

Very nice work! I am wondering if the discrepancy is due to instability which cause the energy transfer from one mode to another one.

Reply: Thank you for your question. Indeed, at higher wavenumbers it is anticipated that instability may occur during transition of higher order modes. We believe that the presence of a periodic lattice structure induces such higher order modes due to coherent wave scattering at the structure boundary. We therefore suggest that the Solitt and Cross model would agree with wave gauge data at higher wavenumbers using a randomised porous structure, which would generate stochastic/diffuse wave scattering rather than coherent scattering and superposition. We also believe that the increased turbulent kinetic energy observed via 3-D PIV near the porous boundary at $kd = 3.12$ (as compared to other wavenumbers studied) supports our claims.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Wave interaction and turbulent dissipation of a highly-porous periodic breakwater

Authors: Arcondoulis, E.J.G., Porter, R.

Discusser: Alistair Borthwick

Question(s) / Comment(s):

Thank you for a fascinating presentation. Does the fluid mechanics in the vicinity of a porous breakwater have qualitative similarity to that near a circular cylinder fitted with a porous shroud (as a vortex suppression device)?

Reply: Thank you for your question. To some extent, yes, especially during the orbital phase that exhibits maximum horizontal velocity. The emergence of local vorticity at the leeward surface of a porous coated cylinder (PCC) subject to current resembles the patterns observed upstream of the porous structure (PS) during the return phase of the wave orbital. The dissipation of turbulent structures in the shear layer of a PCC is, to some extent, responsible for the attenuation for vortex shedding, and it is hypothesised here for the PS that a similar dissipative mechanism exists. It is future work to quantify the total turbulent dissipation of the PS and compare it against a randomised PS (without periodicity) to strengthen this claim.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Wave interaction and turbulent dissipation of a highly-porous periodic breakwater

Authors: Arcondoulis, E.J.G., Porter, R.

Discusser: Bin Teng

Question(s) / Comment(s):

At higher frequency, the experimental results seem not very good. Is there any waves in the flume? The wave flux across the flume seem to use the correct equation to compute. It is suggested to run high frequency experiment in a narrow flume.

Reply: Thank you for your question. We do not suspect the existence of spurious transverse waves from flume walls or other sources of significant amplitude to influence the readings of the wave gauges at various downstream stations. This claim is based on observations using slow-motion video of the free surface both upstream and downstream of the porous structure over a sweep of wavenumbers. However, at the highest wavenumbers, we did observe some transverse velocity fluctuations at the near-wall region just beneath the free surface using time-resolved 3-D PIV. We believe that these velocity fluctuations are due to wave coherent scattering about individual pores, which is supported by slow-motion video captures, amd also provides some justification for the disagreement between the Solitt & Cross model and the experimentally obtained wave gauge data of the periodic model at $kd > 2.8$, which would likely not be seen with a randomised pore structure.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Layout and device parameter optimisation of a wave energy park in a broadband sea

Authors: Wilks, B., Meylan, M.H., Montiel, F., Balasooriya, D.S., Jauhar, T., Blair, A., Wheeler, C., Chalup, S.

Discusser: Siming Zheng

Question(s) / Comment(s):

How the wide spacing approximation affect the simulated results? Did you consider the evanescent wave modes for a single WEC? I see in the optimal array, some devices are not far away from each other.

Reply: The evanescent modes were considered when solving the single scattering problem, but not when solving the multiple scattering problem. The contribution of evanescent modes to the multiple scattering problem was deemed negligible due to satisfaction of the generalised optical theorem, i.e. the conservation of energy identity. The devices were not drawn to scale in the figure of the optimal arrays, so they appear closer than they actually are. The devices cannot become too close due to a proximity penalty used in the optimisation.

Discussion Sheet

IWWWFB
International Workshop on Water Waves and Floating Bodies

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Layout and device parameter optimisation of a wave energy park in a broadband sea

Authors: Wilks, B., Meylan, M.H., Montiel, F., Balasooriya, D.S., Jauhar, T., Blair, A., Wheeler, C., Chalup, S.

Discusser: Harry Bingham

Question(s) / Comment(s):

To follow up on Dr Michele's question: do you find any constructive interference solutions? I.e. can an array of N absorbers perform better than N individuals? In a similar vein, does your optimal rectangular layout improve over a grid layout with rainbow tuning?

Reply: Constructive interference is not typically observed beyond approximately $N = 4$ scatterers, presumably because positive interactions cannot overcome increased shadowing by the increasingly densely packed WECs. A comparison with grid arrays with rainbow tuning is the subject of ongoing research.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Layout and device parameter optimisation of a wave energy park in a broadband sea

Authors: Wilks, B., Meylan, M.H., Montiel, F., Balasooriya, D.S., Jauhar, T., Blair, A., Wheeler, C., Chalup, S.

Discusser: Simone Michele

Question(s) / Comment(s):

I think you should consider the economic aspects as well. Given the dimensions of the park, other effects can be important (e.g. variable depth and nonlinear evolution of water waves)

Reply: We don't deny the importance of practical considerations such as these. It is important to consider the optimisation of closely packed arrays, since they reduce the costs of the infrastructure associated with the park. Nonlinear effects are beyond the scope of the current study - highly efficient numerical solutions are required for the optimisation procedure, which motivates the use of a linear model.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Lax-Phillips Scattering for Ice Shelf Vibration

Authors: Meylan, M.H., Wilks, B.

Discusser: Masoud Hayatdavoodi

Question(s) / Comment(s):

Thank you for the very nice & interesting talk always. At the boundary between ice and water, the two more freely (seemingly) with respect to each other in your solution. Why are these not enforced to follow each other, and if moving freely, how do you avoid runup over the ice?

Reply: The ice shelf has a face which rises lots of meters above the free water surface. The wave amplitude is small. The illustrates I gave exaggerated the displacement as the vertical axis was much smaller than the length.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Lax-Phillips Scattering for Ice Shelf Vibration

Authors: Meylan, M.H., Wilks, B.

Discusser: Aleksandr Korobkin

Question(s) / Comment(s):

Is it possible to generalize your technique to more complex problems with water of finite (and infinite) depth, where the matrix A is of infinite dimension?

Reply: Yes, the method can be generalized to finite depth. However, the final part where the modes have simple structure cannot be accomplished.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Experiment of modulational wave train under sea ice in Wave-Ice Tank and Numerical calculation by Nonlinear Schrödinger Equation with Raman Scattering Term

Authors: Sato, K., Waseda, T., Kodaira, T.

Discusser: Bin Teng

Question(s) / Comment(s):

I think what you have done is very important. (1) Do you have evidence attenuation is proportioned to f^3. (2) Do you obtain f^3 attenuation in your NLS?

Reply: (1) In our tank, the ice we made shows $f^{3.1} \sim f^{3.75}$. So maybe $n = 3.1 \sim 3.75$ is better. (2) No, I didn't check that. Raman term drives downshifts, so attenuation may not proportioned to f^3 even if we implemented it.

Discussion Sheet

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Paper: Experiment of modulational wave train under sea ice in Wave-Ice Tank and Numerical calculation by Nonlinear Schrödinger Equation with Raman Scattering Term

Authors: Sato, K., Waseda, T., Kodaira, T.

Discusser: Hui Liang

Question(s) / Comment(s):

I wonder whether authors have looked into the effects of Raman scattering term on the frequency range where modulational instability occurs?

Reply: No, we have to look the initial evolution of modulation instability + Raman term and compare with only modulational instability. Thank you for the hint.

Discussion Sheet

40^{th} INTERNATIONAL WORKSHOP ON WATER WAVES AND FLOATING BODIES

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Experiment of modulational wave train under sea ice in Wave-Ice Tank and Numerical calculation by Nonlinear Schrödinger Equation with Raman Scattering Term

Authors: Sato, K., Waseda, T., Kodaira, T.

Discusser: Aleksandr Korobkin

Question(s) / Comment(s):

Where was the Raman term come from if we start from the original equations of hydrodynamics and ice dynamics?

Reply: Frankly speaking I have no idea, but I think $r = d/dt(M_c - E)/E_t$ implies something. $r \neq 0$ means energy and momentum is not lost as free haves, so something should happen inside the ice layer.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Experiment of modulational wave train under sea ice in Wave-Ice Tank and Numerical calculation by Nonlinear Schrödinger Equation with Raman Scattering Term

Authors: Sato, K., Waseda, T., Kodaira, T.

Discusser: Jun Fan

Question(s) / Comment(s):

(1) Are the Kurtosis and skewness evaluated from the flume experimental measurement? (2) How the derivation results reflect the asymmetry of the amplitudes of two side-bands measured by experiment? (3) How to overcome the reflection by flame's end when measuring the modulation instability (especially for relatively longer time)?

Reply: (1) I've never checked Kurtosis and skewness. (2) Actually the derivated results fails to reproduce the experiment outcome itself. We can estimate EM imbalance r from experiment data, but the value is too large. So it causes numerical instability. Maybe it's beyond SVEA of NLS. Also frequency-dependent attenuation can explain down shifting. It's difficult to judge it reflects the asymmetry or not. (3) In my case, dissipation of ice is too strong, so we can neglect the reflection. Our tank is so small, so without ice case is difficult to avoid the reflection.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: The governing equations for the hydro-acoustic waves in an inviscid compressible fluid with irrotational flows

Authors: Lu, D. Q., Yan, X. Y.

Discusser: Mike Meylan

Question(s) / Comment(s):

Your derivation is correct, I think. I agree that the fluid cannot be described as homogenous if there is static compression. (1) Is this your problem with what was done? (2) How could this be extended to non-constant CR to the atmosphere?

Reply: Thank you for your questions. (1) Yes. But we think a highly concerned term $g(\partial\Phi/\partial z)$ in some recent publications is due to the combined effects of the flow convection and the vertical gravitational acceleration, but not the so-called "static compression". (2) A nonconstant c will lead to a new governing equation instead of Eq. (94) of M. S. Longuet-Higgins (1950), and can be considered in the future.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: The governing equations for the hydro-acoustic waves in an inviscid compressible fluid with irrotational flows

Authors: Lu, D. Q., Yan, X. Y.

Discusser: Yonghwan Kim

Question(s) / Comment(s):

If my understanding in correct, the equation of Longuett-Higgin is based on the assumption that the compressibility is very weak. In such case, we can assume (almost) constant speed of sound, and the formulation seems fine. How do you think?

Reply: Thank you for your comment and question. M. S. Longuet-Higgins (1950) assumed that the acoustic waves in an inviscid fluid with an irrotiational flow propagate with an adiabatic fluid motion in an isentropic process. Therefore, the sound speed in the ocean is approximately taken as a constant. This is acceptable for many cases.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: The governing equations for the hydro-acoustic waves in an inviscid compressible fluid with irrotational flows

Authors: Lu, D. Q., Yan, X. Y.

Discusser: Elias Arcondoulis

Question(s) / Comment(s):

(1) What is the approximation order or magnitude in eq.(28) difference between the C^2 term and the g term, since $c^2 \approx (1500m/s)^2$ and $g \approx 10m/s^2$? (2) How valid is the assumption c^2 constant in a non-homogenous fluid? What size control volume is this approximation valid?

Reply: Thank you for your interesting questions. (1) The presentation deals with an important issue in hydro-acoustics, that is, what is the implicit assumption for two different governing equations. We qualitatively find the applicable conditions for two governing equations. More in-depth quantitative investigation is required to compare the difference between the c^2 term and the g term. (2) A nonconstant c will lead to a new governing equation instead of Eq. (94) of M. S. Longuet-Higgins (1950), and can be considered in the future.

Discussion Sheet

40th **International Workshop on Water Waves and Floating Bodies**

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Response of a frozen polynya to the motion of an underwater circular cylinder

Authors: Xiong, H., Ni, B.Y., Korobkin, A.A.

Discusser: Masoud Hayatdavoodi

Question(s) / Comment(s):

Have you had a chance to compare your results with experiments? If there are no experimental data available, do you possibly plan to conduct test?

Reply: Thank you for your questions. At present, we have not found the experimental data of related problems. Our current research is limited by two-dimensional assumption (in sufficient experimental technical conditions) and cannot be directly verified by experiments for the time being. If future conditions permit, priority will be given to supplementary experimental verification. Thank you very much.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

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Paper: Response of a frozen polynya to the motion of an underwater circular cylinder

Authors: Xiong, H., Ni, B.Y., Korobkin, A.A.

Discusser: Mike Meylan

Question(s) / Comment(s):

What is the condition outside polynya?

Reply: The ice outside the polynya is assumed rigid and flat.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: On the interaction of regular waves with linear shear currents by use of the stream function theory

Authors: Zhao, B.B., Zhang, Z.H., Hayatdavoodi, M., Ertekin, R.C., Duan, W.Y.

Discusser: Harry Bingham

Question(s) / Comment(s):

As far as I can tell, your "new" algorithm is identical to that developed by Fenton(1988) Computers Geosciences Vol 14. Is that correct?

Reply: Yes, it is correct. The "new" algorithm is not new for people who is familiar with Fenton's paper, the "new" here means it is new for Dalrymple's stream function model. Later when we submit the journal paper, we will modify our words, not using "new". Thank you for your nice comment.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Theoretical and experimental evidence of negative refraction of water waves in elliptic and hyperbolic regimes

Authors: Maurel, A., Euvé, L.P., Petitjeans, P., Pagneux, V., Pham, K.

Discusser: Harry Bingham

Question(s) / Comment(s):

Do you have any practical applications in mind for the negative refraction phenomena or is it just of theoretical interest?

Reply: At this stage, the study is of a fundamental nature. We do not have any specific practical applications in mind.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Zero reflections of water surface gravity waves caused by a finite periodic array of trapezoidal bars

Authors: Liu, H.W.

Discusser: Mike Meylan

Question(s) / Comment(s):

Why the terms genetic, etc.

Reply: Yes, in the paper, we also call Type-1 zero reflections as genetic zero reflections, because once they appear in the single bar field (N=1), then they will definitely appear in all the Bragg bar field with N being larger than I. Just like genetic diseases, if they appear in a mother, then they will probably appear in their children. In addition, we name Type-2 zero reflections as symbiotic zero reflections, because they coexist with Bragg resonances. Thank you very much for your question.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Zero reflections of water surface gravity waves caused by a finite periodic array of trapezoidal bars

Authors: Liu, H.W.

Discusser: Masoud Hayatdavoodi

Question(s) / Comment(s):

Can you comment on what do you do in practice with the information provided here in terms of the number of zero reflections?

Reply: Zero reflection means the Bragg bar field is totally transparent to incident waves and loses its ability to block water waves. If the distribution of Zero reflection is clear, then we can guide the design of Bragg bar field to avoid those Zero reflections, especially those Type-1 zero reflections. Thank you very much for your question.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Numerical Study of Different Types of Focused Wave Breaking on a Cylinder

Authors: Zhao, L.G., Borthwick, A.G.L., Greaves, D.M.

Discusser: Peter Wellens

Question(s) / Comment(s):

You seem to assume that focused breaking waves give the largest F_{max} (wave force). In real irregular seas nonlinear interactions can generate breaking waves that are even steeper, with even larger forces. Can you comment on the assumption?

Reply: 1. Nonlinear effect could generate larger forces at some situations. But with linear focused wave, it could generate the breaking wave with high nonlinear effect, therefore drop the larger forces. 2. With wave breaking, a sharp, slamming force signal can be observed, this force is much larger than the nonbreaking force.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Numerical Study of Different Types of Focused Wave Breaking on a Cylinder

Authors: Zhao, L.G., Borthwick, A.G.L., Greaves, D.M.

Discusser: Aleksandr Korobkin

Question(s) / Comment(s):

To estimate wave leader for steep waves, we need statistics of wave shapes, their speed distributions (and accelerations, as Alistair pointed). Can we extract this information from your analysis?

Reply: Yes, there are some parameters that describe the "shape" of a breaking wave, such as the "rear steepness" or "front steepness". I believe these parameters contribute of the process of breaking. Towards the kinematic and dynamic properties, we've showed the kinematic breaking threshold "B: 0.85" and the breaking strength. I have some relationship with the "F_{xmax}". I would like to explore the more clear model to explain the relations. Thanks!

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Modeling of wave breaking in short-crested seas

Authors: Wang, Y., Ducrozet, G.

Discusser: Young-Myung Choi

Question(s) / Comment(s):

The wave breaking event occurrence parameter B may depends on the direction of crest velocity and phase velocity for short crested waves. We may need a vectorial from $B = (B_x, B_y, B_{xy})$ to detect the wave breaking event.

Reply: Yes, it's interesting to see the vectorial form as well.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Modeling of wave breaking in short-crested seas

Authors: Wang, Y., Ducrozet, G.

Discusser: Yonghwan Kim

Question(s) / Comment(s):

I wonder if you aimed to find the location of wave breaking only. If not, e.g. categories for severer wave breaking, is spectral method appropriate for such purpose? Spectral method have a limitation in wave profile representation, I think.

Reply: Yes, we only intend to identify the wave breaking location. Once the breaking wave is detected, we will manage no dissipate energy due to wave breaking. Thus, there is no issue of the wave profile representation in the HOS model.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Modeling of wave breaking in short-crested seas

Authors: Wang, Y., Ducrozet, G.

Discusser: Takuji Waseda

Question(s) / Comment(s):

(1) What happens of V_{eddy} is not implemented? (2) What was the order of M (nonlinearity)? (3) Did other M used? (4) What about anti-aliasing filter? (5) Was the breaking inception properly defined?

Reply: (1) The HOS model will evolve to crash when wave breaking happens. (2) $M = 5$. (3) Yes, I tried several M values, ranging from 3 to 7. The higher M value led to increased instability when wave breaking occurred, unless a breaking model was implemented. (4) Sure, using a filter is good, but we want to develop a more delicate, localised and physics-based breaking model. (5) Yes, since it agrees well with the experiment.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Cloaking waveguide defects at low frequencies using local wall deformations

Authors: Zyla-Jablonska, D., Bobinski, T.

Discusser: Ben Wilks

Question(s) / Comment(s):

Did you consider the cloaking of waves with angular components at higher frequencies? e.g. incident waves of the form $\cos(n\pi g/L)e^{k_n x}$ with $k^2 = k_n^2 + (n^2\pi^2)/L^2, n = 1, 2, \dots, k > n\pi/L$

Reply: No, we consider only plane wave as boundary condition at inlet. This condition (plane wave) expresses movements of our wavenumber in the experimental setup.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Generating Square Wave by use of the HLIGN Equations in Deep Water

Authors: He, L., Zhao, B.B., Hayatdavoodi, M., Ertekin, R.C.

Discusser: Aleksandr Korobkin

Question(s) / Comment(s):

Can you describe these waves using fully nonlinear potential theory for finite depth using cells with periodic behavior of flow in them? Your waves look like double-periodic 3D waves, is it right?

Reply: To our knowledge, square waves can also be generated using the nonlinear potential flow theory (and other approach), subject to the limitation of the theory. Square waves one generated due to the interaction of progressing waves which may have different characteristics (frequency and height), propagating in different direction.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

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Paper: Generating Square Wave by use of the HLIGN Equations in Deep Water

Authors: He, L., Zhao, B.B., Hayatdavoodi, M., Ertekin, R.C.

Discusser: Young-Myung Choi

Question(s) / Comment(s):

In the results of nonlinear waves, the wave height at the wave crest seems to be higher than that of linear wave, while the elevation height profile is almost same as the linear one. It means that the mass should be distributed its spatial direction. Therefore, it would be nice to check the mass conservation.

Reply: Thank you for your good comments. We will check later about the mass conservation of this 3D square wave numerical simulation.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Generating Square Wave by use of the HLIGN Equations in Deep Water

Authors: He, L., Zhao, B.B., Hayatdavoodi, M., Ertekin, R.C.

Discusser: Zhiming Yuan

Question(s) / Comment(s):

In the real video record, it seems the wave length is very small. In such case, the energy shouldn't be high. It is not clear that those type of waves could induce a large wave force on ships. In the real sea, the wave length of square wave could be interesting to look at.

Reply: In that video, it is true that the square wave length is small. But wave length in ocean could be 30 m or 100 m long. It may generate square wave with large energy. We'd like to conduct a systematic research about it. Thanks for your comment.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: An efficient fully nonlinear potential model for wave groups propagation over arbitrary bottoms

Authors: Feng, X.Y., Wu, Q.

Discusser: YAlistair Borthwick

Question(s) / Comment(s):

Discuss effect of step on Kurtosis of crest elevation of Gaussian wave at the step. Does there have any implication for focused waves at the step?

Reply: Yes. You are right that for focused wave groups, the stop also has significant effects on the kurtosis of the group elevation. The complexity for wave group is that there are non-linear effect from wave-wave interactions and wave-bottom interactions. Identifying the effect from each of them needs further analysis.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: An efficient fully nonlinear potential model for wave groups propagation over arbitrary bottoms

Authors: Feng, X.Y., Wu, Q.

Discusser: Dezhi Ning

Question(s) / Comment(s):

How to separate higher-order free and bound waves in a wave group with many wave components in different frequencies?

Reply: Thanks for your question. As the free and hound waves travel with different phase velocities in a wave group. It is straightforward to separate them when sufficient time is allowed for propagation. They separate naturally. Before that, we apply a wavelet transform technique to separate them.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Towards a second-order force model for floating non-slender structures in fully nonlinear waves

Authors: Dermatis, A., Bredmose, H., Bingham, H., Ducrozet, G., Bouscasse, B.

Discusser: Francis Noblesse

Question(s) / Comment(s):

I think you should pay more attention to the validation. There is a lot of literature on 2nd order loading in frequency domain. This will help to identify if the Pinkster's approximation is ok, and if the contribution of 2nd order loading potential F_p is important or not.

Reply: We know that Pinkster's approximation is only valid for low frequency loading, hence applicable for the case study for this work. For a cylinder, please refer to Bredmose et all. (2024) work cited in the abstract, where we can see the applicability of the model.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Towards a second-order force model for floating non-slender structures in fully nonlinear waves

Authors: Dermatis, A., Bredmose, H., Bingham, H., Ducrozet, G., Bouscasse, B.

Discusser: Xinshu Zhang

Question(s) / Comment(s):

Do you consider the flare angle of ship in the computation of second-order force? Or you made assumption that it is wall-sided hull?

Reply: Yes, the flare angle is taken into account in the waterline integral.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Towards a second-order force model for floating non-slender structures in fully nonlinear waves

Authors: Dermatis, A., Bredmose, H., Bingham, H., Ducrozet, G., Bouscasse, B.

Discusser: Bin Teng

Question(s) / Comment(s):

A HOS model is used replace the linear incident waves. The first order force may also include higher order terms. Is the method consistent in the perturbation order?

Reply: The HOS solution satisfies the fully nonlinear FSBC, thus we do not distinguish into orders. The integral of $\partial\phi/\partial t$ over the body will give the nonlinear force (not just first-order), with the approximation of using a linear transfer function on the nonlinear wavefield (as well as the Pinkster)

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Towards a second-order force model for floating non-slender structures in fully nonlinear waves

Authors: Dermatis, A., Bredmose, H., Bingham, H., Ducrozet, G., Bouscasse, B.

Discusser: Young-Myung Choi

Question(s) / Comment(s):

(1) Computing the force with transfer function is not straightforward for the floating body which moves. The memory function itself is evaluated at the mean position, therefore the effects of movement should be taken into account. (2) There is an additional velocity potential to satisfy the non-homogeneous free surface boundary condition.

Reply: (2) There is the ϕ_s that satisfies the homogeneous FSBC , since we are consistent with Pinkster's approximation. We are currently investigating how this FSBC can be satisfied to be consistent with the "full QTF". (1) All quantities are indeed evaluated in the mean body position. The force is then Taylor-expanded around that position to evaluate it at the instantaneous position.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Wave interaction with a periodic array of floating PV system

Authors: Barman, K.K., Zheng, S.M.

Discusser: Mike Meylan

Question(s) / Comment(s):

Can you use concept of a bad diagram to analyze this system?

Reply: Yes, it is possible. We will try to incorporate in future.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Wave interaction with a periodic array of floating PV system

Authors: Masoud Hayatdavoodi

Discusser: Mike Meylan

Question(s) / Comment(s):

(1) For comparison of your results, one place would be a recent study we published on nonlinear wave interaction with moored elastic plates: Kostikov, Hayatdavoodi, Ertekin (2024), published in Marine Structures journal. (2) How would the solution change if plate length and the gap is between one variable?

Reply: (1) Yes, that's a nice suggestion and we are thankful for that. We will try to incorporate it in our work. (2) Yes, the solution will change as the plate lengths are changing. As the effective plate length is L and the gap is d, the ratio is like $l/(l+d) : d/(l+d)$, and both l& d range in between $(0, \delta)$. So, the changes in the ratio $l : d$ will create changes in the Bloch wavenumber as well as in the total solution. In our present ease, we have not analyzed the wave diffraction solution and have instead focused on Bloch wavenumber& bandgaps. We can pursue further& conclude the remarks on the wave diffraction solution.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Wave interaction with a periodic array of floating PV system

Authors: Masoud Hayatdavoodi

Discusser: Ben Wilks

Question(s) / Comment(s):

Did the figure shown before the homogenisation analysis represent a band diagram? if so, did the cusp represent a band gap?

Reply: Yes, but unfortunately it is based on to numerical computation. We have validated with the $O(\epsilon)$ homogenized transcendental equation. We will try to figure it out analytically whether there is any passing band exists or not.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Wave interaction with a periodic array of floating PV system

Authors: Masoud Hayatdavoodi

Discusser: Bin Teng

Question(s) / Comment(s):

In the eq.(6), As is defined as complex. It seems only a real β can make equation periodically, people usually get band structure for this problem. Have you gotten the stopping hand and passing band for this problem?

Reply: Thanks for your suggestion. We have not carried out the band structure for the problem. Even we get the complex Bloeh wavenumber, it stands in the form $B = n\pi/\delta + i\gamma, n \in Z$. Even though its complex, $\mathrm{e}^{iB\delta} = (-1)^n e^{-\gamma\delta}$. This means if $\psi(x,\delta) = e^{iB\delta}\psi(x) = (-1)^n e^{-\gamma\delta}\psi(x)$, satisfying band-folding symmetry. This is corresponding to evanscent Bloeh wavenumber, which can be observed in bard gaps. As suggested, we will try to find stopping band& passing band for this problem, which will give a complete scenario. In addition, though the system is infinitely periodic. In real life, all the structure seem to be a finite array one. So, we will conduct further analysis to look into this factor.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: A new approach to evaluate second-order wave loads on three-dimensional floating bodies

Authors: Cong, P.W., Teng, B.

Discusser: Chen Xiaobo

Question(s) / Comment(s):

I'd like to congratulate you to obtain new results including the cancellation by the remaining hull integrated in the F_q^2 against that in F_p^2 in the general case up bichromatic waves.

Reply: We fully concur with this perspective. Conducting systematic simulations across diverse structural configurations would provide a rigorous validation framework for the numerical models and methodologies. To date, we have performed comprehensive validations on truncated cylinders and floating hemispheres under both free-motion and forced-motion conditions. These studies not only demonstrated high reliability in computational results, but also thoroughly verified the robust convergence performance of the structure solutions. Moving forward, we will extend these computational analyses to broader scenarios and will be eager to share new findings with the research community upon completion.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: A new approach to evaluate second-order wave loads on three-dimensional floating bodies

Authors: Cong, P.W., Teng, B.

Discusser: Young-Myung Choi

Question(s) / Comment(s):

The treatment of second-order derivatives on the body surface looks like that it can be applied to the forward speed problem, especially on the m-terms. Therefore, I recommend to take a look on the forward speed problem to find a good another example.

Reply: I think this is an excellent suggestion, an I'm genuinely interested in exploring this approach for the forward speed problem, particularly regarding the treatment of the second-order derivative in the m-term. However, implementing this would require a considerable amount of time and effort. Should we obtain any relevant results through this methodology in the future, I would be happy to share our findings with the research community.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Asymptotic Generalised Wagner Model

Authors: Khabakhpasheva, T., Korobkin, A.

Discusser: Alistair G.L. Borthwick

Question(s) / Comment(s):

Thank you for a fascinating presentation. Have you considered applying a modified version of your model to wave slam on floating surface-piercing circular cylinder? The hydroelastic response of a very thin-walled cylinder could be interesting.

Reply: Not yet. However, this is an interesting problem and our new model, we expect, can be generalized to this configuration. Our next step is to account for elasticity of a circular cylinder considering water through its free surface.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Wave impacts on an overhang: effects of angle, structural flexibility and aeration

Authors: Bockstael, M., Bromlewe J., Wellens, P.

Discusser: Yonghwan Kim

Question(s) / Comment(s):

Congratulation on a good experiment and results! Two question are asked: (1) Did you try different size of bubbles? (2) How can you confirm the uniform bubble distribution in local domain, i.e. near impact area?

Reply: Thank you! (1) We have not, and the current setup may not allow it with the same liquid. (2) For now, we have to do this by eye from high-speed camera. I think qualifying this inside the volume before impact will be very difficult.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Wave impacts on an overhang: effects of angle, structural flexibility and aeration

Authors: Bockstael, M., Bromlewe J., Wellens, P.

Discusser: Xingya Feng

Question(s) / Comment(s):

(1) Would it be proper to assume incompressible fluid when considering two-phase flow with entrapped air? (2) What is the vibration from? Structural vibration or some local flow effect?

Reply: (1) We do not want to assume incompressible flow. It is in progress of implemtation with the combination of structural flexibility. (2) We have identified it to be from vibration in the measurement setup with two side by-side force transduars. It seems to be most present with this rigid, heavier plate.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Wave impacts on an overhang: effects of angle, structural flexibility and aeration

Authors: Bockstael, M., Bromlewe J., Wellens, P.

Discusser: Aleksandr Korobkin

Question(s) / Comment(s):

Did you visualize the flow before the impact in the experiments? The flow could be more complicated than just vertical one.

Reply: The flow is indeed very likely not just vertical. We have not analyzed the velocity fluid from experimental videos or CFD results. This comparison is important to make sure we have similar impact.

Discussion Sheet

40^{th} International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Capillary waves generated by free surface detachment

Authors: Semenov, Y.A., Ni, B.Y., Blyth, M.G.

Discusser: Yuriy Semenov

Question(s) / Comment(s):

Is this model can be applied to a water entry problem? Can you consider a different contact angel in the model?

Reply: (1) The model based on the B-V condition was used for water entry of an expanding body: JFM, 862, pp. 929-950. (2019). (2) The contact angle 180° is used in the model of ideal fluid, when wettability is ignored. The contact angle different from 180° is due to effect of wettability forces. The model should be modified to account other contact angles. The main challenge is zero velocity of the contact between liquid and solid body.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Experimental study on the deformation and breakup of an ice sheet induced by wave, wind and current

Authors: Ni, B.Y., Yuan, G.Y., Wang, H.X., Xue, Y.Z., Han, D.F.

Discusser: Takuji Waseda

Question(s) / Comment(s):

(1) formulation of ice, is it nature? (2) How uniform is the thickness of ice? (3) Did you measure the flexural strength of ice in parts of ice tank? (4) What are the properties of wind and current?

Reply: (1) Yes. (2) It is uniform. (3) Yes, we measured the flexural strength of ice at both ends of the ice tank. (4) We measured the property of the current but didn't measure that of wind.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Experimental study on the deformation and breakup of an ice sheet induced by wave, wind and current

Authors: Ni, B.Y., Yuan, G.Y., Wang, H.X., Xue, Y.Z., Han, D.F.

Discusser: Peter Wellens

Question(s) / Comment(s):

There was a significant amount of overwash on the ice sheet after breakup. Do you think overwash influences the vertical deflection and the wave propagation underneath the ice sheet?

Reply: Yes, we think overwash influence the vertical deflection of ice and the wave propagation underneath the ice sheet. At this moment, we can separate its effect. However, for ice deflection, we concern it before breakup more, so the overwash effect is small then.

Discussion Sheet

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May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Experimental study on the deformation and breakup of an ice sheet induced by wave, wind and current

Authors: Ni, B.Y., Yuan, G.Y., Wang, H.X., Xue, Y.Z., Han, D.F.

Discusser: Mike Meylan

Question(s) / Comment(s):

What is the relationship between wind and attenuation?

Reply: In our experiment, the larger the wind speed, the larger the attenuation rate of the wave after broken ice floe field. This is because we define attenuation rate as $\eta = |A - B|/A$, where A and B are average wave height before and after broken ice area. As we can expect, the wind generate wave, and it make both A and B rise. However, the larger wave height induce more intense collision of ice floe, so η is rising under a larger wave height, as well as a larger wind speed.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Wave interaction with a large number of floating ice sheets of arbitrary shapes: exact and wide space-approximation approaches

Authors: Yang, Y.F., Wu, G.X.

Discusser: Takuji Waseda

Question(s) / Comment(s):

(1) How is the ice floe simulated? (2) Is the geometry of sea ice meaningful? In reality, ice floes are not "sheet". (3) For an ice floe, K-L theory may not be applicable.

Reply: (1) thin elastic plate - or ice sheet. (2) Many thanks for the suggestions, I will revised it in the next journal paper! (3) I fully understand this, I will try to check the literature and maybe have a look whether some more reasonable and more reality models can be found and used.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Wave interaction with a large number of floating ice sheets of arbitrary shapes: exact and wide space-approximation approaches

Authors: Yang, Y.F., Wu, G.X.

Discusser: Koushik Kanti Barman

Question(s) / Comment(s):

(1) If you ice-shape is not symmetric will the methodology considering "$n = -2, -1, \ldots$" will be sufficient to handle the wave scattering?

Reply: Hi Barman. Yes, it can be treated. I am a little confused here, you mean we need to increase the number of vertical modes in the series? I believe this is related to the water depth. Do you mean that? If not, I will try to provide more detailed answer.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Wave interaction with a large number of floating ice sheets of arbitrary shapes: exact and wide space-approximation approaches

Authors: Yang, Y.F., Wu, G.X.

Discusser: Mike Meylan

Question(s) / Comment(s):

Have you validated this model against the circular solution?

Reply: Dear Prof. Meylan, yes, the results and codes are validated by comparing with those in literature. In detailed, I compared our results with your paper published in 1996 (Meylan & Squire, 1996). In the paper extending from this conference paper, I will provide more details! Thank you for pointing out the mistake of using ”ice sheet”, I wild use ice floes in the paper next.

Discussion Sheet

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May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Wave interaction with a large number of floating ice sheets of arbitrary shapes: exact and wide space-approximation approaches

Authors: Yang, Y.F., Wu, G.X.

Discusser: Xiaobo Chen

Question(s) / Comment(s):

Nice work! I imagine that you can easily extend you work to get 2nd-order drift forces on each ice floe and steady their drifting in waves. On the other side, have you special treatments of G.F. expressed by $\sum H_0^2(k_m R)$ for $R \to 0$?

Reply: Dear Prof. Chen, yes, I think it is worth to predict the drift force, especially it can be used to reflect the attracting and exclusion between ice sleets. Yes, special treatment is dore. When $R \to 0$, we note $H_0^2(k_m R) \to \frac{2}{\pi i} \ln R$, then the term is written as $H_0^2(k_m R) - \frac{2}{\pi i} \ln R + \frac{2}{ni} \ln R$. (Regular and bounded + Analytical solution for the singular integral)

Discussion Sheet

40^{th} International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Effects of Inside-Ship Oscillator Placement on Wave Energy Harvesting

Authors: Liu, Y., Chen, W.M., Zhang, X.S.

Discusser: Harry Bingham

Question(s) / Comment(s):

Comment: I suggest that the appropriate length to define your CWR is the largest dimension of your oscillator. Question: With forward speed, the coefficients are not very accurate when using NEMOH. Why don't you use a forward speed Rankine panel method instead?

Reply: Thank you for your constructive comments to questions. We acknowledge that NEMOH, like other linear potential flow-based low-order methods may exhibit low or reduced accuracy. We calculated zero-speed hydrodynamic coefficients and corrected them using wave encounter frequency approximation. Such simplified method leads to highly efficient computations, suitable for extensive parametric studies. In future, we will use Rankine source method for improving the accuracy of hydrodynamic coefficients with forward speed.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Experimental investigation on an energy-focusing type OWC wave energy converter array

Authors: Ge, M.K., Ning, D.Z., Cong, P.W., Chen, L.F.

Discusser: Xiaobo Chen

Question(s) / Comment(s):

Could you expand the way how to design the parabolic wall? Is the wall geometric dependent on incoming wavelength (and water depth)?

Reply: Before the experiments, the numerical model was established, and the simulation was conducted. The optimal geometries was designed. In this process, to the design was hot depend on incoming wavelength and water depth.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Study on the interaction between nonlinear wave and fixed floating box based on non-hydrostatic model

Authors: Yang, P.Y., Ma, Y.X., Ai, C.F.

Discusser: Peter Wellens

Question(s) / Comment(s):

Can you explain why you chose the pressure points in the top cell faces and not in the cell centers as we often see in literature?

Reply: The purpose of us doing this is to correctly implement the zero-pressure boundary condition at the free surface. This method employs only two vertical layers to accurately and efficiently simulate wave nonlinearity, dispersion and other phenomena.

Discussion Sheet

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Paper: Study on the interaction between nonlinear wave and fixed floating box based on non-hydrostatic model

Authors: Yang, P.Y., Ma, Y.X., Ai, C.F.

Discusser: Mike Meylan

Question(s) / Comment(s):

If is said $\eta(x)$ is a single function of x, why it can be used for vertical wall structure? At the wall η is not a single function of x ?

Reply: In our model, $\eta(x, y)$ is just function of horizontal coordinates x and y. For a vertical wall, only one horizontal coordinate can be used to define it. Therefore, our model can deal with vertical walls.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Study on the interaction between nonlinear wave and fixed floating box based on non-hydrostatic model

Authors: Yang, P.Y., Ma, Y.X., Ai, C.F.

Discusser: Young-Myung Choi

Question(s) / Comment(s):

The staggered grid in CFD and immersed body method suffers the pressure oscillation in whole CFO domain. In normal CFD solver based on the IB needs a falter to treat this problem. But the obtained force books very smooth. Why it is like this?

Reply: We didn't use any filters to treat the pressure oscillation. In fact, there are no oscillation encountered in our model, because we used implicit scheme to discretize the pressure terms and the free surface terms in governing equations.

Discussion Sheet

40^{th} International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Broadband energy attenuation of long-period water waves by a graded array of C-shaped cylinders

Authors: Cao, H., Chen, L.F., Ning, D.Z., Peng, C., Xu, J., Lin, H.X.

Discusser: Petter Wellens

Question(s) / Comment(s):

Do you think closing the slit above the mean free surface will improve correspondence with Bragg theory?

Reply: Thank you for your question. Bloch's theory is based on the resonance period solved by linear potential flow, and does not consider the structure above the free water surface when solving. If the gaps above the free water surface are sealed, there is indeed a possibility of improvement.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Observation on Effects of Liquid-Gas Density Ratio in Sloshing Pressure for LNG Cargo Design

Authors: Kim, Y., Park, T.H., Lee, J., Ahn, Y., Kim, S.Y.

Discusser: Sime Malenica

Question(s) / Comment(s):

Could you comment on the problem of modeling?

Reply: As you know, two approaches are typical in the sloshing assessment for LNG carrier: comparative study and direct analysis. In the former case, we know that the experimental medium, i.e. water-air or water-heavy gas, is not a concern. General materials are water and air for this purpose. In the case of direct analysis, we need to get closer to real physical problem. Then, as you pointed, the scale is an important issue. The scale-up law is a critical issue for such case, and there is no clear method to scale up from model test to real-ship cargo. However, whatever the scale-up law is considered, it is obvious that we need to carry out model test as close as possible to real physics. The adoption of water and heavy gas is from such fundamental desire. So far, a practical method for scaling of sloshing loads may be the Froude scale if density ratio and phase transition are considered in model test.

Discussion Sheet

IWWWFB
International Workshop on Water Waves and Floating Bodies

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Paper: Observation on Effects of Liquid-Gas Density Ratio in Sloshing Pressure for LNG Cargo Design

Authors: Kim, Y., Park, T.H., Lee, J., Ahn, Y., Kim, S.Y.

Discusser: Aleksandr Korobkin

Question(s) / Comment(s):

I understand (from your presentation) that the pressure measured for water/air sloshing are about twice higher than the pressures for LNG/NG sloshing. Then we can use water/air pressure as a conservative estimate of the sloshing LNG pressures. Is it right?

Reply: Currently, scaling law is not very clear for LNG sloshing. But, if we scale up the pressure due to water and air, to real ships, the values are too high and believe that those are unrealistic. Also, water and heavy gas test must be closer to physics. So, for design purpose, water and heavy gas test is preferred. Thank you for comment, though!

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Prediction of Parametric Roll Motions and Their Dynamic Properties Using Machine Learning Approach

Authors: Lee, J., Kim, Y.

Discusser: Jun Fan

Question(s) / Comment(s):

How the detailed wave information with phase in the square shape target space is obtained? (How the wave field is reconstructed based on SAR information)

Reply: In our study, we assume that the wave field information is given. That means, the wave field database for machine learning training was generated based on the “numerical simulation”. Your comment is very good point, but incorporating wave field prediction with our machine learning technique will be the next step of our future work.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Machine Learning for Computation of Wave Added Resistance

Authors: Amini-Afshar, M., Mittendorf M., Bingham, H.B.

Discusser: George Jagite

Question(s) / Comment(s):

How is your model answering to the research question formulated in the introduction? i.e. how to assess the added resistance of real hulls with ?. Are you planning to calculate a surface integral in the future?

Reply: In your question added resistance refers to increased frictional resistance due to marine fouling on hull surface. However, by added resistance I mean wave added resistance. As I have mentioned in the Introduction, the increased resistance (due to fouling), can be estimated based on ship operational data through the performance analysis. This is achieved by just subtracting the wind, and the wave added resistance from the total measured resistance for ship in operation.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Machine Learning for Computation of Wave Added Resistance

Authors: Amini-Afshar, M., Mittendorf M., Bingham, H.B.

Discusser: Yonghwan Kim

Question(s) / Comment(s):

Can you explain the difference between your ML method with regression method? The differences are clear between two methods, but also the similarity is also clear for this kind of problem. More information about ML will be appreciated.

Reply: Basically, there should be no fundamental difference between these two methods. However, in comparison with the traditional regression models used for naval architecture purposes, the presented ML model could be more flexible in terms of leveraging advanced methodologies to minimize the error, and to obtain more accurate results, as has been presented.

Discussion Sheet

40^{th} International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Machine Learning for Computation of Wave Added Resistance

Authors: Amini-Afshar, M., Mittendorf M., Bingham, H.B.

Discusser: Ziwen Zhang

Question(s) / Comment(s):

Do you think that the new ML methods based on past experimental data or numerical simulation results can give us new insight of wave added resistance? If no, as an alternative methodology, what's the advantage compared with traditional numerical/experimental methods or traditional regression methods?

Reply: I have not conducted research on this field (ML methods & past data), but I know my colleague Prof. Ulrik D. Nielsen at DTU has published promising results about this topic. The presented work here, is about applying ML methods for computation of added resistance using a dataset which is "created" using physic-based computations. These physic-based computation take ship motion data into account in much more reliable manner than traditional semi-emprical methods.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Advancing the Understanding of Added Resistance in Waves Through Fourier-Kochin Theory

Authors: Liu, S.K., Liang, H., Chen, X.B.

Discusser: Mostafa Amini-Afshar

Question(s) / Comment(s):

I appreciate your work on visualization and depicting of k_1 and k_2 wave systems. However, neglecting k_1 wave system and the related integral in the Maruo's formulation, leads to wrong results for added resistance. Here by wrong I mean that there is no reasonable agreement with the near-field formulation. This is puzzling and still problematic.

Reply: Thank you for the comment, Prof. Mostafa! I am sure when one wave system is neglected, the two formulations won't agree with each other. From engineering point of view, it's acceptable to simplify the formulation according to the specific scenario. Whether these simplifications are valid or not, or to what extent they are valid, is the problem discussed here. This is also the motivation of the presented work.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: CFD Study on Seakeeping Performance of Planing Hulls

Authors: Wang, S.G., Choi, J., Kim, Y.

Discusser: Yongbo Chen

Question(s) / Comment(s):

Regarding differences of two surfaces: (1) Are the mesh the same in Star-CCM+ and Foam? (2) How do you make sure the turbulence modeling is implemented in the same way?

Reply: (1) Yes. We conducted two sets of OpenFOAM simulations: one employed the identical mesh transferred directly from STAR-CCM+, while the other used a separately generated mesh following the same meshing strategy. This ensured that both the grid resolution and boundary layer characteristics were nearly identical between the two cases. (2) The SST $k - \omega$ turbulence model was adopted in both solvers. The primary distinction lies in the near-wall treatment: Spalding's law (Spalding, 1960) was applied in the OpenFOAM-based solver, whereas Reichardt's law (Reichardt, 1951) was utilized in STAR-CCM+. Both wall functions exhibit comparable accuracy in the logarithmic region. Provided that the y+ values along the hull surface are appropriately maintained through careful mesh design, the near-wall modeling remains consistent across the two CFD solvers.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Reanalysis of experimental data on towing resistance of a barge in a two-layer fluid

Authors: Gou, Y., Sun, J.W., Tang, P.C., Teng, B.

Discusser: Yongbo Chen

Question(s) / Comment(s):

How about the density variation between two layers in CFD?

Reply: The two-layer fluid is simulated, so the density variation are not considered. There are two surfaces in the CFD model, the free surface and internal face.

Discussion Sheet

IWWWFB
International Workshop on Water Waves and Floating Bodies

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Some characteristics of the fluid dynamics in nonlinear wave train

Authors: Scolan, Y.M.

Discusser: Xiaobo Chen

Question(s) / Comment(s):

Very interesting work! May you expand the physical signification of "backbone" lines in waves?

Reply: The backbone line has a precise mathematical definition but no physical meaning. One could possibly visualize it in 2D flow by using a PIV device provided that the Lagrangian acceleration and its spatial derivative are calculated with much accuracy. It seems that 3D PIV becomes more and more accurate (see the presentation by Arcondoulis in session 4), maybe the backbone line in 3D space could be determined in the future as well.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Some characteristics of the fluid dynamics in nonlinear wave train

Authors: Scolan, Y.M.

Discusser: Harry Bingham

Question(s) / Comment(s):

You show from these calculations that breaking is indicated by a downward particle acceleration of $0.5g$ for focused waves in deep water. This is very interesting since it has been argued in the literature, mainly based on field measurements, that the value should be somewhat less for irregular waves. Can you comment on this?

Reply: Indeed, in the paper K. Nadaoka, et al. 7th ISOPE conf. 1997, it is shown that the vertical pressure gradient may drop to zero close to the crest when breaking is likely to occur. Here we show where in the crest the non-dimensional vertical pressure gradient is close to -1/2. We don't have any references for that, but it is said that mathematicians, at best, predict that the non-dimensional vertical pressure gradient is in the range [-1,0] in the crests of irregular wave fields. In any case, further experimental programs, mathematical analyses and systematic numerical studies will better describe the dynamics in near breaking wave.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Seasonal Wave Forecasting for Hawaii

Authors: Li, N., Zhao, S., Cheung, K.F., Jin, F.F., Yang, Z.Q.

Discusser: Masoud Hayatdavoodi

Question(s) / Comment(s):

Thank you for the very clear presentation. Is the approach you discussed applicable to forcasting wave condition in other locations, particularly with continuous shelves and slow change in bathymetry? In other words, do you expect accurate capturing of wave conditions globally?

Reply: The third-generation spectral wave models, such as Wavewatch III and SWAN, can accurately simulate wave generation in the open ocean as well as wave propagation from deep seas to shallow coastal waters. These models have proven to be valuable tools for both short-term wave forecasting and long-term wave hindcasting across broad regions. For instance, both the NOAA Environmental Modeling Center in the U.S. and the European Centre for Medium-Range Weather Forecasts (ECMWF) in the EU incorporate spectral wave models in their operational wave forecasting systems. However, seasonal wave forecasts based on statistical-dynamic models—which leverage the long-lead and reliable predictability of climate modes—are generally limited to regions with strong climate-wave connections.

Discussion Sheet

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Paper: Seasonal Wave Forecasting for Hawaii

Authors: Li, N., Zhao, S., Cheung, K.F., Jin, F.F., Yang, Z.Q.

Discusser: Peter Wellens

Question(s) / Comment(s):

The variation you found will be used for coastal management. Can you say anything about how coastal management may benefit from this knowledge and what the involved projected costs are?

Reply: Seasonal wave forecasts provide valuable insights into overall wave conditions months in advance and have numerous practical applications. For example, by anticipating periods of heightened wave activity, coastal managers and stakeholders can optimize planning for erosion control and hazard mitigation. Conversely, during anticipated calm seas, they can schedule infrastructure maintenance and at-sea operations more effectively. While I don't have exact figures for the projected costs involved, preventing the loss of a single home to erosion could save approximately 1 million—the median home value on the North Shore of Oahu.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Chaotic Dynamic Characteristics during the Long Time Evolution of Wave Trains

Authors: Xie, S.Y., Fan, J., Tao, A.F.

Discusser: Yanlin Shao

Question(s) / Comment(s):

The instability takes very long time to occur, where viscosity of the fluid and even the surface tension may play a role. Have the authors investigated the damping effect? There are similar on sloshing in tanks.

Reply: In our study, we have not yet considered the viscous damping effect. The High-Order Spectral method we employ is based on the theory of inviscid potential flow, and terms of viscous damping and surface tension have not been introduced into the governing equation. The primary advantage of High-Order Spectral method lies in its ability to consider high-order nonlinear interactions during the long time evolution of wave trains, enabling the description of high-order nonlinear effects for an arbitrary number of component waves. In future work, we will attempt to introduce the effects of viscosity and surface tension.

Discussion Sheet

40th International Workshop on Water Waves and Floating Bodies

May 11-14, 2025, Hosted by Shanghai Jiao Tong University

Paper: Nonlinear wind wave model under wind forcing and dissipation

Authors: Cheng, W.H., Liu, Z.

Discusser: Bin Teng

Question(s) / Comment(s):

(1) Is the wind pressure / wind is uniformly distributed on the free surface? (2) Why the wave energy dissipate with time when wind speed is zero? Why the energy drops quickly at same time step (t/T)?

Reply: (1) Yes, the wind pressure is uniformly distributed on the free surface during the numerical simulation. (2) Wave energy dissipation under no-wind condition is primarily due to the viscous dissipation term in the governing equations, which is to simulate a more realistic sea surface. The rapid drop of wave energy occurs when wave breaking is detected, as the breaking dissipation terms in the equations result in significant energy loss.