Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: **On the modeling of nonlinear wave-wave and wave-body interactions in a realistic sea state**

Author(s): **Bai, W., Feng, X., Chen, X. & Ang, K.K.**

Question(s) / Comment(s):

When generate waves from a spectrum, do you have any limit on the number of the components?

Asked by: **Wanan Sheng**

Answer(s):

When generating waves according a specified wave spectrum, we do not have any limit on the number of components. Actually, the process of wave generation is very straightforward. For any given number of components the wave generation is automatic; it is just a summation of various components, which can give the signal to the wave paddles. In addition, the cost of computational time for the calculation of this signal is minimum.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: On the modeling of nonlinear wave-wave and wave-body interactions in a realistic sea state (p.5)

Author(s): Bai, W., Feng, X., Chen, X. & Ang, K.K.

Question(s) / Comment(s):

For the waves which you have used in your research, though they both have 10 times difference, probably they are in the linear regime and that is why it doesn't have much difference in the results.

Asked by: Jun Zang

Answer(s):

This is a good point. Thanks for the comments. This work just shows some preliminary results. It is true that all the two waves are very small. We will go back to test even higher waves. One point I would like to highlight is that the numerical instability will occur when the wave is very steep. Therefore, we need to carefully choose what larger wave will be considered.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Linearized potential flow analysis of a 40 chamber, oscillating water column wave energy device (p.13)

Author(s): Bingham, H.B. & Read, R.

Question(s) / Comment(s):

At the past conference, at the 4th IWWWFB in Norway back in 1989, we visited the two wave power test facilities at Toftestallen west of Bergen, the tapered channel device and Kvaerner's OWC. In a later storm, the OWC was blown off the cliff because the bolts were not strong enough. Regarding your analysis, do you also evaluate the structural shear forces?

Asked by: John Grue

Answer(s):

We have not yet done that but we will!

Discussion Sheet

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Title of paper: Linearized potential flow analysis of a 40 chamber, oscillating water column wave energy device

Author(s): Bingham, H.B. & Read, R.

Question(s) / Comment(s):

1) You show over 10MW of power, measured experimentally – that is barely credible, for a machine the size of PELAMIS
2) But perhaps you are right – in which case is this the end for hydraulic machines like PELAMIS and OYSTER?

Asked by: Rob Rainey

Answer(s):

1) It is important to note that this plot (Fig. 3 in the abstract) shows absorbed power, not electrical power, so realistically approximately half of that will be transformed into electrical power, assuming that the turbine can handle the associated pressures. Also note that the peak measured value of about 15MW corresponds to a wave of period 9.44s, length 136m and height 8.2m, which is not something that we expect to see very often off the coast of Denmark! Normal operating conditions will be towards the left end of that plot at wave periods of 4-8 seconds. This does however illustrate that a device which continues to operate in very large waves will produce a lot of power, even if only 10 or 20% efficient, simply due to the enormous amount of available energy in those waves.
2) Although the length of this device is about the same as the Pelamis, the displaced mass is over 10,000 tonnes which is about 7.5 times larger than the Pelamis P2. The Oyster device is only about 230 tonnes, so the comparison is more complicated than raw power and I would not say that these calculations spell the end for any other devices. I will say though that this kind of an OWC-based device offers the attractive feature of a simple structure that can be mass produced in sections using relatively cheap materials, for example reinforced concrete.

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IWWWFB — UNIVERSITY OF BATH — University of BRISTOL

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Experimental demonstration of Epsilon-Near-Zero water waves focusing

Author(s): Bobinski, T. Eddi, A., Maurel, A., Pagneux, V. & Petitjeans, P.

Question(s) / Comment(s):

Please show slide 18 again! You commented that you found the waves focus nearer to the circular profile where the change of depth occurs, whereas you expected focussing to occur at the circle's centre.

Asked by: Mark Cooker

Answer(s):

The wave does not follow typical ENZ focusing, being slightly shifted from the expected focal point. Indeed, constant phase at the lens should result in the focal point at the center of the circular edge. Rather, the observed focal spot is located in front of the center of the circle. This is a kind of negative refraction effect that might be ascribed to non linearities.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Forced heaving motion of a floating air-filled bag (p.29)

Author(s): Chaplin, J., Farley, F., Kurniawan, A., Greaves, D. & Hann, M.

Question(s) / Comment(s):

I am wondering what kind of support structure you may have in your mind to support the air flow or turbine.

Asked by: Jun Zang

Answer(s):

During operation there is a fixed mass of air in the system so that the bag is always inflated. The bag itself supports the internal structure including the chamber V2 and the turbine

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Forced heaving motion of a floating air-filled bag

Author(s): Chaplin, J., Farley, F., Kurniawan, A., Greaves, D. & Hann, M.

Question(s) / Comment(s):

I am wondering about how the geometrical variation of the inflated bag during a cycle influences the motion and hydrodynamic quantities such as added mass. Could variability of the latter during the cycle contribute to the discrepancy between experimental and theoretical predictions of the resonant heave period?

Asked by: R. EATOCK TAYLOR

Answer(s):

The theory assumes that all deformations are small so all finite amplitudes and their effects are neglected. Also in the experiments, over the range of tested conditions, there were no indications of nonlinearities in the measured amplitude.

It is likely that the mis-match in resonant frequencies was due to flexibility in the plastic tanks representing volumes V1 and V2.

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The 30th International Workshop on Water Waves and Floating Bodies

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Title of paper: Forced heaving motion of a floating air-filled bag

Author(s): Chaplin, J., Farley, F., Kurniawan, A., Greaves, D. & Hann, M.

Question(s) / Comment(s):

Can flexible bags of this type and size be fabricated with sufficient longevity and reliability to be practical?

Asked by: Newman

Answer(s):

I believe they can. Bags of the right nest of size are routinely used as floatation devices and the form of construction is the same as envisaged for the SQ. It's true that they do not experience the large number of loading cycles that a SQ device would, but the material has a long fatigue life.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Added Resistance Simulation of Blunt Ship in Short Waves

Author(s): Chen, J. & Duan, W.

Question(s) / Comment(s):

Thank you for great work. The results are impressive. I wonder if you have any result for slender ships. KVLCC2 has a blunt bow which the computation of added resistance is rather easy. Did you validate your computation for slender ships?

Asked by: Yonghwan Kim

Answer(s): Thank you Professor Kim. Your suggestion is valuable. We have calculated the added resistance of Wigley 3 for validating the program of TEBEM method. Numerical results show that the values of the slender ships vanish in the short wave. While for the blunt ship, the added resistance don't vanish in the short wave like the slender ships. Hence, we think that the added resistance for blunt ship in short wave is more important. In addition, we will develop our method for the added resistance computation of the slender ships and validate the influence of the non-wall bow for the added resistance. Thank you!

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Particle–In–Cell Numerical Solver for Free Surface Flows with Fluid–Solid Interactions

Author(s): Chen, Q., Zang, J., et al.

Question(s) / Comment(s):

Question on accuracy? Advection scheme using particles as accuracy can be increased by increasing time step while accuracy decreased on fixed mesh with increasing time step.

Asked by: Peter Stansby

Answer(s):

We are actually interpolating velocity increment on the grid to the particles to update particle velocity, which reduces numerical dissipation and thus improves the accuracy.

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IWWWFB International Workshop on Water Waves and Floating Bodies

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The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Particle–In–Cell Numerical Solver for Free Surface Flows with Fluid–Solid Interactions

Author(s): Chen, Q., Zang, J., et al.

Question(s) / Comment(s):

Could you say some more about how you calculate the pressure distribution on the structure? (In particular when the structure is the caisson you desisted.)

Asked by: M. J. Cooker

Answer(s):

As we are using Distributed Lagrangian Multiplier (DLM) method, everything is just based on the velocity calculation. The pressure is used to project the fluid velocity on to a divergence free velocity field. We didn't use pressure to calculate the force and thus move the caisson.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Dispersion relation and instability onset of Faraday waves (p.45)

Author(s): Clamond, D. & Rajchenbach, J.

Question(s) / Comment(s):

Do the lateral boundaries of the container play a role?

Asked by: Paul Martin

Answer(s):

Yes, but to a limited extend. You can find the same patterns in containers of different shapes

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Energy dissipation and spectrum evolution during the breaking of modulated wave trains

Author(s): De Vita, F., Verzicco, R. & Iafrati, A.

Question(s) / Comment(s):

You show that wave breaking broadens the wave spectrum. Why, then, is exactly the opposite observed in the ocean? The JONSWAP empirical spectrum has bandwidth parameter gamma, which gives narrower, not broader spectra when the waves are steep. See DNV-RP-C205 (April 2014) section 3.5.5.5 page 50.

Asked by: Rob Rainey

Answer(s): We thank the discusser for the question which allows us to provide some additional details. The evolution of a wave train with sideband perturbations and the related instability was theoretically addressed by Benjamin and Feir, JFM (1967), and it was a subject studied, either numerically or experimentally, by many different groups. Among them we mention the study by Tulin and Waseda, JFM (1999) and at the IWWWFB by Landrini et al. (1998). In the latter it is shown that the instability mechanism is such that the fundamental component diminishes whereas the sidebands grow. This phenomenon is not related to the breaking occurrence and is theoretically explained by BF. Without breaking, the phenomenon is reversed at a certain point and the components get back at their original values. However, if the initial wave amplitude exceeds a threshold value, due to the amplification the steepness to be too high and the breaking starts. Because of the breaking occurrence the components do not get back to their original values but the peak shifts from the fundamental component to the lower sideband (Tulin and Waseda, 1999). In this sense it is not the breaking which is broadening the spectrum but it is the modulational instability process. The effect of the breaking is to frozen the lower sideband component at the value it takes when the breaking start and to reduce (or suppress) the higher sideband.

Of course we're aware that situation considered is somewhat academic. The choice was motivated by the need of achieving a good control of the breaking conditions and to use a spectrum which could be described in a computational domain with a limited the horizontal extension. However, just recently we have started extending the analysis to a more realistic JONSWAP spectrum (Iafrati, De Vita, Toffoli, Alberello, *Strongly Nonlinear Phenomena in Extreme Waves*, paper submitted at the World Maritime Technology Conference, 2015).

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Ship waves at finite depth in the presence of uniform vorticity

Author(s): Ellingsen, S.A. & Li, Y.

Question(s) / Comment(s):

Is the group velocity useful in interpreting your results?

Asked by: Newman

Answer(s): Certainly, although in the cases with stationary (ship waves) or periodic (oscillating source) time dependence, it enters only via the radiation condition, making sure waves with outgoing group velocity are included. When considering a transient wave system such as an initial disturbance (the Cauchy-Poisson problem) the group velocity matters greatly and indeed varies greatly with the conditions, depending on water depth and shear strength. A ring wave in the presence of strong shear, for example, spreads like a single coherent oval ring because the group velocity approximately equals the phase velocity in all directions. In deep waters, on the contrary, the upstream propagating wave is a single long-lived crest in the same way, but the downstream waves have a totally different appearance because the phase velocity far exceeds the group velocity in the downstream direction in deep water, and the waves seem to fly downstream at great speed while the wave packet itself moves much more slowly. Without shear the two velocities are a factor 2 different, but in the presence of shear the difference can be far greater.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Total transmission through narrow gaps in channels (p.61)

Author(s): Evans, D.V. & Porter, R.

Question(s) / Comment(s):

Is there any transverse waves when waves pass through the gaps? What are the proper far field conditions for the refection and transmission waves?

Asked by: Bin Teng

Answer(s):

There are no transverse waves as I have restricted $k<\pi/d$, so any plane waves can exist in the far field and the gaps are symmetric about the centre line of the channel.

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The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Total transmission through narrow gaps in channels

Author(s): Evans, D.V. & Porter, R.

Question(s) / Comment(s):

If the total transmission has been achieved, then what happens on the wave forces on the barriers?

Asked by: Zhinming Yuan

Answer(s):

The author has not carried out any studies on this issue.

Discussion Sheet

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The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: **Total transmission through narrow gaps in channels**

Author(s): **Evans, D.V. & Porter, R.**

Question(s) / Comment(s):

Have you considered sets of barriers which have different spacing between them (shell widely spaced)?

Asked by: **Maureen McIver**

Answer(s):

We have considered two sets of N barriers spaced apart by an amount c and determined R_{2N} and T_{2N}. The condition $R_{2N} = 0$ appears to give a few set of values of k_d. In addition it appears that c may be varied to give cloaking in case 2N = 4. However it also appears proscribe to adjust the phase of T_N (kb) to achieve cloaking in the case presented.

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Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Numerical Simulation of Breaking Wave Impact on a Vertical Wall

Author(s): Feng Gao, Jun Zang, Chris Blenkinsopp

Question(s) / Comment(s):

Could you explain the higher pressures by compressible solver compared to the pressures without account for compressibility?

Could you say more about your results for aerated water impact?

Asked by: A. Korobkin

Answer(s):

The incompressible solver *interFoam* treated the air and water as incompressible fluid, the air and water will not be mixed during the air bubbles trapped in the water. Whilst the compressible solver *twoPhaseEulerFoam* treated the air and water-air mixture as compressible fluid, and the air phase is dispersed, e.g. air bubbles trapped in the water, the air and water will be mixture. Which is more realistic, but not sure why compressible solver give higher pressure. We will continue working on this problem.

We have done some simulation for aerated impact, but have not pay much attention on it at this moment for its impact pressure on the wall are much less then air pocket and flip through impact. We will look at it carefully later.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: **Numerical Simulation of Breaking Wave Impact on a Vertical Wall**

Author(s): **Gao F., Zang, J. & Blenkinsopp, C**

Question(s) / Comment(s):

The free surface in videos looks smeared. Are you using a conventional VOF scheme for interface capturing? These must be a most sophisticated scheme to make the interface sharper, which may be used.

Asked by: **M. Kashiwagi**

Answer(s):

We just used the normal VOF scheme to capture the free surface by now. We may try other scheme later to manage to get a sharp interface. Thanks for your suggestion.

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The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Numerical Simulation of Breaking Wave Impact on a Vertical Wall

Author(s): Gao F., Zang, J. & Blenkinsopp, C

Question(s) / Comment(s):

Experimentally there is always a pressure peak at the wave crest level in an air pocket impact. It seems that your simulations did not capture this peak, any explanation?

Asked by: Laurent Brosset

Answer(s):

The mesh around the air pocket may need more refiner for the sharp peak impress pressure and also the output time step may need even smaller.

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Discussion Sheet

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The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: **Numerical Simulation of Breaking Wave Impact on a Vertical Wall**

Author(s): **Gao F., Zang, J. & Blenkinsopp, C**

Question(s) / Comment(s):

What is the location of the maximum impact pressure relative to the still water level?

Asked by: **Alison Raby**

Answer(s):

Around the mean water level.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Interaction distance for scattered and radiated waves in large wave energy parks

Author(s): Goteman, M., Engstrom, J., Eriksson, M. & Isberg, J.

Question(s) / Comment(s):

How many bodies do you intend to use your method for?

Asked by: M.A. Peter

Answer(s):

I want to be able to model parks with at least, say, 200-300 devices with high accuracy. This is the planned size of the wave energy park that is currently being built on the west coast of Sweden.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

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Title of paper: **Interaction distance for scattered and radiated waves in large wave energy parks**

Author(s): **Goteman, M., Engstrom, J., Eriksson, M. & Isberg, J.**

Question(s) / Comment(s):

Would comment on the range of the water depth intended for the wave power device you are investigating?

Asked by: **John Grue**

Answer(s):

The concept is rather flexible, but most suitable for intermediate water depths (neither deep nor shallow). Our test site has a water depth of 25 m, and the water depth at the site where the large wave energy park is being built is 40 m.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

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Title of paper: Interaction distance for scattered and radiated waves in large wave energy parks

Author(s): Goteman, M., Engstrom, J., Eriksson, M. & Isberg, J.

Question(s) / Comment(s):

These exists the so-called group-body concept for multiple-body interactions. Are you going to use or did you use this group-body concept in your study?

Asked by: M. Kashiwagi

Answer(s):

I want to have a very flexible model, where I don't have to make any assumptions on length scales or group bodies together by hand. However, with the interaction distance a sort of grouping will take place automatically, since full multiple scattering will be computed within closely spaced devices in groups, but not between far groups. But no, I am not using an explicit group-body concept. (not yet, anyway)

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Interaction distance for scattered and radiated waves in large wave energy parks (p.69)

Author(s): Goteman, M., Engstrom, J., Eriksson, M. & Isberg, J.

Question(s) / Comment(s):

I suggest you investigate the Fast Multipole Method to calculate the wave field for a large number of scatterers. See the Wikipedia page and papers by Rokhlin, Greengard and many others.

Asked by: Luke Bennetts

Answer(s):

Thank you for your suggestion!

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The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Interaction distance for scattered and radiated waves in large wave energy parks (p.69)

Author(s): Goteman, M., Engstrom, J., Eriksson, M. & Isberg, J.

Question(s) / Comment(s):

How do you choose the interaction distance?

Does the wavenumber play a role?

Asked by: Paul Martin

Answer(s):

I haven't yet looked into optimal values of the interaction distance. Hints of suitable values can of course be given from earlier works (e.g. by Mavrakos & McIver) on limits for the separation distance where the point absorber approximation is valid. I will look into it more in the near future.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Validation of a nonlinear spectral model for water waves over a variable bathymetry

Author(s): Gouin, M., Ducrozet, G. & Ferrant, P.

Question(s) / Comment(s):

Have you given any consideration to breaking wave? For large waves and large changing bathymetry, break wave might be a problem.

Asked by: Bob Beck

Answer(s): For the moment wave breaking has not be considered, and only studies with small steepnesses have been made. A wave breaking model is expected to be implemented in the coming years.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Strongly nonlinear evaluation of internal ship wakes

Author(s): Grue, J.

Question(s) / Comment(s):

Do you deal with the free surface as a rigid lid? If so, maybe it is another reason why your numerical results show some differences with field observation.

Asked by: B.B. Zhao

Answer(s):

The steady free surface boundary condition in this application is $\partial\phi/\partial(y/l)+(U^2/gl)\partial^2\phi/\partial(x/l)^2=0$, in which l is the ship length, U is the speed, g is the acceleration due to the gravity. In its linear version, where $U^2/gl \cong 0.02$, this means that the double body flow applies close to the body, for the free surface condition, with $\partial\phi/\partial y=0$. When $\Delta\rho/\rho\to 0$ the surface and internal wave modes separate anyway, and $\partial\phi/\partial y=0$ at the free surface applies for the internal wave propagation. A main reason for the discrepancies from the field observations is a spatio-temporal background shear velocity field in the fjord, however.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: The interaction of a waves with a Submerged Very Large Elastic Plate

Author(s): Hermans, A.J.

Question(s) / Comment(s):

Do you think you could get cloaking by two independent elastic plates either in the surface or submerged?

Asked by: D. V. EVAWS

Answer(s):

In 2004, I published a paper in JEM 49, 133-147 about the interaction of waves with multiple floating ships. I will look at the results whether cloaking occur in this case.

Discussion Sheet

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The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: **Singularization of Sloshing Impacts**

Author(s): **Karimi, M.R., Brosset, L., Ghidaglia, J.-M. & Kaminski, M.L.**

Question(s) / Comment(s):

Do you have any idea how to implement your study for the prediction of design load?

Asked by: Yonghwan Kim

Answer(s):

As it is common practice and also recommended by the sloshing assessment methodologies of LNG tanks, design loads are predicted by performing 6 DOF sloshing model tests usually at scale 1:40 and scaling the measured loads followed by statistical post-processing in order to predict the design loads. Scaling the measured pressures includes biases and is not accurate since not every gas and liquid property can be scaled at the same time to model-scale.

Also considering the statistical post-processing on the one hand calculations are done by taking into account all the impact pressures which come from different impact types (slosh, flip-through and gas pocket) which could be improved by considering the impacts which are of the same impact type or even better by studying every impact separately. On the other hand not all the impacts that are measured during sloshing model tests are of interest. For sloshing ULS (Ultimate Limit State) is more important and in that sense extreme impacts would be of more interest. If out of many impacts that can be obtained in a long sloshing model test, only severe ones are selected and created many time with short model tests instead, the statistics would be more relevant and the time spend for the model tests would potentially be shorter.

The question which needs to be answered is what is the criterion to call an impact severe or not severe and based on that criterion which impacts should be selected and which ones should be neglected. If a reliable criterion (or criteria) is (are) found, design loads can be predicted in a more accurate yet easier way. In this abstract it was shown that every selected impact can be generated using tank motions of short durations with no need to perform the whole long sloshing model test. Other issues remain to be addressed in the future.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

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Title of paper: Singularization of Sloshing Impacts

Author(s): Karimi, M.R., Brosset, L., Ghidaglia, J.-M. & Kaminski, M.L.

Question(s) / Comment(s):

Why don't you observe the impulse by multiplying the duration of impact pressure? Such quantity may be more meaningful

Asked by: Mark J. Cooker

Answer(s):

In order to find the right criterion to select severe and relevant sloshing impacts, the impulse is indeed relevant and can be considered among other parameters such as impact pressure and rise-time.

Discussion Sheet

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The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Wave Drift Force on Floating Bodies of Cloaking Configuration and Associated Wave Patterns (p.101)

Author(s): Kashiwagi, M., Iida, T. & Miki, M.

Question(s) / Comment(s):

From the video, there appears to be clear higher harmonic scattering.

1) Have you focused here only on the 1st harmonic?

2) Please comment on the influence of higher harmonics on the forces

Asked by: Harry Bingham

Answer(s):

1) Yes. We intended to confirm the degree of agreement with the linear theory and hence we used incident wave with smaller wave steepness of 1/50.

2) I don't have any information at present. But it was true that there were experimental scatterings in the range of higher frequencies, which may be attributed to nonlinear effects.

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Discussion Sheet

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The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Non-linear problem on unsteady free surface flow forced by submerged cylinder

Author(s): Kostikov, V.K. & Makarenko, N.I.

Question(s) / Comment(s):

1. The comparisons between others is suggested to be provided in a more clear picture. For example, it would be much better to compare them in one-picture by overlapping the curves.
2. Greenhow & Moyo (1997)'s results are also a good choice for you to compare because the assumption of your simulation's method is similar to theirs. Than you.

Asked by: B.Y. NI

Answer(s): Thank you for your suggestion, I will try to make the graphics more clear. Greenhow & Moyo's results are known to us. We rely on their works in our study.

Discussion Sheet

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Title of paper: **Non-linear problem on unsteady free surface flow forced by submerged cylinder**

Author(s): **Kostikov, V.K. & Makarenko, N.I.**

Question(s) / Comment(s):

Comment: In this approach the boundary conditions on the surface of the cylinder are satisfied automatically

Question: In this approach the time t must be small enough. It t = 0.8 small or not?

Asked by: **Dmitri V. Maklakov**

Answer(s):

Yes, we think that the value 0.8 is still small enough for our small-time asymptotic solution. Actually this correspond to the problem, we are trying to solve: to find the applicability limit of the model, until which value of parameters t, γ, λ we can processed.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: When no axisymmetric modes are trapped by a freely floating moonpool

Author(s): Kuznetsov, N.

Question(s) / Comment(s):

1. I am interested in the connection between non-negative added mass and uniqueness. There seems to be some differences because the KE and PE are not individually bounded in the radiation problem in general. Do you think these is one to one correspondence?

2. Do you think you might be able to relax the interior John condition in the uniqueness problem to allow for, say a circulars sill?

Asked by: M. McIver

Answer(s):

1. Presumably it is a coincidence that the same conditions guarantee the uniqueness and the positivity of the added mass

2. The method guaranteeing the proper inequality between the PE and KE is based on the interior John condition. So far, I failed to find an alternative method.

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Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: **On Stokes' Coefficients and the Wave Resistance of a Towed Body**

Author(s): **Maklakov, D.V. & Petrov, A.G.**

Question(s) / Comment(s):

Dose a circulation around the cylinder, like for a submerged foil, change the results?

Asked by: **John Fime**

Answer(s):

The answer is not. The results will be the same. Independently of there is the circulation over the foil or not.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Scattering by rings of vertical cylinders (p.141)

Author(s): Martin, P.A.

Question(s) / Comment(s):

I am surprised that in the limit $N\rightarrow\infty$ there is no significance of internal resonances or near trapped modes within the ring of cylinder, which one might imagine, exist even if there is a small gap between cylinders. One might image this effect might exist in the Dirichlet case also.

Asked by: R. Porter

Answer(s):

I am surprised too, but I have not seen this (yet). It may be a defect in the underlying Foldy-type approximation.

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Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Scattering by rings of vertical cylinders (p.141)

Author(s): Martin, P.A.

Question(s) / Comment(s):

Why you haven't applied the addition theorem for Bessel function to describe the scattering potential by each body with respect to the coordinate systems of any arbitrary selected body? To my opinion this would be an easier approach.

Asked by: I.K. Chatjigeorgiou

Answer(s):

What you describe is the exact multipole method for scattering by N circles. This method (which I like) becomes inconvenient and expensive as N increases. That is why I tried an approximate method, a method that is expected to be good when ka is small.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: **The Sign of the Added Mass Coefficients for 2-D Structures**

Author(s): **McIver, M. & McIver, P.**

Question(s) / Comment(s):

Can you prove that for a 2d symmetric submerged body in a depth of submergence above which the added mass is non-negative or even belle, below which the added mass can be negative.

Asked by: **David Evans**

Answer(s):

I haven't tried this, but it would not easy to do because the method used in this work relies on being able to drop a vertical line from each point on the mean free surface to a horizontal sea bed (or infinity).

Discussion Sheet

IWWWFB
The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: The Sign of the Added Mass Coefficients for 2-D Structures

Author(s): McIver, M. & McIver, P.

Question(s) / Comment(s):

Thank you very much for the impressive presentation.

Could you give us some clue on how added mass be negative for two-symmetric body in physics?

Asked by: Xinshu Zhang

Answer(s):

Mathematically I can see that the potential energy associated with the region between the structures must be greater than the kinetic energy in this region for negative added mass to occur. However, I don't know why this should be the case on physical grounds.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Bursting of a high pressure bubble through a free surface

Author(s): Ni, B.

Question(s) / Comment(s):

When two boundaries are approaching very closely, there may be numerical instability. This can be due to two different BCs on each side. Do you have any problem? When did you define the collapse of air bubble?

Asked by: Yonghwan Kim

Answer(s):

Yes, I encountered the numerical instability as you mentioned when bubble surface is approaching the free surface very closely, namely the thickness of the water layer between bubble and free surface is very thin. To avoid this problem, I define a small critical distance delt_s1. When the thickness of the water layer is smaller than delt_s1, I take this moment to burst the bubble or collapse the bubble as you mentioned. The sensibility study of this critical delt_s1 has been done and it is taken as 20% of the smallest bubble element size finally in my abstract.

Discussion Sheet

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The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: **Bursting of a high pressure bubble through a free surface**

Author(s): **Ni, B.**

Question(s) / Comment(s):

I think that the high pressure gradient that you report in your results can be explained by a simple model: with $p = 0$ on the free surface and prescribed initial velocity v you can construct a boundary-value problem for $\partial\phi / \partial t$. For a converging velocity field v, my published book showed you obtain a high pressure maximum just below the free surface. See "Cooker, M.J., Proceedings of the Royal Society, Unsteady pressure fields which precede the launch of liquid jets"

Asked by: **M.J. Cooker**

Answer(s):

Thank you very much for your comments. Your suggestion is very helpful. I will read your paper carefully.

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Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Bursting of a high pressure bubble through a free surface (p.157)

Author(s): Ni, B.

Question(s) / Comment(s):

At some moment of time, you cut the initial process of computations. What will be if you do not cut it and continue the initial process?

Asked by: Dmitrii Maklakov

Answer(s):

If I continued the simulation, the bubble surface would penetrate through the free surface and the meshes would cross with each other.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Bursting of a high pressure bubble through a free surface

Author(s): Ni, B.

Question(s) / Comment(s):

Can you comment about how you deal the effect of surface tension at the tip? (I assume the curvature is unbounded there)

Asked by: ALESSAMDRO IAFRATI

Answer(s):

I did not deal with the surface tension at the tip particularly. I just took it as normal point when calculated its curvature, although it is really very large compared with others. But its effect is very local because it is just one point, given the effects of surface tension is small after all.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: A fully submerged flap-type wave energy converter

Author(s): Noad, I.F. & Porter, R.

Question(s) / Comment(s):

In your analysis you included oblique incident waves. If the incidence angle is nonzero, wouldn't it be necessary to include the same 'snake-like' for the flap angle θ?

Asked by: Newman

Answer(s):

Yes, it would. Since the directional spectrum in the near-shore environment is strongly focused around a particular angle of incidence I didn't consider this. It might make an interesting extension though.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: A fully submerged flap-type wave energy converter (p.161)

Author(s): Noad, I.F. & Porter, R.

Question(s) / Comment(s):

Your integral equation for P(x, z) is valid for a flap of any shape, not just a rectangle. Do you know if non-rectangular shapes might be of interest? (Of course, your Galerkin scheme would not be so nice!)

Asked by: Paul Martin

Answer(s):

I hadn't looked at this, but it is an interesting point and indeed remove the sharp corners of the rectangle!

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: A new linearization method for vectorial Morison equation

Author(s): Ouled Housseine, C., Monroy, C. & Bigot, F

Question(s) / Comment(s):

For the linearized Matrix, is it proved that the off-diagonal terms to be zero, or just written as zero? For an inclined cylinder, the two velocity components may be not independent.

Asked by: Bin Teng

Answer(s):

The off-diagonal terms are not equal to zero for the linearized matrix but for the matrix C I obtain for the MSE problem:
For a 2D case, if I define the linearized matrix as:

$$A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$$

My MSE problem is equivalent to find A that minimizes the quadratic function:

$$J(A) =< (A.X - |X|X)^T(A.X - |X|X) >$$

With X the wave velocity vector and $<.>$ the expected value.
Then if I write my unknown coefficients as: $U = [a_{11}\ a_{12}\ a_{21}\ a_{22}]^T$. J can be written as:

$$J(U) = U^T CU + 2B^T U + f$$

With:

$$C = \begin{bmatrix} < X_1^2 > & < X_1X_2 > & 0 & 0 \\ < X_1X_2 > & < X_2^2 > & 0 & 0 \\ 0 & 0 & < X_1^2 > & < X_1X_2 > \\ 0 & 0 & < X_1X_2 > & < X_2^2 > \end{bmatrix}$$

$$B = \begin{bmatrix} < |X|X_1^2 > \\ < |X|X_1X_2 > \\ < |X|X_1X_2 > \\ < |X|X_2^2 > \end{bmatrix}$$

$$f =< (|X|X)^T|X|X >$$

The minimum is obtained by solving the linear system:

$$CU = B$$

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Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Hydrodynamic Interaction of Two Bodies in Waves

Author(s): Peng, H., Ashim Ali, Md. & Qiu, W.

Question(s) / Comment(s):

In your calculation how you account for the wall of the towing tank?

Asked by: Bob Beck

Answer(s):

The tank walls were modelled as two long boxes. The computations were essentially carried out for four-body interactions in waves.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Hydrodynamic Interaction of Two Bodies in Waves

Author(s): Peng, H., Ashim Ali, Md. & Qiu, W

Question(s) / Comment(s):

Is damping factor determined by the gap? If so, each cased must be simulated by CFD first to get it. It means no need to use potential flow.

Asked by: Zhiming Yuan

Answer(s):

It is determined by the gap.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Long-period waves and current variations in a port due to a passing vessel

Author(s): Pinkster, J. & van der Hout, A

Question(s) / Comment(s):

Are the channel boundaries included in the two solutions?

Asked by: Newman

Answer(s):

That is optional for the first part of the computations i.e. double-body solution for the case that the vessel sails through the port model. If it is included then the passing vessel will feel blockage effects which will then also be present in the pressures and velocities generated on the port and moored vessel grids. The double-body problem is solved at each step.

If the blockage effect is expected to be small then the double-body problem (source strengths on the passing vessel) are solved only once not accounting for the presence of port or moored vessel. The solution is then used to generate the velocity and pressure disturbance on port and moored vessel grids for all remaining positions of the passing vessel.

The second part of the computations, i.e. solving the 3-d diffraction problem remains the same only involving the port geometry and the moored vessel.

Discussion Sheet

IWWWFB
The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Extended Mild-Slope Equations for Compressible Fluids (p.177)

Author(s): Renzi, E., Cecioni, C., Bellotti, G., Sammarco, P. & Dias, F.

Question(s) / Comment(s):

Researchers in computational underwater acoustics usually ignore free surface conditions and replace with simple "pressure release" condition. Could you just use the hydrodynamic part to generate the initial pressure field and then propagate using "simpler" acoustic methods (based on pure wave equation) with simple boundary condition at free surface location?

Asked by: Paul Martin

Answer(s):

No. Because direct interaction of gravity and acoustic waves, generated by the same source, is important in this study. The initial pressure field generates both hydro-acoustic and surface gravity waves. The hydro-acoustic waves are the forerunners of the gravity wave and are forced by the same mechanism (bottom of surface forcing) as the surface wave. Hence they cannot be separated in principle. This is especially true for a surface pressure perturbation, where using a pressure release condition would be incorrect.

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Discussion Sheet

IWWWFB — University of Bath — University of Bristol

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Extended Mild-Slope Equations for Compressible Fluids (p.177)

Author(s): Renzi, E., Cecioni, C., Bellotti, G., Sammarco, P. & Dias, F.

Question(s) / Comment(s):

For homogeneous incompressible fluid, the irrationality assumption is valid only to the linear approximation. For nonlinear waves, vorticity could not be neglected. Is the irrationality hypothesis justified in your situation?

Asked by: D. Clamond

Answer(s):

Our model is linear. Therefore the irrationality assumption is justified here.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Inertia forces on conductor arrays in a jacket model in regular waves

Author(s): Santo, H., Taylor, P.H. & Day, A.H.

Question(s) / Comment(s):

Large body: inertia loading dominates; small body: drag force dominates. I'm wondering whether you have looked at ranges of waves periods and how that affect the inertia loading and drag loading in your case.

Asked by: J. Zang

Answer(s):

We have not altered the wave period (1.4 sec) at lab scale. The individual conductors were 1.6cm diameter, so the flow is in the high KC-regime. We would not expect to see inertia coefficient changes with wave period for large wave amplitude.

Analysis of the drag component will be described elsewhere.

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Discussion Sheet

IWWWFB · University of Bath · University of Bristol

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Inertia forces on conductor arrays in a jacket model in regular waves

Author(s): Santo, H., Taylor, P.H. & Day, A.H.

Question(s) / Comment(s):

Generally inertia forces on conductors are relevant to fatigue loading and fatigue damage. Conventional design methods for fatigue do not include current. What influence do you expect this better characterisation of inertia forces in current to have on fatigue assessment of fixed jackets?

Asked by: Mark Mazocchi, Atkins

Answer(s):

For small waves the linear component of the inertia load dominates. This is (close to) completely unaffected by current, so we would not necessarily expect any significant impact on fatigue assessment unless nonlinear structural dynamics involved.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Inertia forces on conductor arrays in a jacket model in regular waves

Author(s): Santo, H., Taylor, P.H. & Day, A.H.

Question(s) / Comment(s):

There are some small components in the model, my question is how do you consider the scaling effect in this model?

Asked by:

Answer(s):

The model is scaled based on Froude's scaling.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Optimising power take-offs for maximizing wave energy conversions

Author(s): Sheng, W., Alcorn, R. & Lewis, A.

Question(s) / Comment(s):

For irregular-wave problems, the frequency dependency on hydrodynamic forces is taken into account with memory effect function, which may imply that the frequency dependency of the damping coefficient of PTO should be taken into account in the form of memory-effect function and convolution integral. How do you think of this idea for your study?

Asked by: M. Kashiwagi

Answer(s):

The damping coefficient of PTO is considered as a constant for a specific sea state, independent of the wave frequency. Hence in the time-domain equation, the PTO damping coefficient will not be considered in a form of memory-effect. In fact, if the damping coefficient of PTO is frequency dependent, then due to the changes of the PTO damping coefficient from wave to wave, so that the dynamic system is not a linear any more. In this regard, it should be considered as a control, rather than a damping optimisation.

Discussion Sheet

IWWWFB — UNIVERSITY OF BATH — University of BRISTOL

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: **Optimising power take-offs for maximizing wave energy conversions**

Author(s): **Sheng, W., Alcorn, R. & Lewis, A.**

Question(s) / Comment(s):

Power take-offs need to be non-linear, I believe. A linear device like an air turbine cannot remain efficient over the very large power range (1000:1) required for a wave energy device. A better scheme is to pump between accumulators, which smooth the power, as on KAIMEI. Better still, engineer the whole thing in rubber, like ANACONDA (2013 workshop)

Asked by: **Rod Rainey**

Answer(s):

This is a critical question for wave energy conversion. Yes, there are a few different types of power take-offs in practical developments, such as direct drive, hydraulic pump, air turbine and water turbine, and they all have their own advantages and disadvantages. Some are more efficient in energy conversion, but may suffer reliability problem, others may be more reliable in the long period energy conversion, but not very efficient. In this research, we presented a method for examine how much power can be extracted by the device. By comparison, both linear and nonlinear PTOs can extract almost same amount of wave energy. Hence it implies a linear analysis which is fast could provide the correct answer to that.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Optimising power take-offs for maximizing wave energy conversions

Author(s): Sheng, W., Alcorn, R. & Lewis, A.

Question(s) / Comment(s):

What is ratio of peak power to average for nonlinear dampers?

Asked by: Peter Stansby

Answer(s):

It depends on the nonlinear PTO types and the wave types. For instance, in regular waves, the ration of peak power to average is either larger than 2 or less than 2, compared to 2 in the linear PTO. In irregular wave, nonlinear damper may be slightly larger than 10, very similar to the linear PTO.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: A Time-Domain Twice Expansion Method for Wave Interaction with a Body of Large Amplitude Motion

Author(s): Teng, B. & Jin, R.

Question(s) / Comment(s):

I noticed a plot in which the frequency is changed very much while the amplitude is kept same, can you talk a bit more about it? Why the dynamic system changes the frequency so much?

Asked by: Wanan Sheng

Answer(s):

The frequency change is due to the body motion, when the body moves from one wave peak to another peak, the wave force will oscillate one more or one less cycle. That is the reason why the wave force frequency changes in the new method. The amplitude of the incident wave force does not change in the simulation. This is depend on the definition of the force. You may see that the scattering force changes with the body motion and the total force amplitude also change with the body motion.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: A Time-Domain Twice Expansion Method for Wave Interaction with a Body of Large Amplitude Motion

Author(s): Teng, B. & Jin, R.

Question(s) / Comment(s):

Do you think the present twice-expansion method can be applied to a problem of ship maneuvering in waves?

Asked by: M. Kashiwagi

Answer(s):

Yes, I think the tracking method by wavelet function can be used to find the long term scale motion in the maneuvering problem.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: A Time-Domain Twice Expansion Method for Wave Interaction with a Body

Author(s): Teng, B. & Jin, R

Question(s) / Comment(s):

You have some very interesting comparisons of results from the original and new methods. The obvious question is how either of the results compares with experimental data, and I expect you have plans to investigate this. What type of experimental configuration would best highlight the significant differences between the two theoretical methods?

Asked by: R. EATOCK TAYLOR

Answer(s):

Thanks for the suggestion. We have tried to find some experimental results to compare. But all the results are from truncation experiment, in which the model designs are based on the original numerical model. We have the plan to carry out some independent model tests, in which bodied will be moored horizontally with vary weak mooring lines, and incident waves will be controlled strictly.

Discussion Sheet

IWWWFB — UNIVERSITY OF BATH — University of BRISTOL

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Experimental observation of near-motion-trapped mode (p.213)

Author(s): Wolgamot H., Taylor, P.H., Eatock Taylor, R., Fitzgerald, C.J., van den Bremer, T., Whittaker, C. & Raby, A.

Question(s) / Comment(s):

Since viscous damping is an issue in your problem, I wonder if it might be useful to consider more streamlined ends to the considered cylinders than half spheres.

Asked by: Francis Noblesse

Answer(s):

We have attempted to estimate the linear viscous damping on the cylinders using solutions* for the laminar Stokes oscillatory boundary layer flow over a flat plate. This gives a reasonable estimate of the magnitude of the linear damping. And since there is little nonlinear damping evident in the results, it is tempting to conclude that separation around the cylinders in a relative minor effect. Hence the gains from changing the end shape may be small. However, we should emphasise that the choice of hemisphere was pragmatic, motivated by the fact that they were "off the shelf" items, so further optimisations is certainly possible.

* (e.g. Lamb, 1993 paperback edition)

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

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The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Experimental observation of near-motion-trapped mode (p.213)

Author(s): Wolgamot H., Taylor, P.H., Eatock Taylor, R., Fitzgerald, C.J., van den Bremer, T., Whittaker, C. & Raby, A.

Question(s) / Comment(s):

Let me congratulate you on a fascinating experimental duty which well deserved the Ernie Tuck Fellowship. It is interesting to see that even as time go along, simple structures can exhibit remarkable behaviours where are capable of being confirmed experimentally.

No comment required.

Asked by: David Evans

Answer(s):

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Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: A linearized free-surface RANS method for unsteady ship maneuvering problems

Author(s): Woolliscroft, M.O. & Maki, K.J.

Question(s) / Comment(s):

In your figure 1, why do the "Field potential" results agree with the viscous solution and experiments?

Asked by: J.N. Newman

Answer(s):

A thorough investigation has not been performed. However, the field potential results are grid independent, so a possible reason for the difference between the field potential and analytical potential data could be dissipative nature of the numerical discretization of the field potential method.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Oblique water entry of a wedge with vortex shedding

Author(s): Xu, G.D. & Wu, G.X.

Question(s) / Comment(s):

What's the Froude number in the cases of your computations? What's the gravity effects on the problem with vortex shedding?

Asked by: Xinshu Zhang

Answer(s):

The gravitational acceleration has been ignored, there is fast interaction of fluid and structure during short period, therefore there is no definition of Froude number.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

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Title of paper: Oblique water entry of a wedge with vortex shedding

Author(s): Xu, G.D. & Wu, G.X.

Question(s) / Comment(s):

In your study you assume the apex already submerged at the beginning. However, it is important to talk about the initial contact time when the vortex sheet and the free surface coincide. That can lead to aeration, as shown in a paper by Judge et al. on J. Eng. Math (2004). Assumption of similarity is not generally valid in these problems.

Asked by: Alessandro Iafrati

Answer(s):

The beginning of the impact is very complex, the study of water entry is under the assumption of attached flow, the flow detachment and cavitation or ventilation is beyond the present study.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: A numerical study on prediction of ship maneuvering in waves

Author(s): Zhang, W. & Zou, Z.

Question(s) / Comment(s):

Numerical computations include various components at the same time. You should check the degree of agreement for each component. For instance, did you compare the wave drift force (added resistance) alone between measured and computed results? How about the degrees of agreement for heave and pitch motions in regular oblique waves (as seakeeping problems)?

Asked by: M. Kashiwagi (Osaka University)

Answer(s):

Yes, we have conducted the computation of the seakeeping problem to validate the numerical method and to check the correctness of the computation code. We compare the calculated motion RAOs as well as the added resistance with the experimental data, the agreement is good.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: Fully Nonlinear Computations of Wave Radiation Forces and Hydrodynamic Coefficients for a Ship with a Forward Speed (p.241)

Author(s): Zhang, X. & Beck, R.F.

Question(s) / Comment(s):

I am surprised by the large differences that you find for the off-diagonal Wigley hull coefficients when comparing the Neumann-Kelvin and Double-body linearizations. These differences appear to be much larger than results by other authors. Can you explain this?

Asked by: Harry Bingham

Answer(s):

Thank you for your question. In Neumann-Kelvin approach, there are two ways to compute the forces and moments after hydrodynamic pressure is obtained. One is direct pressure integration, another is using Ogilvie-Tuck theorem. We use the first one for present comparison instead of the later. The method using Ogilvie-Tuck theorem has some accuracy problems since it drop off some additional terms, although the prediction seems better than direct pressure integration for some cases.

Discussion Sheet

The 30th International Workshop on Water Waves and Floating Bodies

12 - 15 April 2015, Bristol UK, hosted jointly by the Universities of Bristol and Bath

Title of paper: A comparative study of the GN-3 and Boussinesq equations for nonlinear wave propagation

Author(s): Zhao, B.B., Duan, W.Y., Ertekin, R.C., Demirbilek, Z. & Webster, W.C.

Question(s) / Comment(s):

I have two comments:

1) I would be interesting to compare the performance of GN-4 with the Boussinesq model of Madsen et al. (2002; 2003)
2) For the steepest solitary wave, have you compared to Tanaka's result?

Asked by: Harry Bingham

Answer(s):

1. Tanaka's method can't calculate the highest solitary waves with amplitude equal to 0.8332. I will check again. Thank you for your comment. I will look into Tanaka's paper again.
2. Your high order Boussinesq model is strongly nonlinear and strongly dispersive wave model. I will use high level (GN-4) model to compare with your high order Boussinesq model. In present study, the Boussinesq 2-D model is weakly dispersive and strongly nonlinear model. That's why we only use low level (GN-2) model to compare with it. We want to make fair comparison. Thank you for your good suggestion.

Discussion Sheet

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Question(s) / Comment(s):

1. There is a Cocklet theory publish 1970's, it is an accurate theory. It's suggested to compare with the theory.
2. How many terms are used in the stream function theory?

Asked by: B.B. Zhao

Answer(s):

1. Yes, Cokelet give some results on wave speed, but no results on velocity distribution. I will check again. Thank you.
2. Following Fenton's suggestion, 40 terms are used in the stream function wave theory.

Discussion Sheet

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Title of paper: Wave-interference and wave-breaking effects on the Kelvin wakes of high-speed monohull ships and catamarans

Author(s): **Zhu, Y., He, J., Zhang, C., Wei, L., Wan, D. & Noblesse, F.**

Question(s) / Comment(s):

According to the steepest-descent expansion, far downstream the waves on the cusp line of order $R^{-1/3}$ should dominate, with the angle $(19\frac{1}{2})^0$ valid. Doesn't this contradict your conclusions, at least from the asymptotic sense?

Asked by: Newman

Answer(s):

I agree of course that the $(1/r)^{1/3}$ decay along the cusp line of Kelvin wake ultimately dominates the $(1/r)^{1/2}$ decay inside the wake in the VERY far field, where the waves are extremely small and can locally be observed.

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