Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: A High-order Finite-difference Solver for the Linearised Potential Flow Wave Resistance Problem on Curvilinear Overset Grids

Author(s): Afshar M. A., Bingham H. B., Read R.

Discusser: Hermans A. J.

Question(s) / Comment(s):

Looking at the floating cylinder can, one is not realize that double body flow approximation is not correct at the downstream side. In an article in the Handbook of Physics 6? in the article (before Wehausen's?) one can find remarks about a paper of Kohler? About dead wake solutions of a circular cylinder, in infinite fluid they are unstable, however, in free surface flow they play an important role of the downstream side. Suggestion use an (analytic) solution with dead work region instead of double body flow. Of course for the submerged cylinder the double body flow is OK.

Answer(s):

Although the result shown is based on Neumann-Kelvin linearization, I totally agree that even the double body flow cannot resolve the dead wake. Actually the result for the floating cylinder shown here, is just a test to make sure that we can apply forward speed to the model and have a stable solution. Of course to solve for the wave resistance problem in this special case, we need to specify the flow angle at the downstream side properly.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: A High-order Finite-difference Solver for the Linearised Potential Flow Wave Resistance Problem on Curvilinear Overset Grids

Author(s): Afshar M. A., Bingham H. B., Read R.

Discusser: Liao K.

Question(s) / Comment(s):

1) I wonder to know how to couple the sub-domains in your method? As I know, there are two ways to couple the sub-domains when using overset grid in CFD. One is to solve subdomains separately and boundary conditions are satisfied by interpolating flow field information from other sub-domains; the other one is to solve all the sub-domains simultaneously by forming a large algebraic equation system $[A]\{x\} = \{b\}$.
2) What kind of interpolation scheme is used exchange information between sub-domains? And how about the accuracy of the interpolation scheme? As we know, the interpolation accuracy is very important when using overset grids.

Answer(s):

1) The overture library which we are using, uses the second method to interpolate solution among the component grids. In fact the interpolation equation are built in to the system matrix, and are solved simultaneously filed governing equation.
2) It is possible to do either implicit or explicit interpolation, and each one has its own requirements regarding the width of the overlapping region. Of course the correct idea is to keep the order of interpolations the same as the order of the whole scheme. The library enables us to select the order of interpolation. (both second and forth orders).

Discussion Sheet

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Stable Finite Difference Discretizations of the Forward Speed Seakeeping Problem

Author(s): Bingham H. B., Afshar M. A., Read R., Engsig-Karup A. P.

Discusser: Grue J.

Question(s) / Comment(s):

The stability considerations presented, and the equations given in the abstract, seem to assume linear flow of the free-surface motion. Would you comment on the extension to nonlinear surface flows, how that becomes more involved, but also how it will have similarities regarding the integration procedure.

Answer(s):

In the nonlinear case, the best we can do is to look at a "frozen nonlinearity" stability analysis, where we consider for example the evolution of the solution under a stream function wave, which would only be strictly valid for that special case. However, I expect that the essential characteristics of the numerical scheme are illustrated by the linear analysis. In practice, we would at least like the scheme to be strictly stable in the linear case, then we can hope that any nonlinear instabilities will be relatively weak and easily controlled by very gentle high-frequency filtering which does not contaminate the solution at the frequencies of interest.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies
OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Stable Finite Difference Discretizations of the Forward Speed Seakeeping Problem

Author(s): Bingham H. B., Afshar M. A., Read R., Engsig-Karup A. P.

Discusser: Le Touzé D.

Question(s) / Comment(s):

You conclude that your upwind-biased scheme is more stable than full up-winding. Since the latter a priori introduces more damping than the former, this conclusion appears unlikely to me.

Can you comment on that?

Answer(s):

I agree that this conclusion does seem a bit strange, but that is what the analysis says and it accurately predicts what happens in the numerical solution. I.e. if I run the same test case shown in the abstract at order 4 or 6 with full upwinding, then the solution goes unstable very quickly.

Discussion Sheet

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Stable Finite Difference Discretizations of the Forward Speed Seakeeping Problem

Author(s): Bingham H. B., Afshar M. A., Read R., Engsig-Karup A. P.

Discusser: Kim Y.

Question(s) / Comment(s):

Two questions:

1) Did you consider other time-marching schemes than RK4?

2) Upwinding schemes introduce numerical damping. Do you think that we can find a numerical scheme with less damping? This would be desirable for accurate numerical computations.

Answer(s):

1) Any time-stepping scheme can be analyzed by plotting the eigenvalues calculated here together with the stability region of the particular time-stepping scheme. We have so far only considered the RK4 scheme however.

2) Yes, when an eigenvalue moves off the imaginary axis in the stable region that indicates numerical damping of that mode. Ideally we would like to find the stable scheme which introduces the least numerical damping and of the schemes that we have looked at so far, the one-point upwind-biased scheme introduces the least damping. There may be better schemes however and we will continue to look for them.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Wave Trapping and Radiation by Semi-immersed Circular Cylinders

Author(s): Chaplin J. R., Porter R.

Discusser: Grue J.

Question(s) / Comment(s):

I am very fond of your experiments!

1. Please evaluate on your motivation for doing these experiments – what did you, in advance, expect to find differently from the linear theoretical results?

2. In general, would you expect to find differences, experimentally, from the theoretical results, based on linear theory?

Answer(s):

1. As far as I know these are the few laboratory measurements on motion trapped modes. Given the considerable instant in this phenomenon in recent years (particularly at previous workshops), some practical demonstration seemed overdue. I did not know what differences to expect.

2. At sufficiently small amplitudes I would expect measurements to agree with linear theory, once some allowance is made for the effects of viscosity. The slow drift of the freely-floating cylinder that was seen for the first time in these experiments could have foreseen from the linear theory.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY
Dept of Naval Architecture
& Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Wave Trapping and Radiation by Semi-immersed Circular Cylinders

Author(s): Chaplin J. R., Porter R.

Discusser: Molin B.

Question(s) / Comment(s):

For the driving force to be zero, don't you need to be at resonance? That is the hydroelastic force and the inertia Force should cancel out. Moreover you have all horizontal direction component and there's no restoring force in the horizontal direction.

Answer(s):

If the cylinders were oscillating in a motion trapped mode, There would be no external forces on item. So it seems inevitable that if, when driving the cylinders, we tried that the driving force drops to zero at a particular frequency, the motion must be identical to that of a motion trapped mode. It is indeed a resonance.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies
OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: A Semi-analytic Formulation for the Hydrodynamic Diffraction by Submerged Ellipsoids

Author(s): Chatjigeorgiou I. K. , Dassios G., Mavrakos S. A., Miloh T.

Discusser: Korobkin A. A.

Question(s) / Comment(s):

Could you please explain the difference between your resorts and computations by Wu and Taylor for short waves?

Answer(s):

For the results shown Wu and Eatock Taylor used 5 modes (u=5). In our results less modes were used. We believe that in the future we will be able to use more. The number of modes for short waves is very important. (where $k = \omega^2/g$ is increased), in order to achieve final convergence.

Discussion Sheet

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: A Semi-analytic Formulation for the Hydrodynamic Diffraction by Submerged Ellipsoids

Author(s): Chatjigeorgiou I. K. , Dassios G., Mavrakos S. A., Miloh T.

Discusser: Yeung R. W.

Question(s) / Comment(s):

In the late 60's special coordinates wave potential to solve 3-D problems. W. D. Kim(1964,JFM) provided an analytical solution of a floating ellipsoid and have been used as bench mark checks for development of arbitrary body works that followed around 1970's. It may be worthwhile to make some comparison with this published results, which included the case of a shallow draft body, disk-like shape. Submerged bodies do have the additional complexity that if the gap approaches zero at the free surface, an essential singularity will exist and much less is known about it.

Answer(s):

Honestly speaking I didn't know that contribution. All existing studies for this concept are much welcome, and therefore I sincerely thank you for mention it to me.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Numerical Simulation of Wave-induced Roll of a 2-D Rectangular Barge Using OpenFOAM

Author(s): Chen L. F., Sun L., Zang J., Hillis A.

Discusser: Sheng W.

Question(s) / Comment(s):

I noticed that data is from a wave flume, the model width is same as the flume. Hence the model test can be considered as 2D. My question is how to deal with the 2D simulation using linear potential theory?

Answer(s):

We did not do the calculation using 2D linear potential theory, but some groups developed the numerical models based on 2D linear potential theory. Such as Western Australia Prof. Cheng's group.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies
OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: **Numerical Simulation of Wave-induced Roll of a 2-D Rectangular Barge Using OpenFOAM**

Author(s): **Chen L. F. , Sun L. , Zang J. , Hills A.**

Discusser: **Grue J.**

Question(s) / Comment(s):

Would you comment on two usefulness of the code you adapt?

1. For a geometry without sharp corners?
2. With respect to the scale? (The experiments affected to be performed in laboratory scale).

Answer(s):

1. Structure geometry would affect the vortex developed around the structure. Certainly the model can be applied to any shape of geometry.
2. The experiments we compared with were performed in the laboratory, if similarity scale is the same as the prototype and the scale factor is not too small. Physics may be captured well in the laboratory.

Discussion Sheet

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: On the Interfacial Viscous Ship Waves Pattern

Author(s): Dai Y. Z.

Discusser: Grue J.

Question(s) / Comment(s):

Please specify the role of the viscosity in your analysis. Does the viscosity have a role in future calculation problems, for very short waves ($k \to \infty$)?

Answer(s):

1. As indicated by the expressions (20) and (21) and (22), the effect of viscosity on wave amplitude is specified by inside Kelvin wedge, around the cusp line and outside Kelvin wedge.

2. As shown by Chen et al. (2006) and Dai & Chen (2014), the large and short waves of capillary are heavily damped by the viscosity at large distance from the impulsive point.

Chen X. B., Lu D. Q., Duan W. Y. and Chwang A. T. (2006a) Potential flow below the capillary surface of a viscous fluid. Proc. 21st Intl Workshop on Water Waves and Floating Bodies, Loughborough, UK.

Dai Y. Z., Chen X. B. (2014) Asymptotic Expansion of the transient capillary-viscosity green function. ISOPE 2014, Busan, Korea.

Discussion Sheet

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Second Order Wave Loads Based on Second Order TEBEM

Author(s): Duan W., Chen J., Zhao B.

Discusser: Kim Y.

Question(s) / Comment(s):

If you are not handling the collocation point on panel edge, what is the benefit of your approach compared with the numerical scheme developed at MIT by the group of Paul Sclavounos? They used a complete B-spline basis function for potential and strength of singularity, so that it can be applied to higher-order basis function, not handling with collocation point on panel edge.

Answer(s):

I think there are two points of difference, and maybe benefits, with B-spline HOBEM. The first is TEBEM did not restrict the tendency of changing of the unknown function, for example the potential, before sowing the BIE. The second is TEBEM can keep the total and local robust solution with additional BIEs. The second one is obviously different with other HOBEM, like B-spline, which only use the Green's 3rd formula alone.

Discussion Sheet

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Second Order Wave Loads Based on Second Order TEBEM

Author(s): Duan W., Chen J., Zhao B.

Discusser: Bingham H. B.

Question(s) / Comment(s):

You present the TEBEM method as something different from the HOBEM, but I think it is more accurate to say that this is a particular choice of HOBEM where you use that panel geometry and a bi-quadratic representation of the potential on each panel.

Answer(s):

Yes, you are right. TEBEM can be regarded as a partially type HOBEM. The difference with general HOBEM is not only the geometry and representation, but also the requirement of new boundary integration equation to be constructed for same number of unknowns.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY
Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Modified Shallow Water Equations for Mild-slope Seabeds

Author(s): Dutykh D., Clamond D.

Discusser: Bingham H. B.

Question(s) / Comment(s):

I have two questions:

1. I am puzzled as to how exactly the new shallow water formulation improves on the original equations. It seems that neither models includes dispersion and both are fully non-linear with no formal limitations on bottom slope.
2. Both equations must lead to shocks in finite time and should be in a flex formulation in order to accept weak solutions. Can the new equations be put in such a form?

Answer(s):

1. Both models are valid for very long wave only. They do not include dispersion, but you can include it if needed.
2. Yes.

Discussion Sheet

IWWWFB
International Workshop on Water Waves and Floating Bodies
OSAKA UNIVERSITY
Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Transparency of Structures in Water Waves

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

Discusser: Grue J.

Question(s) / Comment(s):

I wonder if you have considered applying a vortex distribution for the flat plate. The vortex distribution leads for a singular integral equation of the first kind, which is easily inverted. Accurate computations even with a current are shown in Grue, Mo and Palm (1988, JFM).

Answer(s):

Thanks for this suggestion. I am aware of the vortex method but have not seen it used for submerged horizontal plate. In my work, I intended only to outline different approaches and potential drawbacks in their application. The transform approach that we used seems to very easy to apply and avoid any issues with singular integral equations. But this is not to say it is always the best method to use.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies
OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Transparency of Structures in Water Waves

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

Discusser: Hermans A. J.

Question(s) / Comment(s):

Is it possible for apply your solution method (section 5) in the case of the flexible thin plate between bottom and free surface?

Answer(s):

Yes, I see no reason why a similar set of arguments and methods could not be applied to flexible plates. The two examples given in the abstract were only chosen for their simplicity.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies
OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Transparency of Structures in Water Waves

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

Discusser: Noblesse F.

Question(s) / Comment(s):

I wonder if the approach you used based on Fourier Transform, is not in fact essentially equivalent to the vortex distribution method suggested by John Grue. Also, your approach is quite natural and elegant.

Answer(s):

Yes, you make a very good point; the Fourier Transform approach in essentially the same as a Green's function method. In particular, if you use the transform of the Green's function that you have the same integral equation as we are advocating. The subtlety is in the way in which you organize transform and space integrals to avoid hyper singular equation.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY
Dept of Naval Architecture
& Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Transparency of Structures in Water Waves

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

Discusser: Eatock Taylor R.

Question(s) / Comment(s):

This is very elegant work. It appeared in your codes of the first antisymmetric model that there was a significant second (or higher) harmonic response. Were you able to explain this phenomenon by investigating behavior at a range of oscillation amplitudes?

Answer(s):

Not systematically. In many cares non-liner effect grew extremely rapidly with increasing amplitudes. Then there was a very narrow range between measurable harmonic conditions and conditions in while the wetted surface in the gap between the cylinders would break. This would make meaning the growth of nonlinear component rather a challenge.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies
OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Nonlinear Simulation of Wave Resonances in a Narrow Gap between Two Barges

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

Discusser: Bingham H. B.

Question(s) / Comment(s):

I have two comments.

1. This decomposition was used by Pierre Ferrant and his colleagues at Ecole Centrale de Nantes beginning in the 1990's, both for Potential flow and CFD calculation. We also recently published an analysis of the method which you might be interested in: Ducrozet et al., J. Comp. Phys, 257(2014).

2. Stokes 5th order theory in limited in terms of steepness, especially in shallow water, so I would recommend using the stream function theory of Fenton(1988) instead.

Answer(s):

Many thanks for those any helpful comments.

1. Actually we have already noticed Ferrant's work in 2003. We have worked deeply into the paper, and adapted the similar concept developed in his paper. The main interest of our work is to study the wave resonance. During the study, we notice some limitation of our model, and according to Ferrant's idea we modify our model. Therefore, as for the model it may not be very new. But we generated some new understanding on wave resonance using the modified model. In addition, we will contribute the JCP paper in 2014.

2. It is correct. We have considered to use the stream function theory to solve the incident wave. However, in order to simplify and consider a wave force, we choose the 5th order Stokes wave as input. This is a simplification. We may consider the stream function theory at the next stage to further improve our model.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Nonlinear Simulation of Wave Resonances in a Narrow Gap between Two Barges

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

Discusser: Yeung R. W.

Question(s) / Comment(s):

Thank you for an interesting approach to this problem. Your higher-order potential-flow analysis seems to suggest that the peak of resonance can be reduced. However, it does not appeal to plain why the location of resonance is higher than it should be. I believe that flow separation at the bilge of the hull section would increase the affective added mass, hence lowering the resonance frequency. We can compute such effects using the FSRVM method (Seah and Yeung, 2003, Int'l J. offshore and Polar Engineers, vol.3, No.4) and may be able to resolve this issue and communicate with you.

Answer(s):

Many thanks for the helpful comments and suggestion. We have noticed this frequency shift in our study and highlighted in the figure. Actually we have tried different ways to find out the reason of this shift. We have read a few papers, and noticed that this shift appears in many numerical papers. Therefore, we have not found the reasons before the workshop.

I think your suggestion is very reasonable. I agree with you that the flow separation around the corner would increase the added mass which may result in a current resonance frequency. However, our current potential model cannot consider the flow separation. We will read the paper done in 2003, and to see him to apply your work in our study.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Nonlinear Simulation of Wave Resonances in a Narrow Gap between Two Barges

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

Discusser: Beck R. F.

Question(s) / Comment(s):

You have not mentioned wave breaking in your talk. However, in fully nonlinear wave computation wave breaking is a margin limitation. How does your method accommodate wave breaking?

Answer(s):

I think Prof. Beck has pointed at a very good point. It is true that the numerical instability will occur in the fully nonlinear simulation when the wave is steep. We can always observe the computation crashing due to this problem. In our model we use mesh regeneration and interpolation to overcome this problem. However we cannot fully remove this problem, and this is why in our sanely some results the high wave steepness cannot be prevented. In this newly developed numerical model we did not do any work to improve this numerical instability, and this is what we are doing now. At the same time, this fully nonlinear numerical model is not able to simulate breaking waves, and breaking waves are not our concern them.

Discussion Sheet

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Analytical and Numerical Approaches to Optimizing Fluid-structure Interactions in Wave Energy Parks

Author(s): Göteman M., Engström J., Eriksson M., Isberg J., Leijon M.

Discusser: Beck R. F.

Question(s) / Comment(s):

Were your irregular waves long crested or short crested seas?
If you used long seas, how would your conclusions change if realistic short crested seas are used?

Answer(s):

For the work presented here, we have used unidirectional irregular waves measured at our research test site at the west coast of Sweden, at intermediate water depth. It would be interesting to consider also multidirectional waves.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY
Dept of Naval Architecture
& Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Analytical and Numerical Approaches to Optimizing Fluid-structure Interactions in Wave Energy Parks

Author(s): Göteman M., Engström J., Eriksson M., Isberg J., Leijon M.

Discusser: Kashiwagi M.

Question(s) / Comment(s):

Most of your explanation was an analysis method in the frequency domain, but I understand that computations are done for irregular waves. How did you compute for irregular waves? Did you assume that the damping coefficient in the power take-off device is constant even in the irregular waves?

Answer(s):

Yes, we compute the hydrodynamical coefficients (excitation force, added mass and radiation damping) in the frequency domain, compute a response amplitude operator and then transform it to the time domain. The position and velocity of each buoy is then computed by a computation with the incoming irregular waves in the time domain.

In the work presented have, we have assumed a constant damping coefficient for the power take-off, but we are currently working on an improved model with a non-linear power take-off in the time domain.

Discussion Sheet

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Analytical and Numerical Approaches to Optimizing Fluid-structure Interactions in Wave Energy Parks

Author(s): Göteman M., Engström J., Eriksson M., Isberg J., Leijon M.

Discusser: Sheng W.

Question(s) / Comment(s):

Analytical method is available for point absorber, or maybe OWCs, can you make a comment whether the analytical method is available for other types of wave energy converter?

Answer(s):

The wave power energy parks we are studying here consist of point-absorber WECs with small buoy radius relative to the wave length, and the separating distance between the devices is relatively large. In this concept, the interaction by radiated waves is much more important than the interaction by scattered waves, and the point-absorber approximation can be used with quite good agreement and enable fast simulation of a large number of structures. However, for wave energy concepts with large devices or devices in close proximity, interaction by scattered waves must be taken into account. I expect that a multiple scattering method combined with a maximal interaction distance (that I am implementing in our model at the moment) could be useful to account for (next-to) nearest neighbor interaction by scattered waves, but still allow for simulations of a large number of structures.

Discussion Sheet

IWWWFB — International Workshop on Water Waves and Floating Bodies
OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: The Limiting Effect of Breaking in Strongly Nonlinear Waves on Intermediate Water Depth, with Emphasis on the Kinematics

Author(s): Grue J., Kolaas J., Jensen A.

Discusser: Sheng W.

Question(s) / Comment(s):

1. Is largest wave generated in tank condition?
2. How you consider the largest wave and the cost of platform?

Answer(s):

1. Yes, the experimental waves we generate, far from the wave maker, have a wave height of H=0.49h at maximum, for $\sqrt{g/h} = 8.75$, fits excellent to field observations, see Nelson (1994).
2. Our measurements are useful to judge the wave loads on vertical piles / columns in the ocean environment.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: The Limiting Effect of Breaking in Strongly Nonlinear Waves on Intermediate Water Depth, with Emphasis on the Kinematics

Author(s): Grue J., Kolaas J., Jensen A.

Discusser: Chaplin J.

Question(s) / Comment(s):

You have quite steep waves in a closed tank, in which there has to be a return current to balance the stokes drift and the forward steady streaming in the boundary layers.

Is this return current (which is absent in the Fenton theory) significant in relation to the measured particle velocities?

It would be instructive to plot the mean reverse current over the depth.

Answer(s):

This is a good point, thank you! The experiments are performed before the waves fill the entire wave tank. Thus, we measure only the first 25 wave periods before any reflection is observed, e.g. we observe the steaming in the boundary layer at the bottom, right outside the boundary layer, with a forward mean horizontal velocity of $0.043\sqrt{gh}$ ($T\sqrt{g/h} = 8.75$), which includes the mean acoustic streaming of $0.028\sqrt{gh}$. Mean velocity, for other potions, may be obtained.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: A New Set of Focused Wave Linear Combinations to Extract Non-linear Wave Harmonics

Author(s): Hann M., Greaves D., Raby A.

Discusser: Taylor P. H.

Question(s) / Comment(s):

The original 4-wave phase combination by Pitzgeald et. (IWWWFB27) was designed to permit the extraction of components up to 4th order. With your 12-wave phase combination it ought to be possible to extract orders beyond 5th (maybe up to 12th).

Also for the low order harmonics it is possible to get second combinations as estimates, allowing checking the adequacy of the Stokes-type expansions –for example using Pitzgeald ($0^{\circ}, 90^{\circ}, 180^{\circ}, 270^{\circ}$), ($30^{\circ}, 120^{\circ}, 210^{\circ}, 300^{\circ}$) and ($60^{\circ}, 150^{\circ}, 240^{\circ}, 330^{\circ}$) all yield estimates for 1st - 4th harmonics. Other combinations would be possible.

Answer(s):

Thank you for your comments. I agree that there are several combinations at lower order which I could also have used. I have checked these, and they are consisted with the data sets I presented.

I now plan to investigate this approach with deeper wave groups. This should give me large higher order harmonics so that I can try your approach to extract harmonics beyond 5th order.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: A New Set of Focused Wave Linear Combinations to Extract Non-linear Wave Harmonics

Author(s): Hann M., Greaves D., Raby A.

Discusser: Zang J.

Question(s) / Comment(s):

Thank you very much for the very nice talk. I am wondering how you generated the perfectly founded wave with specified phase angles in the wave tank.

Answer(s):

Thank you for your kind comments. Focused wave generation is achieved with linear wave generation by one wave paddles. Waves components with frequencies between 0.1Hz and 2.0 Hz are used as input, with the phase of each component chosen to give a crest focused wave at the required wave probe. Once measured, the phases are shifted (by shifting the theoretical focus location) to better improve the focus at the wave probe. Five iterations of the technique were corrected to achieve the crest focused ($\theta = 0^{\circ}$) case. For the other focused wave phases the additional phase (e.g. $30^{\circ}, 60^{\circ}, 90^{\circ}$ etc.) were simply added to each wave components phase from the crest focused case.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies
OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Hypersingular Integral-Equation Method for Wave Diffraction about Arbitrary, Shell-Like Vertical Cylinders in Finite-Depth Waters

Author(s): Hariri Nokob M., Yeung R. W.

Discusser: Kashiwagi M.

Question(s) / Comment(s):

Looking at Fig.6 for force f_2 in the proceedings, I can see a sharp peak for the opening angle $\theta_0 = \pi/6$. Is these certain physical reason for this sharp peak at $\theta_0 = \pi/6$?

Answer(s):

Yes indeed. The fact is that all openings in the range of $\pi/6$ will exhibit similar behavior. The smaller angles will even show greater loads, similar to the behavior of the "harbor paradox". For the specific force you mentioned, the resolution for $\theta_0 = \pi/12$ near the peak wasn't large enough in the proceedings but it is higher than $\pi/6$ case. When the opening becomes very small, the results tend to those of a closed body away from the resonant frequency. In the resonant range however, we will still observe an even large (yet narrower) peak similar, but not the same, as the Gibbs phenomenon. Of course as the opening size increases, it is more difficult to keep the waves inside and constructive interference will be limited even at the appropriate frequencies.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies
OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Hypersingular Integral-Equation Method for Wave Diffraction about Arbitrary, Shell-Like Vertical Cylinders in Finite-Depth Waters

Author(s): Hariri Nokob M., Yeung R.W.

Discusser: Korobkin A. A.

Question(s) / Comment(s):

The problem looks similar to that of sound wave scattering by a structure with opening, so called Helmholtz' resonator problem. Is there a difference between your formulation and that in acoustics?

Answer(s):

The spatial solution of acoustic wave, is governed by the Helmholtz equation which is the same as our horizontal-plane problem. If the obstacle is a thin structure, a hypersingular BEM will be used to solve the problem in both cases. Indeed, for long waves, the open harbor can be said to act similar to a Helmholtz resonator and that was mentioned during the presentation. Keep in mind that the complete problem is different from that of acoustics. This is a free surface flow.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Hypersingular Integral-Equation Method for Wave Diffraction about Arbitrary, Shell-Like Vertical Cylinders in Finite-Depth Waters

Author(s): Hariri Nokob M., Yeung R. W.

Discusser: Chatjigeorgiou I. K.

Question(s) / Comment(s):

Can you please comment on the physics of the resonances you presented? Why they are happening?

Answer(s):

The resonance is this case is only partial became the body is open and complete entropment of wave is not possible. As any resonant phenomenon, it occurs when waves of the "right" wavelength interfere constructively. The exact position of the resonant frequencies will depend on the shape of the body as well as the opening size. The exact resonant modes for shapes like a square or circle are well known. When the body is opened, the interference inside will change so you cannot expect the resonant frequencies to retain the same numerical values.

Discussion Sheet

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Hypersingular Integral-Equation Method for Wave Diffraction about Arbitrary, Shell-Like Vertical Cylinders in Finite-Depth Waters

Author(s): Hariri Nokob M., Yeung R. W.

Discusser: Bingham H. B.

Question(s) / Comment(s):

You mentioned that you who implemented a high-order method but found it to be less efficient than the low-order method. This surprises me as we normally find the opposite. Can you elaborate on this explain why?

Answer(s):

The comment I mentioned is for a single body that does not require too many panels to represent. In that case, most of the computational effect goes into building the system of equation rather than solving it. That is to achieve satisfactory accuracy for practical purposes. If a higher accuracy is desired on multiple bodies one simulated, we expect the higher order method to be more efficient become it converges faster. We did in fact verify the faster convergence of the higher-order method that we implemented.

Discussion Sheet

IWWWFB — International Workshop on Water Waves and Floating Bodies
OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: The Interaction of a Submerged Object with a Very Large Floating Platform

Author(s): Hermans A. J.

Discusser: Korobkin A. A.

Question(s) / Comment(s):

Is it possible to use your approach after some modifications, if necessary, in the problem with infinite water depth?

Answer(s):

The approach used in this paper is not applicable to the case of infinite water depth directly, because the incident wave and the Green's function cannot be expanded in a discrete spectrum. However, in my 2000 paper I show that the problem can be solved in a different way, by expanding the deflection of the plate (beam) in a set of eigenfunctions for the beam in vacuum. The resulting problem can be solved numerically.

Discussion Sheet

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Experimental Study of High Speed Plate Ditching

Author(s): Iafrati A., Siemann M. H., Benítez Montañés L.

Discusser: Newman J. N.

Question(s) / Comment(s):

Could you comment about scaling (different lengths) and 2D vs 3D since the fuselage and wings are so different?

Answer(s):

The experiment presented here refers to the impact phase, which is the one during which the aircraft touches the water. Taking into account the pitch angle, this generally involves the fuselage only whereas the wings enter into play later, in the so called landing phase. Indeed there are important 3D effects not only due to the curvature in the transversal plane but, mainly, to the curvature in the longitudinal plane. These aspects were discussed at IWWWFB 2012 in the abstract by Tassin et al. Therein it is shown that the curvature induces suction forces which have to be accounted for in order to have a correct description of the aircraft dynamics and aerodynamics behavior.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Experimental Study of High Speed Plate Ditching

Author(s): Iafrati A., Siemann M. H., Benítez Montañés L.

Discusser: Kwon S. H.

Question(s) / Comment(s):

Can you tell us the sampling rate of your pressure measurement?

Answer(s):

Pressure are sampled at 200 KS/s. Additional details can be found on the abstract presented at the previous workshop edition.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY
Dept of Naval Architecture
& Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Experimental Study of High Speed Plate Ditching

Author(s): Iafrati A., Siemann M. H., Benítez Montañés L

Discusser: Korobkin A. A.

Question(s) / Comment(s):

Did you find strong FSI in the experiments with elastic plates?
What is the frequency(cies) of the plate eigen-vibration(s)?

Answer(s):

1) Yes, we found fluid-structure interaction phenomena. In a sense, the occurrence of cavitation as a consequence of the plate deformation is already a signal. For future experiments we are planning install how the pressure changes due to the interaction with the structures.
2) We have not yet computed that frequency but we will do that as a part of the analysis. For a rectangular aluminum plate clamped at the sides, a closed form indicated in Wu, Liu, Chen "Exact Solutions for Free-Vibrations Analysis of Rectangular Plates using Bessel Functions" J. App. Mech. Vol. 74(6), 1247-1251 (2007). For a simply supported plate of the same thickness it is about 465Hz, so we can expect something higher. For the composite plates the derivation of the eigen-frequencies requires a detailed description of the stratification sequence and will be done numerically, as a part of the analysis in the near future.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: A Study on the Aerodynamic Properties of a Canard-Configuration WISES

Author(s): Ito Y. , Iwashita H.

Discusser: Sheng W.

Question(s) / Comment(s):

What is the effect when the flight altitude is smaller than h/c = 0.35 ?

Answer(s):

The ground effect becomes more remarkable as h/c becomes smaller than h/c=0.35 (This phenomenon has been already confirmed experimentally and numerically). Therefore the flight altitude should be set low as far as possible to get high ground effect (high lift-to-drag ratio).

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: A Study on the Aerodynamic Properties of a Canard-Configuration WISES

Author(s): Ito Y. , Iwashita H.

Discusser: Bingham H. B.

Question(s) / Comment(s):

How do the wind-generated surface wave affect your calculation?

Answer(s):

Our study is in the second stage. In the first stage we carried out the fundamental studies on the ground effect of the rectangular wings. In the study we obtained the conclusion that both the unsteady heave motion of the wing and the incoming regular wave do not affect the steady flight of the wings. When the wing flies over the incoming regular wave, the center-of-pressure coefficient oscillates around a mean position due to the harmonic change of the lift and induced drag. However the quantity is very small and it does not affect the steady flight. When the wave becomes very steep, the WIG can easily escape from the wave effect by increasing the flight altitude because the wave effect decreases exponentially with altitude.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies
OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: A Study on the Aerodynamic Properties of a Canard-Configuration WISES

Author(s): Ito Y. , Iwashita H.

Discusser: Bingham H. B.

Question(s) / Comment(s):

You described that the free-surface can be treated as rigid wall. Physically I agree that the free-surface will not move much, so rigid wall assumption seems fine. However, the rigid wall condition is slow speed approximation.

When vessel speed is very large, we have different asymptotic behavior.
For instant,

$$\frac{\partial^2 \emptyset}{\partial x^2} + \frac{g}{U^2}\frac{\partial \emptyset}{\partial z} = 0$$

$$\emptyset_z \to 0 \; and \; U = 0$$

$$\emptyset \to 0 \text{ and } \mathrm{U} \to \infty$$

So, mathematically, we may not say that the free surface becomes rigid-wall-like boundary.

Answer(s):

The linearized free-surface boundary condition in our study is expressed in the form

$$\frac{\partial^2 \emptyset_w}{\partial x^2} + \frac{g}{U^2}\frac{\partial \emptyset_w}{\partial z} = \frac{1}{2}\left(\frac{\rho_a}{\rho_w}\right)\frac{\partial}{\partial x}\left(\frac{p - p_0}{1/2\rho_a U^2}\right)$$

where, $\emptyset_w$ is velocity potential of water and ρ_a and ρ_w are density of air and water respectively. When vessel speed becomes high, the pressure distribution over the free-surface shown in the right side also becomes large. Therefore, even when the vessel speed is very large and the contribution of the second term of the left side becomes small, the velocity potential does not necessarily zero.

Discussion Sheet

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Second-order Resonance among an Array of Two Rows of Vertical Circular Cylinders - Comparisons of Theoretical Calculations and Reality -

Author(s): Kagemoto H. , Murai M. , Fujii T.

Discusser: Eatock Taylor R.

Question(s) / Comment(s):

Your experimental data relating to second order trapping is very welcome. I would like to comment on your observation that second order trapping in this case may not be occurring at the frequency corresponding to first order trapping. Like you, I am puzzled by this. I do think, however, that when we consider second order elevations at near-trapping frequencies, we need to consider separately the contribution from quadratic and potential effects (and indeed their relative phasing, as you have mentioned).

Answer(s):

Thank you for the comment.

As you suggested, I thought if I plotted the contribution from second order velocity potential only, the peak value may take place at the frequency corresponding to first order trapping, but it turned out that it was not the case.

Anyway, I have no clear explanation about the reason for this at present.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Second-order Resonance among an Array of Two Rows of Vertical Circular Cylinders - Comparisons of Theoretical Calculations and Reality -

Author(s): Kagemoto H. , Murai M. , Fujii T.

Discusser: Newman J. N.

Question(s) / Comment(s):

If trapping can be interpreted as the existence of a homogeneous solution then it is puzzling that you find a difference between the frequencies for the occurrence of 1st and 2nd order trapping (or near-trapping).

Answer(s):

Thank you for the comment, but I have no clear explanation about the reason for this puzzling thing at present.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Global and Local Effects of Gas-Liquid Density Ratio on Shape and Kinematics of Sloshing Waves and Scaling Considerations

Author(s): Karimi M. R. , Brosset L.

Discusser: Le Touzé D.

Question(s) / Comment(s):

In the different gas liquid configuration you studied, did you look at surface tension effects? In particular what are the ranges of ratio and Weber numbers you had in the different configuration?

Answer(s):

Those effects have not been studied yet. If we rank the different phenomena which influence wave breaking, after the necessarily scaled tank motions, density ratio, gas & liquid compressibility, phase transition, and free surface instabilities are of importance (some of these phenomena could become more or less important depending on the breaking process so ranking is not definitive). The last phenomena are most likely influenced by surface tension and are important as they can modify impact geometries, and will be studied later on. The current study was concerned with the effects of DR.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Global and Local Effects of Gas-Liquid Density Ratio on Shape and Kinematics of Sloshing Waves and Scaling Considerations

Author(s): Karimi M. R., Brosset L.

Discusser: Brosset L.

Question(s) / Comment(s):

Question was raised by Y. H. Kim, the chairman about checking the density ratio before and after model test.

Answer(s):

(I answered as a co-author)

Yes, the density ratio is measured before and after the test and the results given in the presentation correspond to stabilized density ratio.

Discussion Sheet

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Study on Slamming and Whipping Response of Ship Structure

Author(s): Kim J. H., Kim Y., Korobkin A. A., Lee D.Y.

Discusser: Malenica S.

Question(s) / Comment(s):

Your seakeeping model WISH already contains the one part of the slamming forces. How do you exclude this part from GWM?

Answer(s):

The final form of GWM pressure derived by Korobkin has two independent terms, one of which is proportional to a square of velocity and the other is proportional to acceleration. The latter term is not integrated in the coupled analysis because it is included in the pressure of the seakeeping model as you mentioned.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies
OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering
The 29th International Workshop on Water Waves and Floating Bodies
Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Water-exit Problem with Prescribed Motion of a Symmetric Body

Author(s): Korobkin A. A., Khabakhpasheva T. I., Maki K.J.

Discusser: Clamond D.

Question(s) / Comment(s):

Your model does not include line tension. How line tension would matter in such situation?

Answer(s):

We do not expect that the line tension contributes significantly to the force. Both experiments and computations (CFD) show that the contact line does not move (pinned) and the thin liquid layer behind this line is thin. This suggests that the line tension force component, which is normal to the body surface, is small.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Multi-resonant Compressible Wave Energy Devices

Author(s): Kurniawan A., Greaves D.

Discusser: Renzi E.

Question(s) / Comment(s):

1) You mentioned that all wave energy converters should be designed to resonate. However, there are also examples of non-resonant WECs, like for example the oyster, which is specifically designed not to resonate.
2) You showed that the response amplitude operator can attain very large values (i.e. larger than 10) at resonance. How does this relate with your initial assumption of linearized water wave theory? Do you expect that those values will be lower in reality?

Answer(s):

1) We mention that for maximum response the wave energy converter needs to be designed to resonate with the incident wave. However you are correct that some devices such as oyster are designed to avoid resonance in order to restrict motions.
2) The analysis is based on linearized theory and predicts very large value of displacement RAO for the moving surface. These high values are not expected to occur in practice and the experiment. We are planning in the next stage of the work will confirm this.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY
Dept of Naval Architecture
& Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Study on Roll Damping around a Circular Cylinder

Author(s): Kwon S. H. , Kim B. J. , Han S. Y. , Kim Y. J. , Ahn K. S. , Ren D. , Lu L. , Jiang S. C. , Chen X. B.

Discusser: Molin B.

Question(s) / Comment(s):

Have you checked the phase difference between the hydrodynamic roll moment and the roll velocity? In infinite fluid, according to literature, it should be $\pi/4$! The viscous force opposes as much the acceleration as it opposes the velocity. With a free surface things should be different (e.g. see Molin, international ship building progress, vol. 51, 59-85 (2004).

Answer(s):

The authors calculated roll moment from measured hydrodynamic forces. The phase of roll moment and roll velocity varied, depending on frequency, not a fixed phase value of $\pi/4$.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Study on Roll Damping around a Circular Cylinder

Author(s): Kwon S. H. , Kim B. J. , Han S. Y. , Kim Y. J. , Ahn K. S. , Ren D. , Lu L. , Jiang S. C. , Chen X. B.

Discusser: Chaplin J.

Question(s) / Comment(s):

1. Since your experiments (and CFD) were in the laminar regime (Re<10^5) the shear stress would be proportional to the velocity not the velocity squared. (There is also a phase difference). Consequently the factor 8/3π in the last equation should not be there.

2. Did you allow for the shear stress on the ends of the cylinder? This area is about 30% of that of the curved surface, about 19% of the moment (I think).

Answer(s):

1. The present treatment of the friction coefficient comes from the definition of friction coefficient $C_f = \frac{\tau}{\frac{\rho V^2}{2}}$. This is valid for both laminar (Re<1000) and turbulent regime with $R_e = aU_0/\nu$.
   (See Jensen, Sumer, Fredsøe, JFM, 1989, 206, 265-297). Since we are dealing with laminar flow, the experimental tests for oscillatory flow over flat bed by Jensen et al. (1989) showed $C_f \sim \frac{1}{\sqrt{Re}}$. Following the above formula, we can also say that the shear stress is proportional to $V^{\frac{3}{2}}$ in this study. In this work, the coefficient $\frac{8}{3\pi}$ is actually associated with the term of V^2 part.

2. There were gaps between the ends of the cylinder and walls of the wave flume. Therefore the measured moment contains the components contributed from end parts. However, it was not easy to separate them from the entire cylinder surface. Therefore present measured value must have excess moment due to end parts when it is compared with empirical or numerical results.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Comparisons of MPS and SPH methods: Forced Roll Test of a Two-dimensional Damaged Car Deck

Author(s): Le Touzé D. , Hashimoto H. , Grenier N. , Sueyoshi M.

Discusser: Grue J.

Question(s) / Comment(s):

In these tests, using the laboratory and the computations, with good correspondence of the experimental and theoretical/numerical results, after all, now would you modify the set-up/test conditions, to prepare results that can give even more insight and be of value for the safety authorities?

Answer(s):

I think we shall go to two different levels of complexity:

- increase step by step the geometrical complexity of the problem to get close to realistic problems, i.e.: 3D + more realistic internal geometry of the damaged compartment + in the end, floating objects in the compartment
- and in the other way, go towards free motion of the ship which will be coupled to the complex internal flow.

Of course, the more the complexity of the problems is, the more the interactions between the different physical phenomena at stake are, which means that we need to progress step by step in these two directions, validity at every stage, otherwise it will be hard to discriminate between the origins of the discrepancies with experiments.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY
Dept of Naval Architecture
& Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Numerical Simulation of Free Surface Flow Impacting on an Elastic Plate

Author(s): Liao K., Hu C., Sueyoshi M.

Discusser: Le Touzé D.

Question(s) / Comment(s):

Did you take into account the nonlinearity of the material (i.e. the actual nonlinear stress-strain curve) because rubber is often very nonlinear and that influences the coupling in my experience (cf. SPH-FEM simulation by G. Fourey et al.)?

Answer(s):

In this study, we do not take account of the material nonlinear, but we consider of geometry nonlinear. As you said, the rubber plate is relative soft, the material nonlinear plays an important role when there is a large deformation and it will influence the coupling. So we will take account of the material nonlinear to improve our present structural solver.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY
Dept of Naval Architecture
& Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Determination of theWave Resistance of a Towed Body by the Parameters of Generated Waves

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

Discusser: Kashiwagi M.

Question(s) / Comment(s):

In the Padé approximation for the wave resistance formula, there are many terms both in the numerator and denominator.

I am wondering if it is possible to reduce the number of terms with which a reasonable result can be obtained.

Answer(s):

The nonlinear wave has very complicate structure. These for in classical papers of Swaree, Longuet-Higgins, Cocelett and others scientists for the wave form, there are more than 100 terms.

We obtain Padé approximation with 7 terms in numerator and 4 terms in denominator for wave drag, that many less than in classical results.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY
Dept of Naval Architecture
& Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Determination of theWave Resistance of a Towed Body by the Parameters of Generated Waves

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

Discusser: Bingham H. B.

Question(s) / Comment(s):

This is a very nice result. I wonder whether you have any thoughts about how this idea can be applied to the 3-D problem.

Answer(s):

As you have seen from our presentation the results concerning the nonlinear wave drag are scanty even for the 2D case. We are thinking about the 3D problem and maybe, if we have some progress, we will report such results in future.

Discussion Sheet

IWWWFB
International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY
Dept of Naval Architecture
& Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Interference Effects on Farfield Ship Waves at High Froude Numbers

Author(s): Noblesse F., Zhu R., Hong L., Zhang C., He J., Zhu Y.

Discusser: Korobkin A. A.

Question(s) / Comment(s):

Is it correct that the translating sources at the bow and stern are of the same strength and have no phase shift?

These two sources are independent so in terms of stationary phase method. Each source provides its own Kelvin' wave. How do these two Kelvin' waves interacted?

Answer(s):

Thank you for your question Prof. Korobkin.

The wave-interference analysis I presented only assumes that the bow and stern waves are of opposite signs, but requires no other assumption with regard to their magnitude. The relative magnitude of the bow and stern moves will influence the strength of the interference but will not change the location of the largest waves within the Kelvin wake. The only interaction between the bow and stern waves that are taken into account are interferences. That occurs when the bow and stern waves are added.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Interference Effects on Farfield Ship Waves at High Froude Numbers

Author(s): Noblesse F., Zhu R., Hong L., Zhang C., He J., Zhu Y.

Discusser: Bingham H. B.

Question(s) / Comment(s):

As I understand your argument, you find that the angle of largest wave amplitude, based on your simple models, agrees well with observations. We do however expect to find waves all the way out to the Kelvin angle, don't you agree? So, this is basically a question of what is measured in the observations.

Answer(s):

I agree that there are waves between the Kelvin angle and the angle where the longest waves are found, and the wave interference analysis I presented is no way that classical result of Kelvin.

Discussion Sheet

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: The Application of Velocity Decomposition to Fully-Submerged Free-Surface Problems

Author(s): Rosemurgy W. J., Maki K.J., Beck R. F.

Discusser: Mori K.

Question(s) / Comment(s):

How do you determine the shape of Ω_w where the boundary condition for $\mathbf{w}$ is applied? Generally it cannot be determined easily in advance except very simple flows.

Answer(s):

We place the wave surface, $\partial\Omega_w$, on a streamline of the real (viscous) flow emanating from the trailing edge of the foil. This is possible because the two sub-problems are solved in an iterative manner, beginning with the Navier-Stokes sub-problem.

Discussion Sheet

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: The Application of Velocity Decomposition to Fully-Submerged Free-Surface Problems

Author(s): Rosemurgy W. J., Maki K.J., Beck R. F.

Discusser: Kim Y.

Question(s) / Comment(s):

The slope of waves shown in fig.2(c) in your abstract is about 1/40, which nonlinear effect may be important. However, you used linear free surface boundary condition.

If you apply nonlinear free-surface boundary condition, can we expect better correspondence between experiment and computation, particularly in the case of inviscid potential computation?

Answer(s):

Yes, in fact a nonlinear free-surface boundary condition should provide an immediate improvement in the prediction of the free-surface elevation in the visions potential. It would particularly be useful in the higher Fn_c cases where the wave slope approaches 1/11 in the experimental result.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Improvement of Rankine Panel Method by Theoretical Consideration of Panel Forces on Ship Hull

Author(s): Sasa K. , Kashiwagi M.

Discusser: Noblesse F.

Question(s) / Comment(s):

It is important to keep in mind that exact analogical formulae are accurate in the near field in the vicinity of a panel, but are not accurate in the far field at a distance greater than a few panel sizes. Two order Gaussian integration rules are much more accurate in the far field (at distances greater than roughly 2 to 3 times the panel size).

Answer(s):

Thank you for your important comment. We focused on the integration at singular panels or in near fields in this study, because Newman's recurrence formula does not need any specific numerical procedures on singular panels. There is one more reason to introduce the recurrence formula, because Rankine Panel Method (RPM) is considered here. Wave terms are not included in kernel functions of RPM, thus it is necessary to form integration equations based on the free surface boundary condition, besides the body boundary condition. The first and second order differentiations of the integration on panels appear in the part of free surface boundary condition. Analytical formulas can give accurate differentiated values, especially in the second order differentiation terms, than numerical differentiated procedures. As you mentioned, I think that the higher order Gauss integration is more accurate in far fields. It is necessary to consider the optimal algorithm using different integrations depending on the distance, r, between the field point and the panel nodes. This point must be verified in the next study, too.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Improvement of Rankine Panel Method by Theoretical Consideration of Panel Forces on Ship Hull

Author(s): Sasa K. , Kashiwagi M.

Discusser: Eatock Taylor R.

Question(s) / Comment(s):

This formulation seems very hard work. The usual boundary element analysis (not just in hydrodynamics) is to use a triangular transformation to deal with integrating around the singularity, coupled with Gaussian integration. What do you see as the advantages of using analytical integration of such complexity?

Answer(s):

Thank you for your important comment. As you mentioned, derivation of higher order formulas was very hard work and it is necessary to verify the computation accuracy from now on. There are some reasons to introduce the recurrence formula, and main points are as follows.

(1) These integrations will be linked with ship motion analysis in Rankine Panel Method (RPM). In RPM, wave terms are not included in kernel functions, thus it means that the formulation of integration equations based on the free surface boundary condition, besides the body boundary condition. The first and second order differentiations of the integration on panels appear in the part of free surface boundary condition. Analytical formulas can give stable differentiated values, especially in the second order differentiation terms, than numerical differentiated procedures.

(2) The recurrence formulas do not need any specific numerical procedures in singular panels. It may be necessary to consider the optimal algorithm coupling with Gaussian integrations depending on the distance, r, between the field point and the panel nodes. This point must be verified in the next study, too.

Discussion Sheet

IWWWFB
International Workshop on Water Waves and Floating Bodies
OSAKA UNIVERSITY
Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Improvement of Rankine Panel Method by Theoretical Consideration of Panel Forces on Ship Hull

Author(s): Sasa K. , Kashiwagi M.

Discusser: Newman J. N.

Question(s) / Comment(s):

You should refer related papers by Hess and Smith. You can apply the higher order integration for non-flat panels, besides flat panels.

Answer(s):

Thank you for your important comments. I will refer these papers and consider the numerical procedures for arbitrary shape bodies, too.

Discussion Sheet

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Highly Nonlinear Wave in Tank with Small Density Ratio

Author(s): Scolan Y. M., Karimi M. R., Dias F., Ghidaglia J. M., Costes J.

Discusser: Grue J.

Question(s) / Comment(s):

Comment; It is well known from interfacial wave studies, that the curvature of even extreme waves always is finite. Some steady wave solutions are overhanging , and of mushroom shape. However, nobody has done time stimulations of these waves. Maybe you can, by using your method?

Questions; Do you apply numerical damping? Do you encounter problem with regards for the Kelvin-Helmholtz instability?

Answer(s):

Q1: Here is no numerical damping in the model.
Q2: We cannot model Kelvin-Helmholtz instability with the present approach however we got numerical instability which are strongly connected to the jump of tangential velocity of the interface.

Discussion Sheet

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Latching Control Theory for Wave Energy Conversion

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

Discusser: Kashiwagi M.

Question(s) / Comment(s):

In the time-domain motion equation, the damping coefficient of the power-take-off device is treated as constant, but that must be frequency dependent, implying that a form of convolution integral should be used.

With the present framework, how are you going to extend the present method to the case of irregular wave?

Answer(s):

In the latching control case, the PTO is a linear PTO with a constant damping coefficient. Hence the convolution is not necessary for the PTO force.

The present work has been applied to the case of irregular waves, but the latching duration implementation will be based on the wave characteristic period, particularly, the energy period, which you produce the significant wave energy extraction without any future detail in implementing the latching control technology.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Radiation of Waves by a Cylinder Submerged in the Fluid Beneath an Elastic Ice Sheet with a Partially Frozen Crack

Author(s): Sturova I.V.

Discusser: Grue J.

Question(s) / Comment(s):

I have learned from Finnish experts, that low propellers are used on icebreakers, to impose a low pressure, with a subsequent crack of the ice. Can your modelling confirm, that submarine oscillating at an ice crack, are useful in heaving up the ice?

Answer(s):

So far I did not study this problem but it is possible in future.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies
OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Numerical and Experimental Study of the Wave Response of a Floating Support with Partially Filled Tank

Author(s): Su Y., Kimmoun O., Molin B.

Discusser: Bingham H. B.

Question(s) / Comment(s):

I wonder why you have chosen $\hat{z} = -h$ as the expansion level in the Boussinesq model, since this will have much more severe limitation on relative water depth Kh than choosing $\hat{z} = -h/2$.

Answer(s):

The numeral results are not stable when I choose $\hat{z} = -h/2$. I think when the free surface is closed to $-h/2$, there will be some problem for this choice so we choose $\hat{z} = -h$.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY
Dept of Naval Architecture
& Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: A Novel Approach of QTFs for Floating Body

Author(s): Teng B. , Cong P.

Discusser: Eatolk Taylor R.

Question(s) / Comment(s):

Your interesting new development is motivated by difficulties which arise in determining second order terms in a Volterra series expansion of hydrodynamic forces. Such terms are required in an extended Cummins equation formulation which might be used to model a flouting body restrained by nonlinear moorings, or multiple imparting bodies. Have you had an opportunity to investigate such a problem, and observe the significance of the new terms?

Answer(s):

We have applied the present methods for a SPA moored by nonlinear catenary lines, and successfully simulated the large amplitude motion due to second order low frequency excitation. Late we should carry out model test to validate the present method.

For multiple body problem. I think the present method will be too complex to be applied.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: A New Method for the Integration of the Transient Green Function over a Panel

Author(s): van Walree F.

Discusser: Chen X. B.

Question(s) / Comment(s):

Due to the high oscillation and complex singularity of time-domain Green function, it is well known that the traditional way to evaluate Green function before space integration cannot work. You tentative to do the space integral before Fourier (wave number) integral can improve the solution.

Could you expand the convergence and accuracy with a mesh of increasing panels in the solution?

Answer(s):

Increasing the number of panels is unattractive from a practical point of view since it increases the computational time proportional to the number of panels squared. Apart from this reason, increasing the number of panels does reduce the oscillations in the Green function as I have shown on the comparison with the number of integration points. Increasing the number of integration points have the same effect as reducing the panel size.

Discussion Sheet

IWWWFB International Workshop on Water Waves and Floating Bodies
OSAKA UNIVERSITY Dept of Naval Architecture & Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: A New Method for the Integration of the Transient Green Function over a Panel

Author(s): van Walree F.

Discusser: Kashiwagi M.

Question(s) / Comment(s):

For a special case where both z (field point) and ζ_p (integration point) are exactly zero, the time-domain Green function can be expressed analytically with Bessel functions. Nevertheless, when $z + \zeta_p$ approaches to the free surface ($z + \zeta_p \rightarrow 0$), the Green function oscillates rapidly.

Even in that case where $z + \zeta_p$ in very very small, do you think the present scheme improves in accuracy?

Answer(s):

In my opinion the rapid oscillations are largest at the free surface ($z + \zeta_p = 0$). Below the free surface the oscillation reduce exponentially with depth. So the oscillation just below the free surface are not larger than exactly on the free surface bit a bit lower.

For my calculation scheme it does not matter if the location is exactly on the free surface or just below it.

Discussion Sheet

IWWWFB
International Workshop on Water Waves and Floating Bodies

OSAKA UNIVERSITY
Dept of Naval Architecture
& Ocean Engineering

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Recent Progress on the GN Model for a Two-layer Flow

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

Discusser: Grue J.

Question(s) / Comment(s):

In your last figure, it is obvious that the wave speed in your calculation, including the free surface effect, is smaller than the wave speed of the calculation in Grue et al. 1997, using the rigid lid approximation. I think you can also do this calculation using the rigid lid approximation. I do not know about systematic studies combining interfacial flows with a free surface, except for: J. N. Moni & A. C. King, Guided and Unguided Interfacial Solitary Waves, Q. J. of Mech. and Appl. Math. 1995, 48: 21-38. A three-layer fluid was calculated by Rusás and Grue, Eur. J. Mech, B/Fluids, 2003. I think your results are interesting.

Answer(s):

Thank you for your comment! We will find that paper and look for more comparison between rigid lid and free surface.

Discussion Sheet

The 29th International Workshop on Water Waves and Floating Bodies

Suita, Osaka, Japan, March 30 – April 2, 2014

Paper: Latest Trends and Future Outlook of Floating Offshore Wind Turbine

Author(s): Yamaguchi Y. (Class-NK)

Discusser: Grue J.

Question(s) / Comment(s):

Thank you for this thorough overview! I have two questions!

1. It seems that wind turbines standing on the sea floor is of no interest in Japan?
2. What are the two most important scientific points, where you and your company need input?

Answer(s):

Thank you very much for your questions. I answer your questions below, but if they are not enough, please contact me any time.

1. It is considered that the seabed fixed type has a cost advantage up to around 50 meters of water depth. In the North Sea, the Baltic Sea and other ocean areas with shallow water depth the seabed fixed type is used, as a rule. As Japan has smaller sea areas with shoals suitable for supporting seabed fixed type than Europe, expectations for floating type have been heightened. Therefore, I focused only on floating type in my presentation, however Japan is interested in seabed fixed type, as well. As for major demonstration experiments of seabed fixed type, 2 different types of 2 MW-class platforms have been demonstrated since 2013, and 2 huge wind farm projects are under planning. (See P.24-27 for detailed information.)
2. One is an accurate understanding of coupled response of both platform and wind turbine, and another is development of optimizes platform concept which is suitable for floating offshore wind turbine.