25th International Workshop on WaterWaves and Floating Bodies

May 9~12, 2010
Harbin, China

Q/A Sheet

Title of Abstract: Sound Scattering and Noise Control by Free Surface Piercing Cylinders

Author(s): Avital, E.J. & Miloh, T.

Question(s)

Name: Korobkin

Question(s):

1) Is your study about making an elastic structure invisible?
2) Do you think your problem could be valuable to study for ice cover?

Answer(s)

1) Yes, the idea is to make the flexible structure invisible by using active sound control. It is related to the EM cloaking problem by proper coating of the body.
2) The problem of ice cover can be certainly treated along the same lines. The main difference is that instead of a zero-impedance b.c on z=0, we have a more complicated (yet linear) hydroelastic b.c.

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Q/A Sheet

Title of Abstract: Sound Scattering and Noise Control by Free Surface Piercing Cylinders

Author(s): Avital, E.J. & Miloh, T.

Question(s)

Name: David Evans

Question(s):

Is it obvious that it is impossible to make a body appear invisible? Locally the incident field will be deformed but as long as in the far field it looks like the incident field, the body will not appear to be present.

Answer(s)

When using a continous internal pressure distribution (method 1) it is indeed possible to cancel the far-field scattering so as to make the body practically invisible. However it is impossible to achieve this perfect cancelation by using a discrete internal pressure distribution (method 2) which is the more practical means of noise control.

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Q/A Sheet

Title of Abstract: Elastic Deformations of A Porous Circular Cylinder Fixed In Waves

Author(s): Bao, W.G. & Kinoshita, T.

Question(s)

Name: Korobkin

Question(s):

In your model, the lower and the upper membranes are fixed at their edges. Is this a realistic assumption? Would this be valuable to consider these edges as flexible?

Answer(s)

In the present work, the membranes are supposed to the support by a circle with much greater stiffness, comprised to the membranes themselves, at the edge. Therefore they are fixed at the edge when the boundary condition is considered. Of course, the problem of a flexible edge is an interesting one. Especially, how the deformation of edges will be coupled with those of membrane. It might be considered in the future work.

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Q/A Sheet

Title of Abstract: Elastic Deformations of A Porous Circular Cylinder Fixed In Waves

Author(s): Bao, W.G. & Kinoshita, T.

Question(s)

Name: Michael Meylan

Question(s):

From symmetry in the θ direction you can separate variables and solve only for the terms proportional to $e^{in\theta}$. Then matching is only in a one dimensional line.

Answer(s)

The authors agree the comment completely. The matching is made in one dimensional vertical line by means of orthogonality of the eigen functions in z-variable.

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Q/A Sheet

Title of Abstract: Elastic Deformations of A Porous Circular Cylinder Fixed In Waves

Author(s): Bao, W.G. & Kinoshita, T.

Question(s)

Name: David Evans

Question(s):

Can you comment on any problems you had with computing the complex eigen-values of the dispersion relation in the interior region?

Answer(s)

Thank you for your interest in the problem. An efficient way to search for the complex roots of the dispersion relation in the interior region is found. It is just to introduce a new parameter which is the reciprocal of the porous parameter, i.e. $1/\sigma$. Then the search for the roots can be started from the other end of path by increasing $1/\sigma$ gradually. So the trouble caused by the repeated roots at $z=0$ is solved.

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Q/A Sheet

Title of Abstract: Elastic Deformations of A Porous Circular Cylinder Fixed In Waves

Author(s): Bao, W.G. & Kinoshita, T.

Question(s)

Name: Eatock Taylor Rodney

Question(s):

This is an interesting problem leading to rather complex hydroelastic responses. I would imagine that under some conditions the n=0 modes or the top and bottom membranes would be strongly coupled, and perhaps lead to distinct peaks in the frequency responses at the corresponding "wet mode" frequency. Have you observed such effects?

Answer(s)

The authors would like to take this opportunity to express their best respect to Prof. Eatock Taylor for his distinct contribution to the development of hydrodynamics in these years.

To answer his question, the authors agree with that it is a reasonable imagine. Strong coupled deformation might occur under certain conditions, although the authors have not yet observed such phenomenon since only a few cases have been computed with different parameters. Attention will be paid on it in the future investigation in the effects of parameters.

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Q/A Sheet

Title of Abstract: Linear Modelling of Wave Device Arrays And Comparison To Experimental and Second Order Models

Author(s): Bellew, S. & Stallard, T.

Question(s)

Name: David Evans

Question(s):

Maybe you should apply a constraint on the floats to prevent large displacements and see how the power is reduced. Can you say whether an array of 5 floats is more effective in head to beam seas?

Answer(s)

I will certainly look at the inclusion of a constraint as opposed to just correcting the results afterwards. This could be good to compare to the results which you published some years ago.

As far as the comparison from beam to head seas, I am looking at closely-spaced arrays which has received little interest in previous publication. For the frequency range of interest to closely spaced arrays, my results indicate for small arrays (5*1,2*1,5*2) that greater power can be achieved in head seas(i.e. propagating along the line of the array).(This is for regular seas however.)

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Q/A Sheet

Title of Abstract: Linear Modelling of Wave Device Arrays And Comparison To Experimental and Second Order Models

Author(s): Bellew, S. & Stallard, T.

Question(s)

Name: Jun Zang

Question(s):

You claimed 1st&2nd order theory doesn't make difference. What's your wave steepness? (KA). Certainly larger KA will result in larger 2nd order effect.

Answer(s)

I agree, this is clearly an important parameter. These were just preliminary results which I intend to repeat for a range of significant-wave-height & periods. I will forward the results to you when I have done this.

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Q/A Sheet

Title of Abstract: Multi-block, boundary-fitted solutions for 3D nonlinear wave-structure interaction

Author(s): Bingham, H.B., Ducrozet, G. & Engsig-Karup, A.P.

Question(s)

Name: M.Kashiwagi

Question(s):

In a comparison of the run-up around a bottom-mounted circular cylinder, computed results look non-smooth near the rear of the cylinder. Is that physically real or is there numerical problem of some kind?

Answer(s)

Even at rather low incident wave steepness, there are quite high harmonic waves generated near the cylinder; especially on the lee side. We are however, required to apply rather strong filtering near the cylinder for the steepest cases to obtain a stable solution, so it's not clear how much of this is physical and how much is numerical.

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Q/A Sheet

Title of Abstract: Multi-block, boundary-fitted solutions for 3D nonlinear wave-structure interaction

Author(s): Bingham, H.B., Ducrozet, G. & Engsig-Karup, A.P.

Question(s)

Name: J Grue

Question(s):

How does your method and calculations compare to professor Ferrant's results in the late 1990s? How far are you able to carry on force calculations in regards to harmonics?

Answer(s)

Ferrant used a BEM method to solve the same problem. Our results are very close in general. We are able to reach somewhat higher wave steepnesses. We intend to look at the force harmonics but have not done so yet.

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Q/A Sheet

Title of Abstract: Multi-block, boundary-fitted solutions for 3D nonlinear wave-structure interaction

Author(s): Bingham, H.B., Ducrozet, G. & Engsig-Karup, A.P.

Question(s)

Name: Yannis Chatjigeorgiou

Question(s):

Your comparisons with 2nd order numerical and exp. results are perfect but concern only a relatively low normalized freq. Your method should be validated against exp. and num. results for higher freq. where the disturbance of the free surface and the wave run-up are stronger.

Answer(s)

You are right.

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Q/A Sheet

Title of Abstract: Interaction of hydro-elastic waves with a vertical wall
Author(s): Brocklehurst, P., Korobkin, A.A. & Parau, E.

Question(s)

Name: Yeung,R.W
Question(s):

Two comments:

1) It seems difficult to accept the ice sheet is “clamped ” at the wall. Naturally this will yield the highest stress point.
2) This problem has been quite thoroughly investigated or applied by a community involved with very large floating structure in the late 1990’s. There were solutions for finite draft plate by workers by the names of Eretkin,R.C and Kim,J.W. in ASME journals.

Answer(s)

1) The focus of the study was indeed to see if the clamping was a realistic condition. We concluded that for ocean waves the incident amplitude is probably too high to maintain the clamping, but perhaps in frozen lakes or VLFS applications the condition could be realistic. The formulation works for free edge conditions also.

2) I'm not familiar with these studies so I will research them.

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Q/A Sheet

Title of Abstract: Interaction of hydro-elastic waves with a vertical wall
Author(s): Brocklehurst, P., Korobkin, A.A. & Parau, E.

Question(s)

Name: David Evans
Question(s):
Dr Porter and I published a paper in Journal of Fluid Mechanics in 2003 on scattering of waves by a crack in an ice sheet. The present problem is similar apart from the damping of the ice sheet at the origin. In the course of researching the crack problem, we discovered a number of papers from the Russian literature on the clamped cases which could be relevant to your paper.

Answer(s)

I was unable to find many papers myself including this fixed boundary condition considered, but I will investigate the literature you mentioned!

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Q/A Sheet

Title of Abstract: Interaction of hydro-elastic waves with a vertical wall
Author(s): Brocklehurst, P., Korobkin, A.A. & Parau, E.

Question(s)

Name: R.Porter
Question(s):

The problem you are considering can be solved with eigenfunction expansions. I wonder why you choose to use your transform method for this problem when you can write down an explicit solution in terms of eigenfunctions.
Also, in your inverse transform you have poles in your integral which you can exploit to find a solution in the form of a run over the poles.

Answer(s)

For the first part, please refer to Meylan's question.
As for the inverse transform, the integrals already converge quickly leading to satisfactory accuracy, but I'll pursue the suggested method to see if it can be improved.

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Q/A Sheet

Title of Abstract: Interaction of hydro-elastic waves with a vertical wall
Author(s): Brocklehurst, P., Korobkin, A.A. & Parau, E.

Question(s)

Name: Michael Meylan
Question(s):
More of a comment than a question. This problem has been solved before. Can you explain how your method differs and what advantages you see for your method over other methods?

Answer(s)

Without having too much experience on the other methods discussed it's hard to compare them; however the function Q(3) appears also in the three-dimensional model. Because the function is well understood from our two-dimensional work. This could be advantageous. Also, this method allows the phase shift to be expressly written in terms of integrals. I do intend to compare with eigenfunction expansions and Green's function approaches in the future.

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Q/A Sheet

Title of Abstract: Inertia and damping of heaving compound cylinders
Author(s): Chau, F.P. & Yeung, R.W.

Question(s)

Name: Michael Meylan
Question(s):
Did you observe any resonances?(i.e. large responses in the cylinder many times the incident wave height)

Answer(s)

We have not shown results for the motion response but it behaves like any floating system with wave damping coefficient governing the resonance response.

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Q/A Sheet

Title of Abstract: Visco-potential flow and time-harmonic ship waves
Author(s): Chen, X.B. & Dias, F.

Question(s)

Name: Touvia Miloh
Question(s):

I believe that some of the viscous (laminar) free surface damping effects which you mentioned also appear in a CRC book "Free-surface and viscosity (?)" ed. P.A. Tyvand. Extensions for finite depth two-layer, bottom friction and free-surface elasticity are given as well.

Answer(s)

The free-surface damping effects appear in several papers indeed but as far as we know we have never seen them expressed as $\eta_{xx}+\eta_{yy}$ in the kinematic boundary condition.

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Q/A Sheet

Title of Abstract: A 3D Navier-Stokes solver to investigate Water-On-Deck events within a Domain-Decomposition strategy

Author(s): Colicchio, G., Greco, M., Lugni, C. & Faltinsen, O.M.

Question(s)

Name: Malenica Sime

Question(s):

Does the velocity input to NS solver include the incident wave part only or the diffraction and radiation are also included?

If the diffraction and radiation are included, how do you deal with the region Z>0?

Answer(s)

The velocity inputs includes all contributes. We prolonged the solution consistently with linear theory.

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Q/A Sheet

Title of Abstract: A 3D Navier-Stokes solver to investigate Water-On-Deck events within a Domain-Decomposition strategy

Author(s): Colicchio, G., Greco, M., Lugni, C. & Faltinsen, O.M.

Question(s)

Name: M.Kashiwagi

Question(s):

Is your work limited to the zero-speed problem? For the case of forward speed, are you going to use the translating and oscillating Green function?

Answer(s)

We want to apply this work to FPSO ships that are used as platforms. Nonetheless, the same domain decomposition approach is valid when $Fr \neq 0$. In that case, the linear solver would not be based on Green functions, rather we could choose one of the linear boundary element methods developed in the past where both the free surface and the body are discretised.

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Q/A Sheet

Title of Abstract: A 3D Navier-Stokes solver to investigate Water-On-Deck events within a Domain-Decomposition strategy

Author(s): Colicchio, G., Greco, M., Lugni, C. & Faltinsen, O.M.

Question(s)

Name: Harry Bingham

Question(s):

You did not specify exactly how you blend the two solutions, are you using a relaxation function?

Answer(s)

We simply have a weighted sum of the velocity fields from the two solvers. The weights depends from the distances from the interfaces.

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Q/A Sheet

Title of Abstract: A New Algorithm for the Time-domain Green Function
Author(s): Dai, Y.Z.

Question(s)

Name: Yeung,R.W
Question(s):
A similar treatment resulting in Dawson's integral surfaced in the 2-D transient source (Yeung, J. Eng. Math. 1982) and I will arrange a copy of paper for you. The singularly oscillatory behavior was remedied in the 1982 work by a time integration.

Answer(s)

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Q/A Sheet

Title of Abstract: A New Algorithm for the Time-domain Green Function
Author(s): Dai, Y.Z.

Question(s)

Name: X.B,Chen
Question(s):

The issue of unphysical behavior at large time when both source and field points tend to the free surface has been treated by introducing the surface tension and viscosity. The present method may have one important advantage to introduce these two parameters into the expression using Dawson's integral, comparing to the method of polynomial series.

Answer(s)

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Q/A Sheet

Title of Abstract: A New Algorithm for the Time-domain Green Function
Author(s): Dai, Y.Z.

Question(s)

Name: Harry Bingham
Question(s):
Is your new method faster than existing method?

Answer(s)

The Dawson method is faster than series method, but it is slower than the polynomial method.

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Q/A Sheet

Title of Abstract: A New Algorithm for the Time-domain Green Function
Author(s): Dai, Y.Z.

Question(s)

Name: Korobkin
Question(s):
The integrals F2, F3 in (ζ) do not converge (?)
Please explain how to calculate them.

Answer(s)

We take F0-F3 as the limit of F_k' when ζ approaches 0. Otherwise they are divergent.

$$F_k' = 2\int_0^\infty \sqrt{\lambda}\lambda^k e^{-\lambda\zeta} \sin(\sqrt{\lambda}\tau) J_0(\lambda\sqrt{1-u^2}) d\lambda \quad \text{(k=0-3)}$$

We can evaluate F0-F3 according to the method proposed by Kochin(Wehausen and Laitone, eq22.21)

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Q/A Sheet

Title of Abstract: Numerical simulation of wedge water entry based on two-dimensional two phase SPH model

Author(s): Gong, K., Wang, B.L. & Liu, H.

Question(s)

Name: Q.W,Ma

Question(s):

This is an interesting presentation. In numerical simulation, the wedge and its motion are symmetrical about the vertical line through its tip. Would you please explain it unsymmetry in the shape of the cavity shown in the presentation and in Fig.4 is due to physical reason or due to numerical error.

Answer(s)

The numerical results and experiment data show that the cavity running with the wedge deforms significantly in the process of cavity closing. For the open cavity at the early stage of water entry, the computed shape of the cavity shows good symmetry about the vertical line through the wedge tip. For the closed cavity at the later stage of water entry, it is hard to keep the symmetry for the numerical simulation because of numerical error induced by violent deformation of the free surface when the cavity closing appears. We will check the numerical results about this issue using more particles and high resolution in integration in time domain, particularly at time when the cavity is closing.

Hua,Liu

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Q/A Sheet

Title of Abstract: Viscous calculations of hydrodynamic forces on marine bodies
Author(s): Grue, J., Rashid, F. & Vartdal, M.

Question(s)

Name: Yeung,R.W
Question(s):
I thought your Morison's equation as shown has a sign error for a moving cylinder in a still fluid & the mass coefficient in front of acceleration should be (C_m-1) with C_m defines as the effective mass coefficient.

Answer(s)

In the case when the cylinder is fixed and the water is oscillating, the inertia coefficient is Cm=1+the added mass coefficient.
In the present case where the cylinder is oscillating in water otherwise at rest Cm= the added mass coefficient, as also made clear during the presentation.

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Q/A Sheet

Title of Abstract: Numerical Simulation Method for a Coupling Motion of Ship and Tank Fluid
Author(s): Hashimoto, H. & Sueyoshi, M.

Question(s)

Name: Y,Kim
Question(s):
Thanks a lot for nice presentation & excellent work. You mentioned that the vertical location of ART is not important. In terms of roll moment, you are right. However, the mass center of ship changes, and this makes the difference of GM. Therefore, roll natural frequency can be changed. Any comments?

Answer(s)

What I wanted to say is that the vertical position of tank is not problem for our simulation method and any position of tank can be solved with no difficulty. In this case, we put it on the upper deck just for visibility reason. I am sure that rolling motion itself does change depending on the vertical position of tank as you pointed out. Thank you.

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Q/A Sheet

Title of Abstract: 3-D Numerical Wave Tank by CIP based Cartesian Grid Method
Author(s): Hu, C.H.

Question(s)

Name: Y.Kim
Question(s):
You described the coupling between fliud and structure and mentioned that the structural outcome can be reflected as the body force on N-S Eq. In general, structural outcome goes to kinematics of fluid boundary, i.e. displacement and velocity, not directly to dynamics. Could you explain how you did in your method?

Answer(s)

The effect of the structure motion can be considered as a body force $\mathbf{f}_b$ which is added to the N-S equation as shown below.

$$\frac{D\mathbf{u}}{Dt} = -\frac{\nabla p}{\rho} + \nabla \cdot \mathbf{T} + \mathbf{f}_g + \mathbf{f}_b$$

Integration of this equation is divided into two steps:

Step 1: $\frac{\mathbf{u}^* - \mathbf{u}^n}{\Delta t} = -\mathbf{u} \cdot \nabla \mathbf{u} - \frac{\nabla p}{\rho} + \nabla \cdot \mathbf{T} + \mathbf{f}_g$

Step 2: $\frac{\mathbf{u}^{n+1} - \mathbf{u}^*}{\Delta t} = \mathbf{f}_b$

Let $\mathbf{u}_b$ be the body velocity, we have $\mathbf{u}^{n+1} = \mathbf{u}_b$ on the body. Here we write the body force as $\mathbf{f}_b = \phi_3 \frac{\mathbf{u}_b - \mathbf{u}^*}{\Delta t}$, where ϕ_3 is the density function for solid phase. The Step 2 can then be done by using the following equation.

Step 2: $\mathbf{u}^{n+1} = (1-\phi_3)\mathbf{u}^* + \phi \mathbf{u}_b$

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Q/A Sheet

Title of Abstract: 3-D Numerical Wave Tank by CIP based Cartesian Grid Method
Author(s): Hu, C.H.

Question(s)

Name: Harry Bingham
Question(s):

I noticed that you drop the viscous terms in the forces on the body. This motivates two questions:

1) Are you able to properly resovle the viscous effects at these high Reynolds numbers?
2) Why not drop these terms and just solve the Euler equations instead?

Answer(s)

1) Prediction of viscous force on the body is a difficult task in our method. Especially for high Reynolds number problems, it is impossible to resolve the thin boundary layer on the body surface by using the Cartesian grid approach.
2) The N-S equations are solved in our code and the viscosity works properly in computation of low Reynolds number flows. It is not necessary to use Euler equations.

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Q/A Sheet

Title of Abstract: Comparisons Between 2D+t Potential Flow Models and 3D Rans for Planing Hull Hydrodynamics

Author(s): Iafrati, A. & Broglia, R.

Question(s)

Name: Harry Bingham

Question(s):

Would you comment on the importance of viscous effects for this problem? Perhaps you could get equally good results with coarser resolution using the Euler equations.

Answer(s)

I agree that similar results could be obtained by Euler equations. In some sense, this is confirmed by the good agreement found with potential flow simulations. However, I'm not sure the resolution can be significantly coarser than the one we adopted for the Navier-Stokes simulations. Indeed, a high resolution is still necessary in order to resolve the sharp pressure and velocity gradients developing in the spray region. For application purposes, viscous effects are also important to evaluate the friction component of the drag.

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Q/A Sheet

Title of Abstract: Prediction of Added Resistance by Means of Unsteady Wave-Pattern Analysis

Author(s): Kashiwagi, M.

Question(s)

Name: Y,Kim

Question(s):

You described that the short wave components are not much important for the added resistance, showing the global wave profile near initial stage of wave generation.

Is it because that you considered at the case of $\pi / L = 1.0$? If the wave becomes shorter (i.e. at higher frequency), do you expect the same conclusion?

Answer(s)

The short-wavelength component obtained from the side to downstream part does not affect the added resistance ; this conclusion is the same irrespective of the wavelength of the incident wave. The amplitude of the fore-front wave profile is important, in which the superposition of short-wavelength component should not be neglected.

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Q/A Sheet

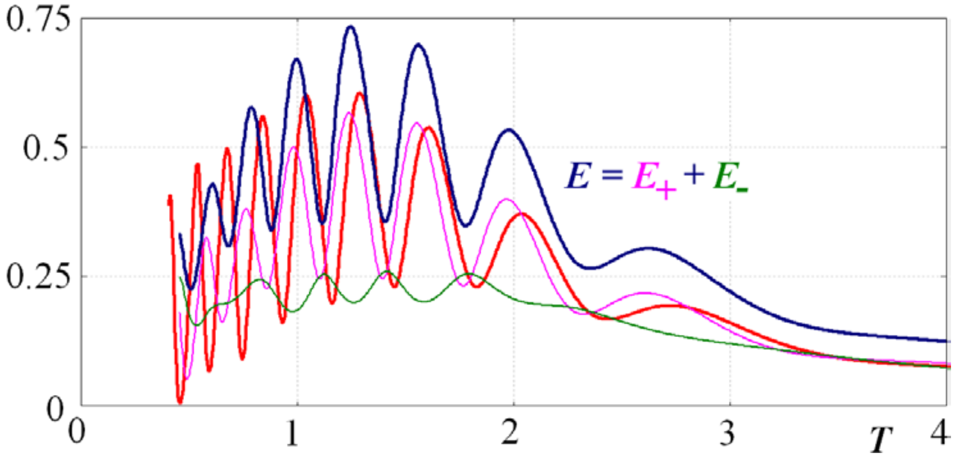
Title of Abstract: Wave Power Absorbers at Floating Platform
Author(s): Khabakhpasheva, T.I. & Korobkin, A.A.

Question(s)

Name: Harry Bingham
Question(s):
Please identify the physically relevant range of non-dimensional period T on your final power extraction plot, if we consider a typical floating airport length.

Answer(s)

I did not make calculations for real values of parameters for a typical floating airport. I just can suppose -- because a typical length of ocean waves (30-100 meters) is shorter then a typical length of a floating airport (3000-5000 meters) about 50 times, we usually are in the part of the plot (see below) between T=0.5 and T=1.



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Q/A Sheet

Title of Abstract: Wave Power Absorbers at Floating Platform
Author(s): Khabakhpasheva, T.I. & Korobkin, A.A.

Question(s)

Name: David Evans
Question(s):
How important is the length of the plate to the amount of energy absorbed?

Answer(s)

In my opinion, the length of the plate is very important
$E_{absorbed}/E_{incoming}$+Transmission+Reflection=1
As it is well known, Transmission and reflection coefficients are strongly dependent on length of the plate, but I don't investigate this dependence for absorbed energy. It will be interesting to do it.

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Q/A Sheet

Title of Abstract: Numerical Analysis on Added Resistance of Ships in Time-domain

Author(s): Kim, K.H., Joncquez, S., Kim, Y.H. & Bingham, H.B.

Question(s)

Name: Wei Qiu

Question(s):

As we know, m_j-terms have great effect on the solution in the double-body scheme. I wonder what numerical approach was used to calculate the m_j-terms in the programs.

Answer(s)

Thanks for pointing out an important technical issue. As you pointed out, an accurate computation of the m-terms is important in solving the boundary value problem. The m-terms contain the second-order difference of basis potential, which makes the direct numerical computation difficult. For instant, the numerical difficulties and loss of accuracy for the evaluation of the m-term with a direct calculation(using FDM) were sysmtematically investigated by Zhao and Faltinsen(1989). In 1990, Nakos applied Stokes' theorem in the integral equation to apply the m-terms as follows:

$$\iint_{S_B} m_j G(\vec{x};\vec{x}')ds = -\iint_{S_B} \left(\nabla\Phi \cdot \nabla_{\vec{x}'} G(\vec{x};\vec{x}')\right) n_j ds \qquad j = 1,2,\ldots,6$$

We applied the same scheme, and the details can be found in the dissertation of Nakos(1990).

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Q/A Sheet

Title of Abstract: Numerical Analysis on Added Resistance of Ships in Time-domain

Author(s): Kim, K.H., Joncquez, S., Kim, Y.H. & Bingham, H.B.

Question(s)

Name: M. Kashiwagi

Question(s):

You have already computed the wave pattern around a ship, with which the added resistance can be easily computed by means of the unsteady wave analysis. By doing that, you can confirm consistency of your method with the far-field method.

Answer(s)

Thank you for comments. You are right, and we can use the wave pattern analysis. Besides the direct pressure integration, we can apply the momentum approach as well as wave pattern analysis. One of concern is that the Rankine panel method is a kind of near-field approach. Therefore, we may not have accurate prediction of wave elevation as the section for wave pattern analysis is getting farther from the body. Anyhow, we will try either wave pattern analysis or momentum approach in near future.

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Q/A Sheet

Title of Abstract: Numerical Analysis and Validation on Ship Springing
Author(s): Kim, Y.H., Kang, B.C. & Kim, Y.

Question(s)

Name: X.B,Chen
Question(s):
The accurate computation of added mass is an important issue at high encounter frequency. If the asymptotic value at infinite frequency is easy to obtain, the added mass associated with some structure modes is much more difficult. The usual approximation using the asymptotic value might not be good since the added mass at a finite frequency (even high) can be quite different from the asymptotic value. Have you taken special treatments (formulation and/ or numerical algorithm) in the diffraction/ radiation computation at high encounter frequency? The discrepancy of peak position between different sets of dynamic responses may be explained by the difference of added mass values. Have you made comparison of added mass matrix?

Answer(s)

Thank you for pointing the added mass effects. In our case, we tried the both modal superposition and direct integration. This means that the added mass effects are considered through two different ways. We could not find any big difference, meaning the same added mass at high frequency. However, there is a possibility of difference with other codes, and it can cause the difference of springing resonance.

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Q/A Sheet

Title of Abstract: Numerical Analysis and Validation on Ship Springing
Author(s): Kim, Y.H., Kang, B.C. & Kim, Y.

Question(s)

Name: Q.W,Ma
Question(s):
This is a very impressive presentation. In fully coupling problems, at least three frequencies are involved, the incoming wave frequency, the lowest natural frequency of rigid-body motion and the lowest natural frequency of structural vibration. They may be very different from each other. I am interested in how you would determine the time step in numerical simulation to deal with such complex problems.

Answer(s)

Thank you for question. This is an important issue, and the resolution of panel is also important as well as time step. Time step can be chosen to resolve the shortest time period in order that at least 20~30 time steps are applied. Normally we didn't experience instability due to time step since we designed a stable numerical scheme. The panel resolution problem was ok, since the added mass plays key role in springing condition. The 'reasonable' amount panels provide very reasonable convergency.

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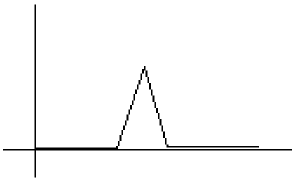
Q/A Sheet

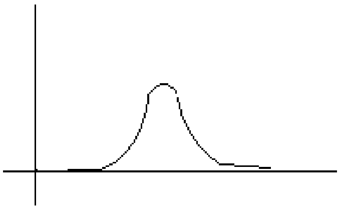
Title of Abstract: Numerical Analysis and Validation on Ship Springing
Author(s): Kim, Y.H., Kang, B.C. & Kim, Y.

Question(s)

Name: Michael Meylan
Question(s):
In your figures the response curve looked like a hat



This implies that you are not resolving the response correctly which looks like



(this shape is the same for all responses under linear theory)

Answer(s)

You are right. We need to observe more frequencies. We just tried to compare experimental data.

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Q/A Sheet

Title of Abstract: Sudden Rotation of Floating Plate With Separation
Author(s): Korobkin, A.A.

Question(s)

Name: Yeung,R.W
Question(s):
Thank you for a very interesting and rigorous analysis. I wonder if you found it necessary to apply a Kutta (smooth-tangency flow) condition at the downward-moving edge. It appears that is needed to obtain uniqueness.

Answer(s)

You are right. The Kutta condition is needed at the downward-moving edge of the plate. This condition was applied in numerical solution of the inner problem for the local flow close to this edge.

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Q/A Sheet

Title of Abstract: Sudden Rotation of Floating Plate With Separation
Author(s): Korobkin, A.A.

Question(s)

Name: Michael Makasyeyev
Question(s):
Your problem in linearized form can be reduced to the integral equation. Have you obtained this equation?

Answer(s)

We did not deal with integral equations in this study. Our problem is intentionally simple. All formulae were derived analytically by using the theory of analytic functions.

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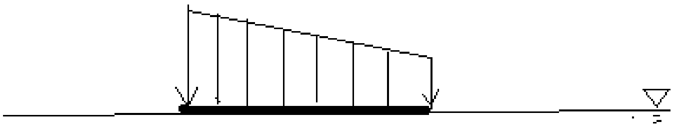
Q/A Sheet

Title of Abstract: Sudden Rotation of Floating Plate With Separation
Author(s): Korobkin, A.A.

Question(s)

Name: T.Miloh
Question(s):

Since you are interested in estimating the dynamics of the two separation points during the initial impact stage of a vertically moving and rotating rigid plate, I wonder if the main separation features can be captured by looking at small-time behavior of a plate with linear distribution of normally applied pressure on the upper side.



Answer(s)

The suggested problem is very interesting. I believe we can study this problem with prescribed external loading. We shall try . Thank you for your valuable suggestion.

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Q/A Sheet

Title of Abstract: Sudden Rotation of Floating Plate With Separation
Author(s): Korobkin, A.A.

Question(s)

Name: John Grue
Question(s):
Is it any similarity between your solution/problem, and that of a plate moving forward with constant speed, at a small angle of attack (even though the latter is steady and the former has accelerations)?

Answer(s)

I am sure there is a similarity between these two problems. However, it is difficult at present to answer your question without deeper investigation of both problems.

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Q/A Sheet

Title of Abstract: Sudden Rotation of Floating Plate With Separation
Author(s): Korobkin, A.A.

Question(s)

Name: Alistair Borthwick
Question(s):
Thank you for an excellent paper and most enjoyable presentation. I have one question concerning the initial hydrodynamics induced by the sudden rotation of the plate. Please could you comment on the effect on the flow motions of the instantaneous infinite acceleration of the plate as its velocity change from $v=0$ at $t=0^-$ to $v=v_0$ at $t=0^+$. It could be very useful to consider case where $v=v_0$ that $(t/\delta t)$, or similar, with δt a prescribed short time scale. Then comparison with experimental data might be more feasible.

Answer(s)

It is possible to consider the problem of plate rotation with variable velocity. Thank you for this valuable suggestion. We studied the simplest case of constant speed. Variable speed but w/o rotation was studies by Iafrati and me in the past.

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Q/A Sheet

Title of Abstract: Wave drift forces on a rectangular barge in varying bathymetry
Author(s): Liu, Y.N., Molin, B. & Kimmoun, O.

Question(s)

Name: Yeung,R.W
Question(s):

There is a very efficient treatment of this problem of varying depth with different asymptotic depths (on the left and right) given in my paper on hybrid methods(Yeung,R.W, 1st Int. Conf. on Numerical Ship Hydrodynamics, Gaitherbary,MD,1975). Computations were made for added mass, damping and reflection transmission.

Answer(s)

Thank you very much for your advice. I will read and learn it and solve my problem.

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Q/A Sheet

Title of Abstract: Analytical solution for the capillary-gravity waves due to an oscillating Stokeslet
Author(s): Lu, D.Q.

Question(s)

Name: T.Miloh
Question(s):

1. You mentioned the "elastic problem", do you mean surfactant?
2. Are you aware of our joint work with G.Zilman (JSR) discussing viscous, surface-tension and surfactants effect on the far field Kelvin waves?
3. You get very short and steep waves, but I wonder how valid is the linearized wave assumption that you are using to describe that waves?

Answer(s)

Answers:

1) The elastic problem we mentioned in the presentation slides is related to the flexural waves in an ice sheet or a Very Large Floating Structure, which are usually modeled as thin plates with the effects of elasticity and inertia. The surfactant defined in Ref. [1] is associated with the sea surface active materials with the effects of elasticity and surface tension. The mathematical formulation are different for these two models.

2) Yes, we have read at least two papers authored by T. Miloh et al. [1-2] on this topic. In the Ref. [1], the hull of the ship is represented by a single layer of singularities. In Ref. [2], the coefficient of surface tension is a function of the surfactant concentration. In our present work, we consider one singularity in a viscous fluid and the surface tension is assumed to be a constant.

3) The analytical solution derived here is valid for the far-field response. In

the near field, the wave lengths decrease. We need a further study on this problem.

References

[1] Zilman, G. & Miloh, T. "Kelvin and V-like ship wakes affected by surfactants". Journal of Ship Research, 2001, Vol. 45, pp. 150-163.
[2] Spivak, B.; Vanden-Broeck, J. M. & Miloh, T. "Free-surface wave damping due to viscosity and surfactants". European Journal of Mechanics B/Fluids, 2002, Vol. 21, pp. 207-224.

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Q/A Sheet

Title of Abstract: Analytical solution for the capillary-gravity waves due to an oscillating Stokeslet

Author(s): Lu, D.Q.

Question(s)

Name: M.Kashiwagi

Question(s):

With a realistic value of the surface tension, it is said that the effect of surface tension becomes important only for the wave length less than 2cm. In addition, the characteristics of the phase and group velocities will be changed in the range of short waves. Thus, I am wondering how much important the effect of surface tension will be in a real problem associated with real size ships.

Answer(s)

Thank you for your comments.

Generally speaking, the waves generated by a surface-piercing or submerged body can be referred to as the Kelvin ship waves. For a real size ship, the effect of surface tension is usually neglected to simplify the problem and the results will be reasonable. However, the effects of viscosity and surface tension become significant for the waves due to a small moving objects (for example, an insect on water surfaces. For more details on this topic, please refer to the recent publications by A. D. Chepelianskii et al [1,2]). In this abstract captioned above, we consider the combined effects of surface tension and viscosity on surface waves due to a point force (Stokeslet in a Stokes flow).

References:

[1] Chepelianskii, A. D.; Schindler, M.; Chevy, F. & Raphael, E. "Self-consistent theory of capillary-gravity-wave generation by small moving objects". Physical Review E 2010, Vol. 81, 016306.
[2] Chepelianskii, A. D.; Chevy, F. & Raphael, E. "Capillary-gravity waves

generated by a slow moving object". Physical Review Letters 2008, Vol. 100, 074504.

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Q/A Sheet

Title of Abstract: Analytical solution for the capillary-gravity waves due to an oscillating Stokeslet

Author(s): Lu, D.Q.

Question(s)

Name: X.B,Chen

Question(s):

The reasons to have a calm region perturbation can be regrouped into 2 classes: one is decay factor with viscosity or submergence, another is tension effect with surface tension or elastic surface. The 2 classes of reason affect the free surface in different way. The viscous effect reduces the wave amplitude while surface tension change, the wave forms. In particular, the capillary-gravity waves present a minimum velocity below which at large wavenumber no wave exist so that a calm region is present around the perturbation and the radius of this region increase at the minimum speed of capillary-gravity waves.

Answer(s)

In the slides presented on the workshop, we listed four reasons for the existence of a calm region in the near field:-

_ The submergence;
_ The viscosity;
_ The surface tension;
_ The elastic surface.

We agree with Dr. Chen that the reasons can be further regrouped into two classes. The mechanisms for the calm region are different. For the first one, there are exponential decay factors, namely $\exp(-kh_0)$ and $\exp(-bh_0)$ in Eq. (20) for the submergence effect and $\exp(-2\nu k^2 t)$ in Eq. (29) for the viscosity effect. As the field point tends to the source point (the origin), the wave number k tends to infinity so the exponential factors tend to zero. For the second one, there is a minimal group velocity C_{gmin} for the wave system in such a way that there is no real solution for Eq. (38) as $R/t < C_{gmin}$. Therefore, wave generation is possible only for $R/t >= C_{gmin}$. The surface profile decay at the region $R/t < C_{gmin}$, as predicted by Eq. (52).

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Q/A Sheet

Title of Abstract: Comparison of Potential Flow and Viscous Fluid Models in Gap Resonance

Author(s): Lu, L., Cheng, L., Teng, B. & Sun, L.

Question(s)

Name: Yeung,R.W

Question(s):

It is difficult to accept your proposal of using a "potential-flow" method that has an arbitrary viscosity factor μ which is not physically based. This is essentially date fitting with a fudge parameter. In your regular N-S equations solution, did you assume the flow in the gap to be one-dimensional? How did you treat the shear layer on the gap walls?

Answer(s)

As for the present special problem involving large amplitude resonant fluid oscillation in the narrow gap formed by multi-body in close approximation, it is the conventional potential flow model leading to the nonphysical solution of wave amplitude in narrow gap. The method of introducing an artificial damping force to overcome the essential difficulty of potential flow model has been used in a variety of numerical implementations, such as Newman (2003) for WAMIT, Chen (2005), Pauw et al. (2005) and Bunnik et al. (2009) among many others and produced acceptable predictions of resonant wave height as an appropriate damping coefficient is adopted. We do understand the arbitrariness you mentioned in this method. That is our very initial intention to calibrate the damping coefficient by the comparisons with experimental data and numerical results from viscous fluid model. The present calibrated damping coefficient can guarantee the corresponding predicted resonant wave heights in good comparisons with experimental and viscous numerical results. Also, this is not a particular coincidence but valid for different draft, gap width, breadth ratio and gap number. We just intend to show here that this method maybe very promising for practical applications. Actually, it is not possible for anybody so far to conduct numerical simulations using the viscous fluid model to deal with the real-lift problems although it might be very rigorous in your opinion. Anyway, we are happy to receive valuable and helpful suggestions and comments.

In our rigorous Navier-stokes based numerical model, we did not assume the flow in the gap to be one-dimensional since this is not consistent with the physical phenomenon. The typical gap width considered in this work is 5 cm. We use very fine mesh resolution to account for the strong shear associated with the resonant wave oscillation. The mesh size used in the gap is generally in the dimension 1~2 mm*1~2 mm. The grid dependence examinations show it works well.

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Q/A Sheet

Title of Abstract: Generalized Eigenfunction Method for Floating Bodies
Author(s): Meylan, M.H. & Fitzgerald, C.

Question(s)

Name: QW.Ma
Question(s):
This presentation is very interesting. I wish you would comment on possibility of extending the work to consider 3D cases, nonlinearity and (a part of) viscosity.

Answer(s)

Firstly, the theory is based on linear superposition so extending to the non-linear case will be difficult, but may be possible using a stokes expansion. Extension to three dimensions has been done theoretically by Hazard and Loret 2007 but not as a numerical method. Inclusion of viscosity may be difficult as the theory requires conservation of energy as presently given.

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Q/A Sheet

Title of Abstract: Non-uniqueness in the plane problem of steady forward motion of bodies

Author(s): Motygin, O.V. & McIver, P.

Question(s)

Name: David Evans

Question(s):

Your examples of the delta shape and the two cylinders give eigenvalue when the shapes are very close to the surface. Can you develop an asymptotic theory based on such a small depth of submergence?

Answer(s)

Thank you for the question. Such asymptotics are of interest for us, though it might be not straight forward to find high order terms. It would also be noted that it is likely that more eigenvalues appear as the body approaches the free surface.

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Q/A Sheet

Title of Abstract: An Attempt to Demystify Flat Impact
Author(s): Oh, S.H., Kwon, S.H., Kwak, D.W. & Choi, Y.M.

Question(s)

Name: Q.W,Ma
Question(s):

I would like to make a comment on author's answer to the question of Prof. Eatock Taylor about surface tension. I agree that the surface tension may be ignored when surface waves are long. However, in the case you presented the curvature at the surface is large at the moment when the body just touched the surface and so surface tension effects may need to be investigated before making concrete conclusion to find the reason why the difference in your numerical and experimental results is quite significant.

Answer(s)

I completely agree with your opinion.

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Q/A Sheet

Title of Abstract: An Attempt to Demystify Flat Impact
Author(s): Oh, S.H., Kwon, S.H., Kwak, D.W. & Choi, Y.M.

Question(s)

Name: Korobkin
Question(s):

In your presentation, the shape of the free surface(observed in experiments) is well defined without zones of mixing between water and air close to the edges of the box as they were observed by Tanizawa in his experiments. Could you comment, please, on difference between your experiments and those by Tanizawa?

Answer(s)

The picture we have got reflects the picture taken in the laser sheet. Therefore, if the seedings are not enough, some parts of flow field would have been missed. Of course, there were mixing region during the experiment.

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Q/A Sheet

Title of Abstract: An Attempt to Demystify Flat Impact
Author(s): Oh, S.H., Kwon, S.H., Kwak, D.W. & Choi, Y.M.

Question(s)

Name: Eatock Taylor, Rodney
Question(s):
In your experiment you have shown that important physical effects occur at a scale of less than 1mm. Could you please explain the relevant scaling parameters governing surface tension in this problem, and the extent to which surface tension might influence your observation and models.

Answer(s)

We tested the surface tension effect by including Weber number in the dynamic boundary condition. However, this inclusion did not affect the surface deformation and pressure time history.

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Q/A Sheet

Title of Abstract: Wave focusing over submerged elliptical topography
Author(s): Porter, R. & Griffiths, L.S..

Question(s)

Name: Frederic Dias
Question(s):
Comment
Experiments on wave over similar topography were conducted by O.Kimmoun in the FIRST wave tank. Even though the topography was not elliptical, it would be interesting to look at the data.

Answer(s)

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Q/A Sheet

Title of Abstract: Wave focusing over submerged elliptical topography
Author(s): Porter, R. & Griffiths, L.S..

Question(s)

Name: Harry Bingham
Question(s):
Your method looks very similar to the generalized Dual Reciprocity-BEM of Brebbia subsequently applied to this problem by many others. You may want to look at these references.

Answer(s)

Thank you for alerting me to this similarity and directing towards a method of which I was unaware.

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Q/A Sheet

Title of Abstract: Wave focusing over submerged elliptical topography
Author(s): Porter, R. & Griffiths, L.S..

Question(s)

Name: J.Grue
Question(s):
It was good to see the reference to Mehlum/Stamnes' work(s) from the late 1970's, early 1980's!
Question: 1) What limitations do the assumption in eq. 7 pose. E.g. when is this assumption not useful? 2) what are the most important nonlinear effects in this problem (not captured by linear theory)? 3) The Hankel function evaluated in spectral space may have same illposedness, meaning that the Green function you use does not provide a full solution. See Fructus and Grue, JFM(2004)

Answer(s)

1) The mild slope equation is valid for small gradient with respect to the wave length. i.e. h`/kh<<1
2) The linear solution will be valid provided the steepness of the caves is small enough in the region of highest steepness. This may not be valid close to the point of focusing for real incident waves.
3) The Green's function here is entirely appropriate and well defined. There is no ill-posedness and we compute the full solution.

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Q/A Sheet

Title of Abstract: Wave focusing over submerged elliptical topography
Author(s): Porter, R. & Griffiths, L.S..

Question(s)

Name: Korobkin
Question(s):
A similar 2D integral equation on a topography can be derived and solved for 3D problem w/0 mild-slope approximation. Why it is difficult?

Answer(s)

3D is more difficult than 2D! The mild-slope equations are well established and widely used and give an extremely simple and effective route to solving this type of problem. The 3D problem could be derived and you are right that we could end up with an integral equation of precisely the form I presented, but with a much more complicated kernel with a Cauchy-singular kernel. So it can be derived this way, but our approach is easy, cheap and accurate enough!

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Q/A Sheet

Title of Abstract: Green function with dissipation and side wall effect in wave tanks

Author(s): Qin, H.D., & Shen, J.

Question(s)

Name: David Evans

Question(s):

Comment: I assume you have introduced an artificial viscosity so as to improve the convergence of the image series in the side walls. An alternative method is to write the Hankel function as an integral involving x and y and then a new set of function can be introduced which ensures that the conditions on the walls are satisfied automatically. In this way the physics of the problem, namely the wave field far dawn the tank is preserved. This was done by McIver(1993) and also by Linton&Evans.

Answer(s)

You are right. In fact, a decaying factor which reflects the viscosity in water surface is introduced to make the convergent series converge more quickly. The method you mentioned should also work and I will check it in future research.

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Q/A Sheet

Title of Abstract: Green function with dissipation and side wall effect in wave tanks

Author(s): Qin, H.D., & Shen, J.

Question(s)

Name: Harry Bingham

Question(s):

To remain faithfully physical, it seems that you should choose the physical viscosity. If you fix the value, then it should be straight forward to compute the Green function using polynomials in the standard way.

Answer(s)

What I have done doesn't faithfully reflect the physical characteristics of water viscosity. Only the surface viscous effect is introduced to make the tank Green function converge more rapid.

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Q/A Sheet

Title of Abstract: Influence of wind on focusing waves packet using a Boussinesq-type model

Author(s): Robin, P., Kimmoun, O. & Kharif, C.

Question(s)

Name: S.Yan

Question(s):

Do you consider wind-driven current in the numerical model?

Answer(s)

Wind-driven current is not considered currently.

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Q/A Sheet

Title of Abstract: Some numerical aspects of nonlinear free surface motions by a Method of Fundamental Solutions

Author(s): Scolan, Y.M.

Question(s)

Name: Dias Frederic

Question(s):

Have you compared the running time between your method and the BEM?

Answer(s)

The time stepping is achieved by using a Runge-Kutta scheme at 4th order. Over one time step, the linear system is solved 4 times, its rank reduces to the number of markers at the free surface only, say N. Hence the running time varies as N**3 if a Gauss method is used. That is quite similar with standard BEM. In the present approach, N can be much smaller than the number of markers used in standard BEM while the same flow is simulated

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Q/A Sheet

Title of Abstract: Some numerical aspects of nonlinear free surface motions by a Method of Fundamental Solutions

Author(s): Scolan, Y.M.

Question(s)

Name: Kim Y

Question(s):

According to my experience (ref AOR 2004) the desingularized method provides a slight different dispersion relation when depth is finite. In your case, I concern the possibility of fluid velocity near side wall when flip-through phenomena occur. Do you have any comment?

Answer(s)

Simulations of focused waves in finite depth have been performed. Comparisons are done with standard BEM. The desingularized method does not seem to affect the dispersion relation.

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Q/A Sheet

Title of Abstract: Some numerical aspects of nonlinear free surface motions by a Method of Fundamental Solutions

Author(s): Scolan, Y.M.

Question(s)

Name: Ma, Q.W

Question(s):

The work is impressive. When an overturning jet approaches and becomes close to a wall, the source point in the gap between the wall and the jet should be very close to the free surface unless it is allowed to be put outside the wall. Could you please explain how to deal with this situation?

Answer(s)

So far, regridding or smoothing are not necessary to capture the flip through phenomenon, although small radius of curvature appears. If by chance singularities go through any physical boundary, the code stops.

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Q/A Sheet

Title of Abstract: Numerical Study on the Second-Order Radiation/Diffraction of Floating Bodies with/without Forward Speed

Author(s): Shao, Y.L. & Faltinsen, O.M.

Question(s)

Name: M,Kashiwagi

Question(s):

At the beginning of the presentation, the advantage of using the body-fixed system was explained, and then results for a bottom-mounted circular cylinder were shown. In that particular problem, these must be no difference from the work in the past.
What are actually different between your method and other conventional methods?

Answer(s)

For cases with fixed bodies, the inertial coordinate system is the same as the body –fixed coordinate system.
The proposed domain-decomposition is expected to work for both diffraction and radiation problems. The difference of the present and the traditional method for the diffraction problem is that, the wave field is not decomposed into incident and scatter part in the inner domain.
The outer domain acts as wave generator for the inner domain. It is for the purpose of validating the numerical program that we studied the diffraction problem by the new method.

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Q/A Sheet

Title of Abstract: Numerical Study on the Second-Order Radiation/Diffraction of Floating Bodies with/without Forward Speed

Author(s): Shao, Y.L. & Faltinsen, O.M.

Question(s)

Name: X.B,Chen

Question(s):

1) The problem associated with sharp corners(tangential velocity and higher-order derivatives) is the same for a fixed body as for a moving body. Your new method using body-fixed coordinate system cannot remove this difficulty. Have you performed convergence tests for a fixed body with sharp corners? Ex. 2nd-order drift load by far field formulation or new middle-field formulation(J.E.M 2006, Chen)
2) It seems your formulation is general. Can you work in the frequency domain to solve 2nd-order and 3rd-order diff/rad problem and what will be the advantage of the method?

Answer(s)

1) There are two major issues related to the sharp corner problems
   a. The second- and higher-order derivatives in the body boundary conditions.
   b. The integral of the velocity square terms which are singular but integrable with very slow convergence rate.

   In this study, we presented a new method to solve the first issue. We have the same problem as the traditional method when it comes to the second issue, i.e. very slow convergence. We have aware of the work using the middle-field formulation. It seems difficult to us how to totally avoid singular integrals on the body when it comes to a second-order problem with forward speed.
2) It is possible to apply the same idea in frequency domain analysis of second- and third-order diff/rad problem.

The advantages are

a. It works for body with/without sharp corners.
b. No derivatives on the body surfaces.

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Q/A Sheet

Title of Abstract: Radiation Loads Acting On a Horizontal Cylinder Oscillating in Stratified Fluid With An Ice-Cover

Author(s): Sturova, I.V.

Question(s)

Name: Michael Meylan

Question(s):

Why do you include the compressive stress and do you observe that this term has significant effects?

Answer(s)

The compressive stress is included in some models of an ice-cover (see, for example, Schulkes R.M.S.M. etal, JFM, 1987). I obtained in my calculations that the compressive stress has to be very large(much greater than in real ice-cover) to problem measurable effects on the hydrodynamic load.

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Q/A Sheet

Title of Abstract: Radiation Loads Acting On a Horizontal Cylinder Oscillating in Stratified Fluid With An Ice-Cover

Author(s): Sturova, I.V.

Question(s)

Name: David Evans

Question(s):

This is a very impressive paper taking into account many effects, including uniform stratification, ice cover and arbitrary –shaped cylinders. Do you know of the work of Linton and Mciver who solved the simpler problem of a discontinuity in fluid density and a submerged circular cylinder, both about and below the discontinuity, but with the simpler free surfaces, using multipoles?

Answer(s)

Thank you for your comment. I know this work.

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Q/A Sheet

Title of Abstract: Rogue Waves Due To Nonlinear Broadband Wave Interactions
Author(s): Tao, A.F., & Liu, Y.M.

Question(s)

Name: J.Grue
Question(s):
First of all, spectrum with energy on high wave numbers, during freak event, has been presented in fully nonlinear computations previously, and should be acknowledged(ref.1) below. Secondly, your HOSM does not converge, in the vertical velocity! This produces an error in the phase, leading to wrong freak predictions, for large time, see ref.2 below, comparing two after fully nonlinear methods.
Ref 1. D.Clamond and J.Grue. Interaction between envelope solutions as a model for freak wave formations. C.R.Mecanique, 2002,vol.330,pp.575-580
Ref 2. D.Clamond, M,Francius, J.Grue & C.kharif . Long time interaction of envelope solutions and freak wave formations. Eur.J. Mech.B/Fluids 2006,Vol.25, pp 536-553
Ref 3. D.Clamond & J.Grue. A fast method for fully nonlinear water wave computations. J.Fluid Mech. Vol 447

Answer(s)

We will cite the mentioned work that studied the long time evolution of a HOSM is based on the use of perturbation expansions in solving the boundary value problem for the vertical free-surface velocity at each time. More higher-order terms need to be included in obtaining the convergent solution as the wave become steeper. For the cases considered in this work, the nonlinear terms with interaction order up to M=6 are included, and our solutions is shown to be convergent by comparison with results obtained with increasing M values. We acknowledge that as a perturbation expansion based approach, HOSM cannot be applied for very steep waves such as overturning waves.

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Q/A Sheet

Title of Abstract: Rogue Waves Due To Nonlinear Broadband Wave Interactions
Author(s): Tao, A.F., & Liu, Y.M.

Question(s)

Name: P.H.Taylor
Question(s):
Your analysis is for uni-directional waves but the real sea states are directionally spread, so are your results on the BFI/Kustosis relevant?

Answer(s)

The present study consider uni-directional waves with the focus on the understanding of effects on nonlinear broad band wave-wave interactions or rogue waves characteristics. For short-crest waves, similar features of the rogue wave results on BFI/Kurtosis are also obtained (Xiao, Liu &Yue 2010).

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Q/A Sheet

Title of Abstract: A coupled Rankine - Green function method applied to the forward-speed seakeeping problem
Author(s): Ten, I., & Chen, X.B.

Question(s)

Name: Y,Kim
Question(s):
Similar method has been applied to LAMP program at earlier time. In that case, most CPU time was due to the computation of wave Green function. In your case, the frequency-domain approach is used, so such CPU time will not be needed. However, the most CPU time may be due to the treatment of wave Green function. Is it right?

Answer(s)

Yes, we expect that the computation of the Wave Green function will take the most CPU time. Fortunately, for one set of parameters (incident wave frequency, heading, characteristic of the semi-spheroid) the external problem, where integration of the Green function happens, should be done only once. After that we may use this solution to solve the internal problem by Rankine panel method for any ship or floating body, sizes of which are not exceeds the control surface. Thus, for a big range/set of bodies only the internal problem must be solved.

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Q/A Sheet

Title of Abstract: A coupled Rankine - Green function method applied to the forward-speed seakeeping problem

Author(s): Ten, I., & Chen, X.B.

Question(s)

Name: T.Miloh

Question(s):

The notation in the double summation in your eq.(4), i.e. $\sum_{m=0}^{\infty}\sum_{n=m+1}^{\infty}$ is not common (see Hobson's book) notation. It should be reversed to read $\sum_{n=0}^{\infty}\sum_{m=0}^{n}$

Answer(s)

Than you for your comment . The double summation used in our work is because the first book where I saw such series expansions of a harmonic function with respect to surface harmonies was Lebedev N.N "special functions & their applications". Dover publication Inc, New York. In our case we do need to use P_n^n functions, which are constants because the solution should decay at infinity. It is easy to show that our summation in your notation becomes:

$$\sum_{m=0}^{\infty}\sum_{n=m+1}^{\infty} p_n{}^m = \sum_{m=0}^{\infty}[p_{m+1}^m + p_{m+2}^m + \ldots + p_{m+k}^m + \ldots]$$

$$= p_1^0 + p_2^0 + \ldots + p_k^0 + \ldots$$

$$+ p_2^1 + p_3^1 + \ldots + p_4^1 + \ldots$$

$$+ p_3^2 + \ldots + p_k^2 + \ldots$$

$$+ \ldots = \sum_{n=1}^{\infty}[p_n^0 + p_n^1 + \ldots + p_n^{n-1}] = \sum_{n=1}^{\infty}\sum_{m=0}^{n-1}$$

In the future we are going to follow your suggestion to use common notation to avoid misunderstanding.

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Q/A Sheet

Title of Abstract: A coupled Rankine - Green function method applied to the forward-speed seakeeping problem

Author(s): Ten, I., & Chen, X.B.

Question(s)

Name: Korobkin

Question(s):

You divided the flow domain into two parts. One of them is finite. Do you expect irregular frequencies for this part of the flow region?

Answer(s)

Unfortunately, the work is ongoing. We just finished to solve the extension domain problem. We do not have an experience with Rankine panel method, so we cannot answer to your question. According to the opinion of other researchers (Prof. Y.H.Kim, SNU) the irregular frequencies are not expected in this model. It should be investigated in near future.

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Q/A Sheet

Title of Abstract: A coupled Rankine - Green function method applied to the forward-speed seakeeping problem

Author(s): Ten, I., & Chen, X.B.

Question(s)

Name: Michael Meylan

Question(s):

Can you extend this to finite depth or to ship in a channel. Why did you choose the prolate semi-spheroid.

Answer(s)

As soon as the control surface does not intersect the bottom or sides of the channel and we know the Green function for finite depth or for a channel, the presented method can be easily extended to such a problem.
We chose the prolate semi-spheroid to reduce number of panels for inner domain problem, because the longitudinal size of the ship is much greater than its breadth or draft, which are almost of the same order. Thus the semi-spheroid fits the ship better than, for example, a sphere.

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Q/A Sheet

Title of Abstract: A coupled Rankine - Green function method applied to the forward-speed seakeeping problem

Author(s): Ten, I., & Chen, X.B.

Question(s)

Name: M,Kashiwagi

Question(s):

For a case where the ship is a prolate spheroid with forward speed, the extension Green function in this paper can be used directly without using the formulation for the inner domain. Is this correct?

Answer(s)

Yes, this is correct. The solution of the extension domain is the matrix DN, which expressed the normal derivatives at the velocity potential using the velocity potential itself: $\frac{\partial \varphi}{\partial n} = DN < \varphi >$, thus, if the ship has a shape of spheroid, then the solution can be easily obtained as

$\varphi = DN^{-1} < \frac{\partial \varphi}{\partial n} >= DN^{-1} < V_n >$,

where V_n is a normal velocity at the point on the ship.

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Q/A Sheet

Title of Abstract: Study on the higher harmonic waves over a submerged bar
Author(s): Teng, B., Chen, L.F., Ning, D.Z. & Bai, W.

Question(s)

Name: Harry Bingham
Question(s):
Just a follow up comment to John Grue's remark. As it is difficult (or impossible) to generate constant form nonlinear waves in intermediate to deep water in the physical tank, this is an area where numerical calculations can shed important light on the harmonic generation.

Answer(s)

It is not easy for numerical technique to generate such high nonlinear waves yet. There are great demands for the numerical method to realized it and more calculations are needed. We are now focusing on this study. Maybe the more interesting results can be shown at the next workshop.

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Q/A Sheet

Title of Abstract: Study on the higher harmonic waves over a submerged bar
Author(s): Teng, B., Chen, L.F., Ning, D.Z. & Bai, W.

Question(s)

Name: Jun Zang
Question(s):
Very pleased to see the potential flow theory working well for this difficult case. We have performed the same test case using Open Foam . We found up to 8th order harmonic were observed for the stations at the lee side, 2nd, 3rd & 4th order harmonic are noticeable large for this case. We would like to see some comparison between your model and our simulation.

Answer(s)

It is much better to compare nonlinear numerical results and experimental date for higher harmonics. We can corporate for that.

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Q/A Sheet

Title of Abstract: Study on the higher harmonic waves over a submerged bar

Author(s): Teng, B., Chen, L.F., Ning, D.Z. & Bai, W.

Question(s)

Name: J.Grue

Question(s):

First a comment. In this problem the bound waves do not have important role, as your results also confirm. Rather the combined nonlinear and dispersal effects in the shallow region over the ridge, are important. The higher harmonic waves grant according to $A^{(2)} \sim A^2$, $A^{(3)} \sim A^3$, where A is the incoming wave amplitude. Alternatively, A/h is a useful nonlinearity parameter. For increasing A/h, Grue(1992) found saturation for the higher harmonics. This can be obtained by increasing A, a decreasing H. Have you been able to find this in some of your computations? So far I have not seen computational results that compare to the saturation measurements.

Answer(s)

It is quite interesting and important phenomena for saturation of higher harmonics when A/h is increased to a certain value. For this, we need to carry out more computations. The corresponding results will be talked about at the next workshop or presented on some journal.

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Q/A Sheet

Title of Abstract: The existence and non-existence of waveless ships

Author(s): Trinh, P.H., Chapman, S.J. & Vanden-Broeck, J.M.

Question(s)

Name: Yeung,R.W

Question(s):

Thank you for a nice explanation of your very elegant analysis. My main concern is with the proper modeling of what you refer to as a ship stern flow. Even at low Froude number, and even for 2-D, the upstream (incident) flow will have already a vertical layer, which may or may not stay attached as if twins the stern/transom corner. The shape of the body contour will then be effectively modified, thus rendering a purely potential –flow treatment inaccurate, if not inappropriate. In more recent literature, the vertical nature of the flow in the stern area has been accounted for. Tuck and Vanden-Broeck's original(1977) conjecture was that a waveless stern flow would imply a splashless bow. Computations and experiments in more recent works indicate the generation and break up of a necklace vortex, or even in its absence, are quite complex. This is not to say the application of exponential asymptotics is not correct.

Answer(s)

I very much enjoyed meeting you in Harbin, and I hope we can address some of your
questions:

Your criticisms of [Tuck' s] potential flow model is entirely valid and indeed, the actual flows for bow flows would be quite different (and might, for example, be accompanied by a "Bachelor vortex"). Our work has shown that for most ship configurations, the potential model will break down near the bow, so indeed the assumption of a simple stagnation attachment is wrong. In terms of the stern waves, it would be nice to see just how accurate our predictions are with actual ships.

Also, it is worth mentioning that the amount of vorticity generated would depend on the shape of the hull. But given a ‘sharp’ hull which generates a great deal of vorticity, we can replace the hull with one of its potential streamlines (which generates less), and the singularities in the analytic continuation of the problem would nevertheless remain the same! So in spirit, the ideas underlying our methods would still be applicable in this new flow past smooth ships.

In terms of the methodology, the same principles which underly our application of exponential asymptotics can still be applied (in theory) for more complicated problems (for example, incorporating vorticity or three-dimensional ships), and we certainly have a desire to do so in the future!

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Q/A Sheet

Title of Abstract: The existence and non-existence of waveless ships
Author(s): Trinh, P.H., Chapman, S.J. & Vanden-Broeck, J.M.

Question(s)

Name: Korobkin
Question(s):

1. The flows in your analysis are with singularities of the flow velocity at the corner points. Does this have a physical meaning?
2. According to your presentation, it looks like the ship shape should be given by an analytical function (like x^2) without singularities at any of its derivatives. Is it true?

Answer(s)

Thank you for your question and for your interesting discussions throughout the conference.
In the analysis of the low-Froude problem, the relevant singularities result from analytically continuing the free-surface ($\psi = 0, \phi > 0$), so they are technically unphysical in nature. However, because of the properties of complex variables, these singularities can often be related to singularities in the geometry of the obstruction in physical space (which is why we often refer to the corners of the ship producing the waves). These singularities are a manifestation of the singular nature of the approximation. Note that we could also replace the solid boundary by one of the inviscid streamlines of the flow. In this case, the ship is completely smooth, but the relevant singularities in this new problem are still at the ‘corners’ of the old problem, and so are no longer physical in nature.

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Q/A Sheet

Title of Abstract: The existence and non-existence of waveless ships
Author(s): Trinh, P.H., Chapman, S.J. & Vanden-Broeck, J.M.

Question(s)

Name: T.Miloh
Question(s):
Maybe you can comment on the relevance of the 2-d slow speed (*F* <=1) theory to real ships? Can we ignore viscous or surface tension effects for extremely short waves? Exponentially small waves have been previously discussed by T. Akylas and R. Grimshawin another context. I want also to draw your attention to a theorem due to Krines which is mentioned in the book by Kostyokov which states that waveless ship forms do not exist for finite ships unless one considers a caravan of in finite ship forms of decreasing size.

Answer(s)

Thank you for the questions. As you mention, exponential asymptotics was used by Grimshaw and Akylas (J. Fluid Mech. 1992) to study waves in a different context, namely that of internal waves. In response to your other questions:

1. The crucial point here is that for a blunt ship (e.g. a tanker), the near-ship behavior is governed by the low-Froude approximation, so while our theory is valid at low speeds for all blunt-shaped ships, it is particularly important in properly understanding the effects of the nonlinear geometry on the free-surface.
2. Both the effects of viscosity and surface tension should be negligible for the waves of interest. Surface tension can be incorporated into the analysis, as well (c.f. Chapman and Vanden-Broeck, SIAM J. Appl. Math, 2002), and the exponential asymptotics would predict the switching-on of capillary ripples ahead of a ship. We have already developed a combined theory of gravity-capillary waves, and this will be published soon.
3. Krein’s result only applies to theories using the thin-ship approximation.

As Tuck (J. Ship Res. 1991) says, “Mitchell’s integral is only an approximation [...] and one cannot be quite sure that a similar result will hold for non-thin ships”. Non-thin ships is precisely our problem of interest.

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Q/A Sheet

Title of Abstract: Wedge impact on liquid surface through free fall motion in three degrees of freedom

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

Question(s)

Name: Y,Kim

Question(s):

This is a very nice work, and congratulate on an excellent results. I assume that this can be directly applied to the prediction of separation around apex. Any comment or result?

Answer(s)

The method cannot be 'directly' applied to the flow separation yet, but it can be extended to include the effects of flow separation, cavitation and trapped air.

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Q/A Sheet

Title of Abstract: Wedge impact on liquid surface through free fall motion in three degrees of freedom

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

Question(s)

Name: Korobkin

Question(s):

This is a very interesting research. Do you plan to verify your numerical results by experiments?

Answer(s)

It is not easy to do experiment on this issue, and the measurement of three freedoms of degree motion is difficult. We do not plan to do experiment recently.

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Q/A Sheet

Title of Abstract: Investigations of Freak Waves on Uniform Current
Author(s): Yan, S., Ma, Q.W. & Adcock, T.A.A.

Question(s)

Name: J.Grue
Question(s):
Have you compared with wave-current estimated by Nwoga (JFM, 2009) or Thomas? They have published such estimates. I have myself estimated the orbital velocity in strong flowing current, finding, to my supervise, that $(u+U)/(c+U) \cong u_0/c_0$,where u denotes the orbital velocity, c the wave phase speed, U the current speed, and index 0 refers to zero current.
Reference: Grue, Romero, Kleiss and Melville, OMAE, 2008.

Answer(s)

Thank you very much for the question. We have noticed that Nwoga (JFM, 2009) carried out the research on interaction of non-breaking normal waves with vertically sheared current fields. Our work in this paper mainly focuses on freak waves under uniform current, paying much attention on breaking wave properties. Therefore we could not compare their results with ours. However, we did compare our results with those from other numerical methods, such as BEM and Boussneq model, to validate our method, as presented in the workshop.
About the second part, thank you very much for kindly sharing your findings with us and providing the reference. We will carefully read it and consider it in our future work. Nevertheless, we did investigate the cases with strong following current and opposite current. No surprising results were found in the cases for following current but some interesting points in the opposite current were found, as given in our presentation, which is not in common with what have been found in literature for interaction between normal waves and current.

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Q/A Sheet

Title of Abstract: Investigations of Freak Waves on Uniform Current
Author(s): Yan, S., Ma, Q.W. & Adcock, T.A.A.

Question(s)

Name: Harry Bingham
Question(s):
When you say that 20 element per wavelength give converged results, what is the order of your basis functions? How many unknowns per element? For nonlinear problems, 20 elements per 1st harmonic will mean that the 3rd –harmonic is resolved by only 3 or 4 elements which does not seem adequate for strongly nonlinear cases.

Answer(s)

We highly appreciate your questions. In our FEM model, we use linear basis function. We did try high order elements many years ago but did not find they were much advantageous over the linear basis function for nonlinear water wave problems.
The number of unknowns in each element depend on if the problem is 2D or 3D. For 2D cases we deal with in this paper, the triangle elements with three nodes are employed, and thus there are three unknowns in each element.

In the QALE-FEM method, the computational mesh is generated only once in the beginning of the calculation. For the freak waves concerned in this paper, 20 elements per wavelength are referred to as 20 elements per minimum wavelength (λ_{min}) of all harmonics in the fundamental frequency range initially. To model the freak waves, a special mesh moving scheme is developed to ensure that more nodes are distributed in the area near the largest wave crest during simulation. Adopting this scheme, the mesh resolution near the largest wave crest/trough at every time step is automatically adjusted and can reach to 60-120 elements per minimum wavelength in this area, before the overturning occurs; after the wave overturns, the mesh resolution near the jet can reach to about 120 elements per minimum wavelength. Our numerical tests with much smaller initial mesh size have shown that for strongly nonlinear waves with overturning, the initial mesh size of $\lambda_{min}/20$ is adequate to achieve converged results.

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Q/A Sheet

Title of Abstract: Hybrid finite difference/BEM solutions of the elliptic mild slope equations

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

Question(s)

Name: Yeung,R.W

Question(s):

I have been a proponent of such type of hybrid method for some time. I wonder in your scheme of things, how sensitive the solution is to the size of the overlapping region and number of points in this region? We have proposed a direct matching on a boundary interface using shell functions. These "shell integrals" can be quickly sectionalized in cylindrical coordinates and stored away in a generalized form for any internal solution. A demonstration of this was made in the OMAE Symposium of J.V.Wehausen, (Yeung,R.W, Hamilton,J.A.,J.OMAE,2003) for a spectral solution. This might be of interest to you. I do enjoy your very clear presentation. Thank you.

Answer(s)

Thank you for your comments, I will have a look at that paper.

The issue of how large the overlapping region should be is one which we need to look at more closely. The spatial convergence of the solution does not seem to be sensitive to the overlap size, but the stability of the solution in time is sensitive to both the size and placement of the overlap region.

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Q/A Sheet

Title of Abstract: Hybrid finite difference/BEM solutions of the elliptic mild slope equations

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

Question(s)

Name: R,Porter

Question(s):

1) In the elliptical shoal topography you appear to have infinite gradient, well outside the range of the MSE!
2) Where you have discontinuities in bed slope, you are forced as a Kinematically to introduce jump conditions to preserve continuity of mass flux. You may have issues with this in your examples.

Answer(s)

1) In the context of our FD solution, this kind of discontinuity is effectively smoothed out by the discretization and subsequent polynomial interpolation. It will be resolved more and more accurately as the grid is refined.
2) Good point. I think that we actually impose such a jump condition by using a second-order, centered FD scheme for $\frac{dh}{dx}$ & $\frac{d^2h}{dx^2}$ at a discontinuity, but it's something to look more carefully at.

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Q/A Sheet

Title of Abstract: A Note on Three-Dimensional Green-Naghdi Theory
Author(s): Zhao, B.B., Duan, W.Y. & Webster, W.C.

Question(s)

Name: Benlong Wang
Question(s):

How to choose shape function for moderate water wave, or in one case there are both shallow and deep water waves?

Answer(s)

I have introduced the "level" of G-N model. For shallow water waves, I choose the shape function as $\lambda_n(z)=Z^n$. But when we use higher level G-N model and $\lambda_n(z)=Z^n$, it also can be used to simulate moderate water waves. Such as Level Ⅶ G-N model, it can predict waves with kd<=26. So the level Ⅶ G-N model with $\lambda_n(z)=Z^n$ can be used in the case there are both shallow and deep water waves(kd<=26).

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Q/A Sheet

Title of Abstract: A Note on Three-Dimensional Green-Naghdi Theory
Author(s): Zhao, B.B., Duan, W.Y. & Webster, W.C.

Question(s)

Name: Harry Bingham
Question(s):

1) For the Boussinesq methods following the approach of Agnon et al.(1999) Madsen et al(2002,2003) there are no approximations to the FSBC.
2) It is interesting to compare the relative efficiency of Boussinesq-type and GN models of equivalent accuracy e.g. GN 7 vs. Madsen et al.(2002,2003) Pade model. A rough way to do this is to simply compare the number of non-zeros in the matrix in both cases.

Answer(s)

1) Thanks for your comments! I said there are approximations to the FSBC(Madsen 2002,2003). I mean the the perturbation method was used in the velocity approach. It is not exactly. Then put it into FSBC. The FSBC is also not met exactly. In GN approach, perturbation method is not used.
2) Good advice! But, I shall say that maybe the GN model need more computer time than Boussinesq model. Because there are more unknowns in GN model. But, there are 4^{th} and 5^{th} derivatives in Boussinesq model. In contrast, the highest derivatives in GN model is 3^{rd}-order. Maybe the accuracy of GN model is better than Boussinesq model.