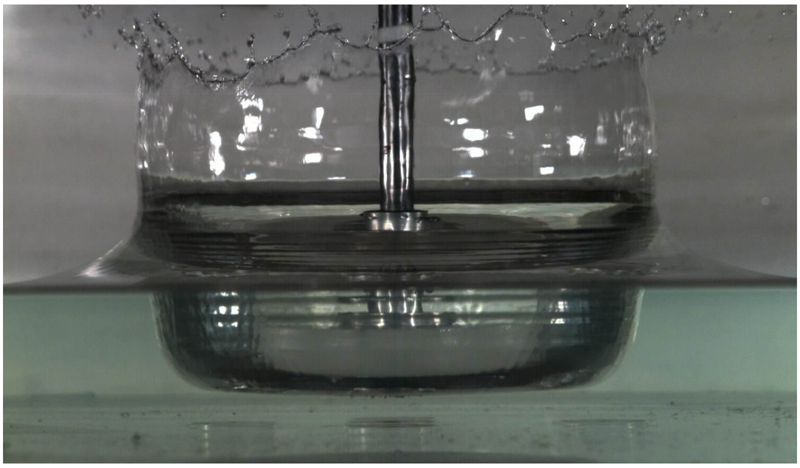
Questions & Answers

24th International Workshop on Water Waves and Floating Bodies



19 – 22 April 2009, Zelenogorsk, Russia

Editors:
Alexander Korobkin and Oleg Motygin

Foreword

In this volume the questions to the authors of the talks presented at the Workshop and the responses to the questions are collected. The papers in this volume are arranged in alphabetical order of the first author's name. This order is the same as on the web page www.iwwwfb.org but slightly different from that in the Proceedings.

The Q&A sheets were collected during the Workshop and shortly after it, scanned and assembled in one file. The organisers believed that this is a rational way to produce the Discussions in a reasonable time. There is an advantage of scanned Q&A sheets – a reader can study the handwriting of the participants of the Workshop and try to understand what kind of people they are. However, as usual, there is a disadvantage: some handwritten Q&A sheets are not easy to read. In any case, we are sure that this volume will be of at least historical value for the participants of future Workshops.

On behalf of the Organising Committee
Prof. A. Korobkin

24th International Workshop on Water Waves and Floating Bodies Question & Answers

CONTENTS

36. Malenica, S., Molin, B., Tuitman, J.T., Bigot, F., Senjanovic, I.
Some aspects of hydrostatic restoring for elastic bodies

No discussions

37. Meylan, M.H., Tomic, M.
Resonances and the approximation of wave forcing for elastic floating bodies

38. Molin, B., Lecuyer, B., Remy, F.
Hydrodynamic modeling of partial dikes

39. Motygin, O.V., McIver, P.
Trapping of gravity-capillary water waves by submerged obstacles

40. Noblesse, F., Delhommeau, G., Yang, C.
Bow waves of a family of fine ruled ship hulls with rake and flare

No discussions

41. Oh, S.H., Kwon, S.H., Chung, J.Y.
A close look at air pocket evolution in flat impact

No discussions

42. Peter, M.A., Meylan, M.H.
Water-wave scattering by vast fields of bodies such as ice floes in the Marginal Ice Zone

No discussions

50. Yoon, B.S., Semenov, Y.A.
Flow separation at the initial stage of the oblique water entry of a wedge

51. Zhao, B.B., Duan, W.Y., Chen, X.B., Webster, W.C.
Tsunamis simulations by using Green–Naghdi theory

No discussions

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Abrahamsen

Question from (your name) Korobkin

Question:

Is it possible to introduce an artificial damping into the problem of air cavity oscillations such that the numerical air pressure evolution fits the measured one?

Answer:

Such a model would be approximate in my view. The decay is much bigger initially than later. It is also stronger from Pmax to Pmin than Pmin to Pmax. (That is local Pmax /Pmin values)

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Abrahamsen

Question from (your name) R Rainey

~~***Question:***~~ ANSWER It is not obvious to me that the air pocket impact will yeild smaller structural response, compared to other types of impact. The ~~load~~ pressure inside the air pocket is uniform in space, and oscillatory in time. Such loading can cause large dynamical amplification of the structural ~~be~~ response, depending of the particular structure and pocket considered. In addition there are scaling ~~issues~~ problems for the a.p. Froude scaling does not apply. ~~Assuming athmospheric pressure in full scale, the pressure time history looks very different~~

~~***Answer:***~~ QUESTION The pressure time history looks very different than in full scale due to this (assuming athmospheric ullage pressure)

DOES THE ENTRAINED AIR NOT HELP TO REDUCE THE WAVE IMPACT LOADS, BY ABSORBING ENERGY THAT WOULD OTHERWISE GO INTO THE STRUCTURE? COULD YOU NOT DELIBERATELY ENGINEER A CHAMBER IN THE CORNER OF THE TANK, TO TRAP AIR AND REDUCE THE IMPACT LOADS MORE?

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Rein

Question from (your name) Campana

Question: In changing the Reynolds number in your simulations, do you change correspondingly the number of particles to capture different scales?

Answer:

Numerical simulation dump breaking problem was perform for various numbers of nodes and Reynolds number. At quantity of nodes greater then ≈2800 calculations visually and on numerical values of hydrodynamical loading do not differ among themselves. At identical quantity of nodes with increase in Reynolds number results of calculation differ slightly.

24th International Workshop Water Waves and Floating Bodies
Zelenogorsk, Russia

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Rein

Question from (your name) M W Dingemans

Question: A remark. A few month ago a large experiment of a dam break has been carried out, the dike of an existing polder (true scale) has been breached on purpose. Later measurements of this experiment may be used to test numerical codes against.

Answer:

Thank you for this offer. It is will be very interesting for me. And for our scientific scool, because a most of numerical methods does not allow doing of numerical simulation ~~for~~ after breaking.

24th IWWWFB, Zelenogorsk, RUSSIA, April 19-22, 2009

24th International Workshop Water Waves and Floating Bodies Zelenogorsk, Russia

Q/A sheet

Paper title & author(s) Avni, Toledo, Agnon

Question from (your name) Dingemans

Question: Two questions and one remark. 1) Why did you use a parabolisation of your mild-slope equation on the Ito shoal instead of the mse itself? 2) Berkhoff's shoal gives a more discrimation test. The measurements along the transects are given in my book.
3) The measurements on the waves over the bar are NOT Luth's measurements. These measurements were carried out apart from the project especially for me to be used in a European intercomparison study, by Klopman.
The measurements are distributed by me. A correct reference is

Answer: the Part note, which is distributed together with the measurements. In that note it is stated that the measurements are performed as those in Luth et al. (1994). The quote is:

"The set-up of the experiments is the same as the one reported in Luth et al. (1994).

1) The parabolisation of the CMSE was used in order to simplify the numerical calculation and also to show its applicability. It is plausible as the reflection from the shoal area is neglible. Still, even with the parabolic approximation the results show good agreements.

3) Thanks for the correction. The citation will be changed.

2) It will be interesting to check the CMSEs agreements to this experiment as well.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Bennetts

Question from (your name) Hara

Question:

Where does the wave energy come from?

Answer:

The polynya is located near an open ocean where large waves exist.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) , Bennetts

Question from (your name) Meylan

Question:

1) Have you solved for a circular polyna?

2) Do you think corner effects will be significant?

Answer:

1) Yes, analytically + computationally

2) Possibly. I think treating the corners correctly is important in respect to the convergence properties of the solution method. Whether the introduction of corners will have a strong influence on the 'global' scattering is debatable & will be investigated.

24[th] IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Bennetts

Question from (your name) Sturova

Question: Is it interesting for you to determine the resonance properties of the polynya? I think that you can calculate averaged over the period $\frac{2\pi}{\omega}$ the energy of surface waves in the polynya and integrate it over the area of the polynya. Then we can determine the frequency and the angle of incident waves for which the energy is maximal.

Answer: The presence of resonances (or near-resonances) in the model is interesting & important. Our investigation will look at responses both local to and far from the polynya. The benefit of our method is that we will be able to assess the role of the shape of the polynya on the resonance.

Thank you for your suggestion.

24[th] IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Bonnefoy

Question from (your name) Mei

Question: Can you comment whether it is practical or physical to allow strong nonlinearity in ice sheet without accounting for fracture?

Answer:

Fracture is certainly an important feature to take into account when dealing with practical ice sheet problems involving high amplitudes.
The authors have not looked however at the solid mechanics formulations needed to account for fracture.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Bonnefoy et. al.

Question from (your name) Yeung, R.W., Univ. of California, Berkeley.

Question: In 2000, we have published a closed-form solution of a moving ~~circular~~ circular pressure patch on a floating elastic plate (Yeung & Kim, J. Fluids & Structures). The wave patterns & asymptotics in large time were developed. While the work was intended for floating airport, we made successful comparisons with a skido moving on ice. The analytical solution will be useful for your high-order spectral solution as a measure on the effects of nonlinearity and as check. I hope that you will find it useful.

Answer:

The authors would like to thank the questioner for his reference. Such analytical results could indeed be used to check the HOS model we have developped either in its linear ($M=1$) or nonlinear ($M\neq1$) formulation.

24th IWWWFB, Zelenogorsk, RUSSIA, April 19-22, 2009

Q/A sheet

Paper title & author(s) Checherin

Question from (your name) Dobrokhotov

Question: Comment: We with my former student wrote several papers about the waves generated by point-like source moving over the uneven bottom and having the varying velocity. I suppose our asymptotic formulas could be used at least like a test for direct numerical analysis. These are the references.

Answer:

1.) S. Y. Dobrokhotov and P. N. Zhevandrov Maslov's operator method in problems of water waves generated by a source moving over uneven bottom (Izv. ANSSR, Fis. atm. i okeana, V. 21, N 7, 1985 p. 744-751; Eng transl; Atmosph. Oceanic Phys., V. 21, N12, 1985)

2.) S. Yu. Dobrokhotov, P. N. Zhevandrov, Nonstandard characteristics and Maslov's operational methods in linear problem of unsteady water waves, Funct. anal. i Prilog; V. 19. N 4, 1985, pp. 43-55 (Eng transl. Funct. Anal. Appl. V. 19. N4, 1985, pp. 285-295)

3.) P. N. Zhevandrov The Cauchy-Poisson Probl. for Gravity-Cappilary Waves on Water of Variable depth, Zh. Vychislit. Math. Mat. Fiz. 1987, V. 27 N 12 pp. 1834-1844

24th IWWWFB, Zelenogorsk, RUSSIA, April 19-22, 2009

Q/A Sheet

Paper title and authors **On the estimation of wash effect of ship waves system** by Chicherin, I., Pustoshny, A.

Question from C.C. Mei:

Question:

It is known that at the critical speed a ship in a channel generates unsteady waves upstream (solitons). Indeed the phenomenon is unsteady and must be solved as an initial-boundary value problem.

Answer:

Thanks for pointing out this reference. We plane to realize the unsteady task in the near future.

24th IWWWFB, Zelenogorsk, RUSSIA, April 19-22, 2009

Q/A Sheet

Paper title and authors **On the estimation of wash effect of ship waves system** by Chicherin, I., Pustoshny, A.

Question from J. N. Newman:

Question:

Please explain how you derive the combined free surface condition, and how you impose the condition of no waves upstream.

Answer:

Thanks for pointing out this reference. The combined free surface condition derived from a kinematics condition $\nabla\Phi\cdot\nabla\eta-\frac{\partial\Phi}{\partial x^3}=0$ and a dynamic condition $g\eta+\frac{1}{2}\left(\nabla\Phi\cdot\nabla\Phi-U_O^2\right)=0$, where $\eta=f\left(x^1,x^2\right)$ is the wave elevation, $\left(x^1,x^2,x^3\right)$ - coordinate system (Ox^1 is positive astern, Ox^2 is positive on star port and Ox^3 is positive in upward direction). For this purpose the nabla operator is applied to dynamic condition and the result is substituted into kinematics condition: $\frac{1}{2g}\nabla\Phi\cdot\underline{\nabla}(\nabla\Phi\cdot\nabla\Phi)+\frac{\partial\Phi}{\partial x^3}=0$ ($\underline{\nabla}=\frac{\partial}{\partial x^1}\vec{i}+\frac{\partial}{\partial x^2}\vec{j}$ because of η is a function of two coordinates).

In the term $\underline{\nabla}(\nabla\Phi\cdot\nabla\Phi)$ of the combined free surface condition the longitudinal derivative is updated by four-point upwind finite difference operator. It prevents propagation of any information to upstream and imposes the condition of no waves upstream.

24th Intl Worshop on Water Waves and Floating Bodies; 19-22 April 2009

Highly simplified Green function for steady flow about a ship

Gérard Delhommeau , Francis Noblesse , Chi Yang

Dr. Xiao-Bo Chen's Questions

1) What is the benefit of your approximation of the local component while a fast and more accurate approximation (cf, Newman) exists ?

2) Although simplified, the wave component contains always the highly-oscillatory and singular term for $Z \to 0$ and $Y \to 0$. The difficulty in the waterline integral remain the same. It is right ?

Authors' reply

We thank Dr. Chen for his questions.

With respect to the first question, we agree that fast and accurate approximations to the local flow component in the steady-ship-flow Green function have already been obtained by Prof. Newman, and several other authors. In fact, these previous approximations are identified as references [8–11] in our paper. However, the approximations given in [8–11] are based on polynomial expansions [8] or table interpolation [9-11] in several complementary contiguous regions of the flow domain, and therefore are significantly more complicated than the approximation (12) given in our paper. Specifically, the new approximation for the local flow component in G (and a related approximation for ∇G) given in our paper is valid within the whole flow domain (i.e. no subdivision of the flow domain into several complementary contiguous regions is required) and does not require storage of polynomial coefficients [8] or tabulated values [9–11] . Indeed, the approximation (12) in our paper is particularly simple. In spite of its remarkable simplicity, our calculations show that this approximation is sufficiently accurate for all practical purposes, mostly because the approximation is asymptotically correct in both the nearfield and the farfield, which yield dominant contributions. In view of this result, might one perhaps not turn the question around and ask about the benefits of subdividing the flow domain into several complementary contiguous regions, and of using high-order polynomial approximations within these subdomains, for the purpose of obtaining approximations that are more accurate than is really necessary?

Dr. Chen's second question is now considered. Steady potential flow about a ship involves gravity waves with wavelengths λ in the range $0 \leq \lambda \leq 2\pi V_s^2/g$ where V_s and g stand for the ship speed and the acceleration of gravity. However, the very short gravity waves in this spectrum are affected by surface tension and viscosity, and thus are physically unrealistic. It is also well known that the difficulties mentioned by Dr. Chen stem from the short waves $\lambda \to 0$. Thus, two options can be pursued. (i) An option is to seek to account for surface-tension and viscous effects on short waves. However, this approach is quite complex. In particular, it involves nontrivial (still not fully understood) fundamental issues with regard to the effect of surface tension and viscosity at the contact line between a ship hull and the free surface. The approach also requires an extremely fine hull discretization, since panel sizes evidently need to be commensurate with the wavelengths taken into account. The benefits of seeking to account for very short waves that have limited influence on flow variables, like the wave drag, of main practical interest are also arguable. (ii) Another, far simpler and more practical, option is to filter the short gravity waves $0 \leq \lambda \leq \lambda^*$ that are affected by surface tension and viscosity, and thus are physically unrealistic, and/or have limited practical effects. This option eliminates all the difficulties mentioned by Dr. Chen, and is believed to be reasonable and sufficient for practical purposes. We also note that no line integral around the ship waterline occurs within the thin-ship theory and the Neumann-Michell theory.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Dobrokhotov

Question from (your name) Kuznetsov

Question: How does the bottom obstacle reveal itself in terms your solution?

Answer:
The solution is localized in the neighbourhood of the ~~...~~ fronts. ~~...~~ These fronts are the circles in the case of a constant bottom, but they are presented by nonsmoth curves with turning and selfintersecting (focal) points. Our main pragmatic result is ~~the~~ possible simplest formulas for description of the solution in the neighborhood of the front including the turning (focal) points.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Duan, Zhang

Question from (your name) Bingham

Question: This seems like a very nice method. How large is the damping zone that you applied in your irregular wave example in terms of number of grid points?

Answer:

In fig 6 and fig.5, the panel number is 15 corresponding to the shorest wave length, say $\omega_{max} = 5.0$.

In fig.7 and fig 8, the number is 15 corresponding to $\omega_{max} = 8.0$.

and the length of damping zone is 5m, say two times of the wave length corresponding to $\omega = 5.0$.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Duan, Zhang

Question from (your name) Dingemans

Question: 1) What is the form of your dissipation region?
2) We have had good experience at Delft Hydraulics, with a dissipation region which goes to zero also at the backside, completed with a Sommerfeld condition for the longer waves; any reflection has to pass through the dissipation region again. Almost no reflection resulted

Answer:

1) the dissipation region length is l, and the damping coefficient $\nu(x)$ is given as formula (9) in the paper.

2) Your experience is similar as our paper, but the 2nd order MTF method is ~~more~~ useful than the Sommerfeld condion, In fact, 1st order MTF is just equal to the Sommerfeld condion.

24th International Workshop Water Waves and Floating Bodies Zelenogorsk, Russia

24th IWWWFB, Zelenogorsk, RUSSIA, April 19-22, 2009

Q/A sheet

Paper title & author(s) "Tank Wall Reflection..." Eatock Taylor et al

Question from (your name) J. N. NEWMAN

Question:

It would seem you could solve the circular tank problem directly in the time domain using the transient free surface Green function. Could you comment on this alternative?

Answer:

Yes indeed, this would be the elegant solution. I'm afraid I used a pragmatic approach. With the method presented here, it was a trivial task to incorporate the factor α in an existing linear axisymmetric program (effectively only one line of code needed changing). The resulting RAOs were then used in a very simple frequency to time domain (FFT) analysis. Though the approach lacks elegance, I think it still provides insight into the reflections of transient radiated waves in a tank.

24th IWWWFB, Zelenogorsk, RUSSIA, April 19-22, 2009

Q/A sheet

Paper title & author(s) Ermanyuk

Question from (your name) Korobkin

Question:

Did you change the ~~d~~ mass of the disk?

Answer:

The mass of the disks in all experiments was kept Konstant. However, since the depth was varied, the ratio of added mass to the mass of the disks was also varied in a broad range. In the major part of experiments the added mass was large compared to the mass of the disks

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Evans & Peter

Question from (your name) Mike Meylan.

Question: 1) How does the R-C include singularity explicitly?

2) Do you need to calculate the roots for the R-C method.

3) Can you use the Cauchy integral method for other W-H problems in linear water waves and would this be advantageous?

Answer:

1) First reduce the two coupled system of equations for say A_m and B_m to a single infinite system for, say A_m. Then in the case of the infinite plate, the solution can be determined analytically under the assumption that $A_m = O(m^{-\frac{1}{2}})$ $m \to \infty$ which is equivalent to requiring a square root singularity in the velocity near the sharp edge.

2) The finite plate does need knowledge of all the roots but an accurate soln. of the new infinite system, with again, $A_m^{finite} = O(m^{-\frac{3}{2}})$, can be determined as a modification to the infinite plate. This solution depends on new terms B_n which satisfy an l_2 infinite system and which are rapidly convergent so that even the B_0 term gives good results. PTO

3) Yes the trick of using the Cauchy formula to split the $K(s)$ term can be used in other problems. Note that it only works if you want to find out R or properties of the solution in $x<0$. If you want to find T or properties in $x>0$ you need to know the roots l_m of the dispersion relation.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) R. Rainey

Question from (your name) D. Evans

Question: I wonder if it is possible to apply slender-body theory or the parabolic wave approximation as a compromise between strip theory and a full diffraction program?

Answer: Slender-body theory, indeed — I understand Odd Faltinsen's PhD covered the necessary extension to compute the attenuation of water wave amplitude along the length of the device, by means of 3-D point sources located on the axis.

I'm not sure the parabolic wave approximation will work though — the device does not produce large velocity gradients in a radial direction, because it ~~moves~~ follows ~~vertically like~~ the water surface.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

24th International Workshop Water Waves and Floating Bodies
Zelenogorsk, Russia

Q/A sheet

Paper title & author(s) R. Rainey

Question from (your name) J. Grue

Question: Please comment on how much wave power the device will produce, and if or not this is superior as compared to alternative devices / converters!

Answer: The power is given in our paper at the 22nd IWWWFB — it is comparable to a "Pelamis" device of the same length and diameter. As one might expect — the variation in immersed cross-sectional area is similar, but produced by quite different means.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Ferreira, M.D., Newman, J.N.

Question from (your name) H. Bingham

Question:

Congratulations on obtaining quite reasonable results which show that this problem can be solved using a traditional radiation/diffraction code. I have two technical questions: 1) Did you use high- or low-order panels? 2) How expensive is the analysis compared to a flat bottom one?

Answer:

In the results shown we used higher-order panels, with B-spline represenations of the potential. The geometry of the ship is represented by a MultiSurf model and the geometry of the bottom is represented by quadrilateral patches. The simulation times depend on the geometry of each bottom analyzed, since the configurations that were defined over a smaller area required fewer control points to achieve converged results. The run with only the ship represented (constant-depth bottom case) took on average 37 seconds per frequency, with the bottom 3D6 took 46 minutes, and with the bottom 3D5 took 60 minutes. We used a Xeon computer (quadcore) with 2.33GHz and 4GB of RAM.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Ferreira, M.D., Newman, J.N.

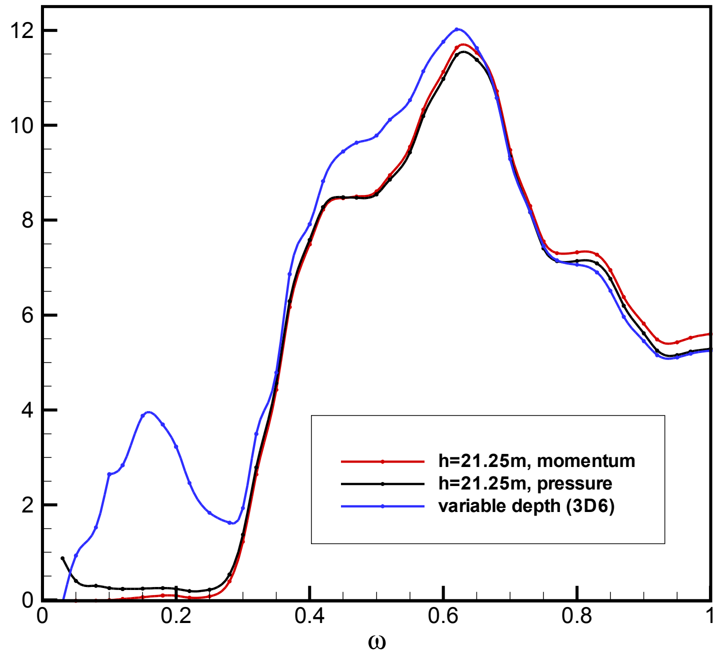
Question from (your name) B. Molin

Question:

I am curious to see how the drift forces react to the different bathymetry idealizations.

Answer:

This is an interesting question, since the most important practical issue may be the low-frequency second-order forces. We have made some computations of the mean horizontal drift force on the ship, for the constant-depth case and for the bottom configuration 3D5. The results are shown in the Figure below. The drift forces are similar for frequencies above 0.3 rad/sec, but for lower frequencies the force with the sloping bottom is substantially greater than for the constant-depth case. This is not too surprising, since the diffraction and refraction effects are more significant at the lower frequencies.



24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Ferreira, M.D., Newman, J.N.

Question from (your name) R. Rainey

Question:

Your longer waves (0.1 RAD/S) are quite close to the simpler case of tidal waves, which are discussed in Lamb (1932). In Art 186(2) he gives a more exact solution for a sloping bottom, when the change is not gradual. The Bessel functions become Hankel functions for your case of a progressive wave -- Interestingly, the horizontal velocity is no longer in phase with the water surface elevation. This is an interesting cross-check on your results, perhaps?

Answer:

Thanks for pointing out this reference. The solution in Lamb is quite different from Green's law, with complete reflection and no singularity at the point where the product of width and depth is zero. Your suggestion to replace the Bessel function by the corresponding Hankel function would fix this, but the singularity would be logarithmic whereas in Green's law it is a fractional power. The relation between these two approximations is not evident, but our results indicate that Green's law is quite useful, at least for the bottom configurations we have studied.

24th IWWWFB, Zelenogorsk, RUSSIA, April 19-22, 2009

Q/A sheet

Paper title & author(s)

Greco, M., Bouscasse, B., Colicchio, G., Lugni, C. Weakly-nonlinear seakeeping model: regular/irregular wave interaction with a ship without/with forward speed

Question from (your name) **Duan, W.Y.**

Question:

In the experiment study of wave added resistance how about the influence of surge motion restricted?

Answer:

We can expect that surge motion would affect the added wave resistance.
In our study it was restrained in connection with the aims of the investigation.
Our study mainly focused on the Water-On-Deck problem,
in this framework top view of the deck was obtained using two cameras attached to the carriage and, to ensure a proper visualization of the deck during the whole wave-body interaction, the surge motion was restrained.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) J. Grue "Modifications to the interfacial wave..."

Question from (your name) H. B. Bingham

Question:

Your model will provide a description of the flow in the vicinity of the submerged pipeline. How do you propose to use this for predicting the loading and motions?

Answer: Internal wave - bottom interaction analysis, which here is fully nonlinear and at the same time fully dispersive, is intended for definition of the input wave field. This typically involves wavelengths starting with the tide, breaking down to the internal tide, and then to shorter waves riding on bores. Such energy cascades are typical in the ocean. The flow is typically nonlinear. The analysis is used for interpretation of the internal wave spectrum on a site. The flow structure interaction is very complicated. It involves the VIV problem, and a Morison type load model may not be sufficient. A more involved computation will in general be required (CFD).

24th International Workshop Water Waves and Floating Bodies
Zelenogorsk, Russia

Q/A sheet

Paper title & author(s) Modifications to the interfacial wavefield... (J. Grue)

Question from (your name) R. EATOCK TAYLOR (University of Oxford)

Question:

The problem you are solving looks very difficult. How would you briefly characterise the circumstances under which the nonlinear effects are important?

Answer:

Both nonlinear and dispersive effects are important in modeling internal wave transformation and the related energy cascades taking place in the ocean. The interaction with bottom is essential in this transformation, and in the present contribution, the effect of a rough bottom has been included for interfacial fully nonlinear/dispersive motion. Internal motion is usually driven by the tide or by weather systems. Scales involve motion from the order of 1000 km down to about 500-1000 m. An example of energy transformation in a single layer fluid has been recently provided by J. Grue et al. (2008), J. Geophys. Res. Vol 113, C05008, doi: 10.1029/2007JC004343

24[th] IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Halbout

Question from (your name) Korobkin

Question:

Is it possible to measure stresses in the balloone?

Answer:

- We thought to stick one or several "extensometric" gauge(s) (as the one used during tensile tests) on the balloon during the drop tests.
- Implied difficulties have to be anticipated: wire, water proof, adapted gauge and glue...

24[th] IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Halbout

Question from (your name) Rainey

Question: SURELY THE MECHAICAL MASS M ATTACHED TO THE BALOON [E.G. A HELICOPTER] IS AN IMPORTANT PARAMETER — IT CONTROLS THE INITIAL KINETIC ENERGY GOING IN TO THE SYSTEM. DO YOU AGREE? MOST OF YOUR RESULTS ARE FOR VERY SMALL M.

Answer:

I agree! One of the final aim of our work is to get the hydrodynamic effort in the anchorings of the inflated floatability systems.

To measure the consequences of the mass variation is a perspective of the next experimental campaign. It's difficult to include in the set-up such a variation without additional interactions.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Hara, Kukulka

Question from (your name) Grue

Question: Would you comment on the turbulence level in the air for old ~~winds~~ seas (i.e. swell – low wind case)? What has been done for that case? Are references available?

Answer:

For old seas with swell, the turbulence is affected in a very different way. For example an elevated wind jet can be observed over well developed swell.

See Sullivan et al. J. Atmos Sci. 65(3) pp. 1225

24[th] IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Hara, Kukulka

Question from (your name) J. N. Newman

Question:

If "wave age" is defined as the ratio of phase velocity to wind speed I would expect this to be less than one. Please explain this.

Answer:

Yes. we define the wave age using the wind friction velocity, which is about 1/30 of the wind speed.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Hara, Kukulka

Question from (your name) R. Rainey

Question: As far as damage to ships and structures are concerned, it is LARGE SCALE breaking which is important. I did investigate this carefully some years ago, by looking at particle trajectories in linear theory, and concluded that the significant waveheight had to be more than 0.05 times the wavelength at the peak frequency of the spectrum, for large-scale breaking to occur. See my paper in the Newman honorary volume of J. Eng. Maths (2007). Does this agree with your findings?

Answer:

Yes, qualitatively. Our theory does not address detailed breaking processes, which may be different between dominant (large) scales & smaller scales. These are important issues to be addressed in the future.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

24th International Workshop Water Waves and Floating Bodies
Zelenogorsk, Russia

Q/A sheet

Paper title & author(s) Iafrati

Question from (your name) Hara

Question:

* What is the physical ~~domain~~ size of the gravity wave?
* Can you conduct a similar calculation with a shorter wave to improve the accuracy?

Answer:

→ wavelength = 0.3 m

→ It is possible. However, shorter wave breaking produces less air entrainment because the surface tension effect increases.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Joncquez, Bingham, Andersen

Question from (your name) J. N Newman

Question:

It is very nice to see good agreement with experiments, since this was not the case with old work based on the thin-ship approximation. Do you expect the results will be equally good at higher Froude numbers?

Answer:

I did simulations with Froude number up to 0.4. The results I was getting were also good. However for very high Froude number I am expecting the Double-body flow linearization to give wrong results as this linearization will not be valid anymore.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Khabakhpasheva and Korobkin

Question from (your name) Compressive jet impact on corrugated plate
M. W. Dingemans

Question: Your set up makes me think of experiments and theory formin in 1978-1982 in the Netherlands. There it concerned wave slamming on dikes. A movie picture has been made of experiments in a flume; a clear oscillation of the entrapped air could be seen; the effect is similar to the "breathing" of a cavitation bubble, according to Prosperetti. Results are published by Jansen in Coastal Engineering in 1982. In 1981 a paper was published in Wave Motion on the impinging of a jet on a vertical wall. The analysis was non-linear. The result was that the reflection of the jet had a phase shift, it took sometime, as when a tennis ball hits the wall.

Answer:

Thank you for these references. We should check our analysis and results with the papers published in Coastal Engineering and Wave Motion.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) KOROBKNIN

Question from (your name) David Evans

Question: A complete formulation of the problem requires a specification of the singularity at the edge, to ensure a unique solution. If this is not done, what guarantee do you have that the truncated 5-mode numerical approximation approaches the correct answer?

Answer:

We agree that deeper analysis is required to account properly for the singularity of the solution at the edge. In our analysis we assumed that the velocity of the flow is square-root singular at the edge.

24th International Workshop on Water Waves and Floating Bodies
Zelenogorsk, Russia

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) COMPRESSIBLE JET IMPACT ONTO A CORRUGATED PLATE (Korobkin)

Question from (your name) RICHARD PORTER

Question:

In your problem, you use domain decomposition with three regions meeting at a single point. Is there a singularity at that point? If so, are the 5 or 10 normal modes enough to resolve that singularity?

Answer:

It was found, that for the correct determination of the velocity of the interfaces we need to keep more than 15 modes for each region, 5 or 10 modes are not enough to resolve the singularity. However, they are enough in terms of convergence of the elastic plate response, because these are global characteristics of the hydrodynamic pressure which matter for the plate response (deflections and stresses).

24th International Workshop Water Waves and Floating Bodies, Zelenogorsk, Russia

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Kuznetsov

Question from (your name) D. Evans

Question: In two dimensions, what can you say about the case when the left-hand wall faces inwards and the right-hand wall faces outwards so that there is no symmetry?

Answer:

I conjecture that the free-surface profile has a maximum on its right-hand side, but attained at an inner point; however, there is no inner minimum on the left.

Thus $u(x, 0)$ has only one inner extremum.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

24th International Workshop Water Waves and Floating Bodies
Zelenogorsk, Russia

Q/A sheet

Paper title & author(s) F. Lin

Question from (your name) X.B. Chen

Question:

About the comparison of vertical load (F_z), are you sure that CFD results obtained by excluding the part of inertia force which is not included in potential method? Or more comments on the discrepancy ~~of F_z comparison~~?

Answer:

In the CFD computation, the amplitude of the force acting on the tank boundary is computed after removing the average value of the force.

FLin

24th International Workshop on Water Waves and Floating Bodies, Zelenogorsk, Russia

24[th] IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) F. Liu

Question from (your name) Newman

Question:

When you solve for the radiation potentials in the tanks, do you use the same solution method as for the exterior flow (as in my approach) or do you solve for the tank potentials separately, if so what is the method?

Answer:

The radiation potentials of the tank flow are solved for unit slip motion of all six degrees of freedom, seperately. We say seperately because that the inner flow potential is determined by the boundary radiation condition on wetted tank boundary only. Like:

$$\Phi^{tank}(\vec{r}) = -i\omega_e \sum_{j=1}^{6} \xi_j \phi_j$$

$$\begin{cases} \nabla^2 \phi_j(r) = 0 & \text{in } \Omega^{tank} \\ \dfrac{\partial \phi_j}{\partial n} = n_j & \text{on wetted tank boundary} \\ \dfrac{\partial \phi_j}{\partial z} - \dfrac{\omega_e^2}{g}(1+i\gamma)\phi_j = \begin{cases} 0 & j=1,2,6 \\ n_j & j=3,4,5 \end{cases} & \text{on liquid surface in tank} \end{cases}$$

($\gamma \equiv$ artificial damping)

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Meylan

Question from (your name) Eatock Taylor

Question:

1. How is the reference frequency parameter α_n defined?
2. Would it be possible to improve the approximation (or perhaps just the robustness of the procedure) by separating out the added mass at infinity, $A(\infty)$, and including it with the term M?

Answer: α_n is an estimate of the real part of the complex resonance. We can solve the equation iteratively and find the ~~closest real~~ α_n which has exactly ~~t~~ real part equal to the real part of the estimate of the resonance

24th IWWWFB, Zelenogorsk, RUSSIA, April 19-22, 2009

Q/A sheet

Paper title & author(s) Meylan

Question from (your name) Korobkin

Question:

We can use the complex modes, you calculated, for high-frequency excitations of a floating elastic structure. What could be the best technique to deal with low-frequency excitations?

Answer:

This is an open question. We know that there is a contribution from the integral along the imaginary axis. There may be methods to estimate this effectively but they are not know (to the best of my knowledge)

24th IWWWFB, Zelenogorsk, RUSSIA, April 19-22, 2009

Q/A sheet

Paper title & author(s) Meylan

Question from (your name) Porter

Question: You have an infinite sequence of poles which tend towards the real axis as the real frequency increases. Is it a valid approximation to ignore all but the first 6 or 10 such complex frequencies?

Answer: The higher frequncies are not important for the low frequncy response, but will become importat if the frequncy is increased.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) B. MOLIN

Question from (your name) D. V. EVANS

Question: A comment about when zeroes of transmission occur. It was shown in a paper in J. Inst. Math Applic (Evans & Morris) 1972 ~~that~~ 2 equal-sized vertical barriers exhibited zeroes of transmission. Since then others have extended the geometry to unequal barriers. See for example 'Math. Techniques in Water Waves' ed. by B. Mandal (1997). See also R. Porter Ph.D thesis Univ. of Bristol (1995)

Answer:

It appears ~~they~~ it does not occur for two barriers one through the surface and the other bottom-mounted but submerged, or for two submerged barriers.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Molin et. al.

Question from (your name) John Grue

Question: Practice from laboratory experiments shows that a set of (many) porous or slotted walls are required for a reasonable damping to be present. The separation doesn't need to be great. Also a zig-zag form when viewed from above may be relevant. Comment?

Answer:

No comment

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) BERNARD MOLIN / HYDRODYNAMIC MODELLING OF PARTIAL DIKES.

Question from (your name) RICHARD PORTER.

Question: Zeros of transmission are relatively rare in water wave problems and normally there is a simple explanation of their existence. Do you have a feeling to what mechanism gives rise to zeros of transmission in this problem?

Answer: The zero-transmission is associated with some resonant sloshing motion in the "buckets" - Why it may completely annihilate the transmission is a kind of mystery to me - I will follow your suggestion and try and have a look at the streamline -

NOTE ADDED AFTER QUESTION: In Porter (2002, Proceedings of Royal Society of London, A), I showed a long submerged thin ellipse, close to the free surface has zeros of reflection. The streamlines (not shown in that paper) resembled a sloshing motion above the ellipse as though confined by a wall attached from the ellipse to the surface. This is reminiscent of your configuration.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Motygin

Question from (your name) Evans

Question: The simplest example of trapped modes in 3-D is the oscillation between two ~~concentric~~ vertical partially-submerged concentric cylinders. They do not exist if the cylinders are bottom-mounted and do not intersect the surface. Have you any idea how to extend your method to consider this case when $s \neq 0$ and to include the angle of contact?

Answer: We are also interested in investigation of the case of surface-piercing bodies. However, this case seems to be much more difficult as due to change of properties of integral equations, which are used in our method, and because of our incomplete understanding of what to do at the contact points when $s \neq 0$. Presumably, it is a very interesting direction of further research, thank you very much for the question.

Q/A sheet

Paper title & author(s) Motygin

Question from (your name) Meylan

Question: 1) Has your method found new families of trapped modes

Answer: Thank you for the question. Yes, we have found new families of trapped modes. First, we have found good agreement when testing our results against those obtained by Porter (2002) for the pure gravity case. For this case we have also found trapped modes for new geometries. For the gravity-capillary case methods for finding trapped modes for given geometry were unknown (examples of trapped modes were only obtained by the inverse method - Harter et al. 2008). So, the examples of trapped modes that we found in this work are new.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Porter & Evans

Question from (your name) Korobkin

Question:

It is expected that your approximation works better for water of finite depth than for infinite depth of water. Is this true?

Answer:

The results for circular cylinders were computed for infinite depth & rectangular cylinders for finite depth. I think you are right that finite depth should give better results than infinite depth as the far-field influence of bodies have a different asymptotic form (exponential versus algebraic decay)

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Porter & Evans

Question from (your name) MIKE MEYLAN.

Question: 1) What method did you use to solve for the added mass etc for your body geometries?, i.e. eigenfunction matching, multipoles etc

Answer: For cylinders in infinite depth, we use multipole potentials, as described in Ursell's work on the motion of floating bodies and reworked by Martin & Dixon in 1983. For rectangular cylinders, we used domain decomposition & mode matching in finite depth (specifically by formulating integral equations and building in singularities at the corners). I should emphasise that the problems of cylinders next to walls requires a large amount of analytical work to implement these methods.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Porter + Evans

Question from (your name) Newman

Question:

Makoto Ohkusu studied multiple bodies using what I believe was a similar approach, both 2D and 3D (multiple cylinders), in the 1970's. One reference is the proceedings of BOSS 76 in Trondheim. There may be later references on the IWWWFB web site.

Answer:

This is very useful information.

24th International Workshop Water Waves and Floating Bodies
Zelenogorsk, Russia

24^th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Sturova

Question from (your name) Williams

Question: Have you considered, or do you plan to consider, non-linear plate models such as in the previous talk (Bonnefoy & Meylan) or ~~the~~ others such as in Hegarty & Squire?

Answer: No, I do not plan to consider non-linear plate models. But my colleagues from Institute of Computational Technologies can do it using finite difference method. At present they considered Green-Naghdi model for fluid motion.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Ten Korobkin

Question from (your name) C.C. Mei

Question: You used linearized wave equations for aerated water. Therefore it can only deal with weak pressure. ~~Can~~ Is the effect of aeration very weak compared with impact air pockets?

Answer: As for the first step of our approach to solve the problem of aerated fluid impact onto elastic structure, indeed we used linearized wave equation. We assumed that the time of the impact is too short, so the changes (sound speed, density, geometry of the mixture area) are approximately time indipendent during the initial stage.

To answer to question about, the further research must be done.

During the short time interval, the gas concentration is weakly depending on time, ~~so we can assume~~ The sound speed in the mixture domain ~~is~~ depends on the pressure inside, thus, if this pressure comparable with initial impact pressure, then the change of sound speed ~~dp~~ with respect to time (pressure is time varying function) should be taken into acount. In this case the wave equation becomes non-linear.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s)_________________Westphalen_______________________

Question from ________________________Grue____________________________

Question: At the intersection between the free surface and the geometry you will in your application experience breaking; it may be difficult/impossible to represent that in refined computations. Please comment.
Please also comment on the need for computational resources in more realistic situations than the ones you consider – I admire what you have achieved so far.

Answer: We hope to resolve the jet by using appropriate meshes. Wave breaking can be simulated using this type of air-water VoF method.
The simulations presented contained 820000 cells and were done with a timestep of 0.0005s. On average three inner iterations for the hydrodynamics were solved including turbulence. Additionally one iteration for the mesh motion was needed. With this setup the solver needed ~28 h/s on 16 CPUs (2.5 GHz and 2 GB RAM each). For these computations there is much potential to reduce the computation time, e.g. by calculating only half or even a quarter of the domain, which was not the aim though.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s)_________________Westphalen_______________________

Question from ________________________Meylan__________________________

Question:

1. Have you compared your solution with linear and second order potential flow solution?
2. Why do you not exploit the axisymmetry in your problem?

Answer:

1) This is presented in the following references:

Drake, K., Eatock Taylor, R., Taylor, P. and Bai, W. (2008), On the hydrodynamics of bobbing cones, submitted for publication.

Eatock Taylor, R., Taylor, P.H., Drake, K.R. (2009) Tank wall reflections in transient testing, 24th IWWWFB, Zelenogorsk, Russia

2) The aim is to calculate the full 6-degree of freedom motions and forces on a floating offshore WEC and this is a test case in development of that aim.

24[th] IWWWFB, Zelenogorsk, RUSSIA, April 19-22, 2009

Q/A sheet

Paper title & author(s) Westphalen

Question from (your name) Toledo

Question:

Remark 1: Solving the axi-symetric problem should give an easy check wether the problem comes from the mesh before making expansive numerical computation.

Remark 2: Making the grid finer near the boundary can be less accurate due to the

Answer:

truncation errors in computer precision, so it should be checked during the calculation

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

24th International Workshop Water Waves and Floating Bodies
Zelenogorsk, Russia

Q/A sheet

Paper title & author(s) Westphalen

Question from (your name) Yoon

Question:

<comment>

Basically, potential approch is quite enough in dealing with wave problems including floating body radiation because viscous effect is thought to be negligible compared to pressure and gravity.

In that sense, if the premitive variables approach (CFD)

Answer:

is once employed to solve the floating body forced motion problem, then viscous effect (such as skin friction on the body surface or vorticity, turbulence etc.) can be investigated additively. (Original purpose of CFD is to simulate viscous flow) To do that, coarse grid system used in the calculation is not enough. At least 2~3 grid points must be located in the boundary layer (2~3 grid points in viscous sublayer for turbulent flow). Finer grid system is recommended in the vicinity of the body surface. If so, much more useful informations can be obtained.

24[th] IWWWFB, Zelenogorsk, RUSSIA, April 19-22, 2009

Q/A sheet

Paper title & author(s) G.D. Xu

Question from (your name) Tim Williams

Question: 1. How much difference would including surface tension make?

2. How much difference does gravity make? (For example, gravity waves could be produced that could change the flow)

Answer:

1. We ignore the free surface tension in the simulation. It's said that the influence of surface tension could be very small in high speed impact problem.

2. In high speed impact problem, gravity can be ignored for the duration is short and the velocity is high.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Time domain simulation --, G.D. Xu et al.

Question from (your name) Yoon B.S.

Question:

What is the minimum deadrise angle of a wedge, which is calculable by your time domain calculation algorithm?

Answer:

I test the deadrise angle about 10°, It become difficult when the deadrise angle become smaller, smoothing is necessary on the free surface. I can not tell the exact deadrise angle as the minimum deadrise angle. I need to test before I give a conclusion.

24[th] IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Semenov

Question from (your name) Korobkin

Question:

The hydrodynamic pressure at the wedge corner point is $-\infty$. What could be an interpretation of this singularity?

Answer: Any corner point is a limit of the rounded edge, when the radius of ~~the~~ rounding tends to zero. For ~~the~~ rounded edges the velocity and pressure are finite, so there ~~are~~ is no singularity. Thus, ~~the interpretation of~~ the singularity at ~~a~~ the corner point can be interpretated as a result of replacing of the real rounded edge~~s~~ by the ideal sharp corner edge~~s~~.

24th IWWWFB, Zelenogorsk, RUSSIA,
April 19-22, 2009

Q/A sheet

Paper title & author(s) Semenov

Question from (your name) G.D. Xu

Question: 1. Did you check the mass conservation?

2. How you deal with the water jet? (solve from the analytical solution or cut it)

3. The similarity solutions give in the Fig.2 in your abstract seem strange and interesting, the pressure goes up and decrease near the stagnation point on the right of the wedge surface. (The results of my iteration solution and time domain solution do not present this specific behavior)

Answer:

1. No, it is not necessary for the case of using analytical functions. Any analytical function satisfies mass conservation condition. We have paid attention to the accuracy of solving the integro-differential equations. The verifications of the method and the calculating procedure has been done comparing the obtained results with those available in literature. The most sensitive parameter to the accuracy of calculations is the contact angle of the tip jet. We obtained 3-4 figures in the numbers of the contact angle, which are the same as predicted by Keady and Fraenkel.

2. The tip jet is the part of the analytical solution of the problem.

3. The analysis of such behaviour of the pressure distribution has been presented in the papers Semenov and Iafrati and Faltinsen and Semenov (please find them in references of the abstract).