EU-EID EAGRE workshop/meeting 22-12-2022 at MARIN

Meeting: Thursday 22-12-2022 at 11:00-14:00 Dutch time
Where: at MARIN

Attendance —all at MARIN:

- Yang Lu and Wajiha Rehman (UoL at MARIN);
- Onno Bokhove (UoL, visiting)
- Tim Bunnik (MARIN)
- **Minutes in bold or blue with 22-12-2022 date.**
- *Old remarks in italics.*

Agenda

1. Approval agenda —*Done.*
2. Short introduction —***if needed. Not needed***
3. Status update project management:
   a) arrival of ESRs at MARIN –health-insurance update
   03-08-2022: Yes, University of Leeds still has not arranged the insurance of the ESRs.

   b) 22-12-2022: Computer/labtop purchase cf Action 03082022-1 Yang: Contact IT to raise an invoice 8 cores; machine maintained by IT preferably.
   - No mac support at MARIN.
   - Internet link broken. Action to resolve: Onno. Python version. Marcus-4. Bulent knows.
   - Linux machine an option.
   - MARIN cluster-3; cores; not in parallel.
   - HPC-Leeds; Yang talk Mark Walkey/Peter Jimack; set-up together. Onno has emailed Mark Walkley from UoL who also uses Firedrake.
   - Reconsidering options besides HPC, on acquiring machine; Onno has emailed Bulent Duz from MARIN.

4. Report Wajiha on progress (overview, paper draft, next steps).
   03-08-2022: For the paper, tests completed:
   - VP linear shallow water LSWE SE, with (compared with VP-NLSWE and PF-code Yang) and without (standing waves with exact)
   - VP nonlinear shallow water NLSWE SE with wave maker (VP-LSWE and PF-code Yang and without (pending).
   - Busy: Potential flow piston wave maker VP SE, from wave flap limit.
   - Step-0: Pending SV needed. Sort out for harmonic oscillator VP and work backwards and/or work from Elena's or Anna's/Onno's results.
   - Step-1: 3.3.28d check with JCP paper VP equation (8) after substitutions for W=R.
   - Step-2 Use LSWE in 2D to sort out discretising Lagrange in y-direction and CG in x-direction (goal to do that later in z and x directions for potential flow). With Firedrake team.
   - Step-3 When done, figure out how to split phi into psi (with L1=Lagrange-1 polynomial) and varphi (with rest of Lagrange polynomials). See pages 105-106 (top and bottom).
   - Step-4 Deal with fact that h and psi are x-dependent in an x-z dependent domain:

extension in Firedrake to do that (aks Koji, teams meeting and/or go to London).
- Step-5: See if you can avoid substituting 3.3.28a,b,c in implementation
- Step-6: Implement all Steps 2-5 combined and test with one of Yang's tests. Hopefully Yang can be soundboard.
- Other Step: strip off beam for Tomasz linear beam-potential-flow test; see whether you can derive his SE-weak forms from a VP; does one need to explicitly split phi=phif+varphi or not.
03-08-2022: Paper writing set-up: in progress with Mark.
03-08-2022: Do discuss with Yang as soundboard.
03-08-2022: Find the 3D Bridges reference in book.

b) Update/news 22-12-2022 on experiments:
- Finished; more tests done then expected. 3g.
- Paper in progress; see OL.
- GitHub to be made.
- 30 to 34 tests.
- Official MARIN photographer.
- Bandpass filter in time. 6 point measurements vs time. Both zero. Hammer.

c) Update/news 22-12-2022:
- restructure.
- Linear potential flow works in Firedrake; from VP; from nonlinear VP.
- Linear PF: exact solution comparison.
- Steps 1, 2 combined; steps 2 and 3 combination likely not possible in Firedrake.

5. Report Yang on progress (conference, archived paper, paper submission, next steps).

a) *03-08-2022: Shortcrested waves situation: 1D Soliton in solid-wall domain works.*
2 and 3 soliton: visualisations in Python made for understanding.
Novel a,b,c 3-soliton case sorted out with Y-divergence (Anna, Mark and Onno) for use in testing.
To do-1: periodic domain in Firedrake in 1D, then 1,2,3- soliton tests;
To do-2: higher amplitude and include wave breaking.

03-08-2022: Quick check whether soliton-collision against wall In Bokhove and Kalogirou 2016 is reproduced (visual check suffice but you can run BLE-code form Surfs-Up GitHub site).

03-08-2022: At the same continue with periodic-boundary in the x-direction.

03-08-2022: Periodic case Step-1: work out split of phi=U0 x+phitilde; start from VP8 make this substitution; then extra terms will show; do the rest as well.
Note Onno 22-12-2022: Incorrect. It turns out Junho did something else, without writing it down clearly in the Water Waves' paper; 42 and 44 are not compatible. November/`December 2022 update. It may now have been sorted by Junho/Onno, which will only be clear if the rational arguments are clearly given in clear prose plus the derivations and plots.

03-08-2022: Periodic case Step-2: test periodic case with R=0. You can first do 2D LSWE with periodic in x and fixed in y. Firedrake.

PS 04-08-2022:
Probably wise for a quad 2D mesh of 2x3 elements, say, (say 3 elements in x and 2 elements in z direction) by hand:
a) to write down node, mesh and element numbering and connectivity table between nodes etc for solid-wall case in x and at z=0 [so given element number and local node number provide the global node numbers]; and,
b) do the same for x-periodic case;
this is order to understand at a low level that
dealing with periodic bc's is a mesh-connectivity issue dealt with at mesh level.
Note sure whether Yang at all understood that on 03-080-2022.
Firedrake does this meshing for the periodic case automatically for you. Send me the two mesh-tables and sketches and I can comment, please.
b) Update/news 22-12-2022:
- Test case SP2. Phi = c0+U0*x+tildephi; phi = c0(y)+U0(y)*x+tildephi; phi = c0(y)+U0(y)*x+tildephi. New updates/progress of last few weeks via Junho and Onno.
- SP1 is fine; artificial or not.
- SP2 not yet implemented.
- TC2 in paper: Lagrange and Chebychev ; HPC-Leeds? Onno : has asked Mark Walkley.
- HPC-Leeds; argue for six users? Onno has emailed Mark alkley, see above.

6. Pending deliverables, e.g.:
- ESR1 delivery of package & Firedrake TC1-TC4, nearly complete (pending JCP submission, etc.). Completed; submission pending (this week); Eartharxiv report online since 15-05-2022. **22-12-2012 note: Done. Paper rejected for major revisions (Tests TC2 and new test TC5 to be added).**
* **Action 27062022-1 Yang**: submit to JCP asap/this week. **22-12-2012 note: Done.**
03-08-2022: ***Done late June: paper has been submitted to JCP.*** **22-12-2012 note: Done.**
- ESR1 short-crested waves TC5-TC6 & *collaboration* with Dr Junho Choi.
03-08-2022: In progress.
* **Actions 27062022-2 Yang**: a) Yang and Junho are implementing matters and comparing their progress; and, b) put potential visit Junho Choi (South Korea) to MARIN & Leeds on the agenda, including arranging matters properly within MARIN & Leeds.
Note 22-12-2022: not done in progress.
03-08-2022: ***See above report from Yang. Visit Junho is in preparation after there are some reliable results. 22-12-2022: unclear?***
- ESR1/ESR2 wave breaking
Discussions on the Wang et al. parameterisation.
* ***Action 27062022-3 Yang****: Implement and test parameterisation of Wang et al. since it is needed for the higher-amplitude soliton interactions (BLE simulations can be used to check whether wave breaking criterion is met and/or required) and for the the soliton shoaling and then colluding with a wall. Discuss implementations with Sander. The Firedrake-FEM code may or may not need location smoothing.*
03-08-2022: ***Not yet started. 22-12-2022 Not done.***
22-12-2022: New time table negotiated with EU by Onno; will be tricky to meet deadlines of deliverables.
- ESR1 potential-flow-beach coupling (one or two pending papers, Delft data);
Use the Delft data; discussion on Delft data.

** **27062022-4 Action Yang/Tim**: find data with more wave reflection?*
*- 03-08-2022: **Not pursued yet.***
22-12-2022: New time table negotiated with EU by all; will be tricky to meet deadlines of deliverables.
- ESR2 waveflap implementation
Ongoing.
** Action 27062022-5 Wajiha/Mark: make draft of paper outline etc.*
03-08-2022: Has started.
22-12-2022 No further progress except OMAE abstract and 10-page paper due 09-01-2022 (in poor state as of 22-12-2022)
- 03-08-2022 ESR2 wave-beam interactions & WP2.7 alternatives.
22-12-2022: Goals revisited and renegotiated with EU by Onno.
- 03-08-2022: Not progressed.
22-12-2022: Renegotiated with EU by all; experiments and experiment analysis and other simulations.
* *Action all 27062022-6: Continue discussions hereon at MARIN.*
22-12-2022: Done by all in renegotiation with EU. Will be tricky to meet deadlines of deliverables.
- theory wave-beam interactions (M&O, ESR2); *not discussed.*
03-08-2022: Nothing happened.
- theory wave-current interactions (O&team): *ongoing*;
03-08-2022: Onno has been working on that; fixing of error, hopefully, in progress;
22-12-2022: Minor progress no breakthrough.

7. Conferences [Poland, EGU: completed], courses (two at MARIN, Burgers' Centre, Burgers' Day 2023), TBD (OMAE , ICCE).
22-12-2022: Done by Wajiha with supervisors submitted two OMAE abstracts; 10-page papers due 09-01-2022; Yang not interested in conferences in year 3 when there is still travel money available.
03-08-2022: July conference in Leeds happened and Wajiha presented results from both projects. See:
- https://twitter.com/EagreH2020/status/1552952182311424001
- https://weibo.com/u/7556086267
22-12-2022: Update on conferences, courses: JMBC CFD-2 (Delft 30-01/03-02); JMBC Day 2023 to do posters and flash-presentations; Burgers Day 2023 deadline and sign up (action W&Y: email them for information) plus date (June 8-9, 2023, Lunteren). Pay course via UoL/Maths reception.

8. Papers (WW out, JCP ready for submission, …). *See above: WW paper out, Eartharxiv paper deposited.*
03-08-2022: Water Wave paper is now out:
https://link.springer.com/journal/42286/volumes-and-issues/4-2 139-179.
03-08-2022: JCP paper submitted and on EarthArxiv:
https://eartharxiv.org/repository/dashboard/3411/
22-12-2022: Update on papers.
9. Experimental data and experiments, e.g. use Delft experiment ones. See above,

10. 22-12-2022 Ethics course and book; Yang and Wajiha: contact EPA officer; see Yang's GRAD message. Wajiha needs to arrange a course and complete the course asap (overdue; was due before transfer of October 2022).

11. 22-12-2022: Outreach: TBD for 2023 by Yang and Wajiha, in NL or UK.
22-12:2022: Update webpages with OMAE matters when papers accepted (Wajiha).

12. 22-12-2022: Closure at 14:00 after lunch.

22-12-2022 Discussion afterwards:

- Next deadlines ESR2: OMAE papers 09-01-20212
- Dead linespring 2023 ESR1: "*Delivery of simulations of short-crested waves for smaller amplitude, i.e., test cases TC5 and TC6 without wave breaking.*
- *Due date EU report: spring 2023.*
- *Submission of a second paper with analysis and TC6 simulation (authors: Lu, Choi, Bokhove, Kalogirou and Kelmanson); note that the analysis undertaken in the summer of 2022 concerns {entirely} new work, augmenting the definition of a proper simulation TC6 and simulation of Benney-Luke equations, thus extending previous work in this EU project published in (Choi et al. 2022); TC5 will become part of the paper revision assigned to deliverable D1.2, i.e. of Lu et al."*
- *So two reports needed in the form of two draft articles (Revision JCP ad WW paper).*

--Onno Bokhove, o.bokhove@leeds.ac.uk