September 2021

Dear Colleagues,

Invitation to

Comparative Study on Breaking Waves Interactions with Vertical Wall attached with Recurved Parapet in Small and Large Scale.

ISOPE-2022 Shanghai, China, June 14 - June 19, 2022

On behalf of ISOPE-2022 IHC, we invite you to join 'Comparative Study on Breaking Waves Interactions with Vertical Wall attached with Recurved Parapet in Small and Large Scale' organized by International Hydrodynamics Committee (IHC) of ISOPE.

The purpose of this comparative study is to share the state-of-the-art numerical analysis capability on the interactions between breaking waves and structure performed in two different scale. In this comparative study, sets of experimental data, including the wavemaker motion, wave elevation and pressure probe, will be provided at prior. Participants should provide results of the time histories of the wave elevations and pressure data recorded at different position. Details of the model test are described below.
Please refer an enclosed participation form for further process of comparative studies.

***Participation form due*: October 20, 2021** or earlier	*Numerical results deadline*:	**February 15, 2020**
	Circulation of preliminary report:	**March 15, 2022**
	Final report	**March 24, 2022**

How to join Comparative Study

(a) **E-mail** your participation form to vsriram@smail.iitm.ac.in and dr.ravindar.rajendran@gmail.com if you'd like to submit a full paper to be included in the Conference Proceeding, please attach a one-page abstract when submitting the participation form.

(b) Experimental data will be sent to participants no later than end of December

(c) **Email** your numerical results following a standard data format to vsriram@smail.iitm.ac.in and dr.ravindar.rajendran@gmail.com

We look forward to seeing you next year in Shanghai, China.

Sincerely yours,

Dr. V.Sriram, Session Organizer, Indian Institute of Technology Madras, Chennai, India
Dr. Shiqiang Yan, *Session Co-organizer, City, University of London, UK.*
Dr. Dimitris Stagonas, Session Co-organizer, University of Cyprus, Cyprus.
Dr. Zhihua Xie, Session Co-organizer, Cardiff University, UK.

Executive members of International Hydrodynamic Committee (IHC)

Prof. Decheng Wan (IHC Chair), Shanghai Jiao Tong University, China, dcwan@sjtu.edu.cn ;
Prof. Yonghwan Kim, Seoul National Univ., Korea, yhwankim@snu.ac.kr ;
Dr. Shiqiang Yan, City Univ. London, UK, shiqiang.yan@city.ac.uk ;
Prof. Jin S Chung, ISOPE, jschung@isope.org.
Encl. Call for papers

Application form for participation of ISOPE-2022 IHC

Comparative Study on Breaking Waves Interactions with Vertical Wall attached with Recurved Parapet in Small and Large Scale.

Dear ISOPE-2022 IHC,

We are willing to participate in the Comparative Study on Breaking Waves Interactions with Vertical Wall attached with Recurved Parapet in Small and Large Scale organized by ISOPE-2022 IHC for the following topic (please mark with 'x'):

- Category A: Small scale (1:8) breaking wave interaction with structure: ( )
- Category B: Large scale (1:1) breaking wave interaction with structure: ( )

We hope to receive the experiment details and probe reading on the subject of comparative studies through the following email address,_____.

Name of Institute:

Address:

Contact Person:

-Name:

-Email:

Comparative Study on Breaking Waves Interactions with Vertical Wall attached with Recurved Parapet in Small and Large Scale.

General Description

Recurved parapets are an overhang structure facing seaward side attached to the new/existing vertical seawall to overcome higher wave heights during extreme events and the rise in sea level. The efficiency of this part is that it takes up-rushing seawater or higher steepness waves to curl around the structures and deflects back into the seaward side instead of overtopping. It is required to develop tools for assessing the reliability and survivability of these structures in presence of extreme loads, such as those applied by breaking waves. We aim to develop an understanding on the current state of numerical tools in studying this problem case by validating them against a set of experiments.

The experiments are classified into two categories. The first category is for generation of breaking monochromatic waves and replicating its impact on the structure in 1:8 model scale. This will be used to evaluate the reflection characteristics and impact pressure in model scale.

The second category will involve the interaction of same breaking waves with the structure tested in quasi-prototype conditions in 1:1 scale. This will be used to evaluate the air compressibility and scale effects involved.

Each experimental case will provide experimental data, including the wavemaker motion, wave probes near and away from the structure and pressure probes on the structure. Both the experiments are validated and published in the peer reviewed journals and moreover the scale effects involved is also investigated, see Ravindar *et al*. (2021b).

Experimental Setup

Category A: Model scale 1:8 experiment

The experiments were performed using a wave flume in the Department of Ocean Engineering, Indian Institute of Technology (IIT) Madras, Chennai, India. The flume is 72.5m long, 2.0m wide, and 2.5m deep with a computer-controlled hydraulically driven piston type wave-maker at one end of the tank and a beach at the other end. The tank was filled with fresh-water to a working depth of 0.51m. The monochromatic waves were generated using the second order Stroke theory, as described in Ravindar *et al.,* (2021a).

In this test case a structure consisting of a vertical wall and a recurve parapet is fixed at a distance of 42.5m from the wavemaker and at the end of a 1:10 slope. A monochromatic Stroke second order wave with a wave height of 0.0875m and 2.1s wave period is generated using the piston type wave-maker. The wave probes and pressure transducers are fixed at the centre of the flume width (consider as Y origin, see figure 2).

Wave probe WP6 will be used to validate the incident wave generation. Four wave probes WP2, WP3, WP4 and WP5 will be used to check the transitional reflected wave characteristics between structure and the wavemaker. WP1 which is placed at 1.0m from the structure is used to validate the reflection characteristics of recurved parapet. Seven pressure probes PP1-7 with sampling frequency of 9600Hz are mounted on the structure, 4 on

the vertical wall at different depths and 3 others on the recurved parapet. Participants will be provided with the measured wave-paddle signal that was used in the experiment or WP6 (if their numerical models don't have the moving boundary wavemaker capability) and they can check the wave propagation till WP5.

Wave Probe	Distance from wavemaker X (m)	Distance from centre of wavemaker Y (m)
WP1	41.67	0
WP2	37.88	0
WP3	37.42	0
WP4	36.84	0
WP5	31.00	0
WP6	18.00	0

Table 1 : Position of wave-probes in 1:8 model scale

Pressure Probe	Horizontal location X (m)	Distance from centre of wavemaker Y(m)	Vertical location Z (m)
PP1	42.5	0.25	0.4375
PP2	42.5	0.25	0.4800
PP3	42.5	0.25	0.5225
PP4	42.5	0.25	0.5650
PP5	42.495	0.25	0.6125
PP6	42.478	0.25	0.6387
PP7	42.423	0.25	0.6600

Table 2 : Position of pressure transducers on the structure in 1:8 model scale

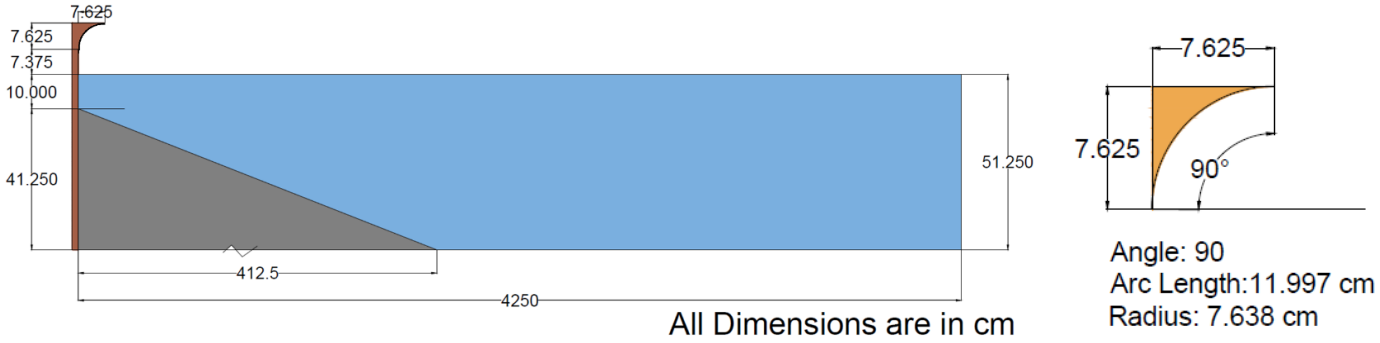

Figure 1: Schematic of experimental setup and details of recurved parapet in 1:8 model scale

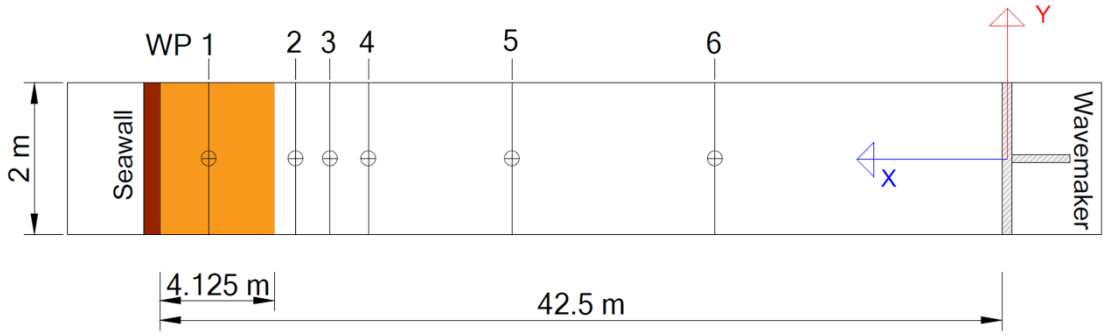

Figure 2: Plan view of the wave flume indicating the wave probes' location in 1:8 model scale (1 to 6 correspond to WP 1 to 6). (WP1: 41.7 m; WP2: 37.9 m; WP3: 37.5 m; WP4: 36.8 m; WP5: 31 m; WP6: 18m from the wavemaker.)

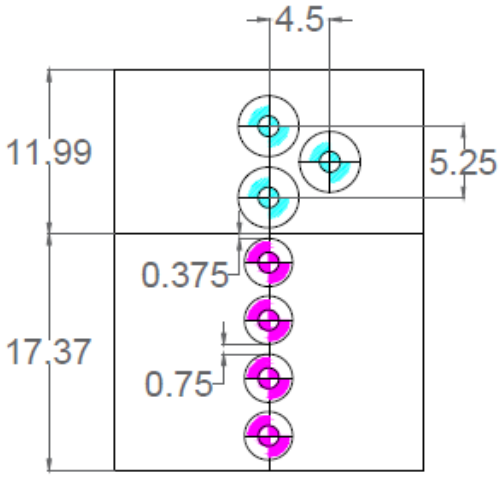

Figure 3: Schematic for position of pressure probes in 1:8 model scale

Category B: Large scale 1:1 experiment

The experiments were performed using a large wave flume (Große Wellenkanal, GWK) in Coastal Research Centre (ForschungsZentrum Küste, FZK), Hannover, Germany as part of the *Large-scale measurements of wave loads and mapping of impact pressure distribution at the underside of parapets* (*HyIV-FZK-06*) project funded by HYDRALAB IV, EU scheme, e.g. Stagonas et al (2014); Ravindar et al., (2019). The flume is 307m long, 5.0m wide, and 7.0m deep with a computer-controlled hydraulically driven piston type wave-maker at one end of the tank and a beach at the other end. The wavemaker is equipped with an active wave absorption system and waves were generated at a water depth of 4.1m (deep section of the flume), see e.g. Ravindar et al., (2021b); Ravindar et al., (2019); Stagonas et al. (2020).

For the large-scale experiments, the vertical wall with the recurve parapet are located at a distance of 243m from the wavemaker, at the end of a 1:10 slope. The midline is chosen as centre of the flume which is at 2.5m from sidewall. Monochromatic waves with height of 0.7m and period of 6s are generated in the flume. Wave probe WP1-WP7 will be used to validate the incident wave generation. Four wave probes WP8, WP9, WP10 and WP11 will be used to check the transitional reflected wave characteristics between structure and the wavemaker. WP12 which is placed at 0.8m from the structure is used to validate the reflection characteristics of recurved parapet. Sixteen pressure probes PP1-16 with sampling frequency of 5000Hz are mounted on the

structure, 8 on the vertical wall at different depths and 8 others on the recurve. Participants will be provided with the measured wave-paddle signal that was used in the experiment or surface elevation measurement at the wavemaker i.e. WP1 (if their numerical models don't have the moving boundary wavemaker capability) and they can check the wave propagation till WP6.

Wave Probe	Distance from wavemaker X (m)	Distance from centre of wavemaker Y (m)
WP1	50.00	0.25
WP2	51.90	0.25
WP3	55.20	0.25
WP4	60.00	0.25
WP5	160.00	0.25
WP6	161.90	0.25
WP7	165.02	0.25
WP8	170.00	0.25
WP9	200.00	0.25
WP10	210.00	0.25
WP11	220.00	0.25
WP12	235.00	0.25
WP_{bridge}	3.65	0
$WP_{wavemaker}$	0	0

Table 3: Position of wave-probes in 1:1 large scale

Pressure Probe	Horizontal location X (m)	Distance from centre of wavemaker Y(m)	Vertical location Z (m)
PP1	243.0	0	3.59
PP2	243.0	0	3.92
PP3	243.0	0	4.16
PP4	243.0	0	4.31
PP5	243.0	0	4.46
PP6	243.0	0	4.61
PP7	243.0	0	4.76
PP8	243.0	0	4.91
PP9	243.0	0	5.16
PP10	243.0	0	5.26
PP11	242.9	0	5.35
PP12	242.8	0	5.43
PP13	242.7	0	5.55
PP14	242.6	0	5.64
PP15	242.5	0	5.76
PP16	242.4	0	5.84

Table 4: Position of pressure transducers on the structure in 1:1 large scale

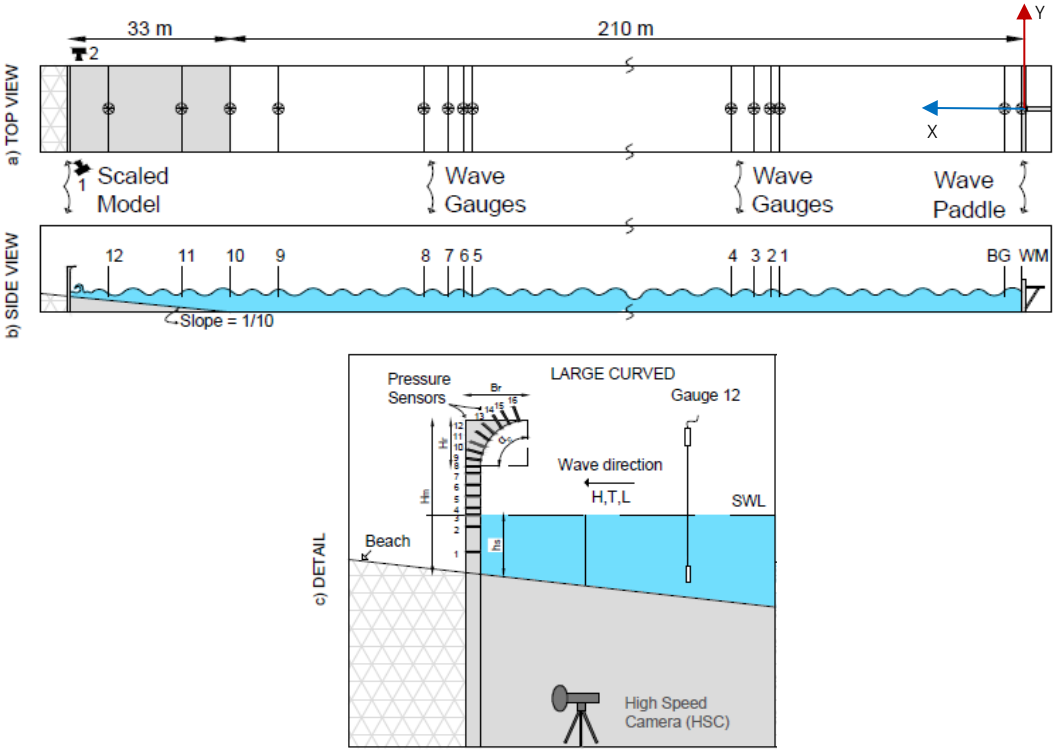

Figure 4: Schematic of experimental setup and details of recurved parapet in 1:1 large scale

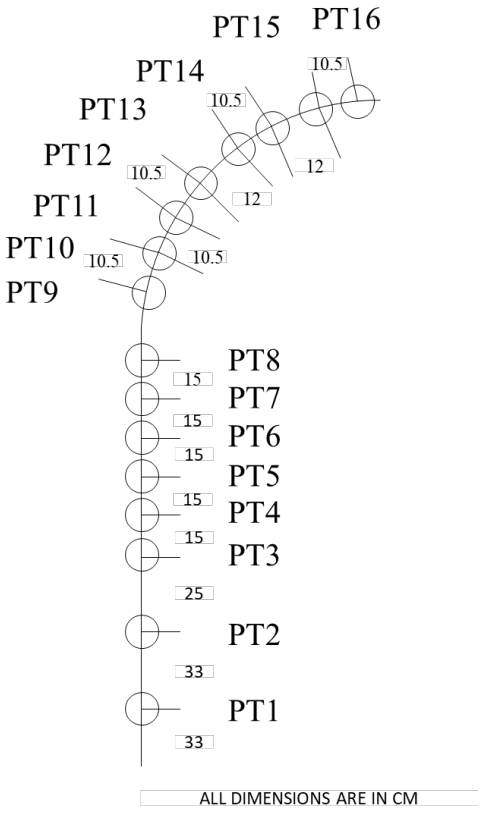

Figure 5: Schematic for position of pressure probes in 1:1 large scale

References

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Stagonas, D., Lara, J.L., Losada, I.J., Higuera, P., Jaime, F.F., Muller, G. (2014) Large scale measurements of wave loads and mapping of impact pressure distribution at the underside of wave recurves. In Proceedings of the HYDRALAB IV Joint User Meeting, Lisbon, Portugal, 2–4 July 2014.

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