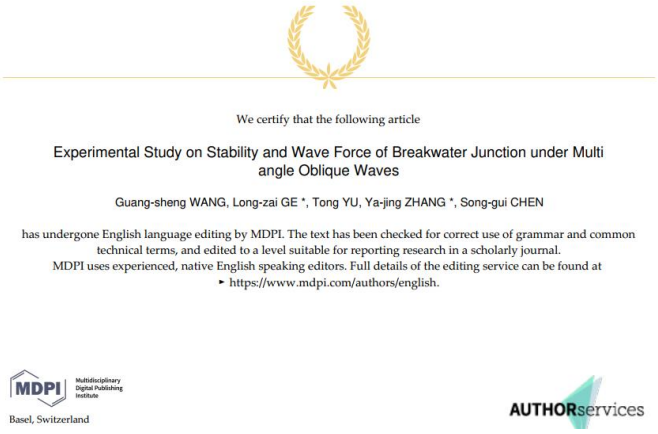
First of all, thank you very much for your valuable comments. According to your comments, all the authors have carefully discussed them item by item. Each comment is replied as follows:

（**1**）It is very difficult to read the abstract and to understand the purpose of the paper.Most of the references are difficult to check because they are not written in English.

Reply: Thank you for your comments. We have commissioned MDPI to polish the paper.



We certify that the following article

Experimental Study on Stability and Wave Force of Breakwater Junction under Multi angle Oblique Waves

Guang-sheng WANG, Long-zai GE *, Tong YU, Ya-jing ZHANG *, Song-gui CHEN

has undergone English language editing by MDPI. The text has been checked for correct use of grammar and common technical terms, and edited to a level suitable for reporting research in a scholarly journal.
MDPI uses experienced, native English speaking editors. Full details of the editing service can be found at
‣ https://www.mdpi.com/authors/english.

MDPI Multidisciplinary Digital Publishing Institute
Basel, Switzerland

AUTHORservices

（2）On line 81 there is a reference to a paper which is not in the list at the end of the paper. It is impossible to identify reference [10] as MORIMOTO.

Reply: Thank you for your comments. Has been deleted.See the manuscript for details.

（3）Equations (2) and (3) should be reviewed and the variables used there explained in the text, especially (H_s)_theta and K_D,theta.

Reply: Thank you for your comments. It has been further supplemented and explained. The details are as follows:

$$H_{s,\theta} = H_s(\sin\beta)^x \quad (2)$$

$$K_{D,\theta} = K_s K_D(\cos\theta)^{-\varepsilon} \quad (3)$$

（4）In equation (4) the variable L_C cannot be the unit dike length. This does not make sense.

Reply: Thank you for your comments. It has been further verified. By reference to "Yu Yuxiu, Li Benxia, Zhang Ningchuan, et al. Wave load acting on vertical wall embankment by oblique and multi-directional irregular waves [J]. Water Transport Engineering, 2011 (1): 24-28 DOI: 10.3969/j.issn.1002-4972.201101.005.Further check to confirm that there is no problem with the meaning of Lc.

（5）Lines 117 to 123 are the example of the importance of seeking the advice of an English speaking person. It is almost impossible to understand the meaning of this statement.

Reply: Thank you for your comments. It has been rewritten as follows:

Battjes [16]solved the spatial related problem of wave forces acting on vertical breakwaters by non-breaking waves, and derived the reduction coefficient of wave loads acting on long

structures by oblique waves and multi-directional waves. The formula for the reduction coefficient of wave forces is:

（6）In line 132 the reference to CHENG [20] does not make sense, since the title of the paper seems to be related to submarine pipelines and not to vertical caissons.

Reply: Thank you for your comments. Has been deleted.See the manuscript for details.

（7）The statement in lines 141 and 142 is difficult to understand.

Reply: Thank you for your comments. It has been rewritten as follows:

Madrigal [22]gives the curve of wave force reduction coefficient (γ^2) of oblique wave and two kinds of multi directional wave (direction distribution width A=15° and 30°) with relative breakwater length (L_C/L_P) by experiment when the main wave direction angle is 0° , 20° and 40° .

（8）In line 231 it should be “weight scale” instead of “gravity scale” since the gravity does not change.

Reply: Thank you for your comments. Has been modified. See the manuscript for details.

（9）It would be interesting to have more information on the “self-developed automatic water collection device” mentioned in line 249. The same applies to the “independently developed TK2008 wave height acquisition system” of line 256.

Reply: Thank you for your comments. Has been deleted.See the manuscript for details.

（10）It is difficult to understand how a huge negative pressure vortex can be seen in figure 6, as stated in line 292.The approach used in the results description is questionable. In fact, it would be best to have first the description of the relevant equations and variables - ideally with a scheme detailing some of the variables – and then a description of the results.

Reply: Thank you for your comments. Has been deleted.See the manuscript for details.

（11）In line 310 H’c should be clarified. Probably this is the crest freeboard.

Reply: Thank you for your comments. Has been deleted.See the manuscript for details.

H_c' is the height of the breakwater crest above the static water surface;

（12）The range 1.21-2.05 of line 325 cannot be seen in table 4.

Reply: Thank you for your comments. The results of specific wave height have been supplemented in the table, as follows:

Table4. Results of the wave height and wave crest height.

Wave	Point	*W.L* (+0.57m)				*W.L* (+5.90m)			
		Specific wave height	Maximum wave crest height			Specific wave height	Maximum wave crest height		
			Test value	Calculated value	Correction factor		Test value	Calculated value	Correction factor
5°	B1	1.38	5.01	3.74	1.34	1.25	4.79	3.66	1.31
	B2	1.58	5.60		1.50	1.39	5.80		1.58
	B3	1.42	5.31		1.42	1.28	5.35		1.46
	B4	1.35	4.96		1.33	1.21	4.71		1.29
15°	B1	1.42	5.84	4.21	1.39	1.30	5.79	4.05	1.43

	B2	1.83	7.08		1.68	1.52	6.91		1.71
	B3	1.70	6.15		1.46	1.39	6.04		1.49
	B4	1.53	5.99		1.42	1.28	5.79		1.43
35°	B1	1.64	7.33	4.77	1.54	1.59	7.75	4.86	1.59
	B2	2.05	8.90		1.87	1.91	9.32		1.59
	B3	1.86	7.66		1.61	1.74	8.49		1.59
	B4	1.65	7.12		1.49	1.53	7.63		1.59
75°	B1	1.68	9.70	4.93	1.97	1.61	8.74	4.73	1.85
	B2	1.87	9.17		1.86	1.56	8.43		1.78
	B3	1.66	8.09		1.64	1.42	7.60		1.61
	B4	1.49	7.55		1.53	1.36	6.58		1.39

NOTE:Specific wave height is $H_{1\%}$ of synthetic wave height and $H_{1\%}$ of design wave height

（13）It is not clear how the effective wave length of line 334 can be computed.

Reply: Thank you for your comments. The wavelength calculation formula is supplemented as follows:

$$L_s = \frac{g(1.15*T_m)^2}{2\pi}\tanh(\frac{2\pi d}{L_s}) \quad (13)$$

（14）The synchronization rate mentioned in line 398 should be explained.

Reply: Thank you for your comments. Synchronization refers to the probability that the pressure at each measuring point will reach the maximum value at the time of the occurrence of the maximum wave force. The result of 5% also indicates that the pressure at all measuring points will not reach the maximum value at the time of the occurrence of the maximum wave force.

（15）In line 416 you mention a factor 1.27-142 but it is not clear how one gets to these values.

Reply: Thank you for your comments. It should be the same as the above test data, which should also be 1.02-1.29.

（16）In the analysis of the armour layer stability (section 3.3) it is not clear how the values in the first columns of table 7 (Test stable weight of Accropode / Outside and Inside) were obtained. Were the Accropode in the armour layer replace until the stability of the armour layer was reached? In such case, how was stability defined?

Reply: Thank you for your comments. Table 7 has shown that the first column is the result of the stable weight of the block obtained from the test;

The test method is that if the block is unstable during the test, the weight of the block is gradually increased by replacement, and the stable weight is finally obtained.

The judgment basis of stability is that, according to the corresponding test specifications, under the action of continuous waves, when the armor block does not move, it is considered stable.

（17）The title of reference [1] in line 535 is not “Preliminary studies …” but “Inquiry on the design method for deep-water breakwater”；There is an author missing in reference [12]. It should be “Clemente, D.; Calheiros-Cabral, T.; Rosa-Santos, P.;

Taveira-Pinto, F."In reference [13] the third author is "Nørgaard, J.Q.H."In reference [22] the second author is "VAN DER MEER, J.W."

Reply: Thank you for your comments. It has been supplemented and improved. The details are as follows:

1. Wang, M.R. Inquiry on the design method for deep-water breakwater. *Port Engineering Technology*, **2010**, 47 (3): 1-7, 41. DOI: 10.3969/j.issn.1004-9592.2010.03.001.

12、Clemente, D.; Calheiros-Cabral, T.; Rosa-Santos, P.; Taveira-Pinto, F. Hydraulic and Structural Assessment of a Rubble-Mound Breakwater with a Hybrid Wave Energy Converter. *J.Mar. Sci. Eng*. **2021**, 9, 922. https://doi.org/10.3390/jmse9090922.

13、1Vicinanza, D.; Contestabile, P.; Quvang Harck Nørgaard, J.Q.H.; Lykke Andersen, T. Innovative rubble mound breakwaters for overtopping wave energy conversion. *Coast. Eng*. **2014**, 88, 154–170. https://doi.org/10.1016/j.coastaleng.2014.02.004.

专家 3

First of all, thank you very much for your valuable comments. According to your comments, all the authors have carefully discussed them item by item. The comments are as follows:

（1）Even though the language has improved significantly, there is still work to be done. For example, L66 starts with the sentence 'Reference previous research ...', which is poorly worded and very long. The sentence should be split into two parts and revised. Also, there are spaces missing or too many in a lot of places.

Reply: Thank you for your comments. The paragraph has been rewritten as follows.

Summarize the research results of various scholars on the relationship between the wave force on the caisson and the wave incidence angle under the action of oblique waves, which can be uniformly described by the following formula:

$$P_\beta = Bk_pP \quad (7)$$

$$k_p = \frac{1+\sin(\beta-22.5^\circ)}{2} \quad (8)$$

Where:P_β is the wave force under oblique wave action at different angles; B is the wave force under the positive wave action; B is the bottom width of the caisson; k_p is the reduction factor.

（2）L71: Do not use capital letters when writing reference names, e.g. ZHANG et al. should be Zhang et al. This also applies to other instances in the paper.

Reply: Thank you for your comments. All have been revised. See the manuscript for details.

（3）L165: The authors state that they summarized the empirical formulas and then give Eq. 7 and Eq. 8. Please also state which reference these equations are from.

Reply: Thank you for your comments. It has been supplemented and explained.The details are as follows:

Summarize the research results of various scholars on the relationship between the wave force on the caisson and the wave incidence angle under the action of oblique waves, which can be uniformly described by the following formula:

$$P_\beta = Bk_pP \quad (7)$$

$$k_p = \frac{1+\sin(\beta-22.5^\circ)}{2} \quad (8)$$

Where:P_β is the wave force under oblique wave action at different angles; B is the wave force under the positive wave action; B is the bottom width of the caisson; k_p is the reduction factor.

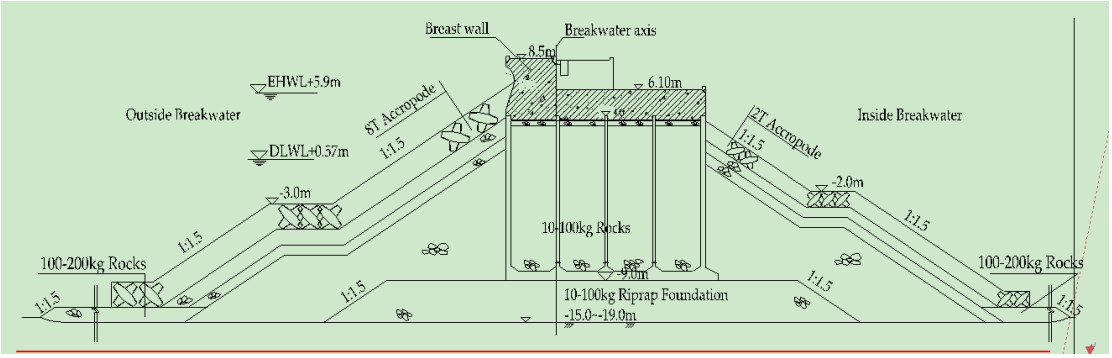
（4）After L192: Please write a clear paragraph about what this paper aims to research. In other published papers this paragraph usually starts with “The aim of this work is to contribute to our knowledge of ...” or some other similar sentence structure.

Reply: Thank you for your comments. It has been supplemented as follows:

In the present study, a physical experiment was conducted to measure the specific wave height , overtopping , the wave force on the caisson and the stability of the armour block in the breakwater transition zone. The test results obtained were compared with the calculated values of the standard formula or empirical formula adopted by the designer ,and obtain the corresponding adjustment coefficient, so as to meet the design needs of this supporting project, and provide basic data and technical support for the subsequent similar projects.

（5）Figure 3, Figure 4, etc.: It would be good to use the same font as for the rest of the manuscript (Palatino Linotype)

Reply: Thank you for your comments. It has been supplemented as follows:



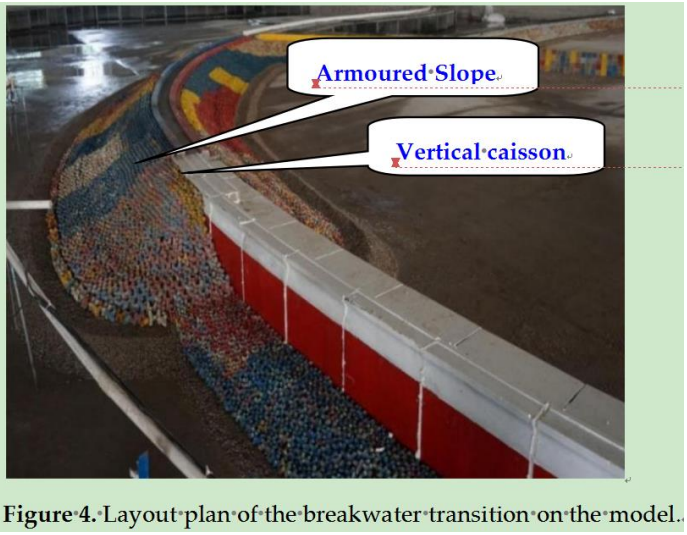


Figure 4. Layout plan of the breakwater transition on the model.

（6）L301: Add the percentage of difference between Van der Meer and Chinese standards.

Reply: Thank you for your comments. Has been supplemented. The details are as follows:

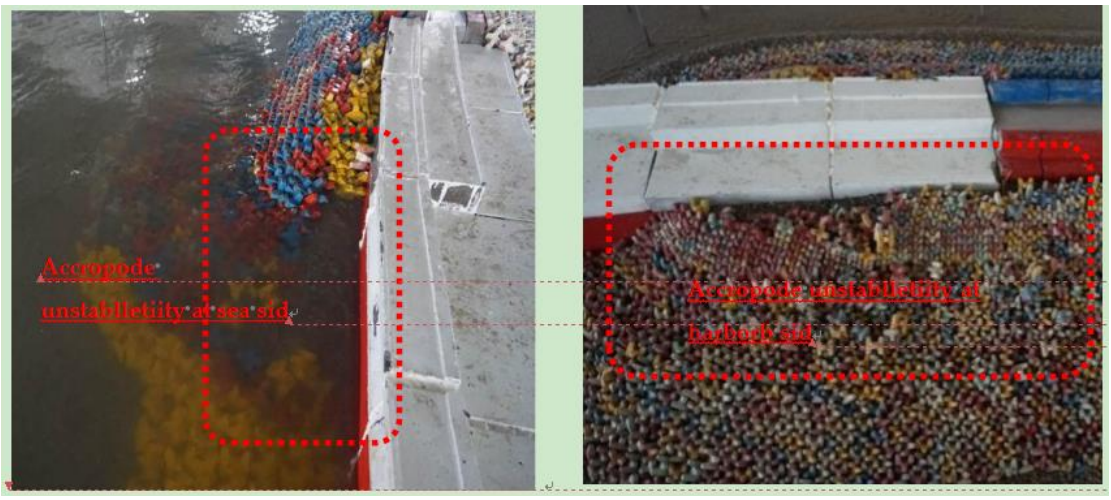
The difference between Chinese standards and Van der Meer is ±20%.

（7）Eq. 10 and Eq. 11: it is common to show the equation right after its first mention in the text. In the current version, the equations are not integrated into the text, but are added as equations would be given in an appendix.

Reply: Thank you for your comments. It has been revised. See the manuscript for details.

（8）Figure 9: Please make the red closed curve smoother and cleaner and add in the caption what the red curve shows.

Reply: Thank you for your comments. It has been modified and supplemented.The details are as follows:



（9）Table 7: The font in the table seems different from the rest of the manuscript.

Reply: Thank you for your comments. It has been revised. See the manuscript for details.