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MEASUREMENTS OF WAVE REDUCTION DUE TO ARTIFICIAL REEF WITH VARYING WIDTH ON AN ATOLL

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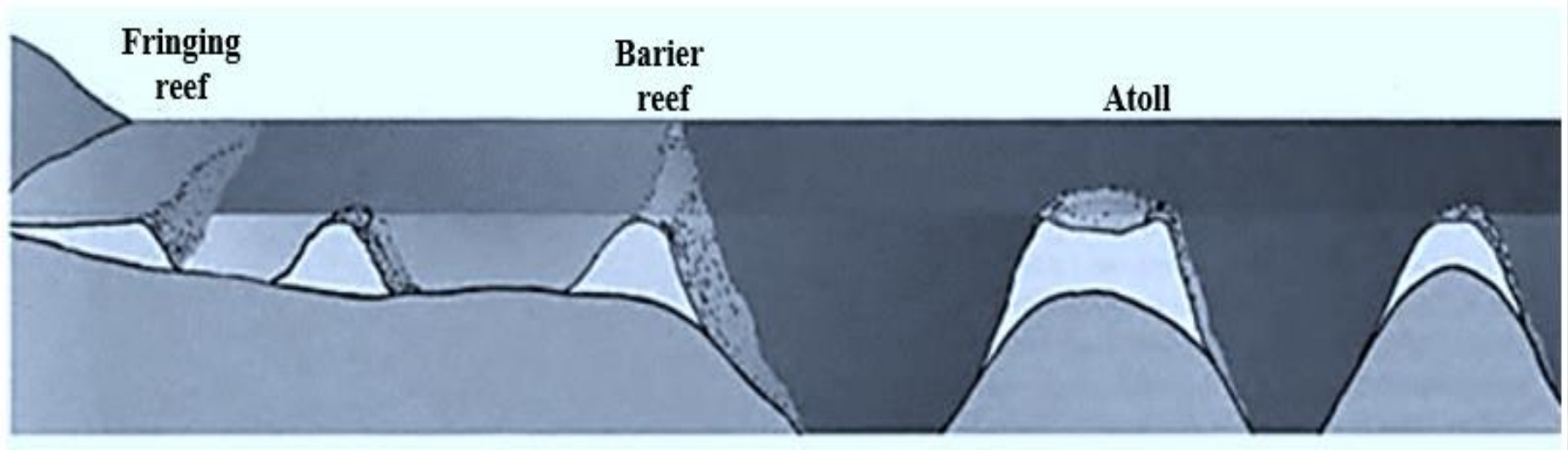
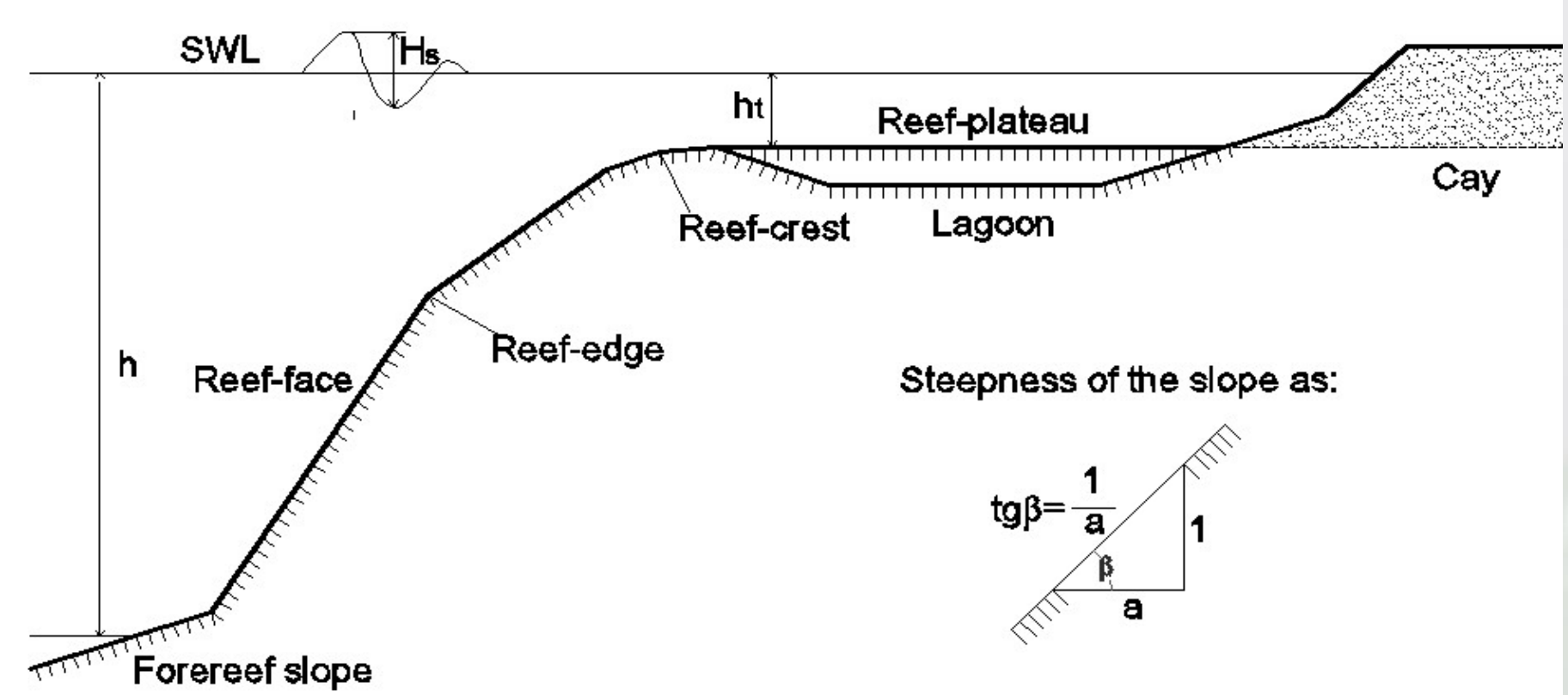


Coral reef types (Spalding, et al 2001) (M. S. M. D. Spalding, 2001)

1 Introduction



A representative cross-section of a coral reef

1 Introduction

A cay at Spratly Islands

1 Introduction

Previous researches about wave transmission:

- Focused on the bio-environmental aspects of the reef.
- But the hydrodynamic regime on the reef; The effects of reefs (height, width, porosity, etc.) on wave characteristics should also be considered.

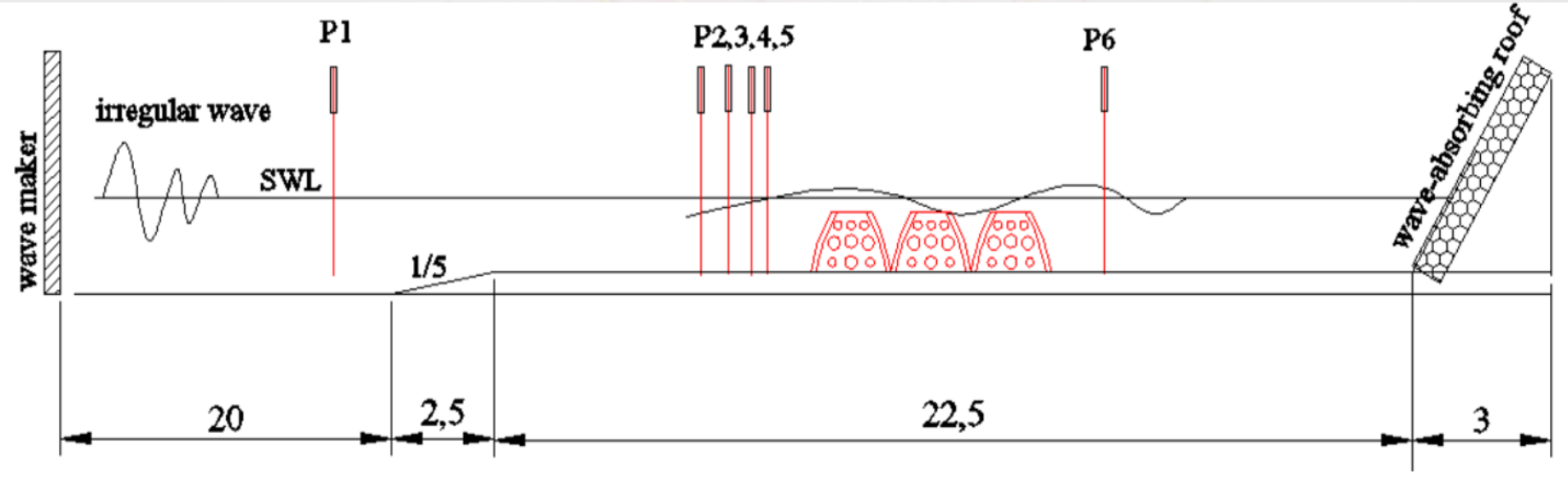
1 Introduction

I. The purpose of this article

The 2D physical Model in wave flume:

- Study the influence of some parameters of the reef on the wave propagation characteristics on the reef flat (B, Kr, wave spectrum).
- Making recommendations on the effective reef width for wave reduction purposes.

2 Experiment design



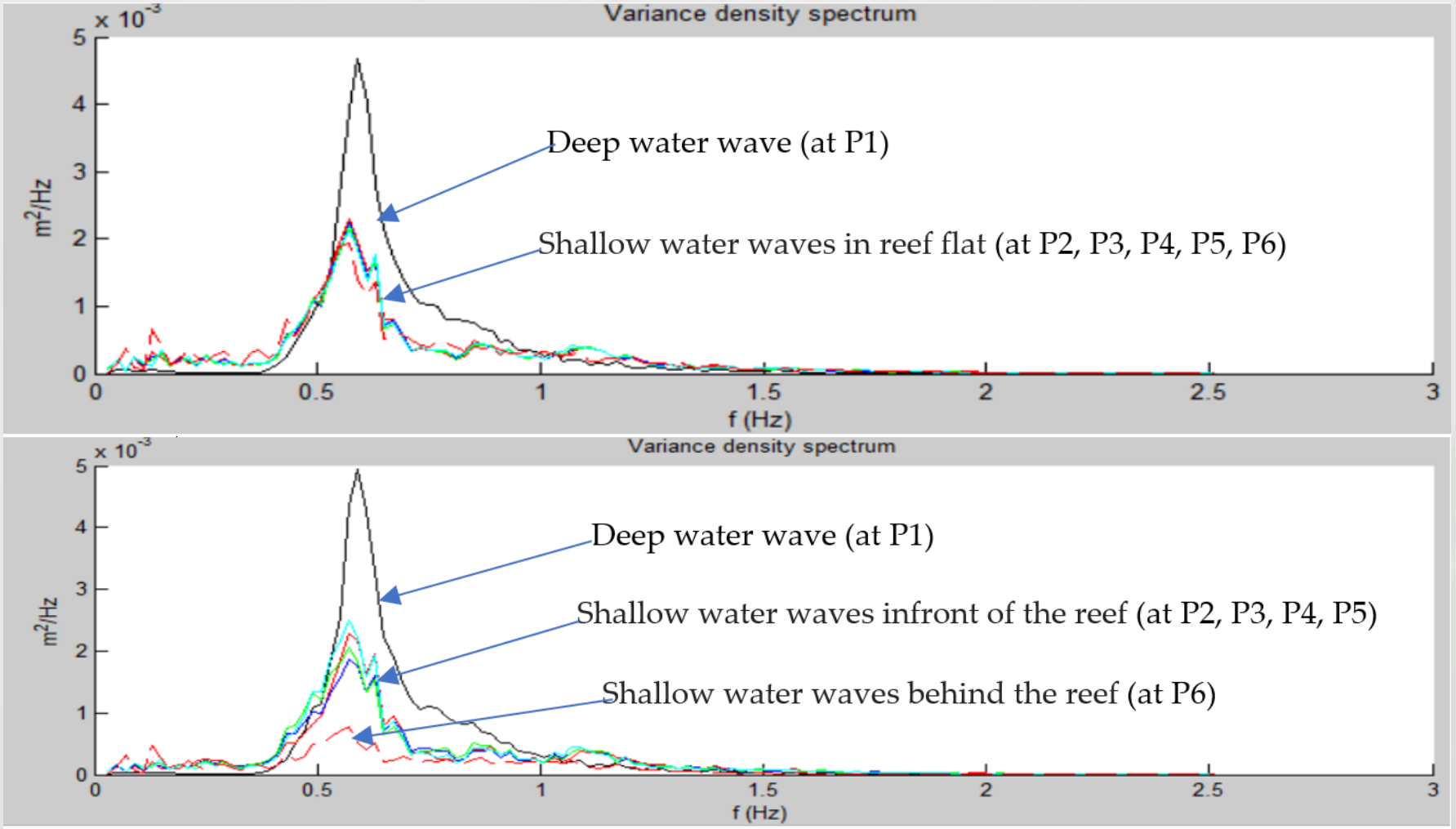
Experiment set up

2 Experiment design

Table 1. Matrix of experimetal program

Model				Prototype			
B(m)	Hs (cm)	Tp (s)	Rc (cm)	B(m)	Hs (cm)	Tp (s)	Rc (m)
1.90	10	1.5	0	28.5	1.5	5.81	0
1.50	12	1.7	5	22.5	1.8	6.58	0.75
1.20	15	1.8	10	18.0	2.25	6.97	1.5
0.80	18	1.9		12.0	2.7	7.36	
0.45	20	2.1		6.8	3	8.13	

3.1. Wave spectrum variation across reef flat



Wave energy spectra Rc=10cm; H_s =12cm; T_p=1.9s

3.2. Reflection wave

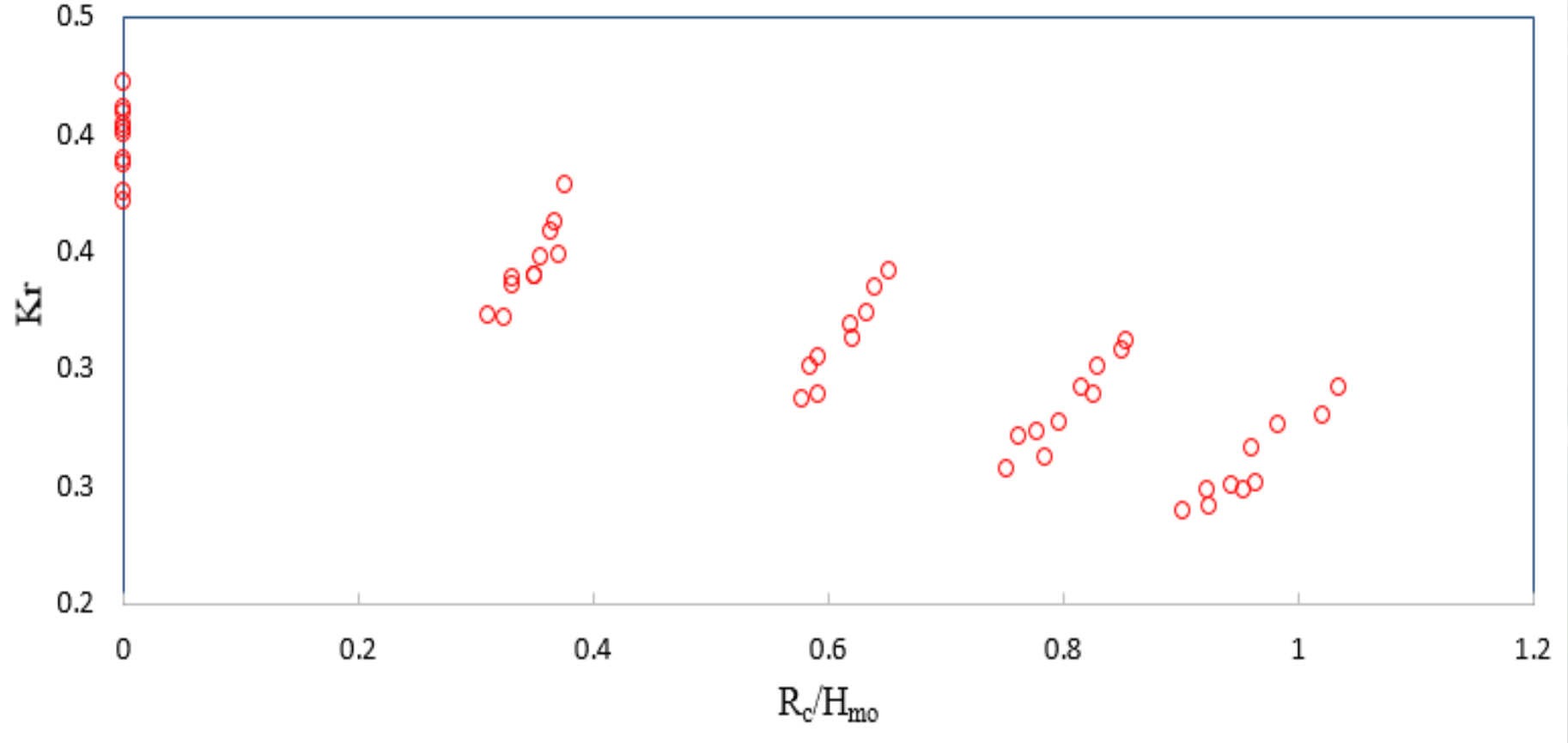


Figure 4. Relationship between Kr and Rc/Hmo when B=2m

3.3. Wave reduction due to artificial reef with varying width

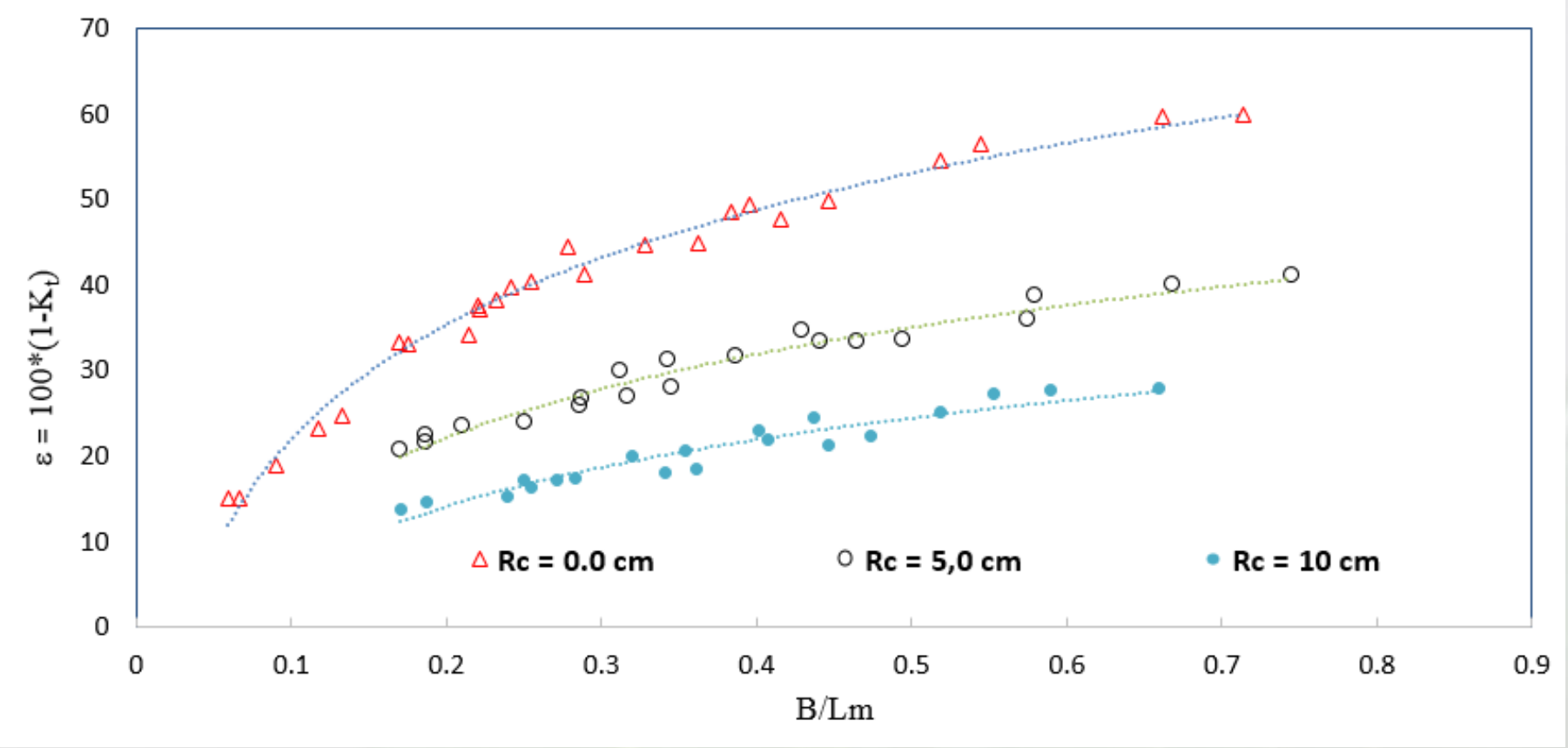


Figure 4. Relationship between Kr and Rc/Hmo when B=2m

3.3. Wave reduction due to artificial reef with varying width

+ B/L_m <0.2 (less than 03 rows of Reef Ball), Rc =0; ε%~15%-25%, the reef width is not less than $0.2L_m$

+When the width of the reef crest rise, the wave reduction efficiency saw an increase dramatically of over 60%

+ B/L_m approaches to over 0.6. The trend of the graph tends to stretch horizontally.

It is recommended that the effective range of B :

$1/5L_m \leq B \leq 03/5L_m$.

4 Conclusions

- When propagating from deep water into the platform, most of waves brake. Waves enormously attenuate, the secondary waves are formed and continue to transmit on the reef flat.
- Moving on the reef flat of shallow water, the wave spectrum tends to stretch out towards the low frequencies. After passing through the field of Reef Balls, the wave spectrum becomes broader and lower.
- Measurements derived reflection coefficient Kr varying between 0.25 and 0.42. Compared with other types of breakwaters, Reef Balls have a considerable ability to absorb incoming waves.
- Due to the low water depth on the reef flat, wave reduction is governed more considerably by the field width rather than the freeboard of the Reef Balls. Experimental results indicate that the effective width of the Reef Balls field should be in order of 1/5 to 3/5 of the shallow water wave length.
- To conclude, the obtained observations and measurements optimize the design of a Reef Balls field regarding wave reduction effect