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Pore Pressure Measurements inside Rubble Mound Breakwaters.

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INTRODUCTION

Large scale model tests have been performed in the LARGE WAVE CHANNEL (GWK) of the Coastal Research Centre (FZK). The main objectives of the above mentioned project were firstly to investigate the influence of rock density on the armour layer stability and secondly to collect large scale data on wave run-up and wave overtopping for comparison with small scale model test results.
Simultaneously pore pressure variations within the core of the breakwater were measured.

OBJECTIVES

Pore pressure variations within the core of a rubble mound breakwater are important to enable correct scaling of core materials in physical models. Burcharth et al. (1999) purposed a scaling method based on similarity between velocities ~~with~~ in the core. One of the crucial points in this method is the determination of a damping factor (δ) within the structure, cf. figure 1.There are only few available measurements of wave induced pore pressures in rubble mound breakwaters in the literature. Comprehensive measurements are available from GWK (Oumeraci, 1991). World unique prototype measurements are available from the Zeebrugge breakwater in Belgium, cf. Troch et al (2002), Troch (2000). However, some scatter is found when comparing previous GWK-data sets, field data and a new data sets from large scale testing in GWK.

The proposed linier damping model by Burcharth et al. is:

$$\delta = a\frac{n^{0.5}L_p}{H_s b} \qquad \text{where}$$

a denotes empirical coefficient determined from model tests.
n denotes the porosity of the core material.
L_p denotes the wave-length.
H_s denotes the significant wave height.
b denotes the width of the core at the level of consideration, cf. fig 1.

The main objectives of the forthcoming paper will be to introduce the new model data-set from the large scale model-tests combined with data from small scale model tests.

LARGE SCALE TESTS

A rubble mound breakwater has been built in the LARGE WAVE CHANNEL (GWK). The total height of the structure was 5.5 m. The

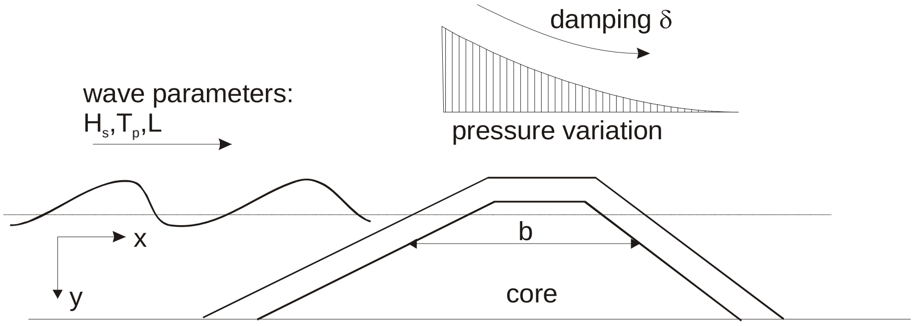

Figure 1. Parameter definition

breakwater was built on a 2 m thick sand bed which was extended ~~to~~ 100 m in front of the breakwater on a 1:50 slope. Twentytwo capacitance type wave gauges were installed in the flume. Pore pressures in the core of the breakwater were measured using 19 pore pressure transducers ~~cf. figure 1~~. Both standard JONSWAP spectra (T_p = 1.5 s to 6 s and H_s = 0.3 m to 1.0 m) and spectra measured in the field (along the German coastline) have been used to generate irregular wave trains. Tests have been performed at three different water levels (water depth at the wave paddle d = 3.5 m, 4.0 m and 4.5 m).

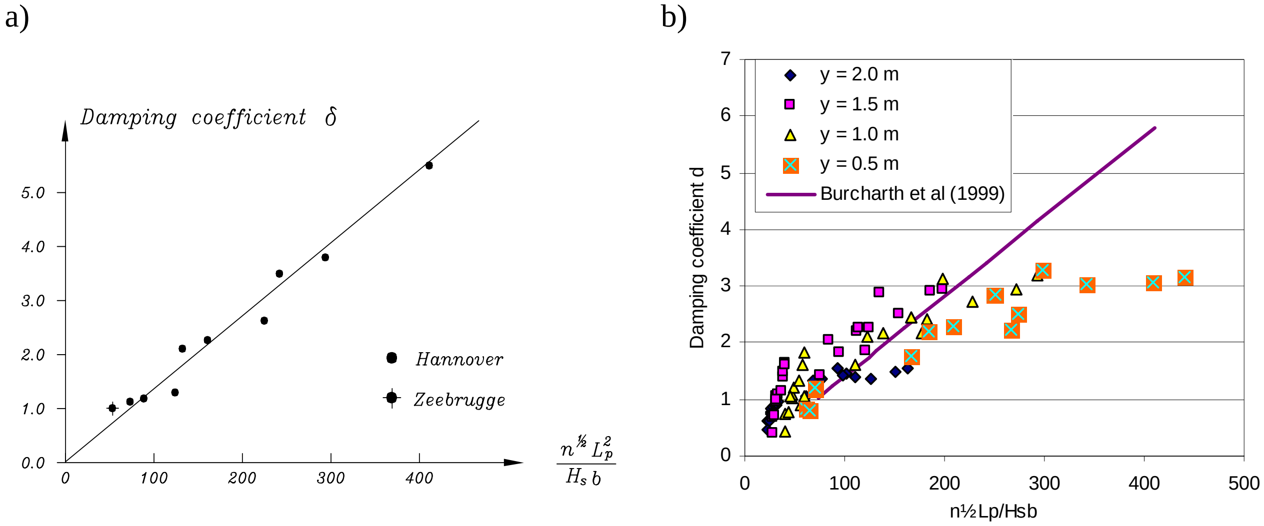

Fig 2. Different results from large scale tests, a) from Burcharth et al 1991, b) new tests.

RESULTS

The former test in GWK (Burcharth et al 1999) gave results as shown in fig. 2a and the new data set gave the results shown in fig. 2b.

As seen from fig. 2 there is some difference between the two data sets. However, the geometry of the two tested structures is not the same. The main difference is the b parameter. For the high value of δ in the early Hannover GWK test (fig. 2a) the core width b is very small~~; this~~ which is not the case for the new tests.

ACKOWLEDGMENT

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