l051hiswa[001]: HISWA basin experiment

Purpose

The purpose of this test is to verify wave propagation and transformation over a submerged bar in a 2D-laboratory experiment with wave-induced currents.

Situation

The dimensions of the basin are 26.4 m × 34.0 m (see Figure 1). The water depth in the basin is 0.4 m. A submerged breakwater is placed on a horizontal bottom. For exact dimensions of the bar see Dingemans (1987). Both side walls parallel to the x-axis are fully reflective. At the opposite end of the tank a passive wave absorber is installed. As shown in Figure 1 the co-ordinate system is not oriented as in Dingemans (1987) but has its origin in the lower left corner of the basin, x=0 corresponds to the wave generators position in rest.

For the case under consideration (case ME35 in Dingemans, 1987) the target spectrum for the generator is a JONSWAP spectrum with a T_p equal to 1.25 s and H_{m0} of 0.10 m.
The mean direction is parallel to the x-axis (normal to the bar) and a directional spread of $\cos^4(\theta)$-distribution is targeted. Kuik et al (1988) show that the observed width of this directional spreading function is about 25°. The observed mean directions at stations 1, 2 and 3 are -5.56°, 1.34° and -3.63°. For the same stations H_{m0} was 0.1 m, 0.1 m and 0.11 m respectively.

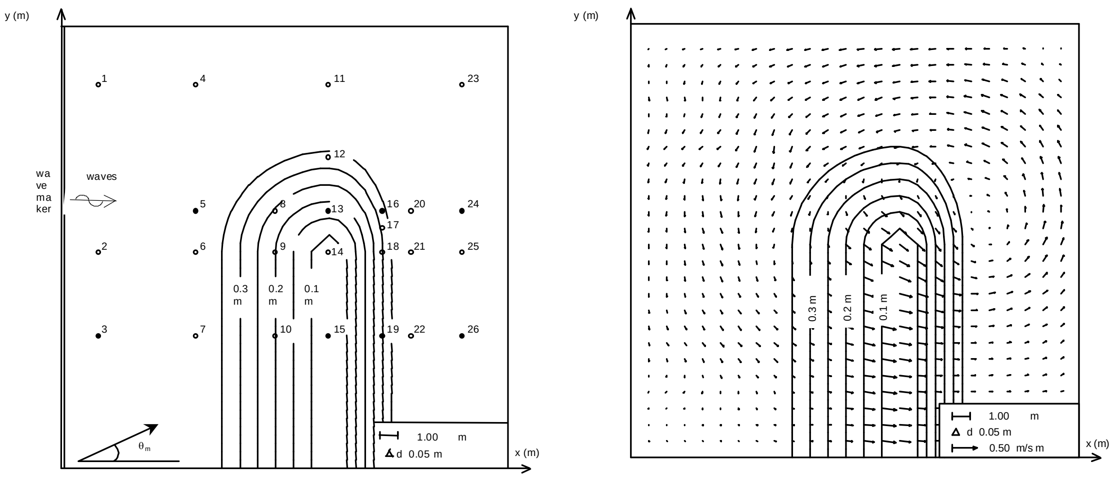

Figure 1 Bathymetry of the HISWA basin experiment (left panel) and interpolated wave-induced current pattern as observed by Dingemans et al. (1987) (right panel).

The waves propagate across the breakwater with a significant loss of energy and the generation of a relatively large high-frequency spectral peak. The breaking waves generate a mean current in the basin (Dingemans et al., 1987). The observed wave induced current field (81 measured locations) is available for this case.

Comparison

Comparisons are made for 8 measured locations as summarised in Table 1. The numbering and co-ordinates in this table are according to Figure 1. This differs from the numbering in Dingemans (1987). Comparisons are made for energy density spectra, significant wave height H_{m0} and mean wave period T_{m01}.

Nr. Location	x-location [m]	y-location [m]	Nr. Dingemans (1987)
2	2	15	10
8	12	17.5	32
9	12	15	12
13	15	17.5	33
14	15	15	13
16	18	17.5	34
18	18	15	14
24	22.5	17.5	39

Table 1 **Locations of measurements for comparison with wave model output**

Default Model commands

	COMPUTATIONAL GRID											
	1D/2D	XPC	YPC	ALPC	XLENC	YLENC						
	2D	0	-30	0	25	65						
	ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC				
	0.5	0.5	0°	360°	10°	0.317	3.125	24				
	PHYSICS											
	GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP			
	3	on	on	on	off	on	on	on	off			
	BOUNDARY CONDITIONS											
	TYPE	BOU	C/V	P/R	SHAPE	P/ME	DSPR	LEN	HS	PER	PDIR	DD
	side	W	var	par	Jonswap	peak	power	25	.1004	1.241	-5.56	4
								30	.1042	1.241	1.34	4
								40	.1108	1.241	-3.63	4
	BOTTOM:	**WIND:**	**CURRENT:**	**WATER LEVEL:**								
	'l051hiswa001.bot'	-	'1051hiswa001.cur'	-								

References

Dingemans, M.W., 1987. Verification of numerical wave propagation models with laboratory measurements; HISWA verification in the directional wave basin. Delft Hydraulics, Report H228, 400 pp.

Kuik et al., 1988: A method for the routine analysis of pitch-and-roll buoy wave data, *J. Phys. Oceanogr.*, 18, 1020-1034

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