l041curbl[001]: Wave blocking

Purpose

The purpose of this test is to verify wave propagation and transformation in the presence of a strong opposing, blocking current.

Situation

To test the wave models capability to represent current-induced wave blocking the experiment of Lai et al. (1989) is used. Here we focus on their violently-breaking case. The bathymetry of the experiment is shown in Figure 1. Both flat parts in the flume measure 1.52 m in length. The front and rear slope of the submerged bar are 1:4 and the height of the bar with reference to the bottom of the flume is 0.3 m. The top of the bar measures 2.44 m in length.

The observed 1-D energy density spectrum at station 1 is available as an up-wave boundary. The maximum velocity on top of the submerged shoal is 0.22 m/s which is large enough to block part of the incoming wave field. The current velocities are defined as the discharge divided by the local still water depth and are assumed constant over depth. Ambient winds are absent.
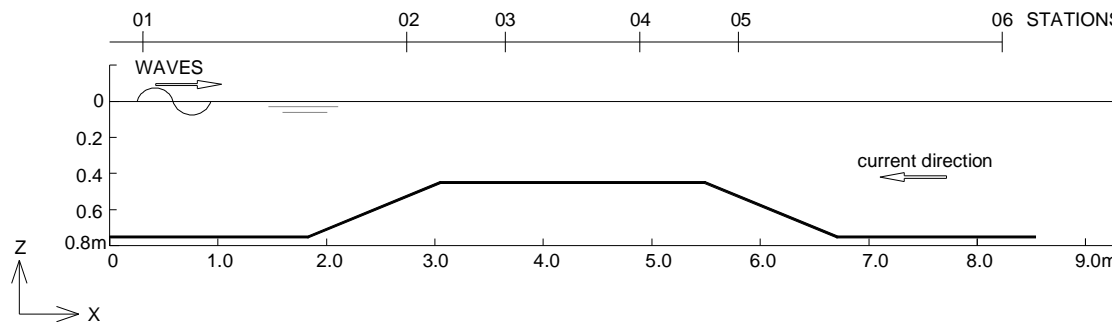

Figure 1 Bathymetry and locations of observation stations of laboratory experiment of Lai et al. (1989)

Comparison

Comparisons are made with observations of Lai et al. (1989) for energy density spectra and the significant wave height H_{m0} and mean wave period T_{m01}.

Default Model commands

COMPUTATIONAL GRID					
1D/2D	XPC	YPC	ALPC	XLENC	YLENC
2D	0	0.31	0	40.0	7.92
ΔX	ΔY	DIR1	DIR2	Δθ	FLOW	FHIGH	MSC
2	0.02	82.5°	97.5°	0.5°	0.869	5.56	35
PHYSICS								
GEN	BREAK	FRIC	TRIADS	QUAD	WCAP	REFRAC	FSHIFT	SETUP
3	on	off	on	off	on	on	on	off
BOUNDARY CONDITIONS					
TYPE	BOU	C/V	P/R	NAME OF FILE	
side	S	con	read boundary from file	'l041curbl001.bnd'	
BOTTOM:		WIND:		CURRENT:		WATER LEVEL:	
'l041curbl001.bot'		-		'l041curbl001.cur'		-	

References

Lai, R.J. et al., 1989: Laboratory studies of wave-current interaction: Kinematics of the strong interaction, *J.Geophys. Res.*, 94, No. C11, 16,201-16,214

Acknowledgements