

Numerical simulation of the field velocities and local disturbances of a long wave passing above an immersed vertical barrier

A. Laouar¹ A. Guerziz¹

May 15, 2007

1. Department of Mathematics, University of Annaba, P.O. Box. 12
23000 Annaba (Algeria)

In this work, we are interested in the study of the passage of a gravity wave over an immersed vertical barrier. The barrier is placed at right angle in the middle of the occupied fluid domain which is limited vertically by both a free surface and an impermeable horizontal bottom. We want to determine the local disturbances and the field velocity in the vicinity of the barrier. For this, we use the generalized theory of shallow water and a complex variable method. For illustrating, we consider as example the solitary wave X_e which is emitted at the upstream at time $t = 0$ and arrives exactly at time $t = t_0$; it's given by:

$$X_e(\alpha - \tau) = \varepsilon h \left\{ 1 - \tanh \left[\frac{3}{4h} (\alpha - (\tau - \tau_0)) \right] \right\}$$

where ε is a small parameter characteristic of the shallow water theory and $\tau = \varepsilon \sqrt{gh}t$, with \sqrt{gh} is the critical celerity of the propagated long waves (h and g respectively are depth of fluid at rest and gravity).