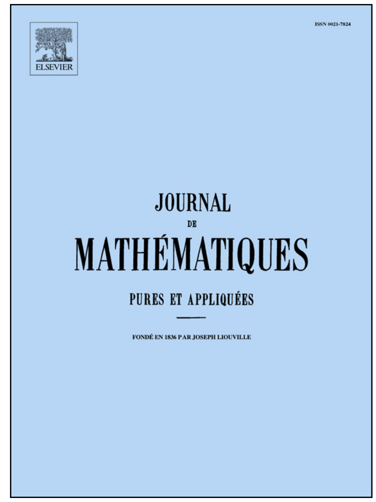

Stabilization of gravity water waves

Thomas Alazard

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Stabilization of gravity water waves

Thomas Alazard[1]

Thomas Alazard CNRS, CMLA (UMR 8536), École Normale Supérieure de Cachan, 61 avenue du Président Wilson, 94235 Cachan. France

Abstract

This paper is devoted to the stabilization of the incompressible Euler equation with free surface. We study the damping of two-dimensional gravity waves by an absorbing beach where the water-wave energy is dissipated by using the variations of the external pressure.

Keywords: Water waves, stabilization, absorbing beach, multiplier method.

1. Introduction

Many problems in water-wave theory require to study the behavior of waves propagating in an unbounded domain, like those encountered in the open sea. On the other hand, the numerical analysis of the water-wave equations requires to work in a bounded domain. This problem appears for the effective modeling of many partial differential equations and several methods have been developed to solve it. A classical approach consists in truncating the domain by introducing an artificial boundary. This is possible provided that one can find some special non-reflecting boundary conditions which make the artificial boundary (approximatively) invisible to outgoing waves. We refer to the extensive surveys by Israeli and Orszag [20], Tsynkov [38] and also to the recent papers by Abgrall, Carney, Jennings, Karni, Pridge and Rauch [22, 21] for the study of absorbing boundary conditions for the linearized 2D gravity water-wave equations. Another method, which is widespread to study wave equations, consists in damping outgoing waves in an absorbing zone surrounding the computational boundary (see [20, 38, 8]). For the water-wave equations, the idea of using the latter method goes back to Le Méhauté [27] in 1972. This approach is very important for the analysis of the water-wave equations for at least two reasons. Firstly, it is used in many numerical studies (we refer to [11, 19, 15, 17, 9, 13, 18] and the references there in) as an efficient approach to absorb outgoing waves.

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☆☆thomas.alazard@cmla.ens-cachan.fr