Título Sensitivity analysis of finite volume simulations of a breaking dam problem

Tipo de Producto Publicación científica

Autores Pablo Caron, Marcela Cruchaga, Axel Larreteguy

Código del Proyecto y Título del Proyecto

A14T09 - Modelado y simulación de flujos de frontera libre de fluidos reactivos no-newtonianos

Responsable del Proyecto

Pablo Caron

Línea

Fluido Dinámica Computacional (CFD)

Área Temática

Modelado y Simulación (MyS)

Fecha

2015

INTEC
Instituto de Tecnología

UADE FUNDACIÓN UADE

Received 18 October 2014
Revised 8 January 2015
Accepted 27 January 2015

Sensitivity analysis of finite volume simulations of a breaking dam problem

Pablo A. Caron
Instituto de Tecnología, Facultad de Ingeniería y Ciencias Exactas, Universidad Argentina de la Empresa, Ciudad Autónoma de Buenos Aires, Argentina
Marcela A. Cruchaga
DIMEC, Universidad de Santiago de Chile, Santiago, Chile, and
Axel E. Larreteguy
Instituto de Tecnología, Facultad de Ingeniería y Ciencias Exactas, Universidad Argentina de la Empresa, Ciudad Autónoma de Buenos Aires, Argentina

Abstract

Purpose – The present work is a numerical study of a breaking dam problem. The purpose of this paper is to assess the effect of turbulence and surface tension models in the prediction of the interface position in a long-term analysis. Additionally, dimensional effects are analyzed by carrying out both 2D and 3D simulations.

Design/methodology/approach – Finite volume simulations performed with the different models are compared between them and contrasted with numerical results computed using other numerical techniques and experimental data.

Findings – The reported numerical results are in general in good agreement with experimental results available in the literature. They are also consistent with numerical solutions of other authors obtained using different numerical techniques. The results show that the laminar simulations exhibit strong mesh size dependency, while the turbulence models seem to help in producing mesh-independent solutions. Surface tension modeling does not seem to play a relevant role in the interface evolution.

Practical implications – Model validation.

Originality/value – The value of the present work encompass the comparison of different flow conditions used to simulate a free surface problem and their validation by contrasting numerical results with experiments. Also, the results shown in the present work are a contribution to the understanding of the role of some specific aspects of the models in the simulation of the proposed problem.

Keywords Numerical study, Dam-break, Experimental validation, Volume of fluid, Finite volume simulations, Dimensional effects

Paper type Research paper

International Journal of Numerical Methods for Heat & Fluid Flow
Vol. 25 No. 7, 2015
pp. 1718-1745

0961-5539
DOI 10.1108/HFF-10-2014-0308