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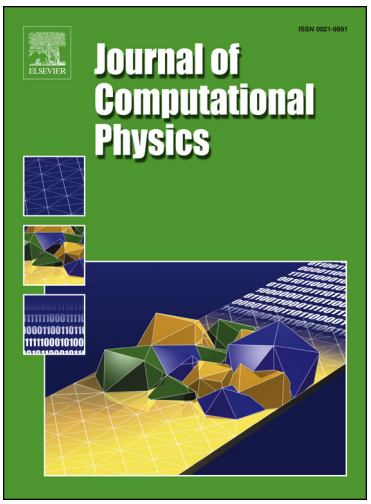

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Treating network junctions in finite volume solution of transient gas flow models

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Abstract

A finite volume scheme for the numerical solution of a non-isothermal non-adiabatic compressible flow model for gas transportation networks on non-flat topography is introduced. Unlike standard Euler equations, the model takes into account wall friction, variable height and heat transfer between the pipe and the environment which are source terms. The case of one single pipe was considered in a previous reference by the authors, [8], where a finite volume method with upwind discretization of the flux and source terms has been proposed in order to get a well-balanced scheme. The main goal of the present paper is to go a step further by considering a network of pipes. The main issue is the treatment of junctions for which container-like 2D finite volumes are introduced. The couplings between pipes (1D) and containers (2D) are carefully described and the conservation properties are analyzed. Numerical tests including real gas networks are solved showing the performance of the proposed methodology.

Keywords: Gas flow in networks, nonlinear hyperbolic systems with sources, junctions, finite volume method, well-balanced schemes.

1. Introduction

In this paper a finite volume method is proposed to solve the equations modelling the gas flow in gas transportation networks consisting of pipelines interconnected at nodes and some other elements like compression stations, pressure/flow

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