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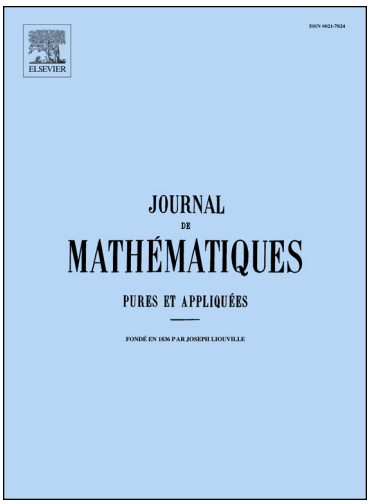

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Interaction of a centered simple wave and a planar rarefaction wave of the two-dimensional Euler equations for pseudo-steady compressible flow

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Abstract

In this paper, we study the expansion problem which arises as two-dimensional (2D) pseudo-steady supersonic flow turns a sharp corner and expands into vacuum. The problem catches interaction of a centered simple wave and a backward planar rarefaction wave, which is deduced a Goursat problem for 2D self-similar Euler equations for compressible flow. By the methods of characteristic decomposition and invariant regions, we get the hyperbolicity in the wave interaction domain and prior C^1 estimates of solutions to the Goursat problem. The global solution up to the interface of gas with vacuum to the expansion problem is obtained constructively.

Résumé

Dans cet article, nous étudions le problème de diffusion pseudo-stationnaire bidimensionnel d'un gaz supersonique à partir d'un coin pointu vers le vide. Le problème est décrit par l'interaction d'une onde simple centrée et d'une onde de détente plane. Il se réduit à un problème de Goursat pour les équations d'Euler autosimilaires bidimensionnelles. Par la méthode de la décomposition caractéristique et du domaine invariant, nous obtenons l'hyperbolicité dans le domaine de l'interaction des ondes et des estimations a priori de solutions de classe C^1 du problème de Goursat. La solution globale jusqu'à l'interface du gaz avec vide du problème de diffusion est construite.

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Keywords: Two dimensional self-similar Euler equations, centered simple wave, planar rarefaction wave, interaction of rarefaction waves, expansion of a gas into vacuum.
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1. Introduction

Supersonic flow around a bend or sharp corner, one of the most important elementary flows, is effected by a simple wave (expansion or compression). These simple waves were constructed by Courant and Friedrichs [5] for steady flow. In this paper, we consider same problem for pseudo-steady flow mathematically. For this purpose, we

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