

## Accepted Manuscript

A re-examination of weakly-nonlinear acoustic traveling waves in thermoviscous fluids under Rubin–Rosenau–Gottlieb theory

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PII: S0165-2125(17)30111-7  
DOI: <http://dx.doi.org/10.1016/j.wavemoti.2017.08.005>  
Reference: WAMOT 2188

To appear in: *Wave Motion*

Received date: 18 April 2017  
Revised date: 10 August 2017  
Accepted date: 31 August 2017

Please cite this article as: P.M. Jordan, R.S. Keiffer, G. Saccomandi, A re-examination of weakly-nonlinear acoustic traveling waves in thermoviscous fluids under Rubin–Rosenau–Gottlieb theory, *Wave Motion* (2017), <http://dx.doi.org/10.1016/j.wavemoti.2017.08.005>

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1 A re-examination of weakly-nonlinear acoustic  
2 traveling waves in thermoviscous fluids under  
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5 September 7, 2017

6 **Abstract**

7 We revisit the analysis of acoustic traveling waves in thermoviscous  
8 fluids modeled by what has come to be known as RRG-theory. In  
9 particular, the propagation anomaly reported in Ref. [1] is resolved and  
10 conditions under which the traveling wave solutions (TWS)s presented  
11 here are physically plausible are established for gases and liquids. In  
12 addition, the analysis is extended to the case of retrograde fluids, the  
13 findings reported here are compared with those of classical acoustics  
14 theory, and we propose a new dimensionless number based on RRG-  
15 theory.

16 *Keywords: Nonlinear acoustics; thermoviscous fluids; RRG theory; material*  
17 *dispersion; traveling waves*

18 **1 Introduction**

19 In Ref. [1], we investigated the question of finite-amplitude acoustic propa-  
20 gation in thermoviscous fluids under the theory of generalized continua put

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