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NONLINEAR WAVES IN REAL FLUIDS

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PREFACE

The study of materials which exhibit new and unconventional properties is of central importance for the development of advanced and refined technologies in many fields of engineering science. In this connection there has been a rapidly growing interest in real fluid effects on wave phenomena in the past few years. Here the notation "real" is not meant simply to infer the incorporation of dissipative mechanisms such as internal friction, heat conduction, etc. which are neglected in studies dealing with ideal fluids. Rather, it signals the occurrence of new effects which are present even in situations where dissipation plays an insignificant role. A prominent example is provided by Bethe-Zel'dovich-Thompson (BZT) fluids which have the distinguishing feature that they exhibit negative nonlinearity over a finite range of temperatures and pressures in the vapour phase. However, two phase flows with and without phase change are an even richer source of new unexpected and previously thought impossible phenomena.

The present volume contains the lecture notes presented during a course at the International Centre for Mechanical Sciences in Udine. Topics covered by these lecture notes include waves in gases near the critical point, waves in retrograde fluids, temperature waves in superfluid helium and density waves in suspensions of particles in liquids. Clearly, the aim of the various contributions is twofold. First, they are intended to provide scientists and engineers working in these and related areas with an overview of various new physical phenomena as for example expansion shocks, sonic shocks, shock splitting, evaporation and liquefaction shocks, ... and the experimental techniques needed to study these phenomena. Second an attempt is made to discuss aspects of their *mathematical modeling with special emphasis on properties which these phenomena have in common. In this respect model equations such as the modified Burgers equation, the Burgers Korteweg de Vries equation are seen to play a key role as far as the propagation of weakly nonlinear waves is concerned. However, methods for treating finite amplitude effects are outlined also.*

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A. Kluwick

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