

# Applications of Lie Group Analysis In Geophysical Fluid Dynamics (Series on Complexity, Nonlinearity and Chaos)

Nail H Ibragimov, Ranis N Ibragimov



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This is the first monograph dealing with the applications of the Lie group analysis to the modeling equations governing internal wave propagation in the deep ocean. A new approach to describe the nonlinear interactions of internal waves in the ocean is presented. While the central idea of the book is to investigate oceanic internal waves through the prism of Lie group analysis, it is also shown for the first time that internal wave beams, representing exact solutions to the equation of motion of stratified fluid, can be found by solving the given model as invariant solutions of nonlinear equations of motion. On the illustrative basis, it is also shown that the presence of the invariant solutions makes it possible to construct a more general class of disturbances, which represent wave beams propagating in certain direction coinciding with the beam energy.

This book is designed for specialists in Geophysical Fluid Dynamics, Ocean and Atmospheric Modeling, as well as for researchers, teachers and students -- mathematicians and nonmathematicians -- interested in methods of applied group analysis for investigating nonlinear problems in physical, engineering and natural sciences. It can also serve as a textbook on practical applications of symmetries of nonlinear differential equations for graduate students in applied mathematics, physics and engineering.

Readership: Specialists in geophysical fluid dynamics, ocean and atmospheric modeling as well as for researchers, teachers and students, mathematicians and nonmathematicians interested in methods of applied group analysis for investigating nonlinear problems in physical, engineering and natural sciences.

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