

<<非线性非分散介质中的波与结构>>

图书基本信息

书名：<<非线性非分散介质中的波与结构>>

13位ISBN编号：9787040316957

10位ISBN编号：7040316951

出版时间：2011-8

出版时间：高等教育出版社

作者：（俄）古尔巴托夫，（俄）鲁坚科，（俄）塞切夫 著

页数：472

版权说明：本站所提供下载的PDF图书仅提供预览和简介，请支持正版图书。

更多资源请访问：<http://www.tushu007.com>

## <<非线性非分散介质中的波与结构>>

### 内容概要

本书结合数学模型介绍了非线性非分散介质中的波和结构的基础理论。

全书分成两部分：第一部分给出了很多具体的例子，用于阐明一般的分析方法；第二部分主要介绍非线性声学的应用，内容包括一些具体的非线性模型及其精确解，非线性的物理机理，锯齿形波的传播，自反应现象，非线性共振及在工程、医学、非破坏性试验、地球物理学等的应用。

本书是硕士生和博士生学习具有各种物理性质的非线性波理论非常实用的教材，也是工程师和研究人员在研究工作中遇到需要考虑和处理非线性波因素时一本很好的参考书。

<<非线性非分散介质中的波与结构>>

作者简介

作者：(俄罗斯)古尔巴托夫 (S.N.Gurbatov) (俄罗斯)鲁坚科 (O.V.Rudenko) (俄罗斯)塞切夫 (A.I.Saichev)  
编者：罗朝俊 (瑞典)伊布拉基莫夫古尔巴托夫(Gurbatov)博士为俄罗斯Nizhny Novgorod State University 教授，副校长，俄罗斯政府奖获得者，出版了7本俄文或英文著作；Rudenko博士为Moscow State University教授，“Acoustical Physical”期刊的主编，出版了15本著作，已有著作翻译成中文；Saichev博士为俄罗斯Nizhny Novgorod State University教授，俄罗斯政府奖获得者，出版了7本俄文或英文著作。

# <<非线性非分散介质中的波与结构>>

## 书籍目录

- part i foundations of the theory of waves in nondispersive media
- 1 nonlinear equations of the first order
    - 1.1 simple wave equation
      - 1.1.1 the canonical form of the equation
      - 1.1.2 particle flow
      - 1.1.3 discussion of the riemann solution
      - 1.1.4 compressions and expansions of the particle flow
      - 1.1.5 continuity equation
      - 1.1.6 construction of the density field
      - 1.1.7 momentum-conservation law
      - 1.1.8 fourier transforms of density and velocity
    - 1.2 line-growth equation
      - 1.2.1 forest-fire propagation
      - 1.2.2 anisotropic surface growth
      - 1.2.3 solution of the surface-growth equation
    - 1.3 one-dimensional laws of gravitation
      - 1.3.1 lagrangian description of one-dimensional gravitation
      - 1.3.2 eulerian description of one-dimensional gravitation
      - 1.3.3 collapse of a one-dimensional universe
    - 1.4 problems to chapter 1
    - references
  - 2 generalized solutions of nonlinear equations
    - 2.1 standard equations
      - 2.1.1 particle-flow equations
      - 2.1.2 line growth in the small angle approximation
      - 2.1.3 nonlinear acoustics equation
    - 2.2 multistream solutions
      - 2.2.1 interval of single-stream motion
      - 2.2.2 appearance of multistreamness
      - 2.2.3 gradient catastrophe
    - 2.3 sum of streams
      - 2.3.1 total particle flow
      - 2.3.2 summation of streams by inverse fourier transform
      - 2.3.3 algebraic sum of the velocity field
      - 2.3.4 density of a "warm" particle flow
    - 2.4 weak solutions of nonlinear equations of the first order
      - 2.4.1 forest fire
      - 2.4.2 the lax-oleinik absolute minimum principle
      - 2.4.3 geometric construction of weak solutions
      - 2.4.4 convex hull
      - 2.4.5 maxwell's rule
    - 2.5 the e-rykov-sinai global principle
      - 2.5.1 flow of inelastically coalescing particles
      - 2.5.2 inelastic collisions of particles

<<非线性非分散介质中的波与结构>>

- 2.5.3 formulation of the global principle
- 2.5.4 mechanical meaning of the global principle
- 2.5.5 condition of physical realizability
- 2.5.6 geometry of the global principle
- 2.5.7 solutions of the continuity equation
- 2.6 line-growth geometry
  - 2.6.1 parametric equations of a line
  - 2.6.2 contour in polar coordinates
  - 2.6.3 contour envelopes
- 2.7 problems to chapter 2
  - references
- 3 nonlinear equations of the second order
  - 3.1 regularization of nonlinear equations
    - 3.1.1 the kardar-parisi-zhang equation
    - 3.1.2 the burgers equation
  - 3.2 properties of the burgers equation
    - 3.2.1 galilean invariance
    - 3.2.2 reynolds number
    - 3.2.3 hubble expansion
    - 3.2.4 stationary wave
    - 3.2.5 khokhlov's solution
    - 3.2.6 rudenko's solution
  - 3.3 general solution of the burgers equation
    - 3.3.1 the hopf-cole substitution
    - 3.3.2 general solution of the burgers equation
    - 3.3.3 averaged lagrangian coordinate
    - 3.3.4 solution of the burgers equation with vanishing viscosity
  - 3.4 model equations of gas dynamics
    - 3.4.1 one-dimensional model of a polytropic gas
    - 3.4.2 discussion of physical properties of a model gas
  - 3.5 problems to chapter 3
    - references
- 4 field evolution within the framework of the burgers equation
  - 4.1 evolution of one-dimensional signals
    - 4.1.1 self-similar solution, once more
    - 4.1.2 approach to the linear stage
    - 4.1.3 n-wave and u-wave
    - 4.1.4 sawtooth waves
    - 4.1.5 periodic waves
  - 4.2 evolution of complex signals
    - 4.2.1 quasiperiodic complex signals
    - 4.2.2 evolution of fractal signals
    - 4.2.3 evolution of multi-scale signals - a dynamic turbulence model
  - 4.3 problems to chapter 4

<<非线性非分散介质中的波与结构>>

references

5 evolution of a noise field within the framework of the burgers equation

5.1 burgers turbulence - acoustic turbulence

5.2 the burgers turbulence at the initial stage of evolution

5.2.1 one-point probability density of a random eulerian velocity

field

5.2.2 properties of the probability density of a random velocity

field

5.2.3 spectra of a velocity field

5.3 turbulence evolution at the stage of developed

discontinuities

5.3.1 phenomenology of the burgers turbulence

5.3.2 evolution of the burgers turbulence: statistically

homogeneous potential and velocity ( $n \geq 1$  and  $n \leq -3$ )

5.3.3 exact self-similarity ( $n \geq 2$ )

5.3.4 violation of self-similarity ( $1 \leq n \leq 2$ )

5.3.5 evolution of turbulence: statistically inhomogeneous

potential ( $-3 \leq n \leq 1$ )

5.3.6 statistically homogeneous velocity and inhomogeneous

potential ( $-1 \leq n \leq 1$ )

5.3.7 statistically inhomogeneous velocity and inhomogeneous

potential ( $-3 \leq n \leq -1$ )

5.3.8 evolution of intense acoustic noise

references

6 multidimensional nonlinear equations

6.1 nonlinear equations of the first order

6.1.1 main equations of three-dimensional flows

6.1.2 lagrangian and eulerian description of a three-dimensional

low

6.1.3 jacobian matrix for the transformation from lagrangian to

eulerian coordinates

6.1.4 density of a multidimensional flow

6.1.5 weak solution of the surface-growth equation

6.1.6 flows of locally interacting particles and a singular

density field

6.2 multidimensional nonlinear equations of the second order

6.2.1 the two-dimensional kpz equation

6.2.2 the three-dimensional burgers equation

6.2.3 model density field

6.2.4 concentration field

6.3 evolution of the main perturbation types in the kpz equation

and

in the multidimensional burgers equation

6.3.1 asymptotic solutions of the multidimensional burgers equation and local self-similarity

6.3.2 evolution of simple localized perturbations

<<非线性非分散介质中的波与结构>>

- 6.3.3 evolution of periodic structures under infinite reynolds numbers
- 6.3.4 evolution of the anisotropic burgers turbulence
- 6.3.5 evolution of perturbations with complex internal structure
- 6.3.6 asymptotic long-time behavior of a localized perturbation
- 6.3.7 appendix to section 6.3. statistical properties of maxima of inhomogeneous random gaussian fields
- 6.4 model description of evolution of the large-scale structure of the universe
  - 6.4.1 gravitational instability in an expanding universe
  - 6.4.2 from the vlasov~poisson equation to the zeldovich approximation and adhesion model
- references
- part ii mathematical models and physical phenomena in nonlinear acoustics
- 7 model equations and methods of finding their exact solutions
  - 7.1 introduction
    - 7.1.1 facts from the linear theory
    - 7.1.2 how to add nonlinear terms to simplified equations
    - 7.1.3 more general evolution equations
    - 7.1.4 two types of evolution equations
  - 7.2 lie groups and some exact solutions
    - 7.2.1 exact solutions of the burgers equation
    - 7.2.2 finding exact solutions of the burgers equation by using the group-theory methods
    - 7.2.3 some methods of finding exact solutions
  - 7.3 the a priori symmetry method
- references
- 8 types of acoustic nonlinearities and methods of nonlinear acoustic diagnostics
  - 8.1 introduction
    - 8.1.1 physical and geometric nonlinearities
  - 8.2 classification of types of acoustic nonlinearity
    - 8.2.1 boundary nonlinearities
  - 8.3 some mechanisms of bulk structural nonlinearity
    - 8.3.1 nonlinearity of media with strongly compressible inclusions
    - 8.3.2 nonlinearity of solid structurally inhomogeneous media
  - 8.4 nonlinear diagnostics
    - 8.4.1 inverse problems of nonlinear diagnostics
    - 8.4.2 peculiarities of nonlinear diagnostics problems
  - 8.5 applications of nonlinear diagnostics methods
    - 8.5.1 detection of bubbles in a liquid and cracks in a

<<非线性非分散介质中的波与结构>>

solid

8.5.2 measurements based on the use of radiation pressure

8.5.3 nonlinear acoustic diagnostics in construction

industry

8.6 non-typical nonlinear phenomena in structurally inhomogeneous

media

references

9 nonlinear sawtooth waves

9.1 sawtooth waves

9.2 field and spectral approaches in the theory of nonlinear

waves

9.2.1 general remarks

9.2.2 generation of harmonics

9.2.3 degenerate parametric interaction

9.3 diffracting beams of sawtooth waves

9.4 waves in inhomogeneous media and nonlinear geometric

acoustics

9.5 the focusing of discontinuous waves

9.6 nonlinear absorption and saturation

9.7 kinetics of sawtooth waves

9.8 interaction of waves containing shock fronts

references

10 self-action of spatially bounded waves containing shock

fronts

10.1 introduction

10.2 self-action of sawtooth ultrasonic wave beams due to the heating of a medium and acoustic wind formation

10.3 self-refraction of weak shock waves in a quadratically

nonlinear medium

10.4 non-inertial self-action in a cubically nonlinear

medium

10.5 symmetries and conservation laws for an evolution equation describing beam propagation in a nonlinear medium

10.6 conclusions

references

11 nonlinear standing waves, resonance phenomena and frequency characteristics of distributed systems

11.1 introduction

11.2 methods of evaluation of the characteristics of nonlinear

resonators

11.3 standing waves and the q-factor of a resonator filled with a dissipating medium

11.4 frequency responses of a quadratically nonlinear

resonator

11.5 q-factor increase under introduction of losses

11.6 geometric nonlinearity due to boundary motion

11.7 resonator filled with a cubically nonlinear medium



<<非线性非分散介质中的波与结构>>

references

appendix fundamental properties of generalized functions

a.1 definition of generalized functions

a.2 fundamental sequences

a.3 derivatives of generalized functions

a.4 the leibniz formula

a.5 derivatives of discontinuous functions

a.6 generalized functions of a composite argument

a.7 multidimensional generalized functions

a.8 continuity equation

a.8.1 singular solution

a.8.2 green's function

a.8.3 lagrangian and eulerian coordinates

a.9 method of characteristics inde

<<非线性非分散介质中的波与结构>>

章节摘录

版权页：插图：Studying wave interactions in nondispersive media until the early 1970s had been based on an analysis of simple theoretical models. Mainly plane or other one-dimensional (spherically and cylindrically symmetric) waves were considered. But in reality, one has to deal with beams, whose evolution is affected by diffraction, and this idealization is often too coarse. Peculiarities in the behavior of bounded nonlinear beams had been noted in early experiments. But systematic studies had been performed later [33,34], after an adequate theory was created, for its verification.

## <<非线性非分散介质中的波与结构>>

### 编辑推荐

《非线性非分散介质中的波和结构:非线性声学的一般理论及应用(英文版)》全面介绍非线性波的结构和动力学行为例如振动、波阵面、锯齿形波、三维细胞结构的第一本专著,描述了天体物理学、声学、机械、地球物理学、海洋资源研究中已经观测到的非线性现象,包括数学模型、一般理论、例子及工程应用叙述清晰、易学易懂,关键词:非线性结构,锯齿形波,发展方程,生物医学工程,非线性检验,非线性物理学。

<<非线性非分散介质中的波与结构>>

版权说明

本站所提供下载的PDF图书仅提供预览和简介, 请支持正版图书。

更多资源请访问:<http://www.tushu007.com>