

Preface

Fluid dynamical processes play a central role in almost all areas of astrophysics. This role is not always acknowledged in undergraduate courses or even graduate courses in the field, however.

This book could reasonably form the basis for a one-semester graduate course in astrophysical fluid dynamics. Over a number of years the material upon which the book is based has been given in lecture courses to graduate students (PhD and Masters-level), and also occasionally to advanced-level undergraduate students, studying astrophysics, physics or applied mathematics in the University of London. The scope of the material has been expanded somewhat for the present book, in particular giving an introduction to concepts of numerical computations in astrophysical fluid dynamics.

The treatment starts from a continuum description of a fluid (be it gas or liquid) and establishes the equations of fluid dynamics, so that no prior study of fluid dynamics is required. After introducing physical concepts necessary for the application to astrophysics, a number of different aspects and application areas are presented. The emphasis is mainly on the fluid dynamical properties rather than, say, radiative transfer or particle dynamics. While the choice of applications inevitably reflects to some extent my own research interests in solar and stellar physics, this introduction is intended to provide readers with the foundations of astrophysical fluid dynamics from which to study applications in areas in addition to the ones developed further here. There are some excellent advanced texts — I would mention in particular Shu's two-volume *The Physics of Astrophysics* (*Volume I: Radiation* and *Volume II: Gas Dynamics*) and Mihalas & Mihalas's *Foundations of Radiation Hydrodynamics* — for the advanced graduate student and researcher, to which it is hoped that the present volume will provide a useful intermediate step.

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