Preface

This book is the third of a series about the physics of the Sun and the stars bringing together the knowledge from the two communities working on these objects. The focus of this book is placed on the environments of the Sun and the stars, with a particular emphasis on recent observations and techniques, and on the interactions between the environment and the central object.

The General Overlook of this Book is as Followed The first three chapters of the book focus on the Sun, a star that can and has been studied in great detail. In the recent years many space missions provided us with important information about shock waves and discontinuities in the natural plasmas of the solar system. The solar wind, i.e., the particles escaping from the Sun via flares, prominence ejection, and coronal mass ejection, impact on the Earth magnetic environment with cascading effects on the Earth atmosphere. This allows us to study the Sun from the magnetic activity of the Earth. For example, from the changing correlation between sunspot and geomagnetic activity, the long-term variations in the components of the solar magnetic field can be estimated. In addition, one can study the link between the solar cycle and the planetary tidal forces.

Chapter 4 proposes a physical picture of tides in planetary systems and binary stellar systems. Tidal interactions are a key mechanism to understand the dynamics and evolution of celestial objects. The following chapter presents the case of massive binary stars, which can be studied thanks to the advent of interferometric techniques.

Interferometry also allows us to study the very close environments of young stars, as presented in Chap. 6. For example, interferometric observations directly probe the location of the dust and gas in the circumstellar disks and allow us to detect and characterize close companions. A more complete review about accretion disks is presented in the following chapter. With Chap. 8 we move on from young stars to main sequence stars, discuss mass loss through the winds of hot massive stars and how these winds interact with rotation and magnetic fields leading to stellar spin-down and large-scale disk-like structures. The next chapter presents the magnetic field and convection in the cool supergiant Betelgeuse. Finally, Chap. 10 focuses on evolved objects, such as bipolar nebulae, post-AGB stars or novae, and discuss in particular the difference between the torus and disk environment.

The audience targeted by this book consists of researchers, PhD students, post-docs, and also all scientists seeking a complementary culture or evolving toward new research topics.

This book is based on tutorials and discussions on the same topic held at a CNRS school in Roscoff (France) in 2011, which has allowed us to give a progress report on the very last solar developments (structure of the solar core for example) and stellar developments (CoRoT results, new stellar models) for a better understanding of environments in general. Let us remind that two previous books titled "The Rotation of the Sun and Stars" (LNP 765) and "The Pulsations of the Sun and the Stars" (LNP 832) resulted from two previous CNRS schools held in Obernai (France) in 2007 and Saint-Flour (France) in 2008. We hope that this new book about the "Environments of the Sun and the Stars" will provide an interesting sequel for the reader.

The editors sincerely thank the authors for the great quality of their contributions published here.

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