

Preface

As a result of the forest decline in Central Europe in the 1980s and 1990s of the last century, a forest research station was established in a large area of spruce in the Fichtelgebirge Mountains in Germany. It is the aim of the book to summarize the scientific results obtained over the last 20 years at the FLUXNET station DE-Bay (Waldstein-Weidenbrunnen). While many of these results have already been published, others—including those in many as-yet unpublished master's theses and some PhD theses—are presented here for the first time. Work presented in early papers also needs a revision in light of the most recent investigations. Because the main focus of the research in recent years has been on the turbulent exchange conditions and turbulent energy and matter fluxes, the book is different to studies that are otherwise similar but more ecology-based. The book does, however, seek to convey an understanding of the functioning of the ecosystem as a whole by highlighting processes in the atmosphere. The Waldstein-Weidenbrunnen site is, alongside sites like Duke Forest, Niwot Ridge, and Hyytiälä, one of the best-investigated FLUXNET sites, with a strong focus on exchange conditions.

The opening chapter describes the history of the site and the research carried out in different types of projects and larger experiments beyond the continuously running observation program. From this, the reader can appreciate how the results in the book came together as a mosaic of many individual projects. The next chapter provides site documentation together with an appendix of the permanent instrumentation of the site, as well as the instrumentation used during special experiments. This allowed us to reduce the site descriptions in the individual chapters to their most important parts. Chapters 3 and 4 provide analysis of the monitoring data for climate, air pollution, water, and carbon fluxes on a scale of hours to years, and they describe the environment for all other research topics. The data are available on a monthly basis in an appendix. Chapters 5–14 mainly describe experimental case studies conducted on a much smaller scale in time and space. The authors used references between the chapters to show the strong interaction of these individual process studies. Model studies conducted from the catchment scale up to a high-resolution large eddy simulation are presented in a similar manner in Chaps. 15–18. Chapter 19 serves to bring everything together. Highlighting some special

problems, it assembles the results of the different chapters—the pieces of the puzzle—and formulates necessary research for the future and recommendations for possible networks similar to FLUXNET.

I am eager to express my acknowledgment of all who supported this research, in particular the European and German funding agencies, the authorities of the University of Bayreuth, and the technicians, mainly Jörg Gerchau, Johannes Olesch, and Gerhard Müller, without whom the intensive measuring program would not be possible. Furthermore, I want to thank Richard Howes for the language editing of many of the chapters. The book was also written in memoriam of Dr. Peter Werle, who supported many optical measurements.

Together with all authors, I hope that the book is not only a documentation of the Waldstein sites but also an interesting account of the generation of a deeper understanding of the turbulent exchange conditions of tall vegetation and that it will contribute ideas for further research.

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