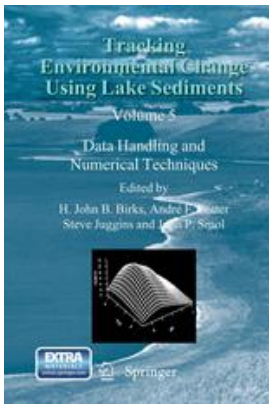

Tracking environmental change using lake sediments, Vol. 5: Data handling and numerical techniques, edited by H. John B. Birks, André F. Lotter, Steve Juggins & John P. Smol, 2012. Springer Verlag, London. 745 pages. Hardcover: price EUR 103.95, ISBN 978-94-007-2744-1; e-book: price EUR 83.29, ISBN 978-94-007-2745-8.

Paleolimnology is a multi-disciplinary science that integrates physical, chemical and biological information stored in lake sediments. With the increasing interest in paleoenvironmental changes over the last decades, paleolimnology has become a rapidly growing discipline with many applications, including both theoretical and practical issues. Detailed investigations of sediment cores commonly generate large and complex data sets. Climate and environmental change are now commonly interpreted from such data.

In the realm of paleolimnology, the widely known statement "data should speak for themselves" does not work, as retrieving consistent information from the diverse proxy data requires using a variety of statistical techniques. Quantitative approach is the subject of the fifth volume of the Developments in Palaeoenvironmental Research series by Springer devoted to tracking environmental changes from lake sediments, which is a logical continuation of the preceding four volumes. While Volumes 1 through 4 explain different methods used in paleolimnology to retrieve proxy data stored in lake sediments, this volume aims to explain the most appropriate approach(es) for the quantitative analysis of paleolimnological data. A wide range of numerical and statistical methods that are ever more often used by paleolimnologists are here brought together for the purpose.

The 21 chapters that constitute four parts give the book a clear structure. Each part comes with a concise introduction that summarizes the content and presents a general background. Part I is an introduction and provides the historical context of the development of quantitative approach in paleolimnology since the 1980s, as well as a general discussion about the methods and data sets that are considered in the following three parts.

The methods applicable to modern surface-sediment data sets as well as to core sediment data are dealt with in Part II. The logical structure starts from basic statistical methods (exploratory data analysis and data display, estimation of uncertainty associated with laboratory analyses), to more advanced multivariate techniques (clustering and partitioning, ordination techniques), and finally to statistical-learning techniques such as classification and regression trees and artificial neural networks.

Part III focuses on methods applicable to stratigraphic data sets and discusses problems related to age-depth modeling, the correlation of two or more cores, the quantitative reconstruction of paleoenvironmental conditions using a calibration-in-time approach and transfer functions, modern analogue technique and time series analysis. Application of these methods has developed into something that determines the everyday work of paleolimnologists, and both Parts II and III are therefore of crucial interest to most of them.

Three case studies are presented in Part IV. The cases show where numerical and statistical methods allowed to explain certain research problems, i.e. limnological responses to environmental change at different time scales, assessment of surface-water acidification and eutrophication, and tracking Holocene climate change. The last chapter concludes the present state in this field of research and outlines the expected future developments.

Twenty-three contributors were involved in the book. They are leading researchers in the field of quantitative paleoecology and related disciplines. Although the authors declare that they

did not attempt to provide a complete textbook on numerical methods, it contains an enormous load of theoretical knowledge. Each chapter provides basic concepts of the method presented, details concerning data preparation and transformation, a thorough discussion supported by case studies, and recommendations regarding potential use in paleolimnologic studies. Fortunately, the content is well illustrated by figures and tables of excellent quality. An important part of each chapter is a list of up-to-date references and suitable software packages. What makes the book even more useful, is the practical information about a range of analyses covered by the software and their availability through the internet. The complete glossary (41 pages!) that covers not only strictly statistical terms may be useful for those who are not familiar with quantitative methods in this field.

The clear structure, professional style, excellent illustrations and many useful additions make this book at first sight suitable for all paleolimnologists; actually, however, the book is aimed at researchers having some experience in statistical methods; the more complex methods can be tackled only after complete training in advanced statistics. Moreover, this is not a book which should be read as a whole. A much more efficient way to retrieve practical information is to look for specific methods of interest and learn how to use it in a proper way. In this context, it is a priceless source of knowledge which should be among must-read books on every paleolimnologist's bookshelf. However, careful reading of the first chapter is compulsory to everyone searching for details, as it contains maybe the most important “take home" message of this book: "No amount of ‘statistical finesse’ will ever compensate for a poor data-set or poorly designed sampling programme". Having this message in mind, we can trustfully use this book and benefit from the complex statistical approaches explained here.

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