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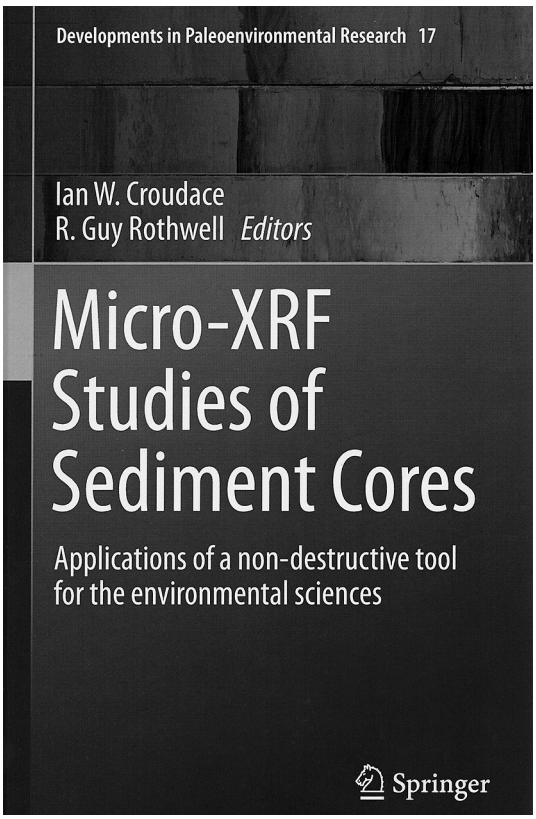
Book reviews

Micro-XRF Studies of Sediment Cores. Applications of a Non-destructive Tool for the Environmental Sciences, edited by I.W. Croudace and R.G. Rothwell, 2015. Developments in Paleoenvironmental Research 17. Springer Verlag, London. 656 pages. Hardcover: price EUR 99.99; ISBN 978-94-017-9848-8. E-book price EUR 83.29; ISBN 978-94-017-9849-5.



With a growing interest in palaeoenvironmental research, the last decades have seen a rapid development of analytical techniques dedicated to sediment core studies. Among a range of technological innovations, micro-XRF core scanners have become valuable tools for the production of high-resolution series of geochemical proxy data. This technique permits the detection of a range of chemical elements by rapid, non-destructive and automatic scanning of sediment cores. Another major advantage of micro-XRF scanning is the possibility to obtain proxy data at high (annual, sub-annual) resolution. These features explain why micro-XRF core scanners have become standard analytical tools in palaeoenvironmental research, which is illustrated by the near-exponential growth during the first decade of this century in the number of scientific papers that include results generated by XRF core scanners. XRF-scanner facilities are now used in about one hundred institutions in Europe, North America and Asia.

The 17th volume of *Developments in Paleoenvironmental Research* is dedicated exclusively to studies of sediment cores using micro-XRF core scanners. The overall goal of this book is to provide a comprehensive overview of marine and lacustrine applications of micro-XRF core scanning, in addition to other environmental applications and technological developments. The editors of this volume, Ian W. Croudace (University of Southampton) and R. Guy Rothwell (BOSCORF), are prominent specialists in the field who have been involved in the design and development of the prototype Itrax XRF Core Scanner. They assembled an impressive group of almost 80 contributors to represent the various scientific disciplines.

The book has a clear structure and contains 27 chapters that constitute five major parts, preceded by a brief introductory chapter written by the editors. Part I 'Marine Studies' kicks off with a broad review of the historical development of the X-ray fluorescence measurement technique and its application to marine sediments. The following five chapters present examples of different applications, i.e., studies of diagenetic and authigenic processes, turbidite geochemistry and identification of submarine landslides. The emphasis is on methodological issues related to standardised measurement protocols, quality and accuracy of measurement data, and calibration with other analytical methods.

Part II 'Lake and River Studies' also starts with a comprehensive survey of micro-XRF core scanning applications in lake sediment research. Different applications of this technique are presented,

inclusive of palaeoclimate investigations, flood histories, erosion changes, metal pollution, identification of volcanic ash layers and varve counting. In the following chapters, the potential of micro-XRF scanning to estimate biogenic silica concentrations in sediments and to support microfacies analysis in annually laminated sediment cores is demonstrated. Also problems related to scanning long and lithologically variable sediment cores are discussed in this respect. Additionally, the potential and problems of investigating fluvial sediments are discussed and illustrated using several case studies.

Part III 'Environmental Geochemistry and Forensic Applications' is dedicated to scientific studies of air, water, land and pollution of biota, caused by anthropogenic impacts. Interesting case studies from heavily contaminated areas show how micro-XRF scanning results, combined with ^{210}Pb and ^{137}Cs dating of sediment cores can be used to identify the sources of pollution and provide historical pollution records.

Part IV 'Technological Aspects' focuses mostly on measurement parameters, raw data transformation and calibration of XRF scanning results. Major problems discussed here cover the influence of measurement parameters and physical properties of sediments on data quality, the calibration of high-resolution X-radiographic images, the conversion of semi-quantitative core scanning data into quantitative measures of sediment composition and a comparison of results obtained by using different scanning instruments. In spite of more 'technical' character of this part, it is also useful for data users as many of the problems discussed here are related to data transformation which can be done after scanning to improve data quality and reliability.

Finally, Part V 'The Future of Non-destructive Core Scanning' presents the personal views of the editors on the possible future development of XRF core scanners. We can expect that increasingly more non-destructive measurement techniques will be incorporated into scanning instruments in the near future.

The book contains an impressive data set regarding specific applications of micro-XRF core scanners in a variety of palaeoenvironmental studies. Spectacular results are accompanied by thorough discussion of potential problems supported by appealing case studies. The content is well illustrated by photographs, line drawings and tables of excellent quality. A list of references is provided at the end of each chapter which helps to find the reference of interest easily. Given the increasing use of micro-XRF scanning data, this book will turn out useful to a large readership. Beyond doubt, it will serve as a priceless source of information for new researchers using scanning data for their palaeoenvironmental interpretations but will also help experienced users of micro-XRF scanners to take full advantage of these powerful instruments.

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