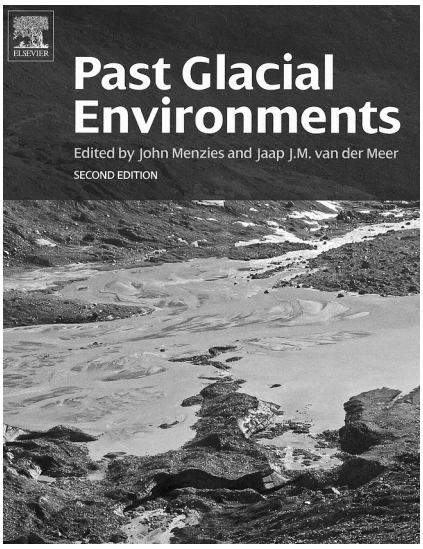
Geologos 24, 2 (2018): 175–176
doi: 10.2478/logos-2018-0018

GEOLOGOS

Past glacial environments (Second edition), edited by J. Menzies and J.J.M. van der Meer, 2017. Elsevier, Amsterdam. 858 pages. Paperback: price $98.70, ISBN 978-0-08-100524-8.



Despite the fact that our knowledge in the fields of geology and other environmental studies is constantly broadening, numerous facets of Earth history remain a mystery to this day. The Earth has changed through the geological ages and certainly will be doing so in the future. Scientists invariably will try to predict what is going to happen in the near future and how this will have an impact on our lives. Recently, special emphasis has been placed on global warming and how glaciers and ice sheets respond to that. But (and this is widely accepted), the past provides the key to understanding the future. Scientific investigations have provided data that document that the Earth experienced numerous glaciations dating back to about 2.9 Ga, i.e., the Pongola glaciation that was punctuated by warmer periods. Each of the past glaciations left traces in the shape of landforms and sediments which record processes which are to be fully deciphered in order to support future-predicting models. In general, this is what the present textbook is all about.

In this tome the two editors, and 30 other contributors, cover a substantial part of the facets related to glacial environments. The volume is divided into five major parts which are further subdivided into 21 chapters, plus the introduction. The first part is devoted to pre-Quaternary ice ages, presenting data on Precambrian glaciations and the commoner glaciations during the Phanerozoic. However, our current knowledge of these glaciations is rather limited due to a dearth of glacial deposits of those ages. It appears that this period in Earth history witnessed two of the most widely distributed ice covers, the Cryogenian glaciations. Concise data on Quaternary glaciations are provided in the second part, although there are no details, nor maps, of the extent of the ice covers, not even during the Last Glacial Maximum.

Part III is the most extensive as well as essential part, comprising 479 pages and twelve chapters. In this part, various contributors describe the full range of glacial environments and focus on processes, sediments and landforms. Discussed first is the subglacial environment – this is of primary importance for the dynamics of glaciers and ice sheets. Moreover, subglacial process and products play a key role in our understanding of both past and present ice sheet advances and retreats. The significance of subglacial processes is stressed right from the start and is repeated in subsequent chapters, including the one entitled 'Glaciohydrogeology'. This term is not in common use; it refers to groundwater in aquifers and aquitards tha experience pressure by the ice cover and by subglacial meltwater/ice interactions that are independent of surface conditions. In addition to subglacial environments, this part of the book also describes processes that operate in supraglacial, periglacial, glaciolacustrine and glaciomarine environments, with special reference to products resulting from such processes. Glacio-aeolian processes, glaciotectonic and glaciovolcanism are not forgotten either. Although the book is generally devoted to past glacial environments, glacial processes are also described with reference to present-day glacial environments – this issue is climate related. In view of the fact that subglacial processes can be, to some extent, interpreted through the use of GIS, there is also a chapter in this part which describes the advantages of this tool.

Different techniques and methods are required to study past environments. Thus, the next part of this tome is dedicated to these issues, although we

look in vain for standard methods such as facies description or macrofabric measurements. In short, this book is not a guide, being out of scope. Subjects discussed in this part are: soils, modelling, dating, mineralogy, geochemistry and micromorphology, i.e., the scope is quite extensive. For example, readers can find mathematical reasoning behind the behaviour of glaciers and ice sheets, but also data on mineral indicators used to trace economically valuable deposits. Another method that is described is highly informative for the classification of till (and thus subglacial processes) is micromorphology which allows analyses of sediments in their undisturbed state. This method has recently been much further developed thanks to, among other people, the editors of the present book.

During the last several decades we have observed significant progress in glaciology, glacial geology and other related fields. Series of studies, inclusive of interdisciplinary work, have documented the complexity of processes. But, still many aspects remain unclear, being matters of extensive debate. Major questions demand answers: these are highlighted in the final part of the book and again emphasise the significance of glacial studies.

The present tome is well written and profusely illustrated in full colour. It is also well structured, but I would rather suggest to move the chapter devoted to GIS to part IV where techniques and methods are described. In addition, I have some doubts about using the terms Tertiary and Anthropocene (pp. 77 and 183, respectively); the former is not a formal unit, although still widely used, and the latter has not been yet formally approved by the International Commission on Stratigraphy. However, these are only minor quibbles which do not influence my overall view that this book is highly recommendable to both students and professionals, who, I believe, will find it very interesting and informative as I do. Hopefully, it will also be stimulating to students and encourage them to broaden their knowledge in the field of glacial geology.

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