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Book Reviews

Water, Ice and Stone: Science Memory on the Antarctic Lakes

Bill Green
Harmony Books, New York (1995).
283 pages. $23. ISBN 0 517 58759 9.

Many of us who conduct research in Antarctic recognize that it is a privilege just to be there, and that with the privilege comes a responsibility to share our experiences with those who are fascinated by this remote continent. When I give classroom presentations or talk to people I meet, I often feel that I have not adequately expressed or explained either my experiences or my research. In this wonderful book, Bill Green succeeds in conveying the nature of being an Antarctic scientist in the fullness of the experience at both the personal and scientific level. The book is organized around the events and experiences of a field season where Bill Green and his colleagues studied the geochemistry of several lakes in the McMurdo Dry Valleys in South Victoria Land. He weaves into the storyline the scientific questions which fascinate him and motivate his research, and the personal experiences which form the context for his thoughts and interactions with the members of his field team during the expedition.

I found this book to be a joy to read. I read only a chapter at a time because, as I read, my own experiences of coming into McMurdo Station and working in the Dry Valleys came back to me and I wanted to take time for contemplation before beginning the next chapter. By incorporating his own personal experience and those of his team mates into the account of the progress of the field season, Bill Green shows how the act of going off to do research in Antarctica becomes a defining experience not only for the Antarctic scientist, but also for the family and friends at home who write letters and cope with the disruption of their routine. The description of the initial uncertainty and hesitancy of the hydrologist Varnmer is particularly evocative of the extension of the experience beyond the individual who is in the field.

Beyond the Antarctic scientific community, this book will be equally appreciated by non-scientists interested in natural history and by scientists working in other regions of the world and in disciplines other than geochemistry or limnology. The excitement of new ideas and the patience required to test them, the tangible satisfaction of actually obtaining a sample, the anxiety of waiting for the safe transport of samples are all conveyed in this book. Bill Green also explains how his own interest in geochemistry can lead him to perceive the world around him in several ways. Because it is so clearly and graciously written, this book would be an excellent gift for friends, relatives and associates of Antarctic scientists. Reading this book would be an enjoyable way to come to understanding the attraction of Antarctic research. I also recommend this book to students and scientists considering becoming involved in any Antarctic research project.

The recognition of the broad appeal and exceptional quality of the book is not just my own. As author of this book, Bill Green was the recipient of the John Burroughs Medal for 1996. This award recognizes writers who combine scientific accuracy, first-hand fieldwork, and outstanding natural history writing. In receiving this award, Bill Green joins a distinguished group of writers, including Rachel Carson, Joseph Wood Krutch, Aldo Leopold, John McPhee, and Barry Lopez. The Antarctic scientific community should be proud to have among our midst a colleague who is also a colleague of these and other Burroughs winners!

DIANE MCKNIGHT

Geology and Seismic Stratigraphy of the Antarctic Margin

Edited by Alan K. Cooper, Peter F. Barker and Giuliano Brancolini
Volume 68, Antarctic Research Series. American Geophysical Union, Washington (1995).
301 pages, atlas (22 plates), 2 CD-ROMs. $65 (AGU members $45.50). ISBN 0 87590 884 5.

Antarctica's important role in determining global climate has been increasingly recognised over the last few decades. A key to understanding the geological evolution of Antarctica is found in the thick sedimentary deposits of the offshore areas surrounding the continent. This has led several countries to collect data from the Antarctic continental margin. At present, an extensive seismic data base exists from the region, forming a powerful tool for deciphering the geological and paleoclimatical history of Antarctica.

The present volume results from a successful international project, the Antarctic Offshore Acoustic Stratigraphy (ANTOSTRAT) project, launched in 1990, under the auspices of the Scientific Committee on Antarctic Research (SCAR). Objectives of the project were to locate, collate, combine and interpret the vast seismic data sets that had been acquired around Antarctica, in order to help resolve in particular the Cenozoic part of Antarctica's geological history. The volume contains 13 research papers, an atlas of seismic stratigraphy of the Ross Sea, and two CD-ROMs with data.

The volume primarily covers two areas of the Antarctic margin, namely the Antarctic Peninsula and the Ross Sea, rather than the margin in general. These areas, however, are well covered, and many of the results have important implications for the Cenozoic history in other parts of the Antarctic margin. The first paper, by ten Brink *et al.*,

presents the results of a series of modelling experiments to explain the Antarctic continental shelf morphology and stratal geometry as a response to erosion and deposition during grounding line fluctuations. Following this is a paper by Barker on the sediment record of Antarctic climate since the Late Miocene. This is a very useful overview, presenting data from all around the continent. However, the paper may seem for some a bit too skewed towards the recent discussion on a "warm" Early Pliocene period. Following these two more general contributions is a series of six papers from different parts of the Antarctic Peninsula, followed by five papers from the Ross Sea. These papers are quite varied, from very detailed descriptions of seafloor acoustic features, to larger scale regional tectonics. Common to all, however, is that they present numerous instructive seismic sections from the margin. The Ross Sea papers form, together with the enclosed atlas, a well organised and constrained part of the volume. The atlas presents 22 plates with maps and seismic sections from the Ross Sea, which add nicely to the knowledge obtained from the Ross Sea papers. The atlas background data are conveniently included in the two CD-ROMs.

This volume forms a very important contribution to our knowledge of Antarctic geology, and could serve as a model for subsequent compilations of data and results from other parts of the Antarctic margin. However, in addition to several details on individual papers, I do find points to criticise, most of which are of a technical or editorial character. Firstly, the printing quality varies considerably through the book. Both text and seismic figures, including atlas seismic sections, often have too much contrast and lines which are too thick. This occasionally makes described features difficult to detect in the figures. The text shifts between poor and good print quality (e.g. page 169). Secondly, the editors could, have synthesised important results from different contributions to a greater extent, in the introduction. The relationship between shelf progradation and aggradation is, for example, discussed in several contributions, as well as being modelled in the first paper. Thirdly, the review process could have been more critical and thereby avoided some unfortunate errors and sources of confusion, such as a mismatch between seismic units described in the text and in fig. 4, respectively, of Sloan *et al.*, the use of wrong figure captions for figs 3 & 6 in the paper by Cochrane *et al.*, and the use of the term "stage", which, in paleoclimatic discussions may be mistaken for isotope stage, e.g. in the paper by ten Brink *et al.*

The criticisms do not, however, reduce the scientific value of this volume. It is a "must" for all geoscientists working with Cenozoic evolution of Antarctica. The combination of scientific papers and an extensive data set, both analogue in the atlas, and digital in the CD-ROMs, is new and very valuable. The maps are especially well done, and the entire volume should also be useful for high level educational purposes. Despite the fact that the contributions are geographically somewhat constrained, the book discusses a number of problems which are general for the whole Antarctic Margin. It should also be mentioned that the CD-ROMs contain full circumAntarctic navigation data for multi-channel seismic lines.

An important point is that the volume clearly demonstrates the great need for more "ground truth" in the form of sediment cores from drilling the Antarctic Margin. This is presently the main focus of the ANTOSTRAT project, and it is to be hoped that this volume will be followed by another, in which new borehole information can be included. Finally, I feel that credit should be given to the many individuals and institutions who have joined forces and provided data to produce the volume. The result of their efforts is clearly successful, and I can recommend the volume to everyone interested in continental margin geology in general and Antarctic geology in particular.

ANDERS SOLHEIM

Glacial Geology: Ice Sheets and Landforms

M.R. Bennett & N.F. Glasser
John Wiley, Chichester (1996).
364 pages. £19.99. ISBN 0 471 96345 3.

This introductory book about glacial geology is focused mainly on the landforms and sediments produced by ice masses varying in dimensions from large ice sheets to small glaciers. The book begins, after a very brief introduction, with the record of ice ages on Earth, including both the Cenozoic Ice Age, which we are still in, and the series of earlier ice ages in Earth history. Then there are simple introductions to, first, the nature of glacier mass balance, flow and thermal structure and, second, glacial meltwater and particularly its role at the base of ice masses. The remainder of the book deals with glacial erosions, the transport of debris in glaciers, and sedimentation on land and in water. The themes of erosion and deposition are each divided into separate chapters on processes and landforms. The last chapter brings together the way that ice sheets, and variations in their extent and dynamics through time, have deposited the nested suite of landscapes and landforms that are observed in formerly ice-covered mid-latitudes today.

Probably the strongest areas of the book are Chapters 6 and 9, on landforms of glacial erosion and deposition, respectively. The authors are very much at home with the depositional glacial landscape in particular. The level of detail offered here goes significantly beyond that of an introductory text. However, the chapter on depositional landforms in water is much less comprehensive and, to some extent, lacks balance. The treatment of the huge glacier-influenced submarine fans present on many glaciated continental margins, the largest of which contain over 100 000 km^3 of sediment and are of the same scale as, for example, the low-latitude Mississippi Fan,

is very brief. By contrast, significantly more emphasis is placed on the small grounding-line fans produced in fjord settings by tidewater glaciers.

The use of a large number of "boxes" in which information is summarized from a single paper or pair of referenced papers, has the effect of making the book easy to dip into but, somewhat disjointed to read. This effect is especially pronounced in Chapter 1, where the running text is limited and repetitive. Many of the boxes work well as "nuggets of knowledge", and are supported by useful illustrations, but a few are weak. For example, in Box 1.4 there is a map which is said to represent "a computer prediction of a future European ice sheet 70 000 years from now". There is no other explanatory text and, with so little additional information, the statement appears superficial.

The compromise in level of detail which the authors have chosen for their introductory text is evident. The level of quantification is limited throughout; undoubtedly a deliberate decision. On the other hand, some additional information on the order of magnitude of rates of operation of processes would have been straightforward to incorporate. For example, in the chapter on mass balance and glacier flow, it is stated that meltwater is derived from both surface and internal sources. It would have been a simple matter to point out that rates of basal melting are often measured in mm yr^{-1}, whereas surface melting can be several orders of magnitude greater.

I would have preferred a single list of references at the end, for ease of access rather than the listing at the end of each chapter. The photographs, although entirely in black and white, reproduce well and illustrate many glacial landforms. The line drawings are clear and consistent in presentation. The index is relatively full.

In conclusion, this is a very well presented book which is aimed at undergraduates taking introductory courses in glacial geology and geomorphology. The authors have succeeded in providing a clear guide to glacial landforms in particular.

JULIAN A. DOWDESWELL