Antarctic Science 14 (2), 195–196 (2002)

Book Reviews

Geology of the Prince Charles Mountains, Antarctica

Edited by *E.V. Mikhalsky, J.W. Sheraton, A.A. Laiba, R.J. Tingey, D.E. Thost, E.N. Kamenov & L.V. Fedorov*
AGSO Geoscience Australia Bulletin 247, Canberra (2001)
ISBN 0 642 39858 5. 210 pp.

This softback book is the result of over 30 years of geological work in the Prince Charles Mountains (PMA) by Russian and Australian scientists. The book immediately gives a good impression, with its pleasing cover design, detailed contents list (including all tables and figures) and a useful abstract of just over one page length. The figures in the book are numbered sequentially from 1 to 190, and the tables 1 to 26, which gives an idea of how well illustrated the book is. The illustrations are of a high standard. There is a well-produced, information-rich 1: 1 000 000 scale geological map of the PMA in a back pocket.

It begins with a very good, brief introductory chapter, with clear regional maps to set the scene, along with excellent photographs of the spectacular terrain. From then on the book is ordered tectonostratigraphically, with the first half of the book taken up with descriptions of the three Precambrian terranes in the PMA. Each of the three terrane chapters is well ordered, with an introduction, followed by good rock descriptions (field notes, mineralogy, petrography), some detailed maps and stratigraphic sections, and excellent field photographs (always spectacular in Antarctica of course!), along with photomicrographs. There is a wealth of geochemical data and many illustrative geochemical plots. At first, I thought the text was overly biased towards the geochemistry of the rocks at the expense of structural and metamorphic considerations, but these aspects are treated in separate chapters later on in the book.

Chapter 5 deals with the Phanerozoic igneous rocks of the region - Palaeozoic granitoids and dykes, Mesozoic ultramafic rocks and Eocene alkaline lavas. This is followed by two short chapters on the younger sedimentary rocks of the area, the Permo-Triassic Amery Group and Caenozoic glacial sedimentary rocks. Specialists in the younger sedimentary sequences may feel that the treatment of these rocks is a somewhat cursory, and at least a map or two of their distribution would have been welcome. For example, the reader is referred back to a previous large-scale map dealing with something else to see the distribution of the Amery Group.

As mentioned previously the structure and metamorphism are dealt with in two separate chapters after all the stratigraphy (chapters 8 and 9). This is an effective way of dealing with the subjects, in that the descriptions are well-intergrated with the previous chapters. The structural chapter shows fine photographs of the main features (folds and thrusts), with some detailed maps and stereograms to illustrate the salient points. The metamorphism chapter includes good petrographical descriptions of the mineral assemblages characteristic of the main metamorphic episodes, and is well illustrated with photomicrographs, from which the P-T evolution is estimated.

The final, 20-page Discussion chapter is excellent. It draws all the geological history together, including a comprehensive history table, and summarises all the geochronological data. The 1000 Ma versus 500 Ma events are discussed and a very useful summary of regional correlations with adjacent Gondwana fragments (India-Sri Lanka-Australia) brings the chapter to a close. The reference list is comprehensive and up to date (to the year 2000).

In conclusion, I feel this is a really impressive book which does great credit to the authors. It surely will be the standard text on the geology of the Prince Charles Mountains for many years to come and should form an essential part of any Antarctic researchers' library.

BOB THOMAS

Environmental Contamination in Antarctica

Edited by *S. Caroli, P. Cescon & D.W.H. Walton*
Elsevier Science, Amsterdam (2001)
ISBN 008043 199 2. €147.48 (US$160). 420 pp.

The coming into force of the Protocol on Environmental Protection has formalized the need for environmental monitoring on a continent-wide basis in Antarctica. As the editors of this book recognize, optimum value and impact from monitoring can only be realized within the context of a coordinated effort by all Treaty nations. Coordination requires a substantial commitment by all parties to high quality and intercomparable methodologies and data reporting. A wide range of activities and studies have been undertaken by the Antarctic community and this book is one more important source of information. To achieve the wished for outcome of providing a sound scientific basis for our stewardship of Antarctica, international coordination and cooperation is needed.

Chapter 1 provides a good overview of the basic precepts of high quality analytical methodologies. Sampling, sample storage, and sample handling and treatment are covered for a variety of matrices. Methodologies are then summarized by sample type and reference materials are identified. Chapter 2 sets the scientific framework for environmental monitoring including discussion of Treaty requirements and the outcomes

of various SCAR and COMNAP workshops. Basic design requirements of monitoring programs are also summarized. The next several chapters (Chapters 3 to 8) deal with the details of analytical methods for trace metals in various matrices. These chapters also summarize much of the information gathered to date on trace metal distributions in Antarctica. Chapter 9 describes methods and results for the analysis of polychlorobiphenyls in Antarctic matrices. Chapters 10 and 11 summarize the availability and preparation of certified reference materials. A specimen bank is described in Chapter 12 and the role of quality assurance in monitoring programs is discussed in Chapter 13. Chapters 14 and 15 describe how the Italian Antarctic program has implemented environmental monitoring in response to Treaty and Protocol requirements.

The book will be a useful reference for those tasked with implementing monitoring programs in Antarctic. The book focuses on trace metal analyses reflecting the interests of the editors. More complete coverage on organic contaminants will be found in other references. This book adds to the growing number of important workshop reports and other references setting the stage for continent-wide, cooperative, international monitoring in Antarctica.

MAHLON C. KENNICUTT II

Debris-covered glaciers

Edited by *M. Nakawo, C.F.Raymond & A. Fountain*
IAHS Publication no. 264, Wallingford (2000)
ISBN 1 901502 31 7. £44. 288 pp.

From time to time in science researchers with interests outside the mainstream fashions of the day are pleased to discover others with similar fascinations The result is that they get together, exchange ideas and introduce a new perspective to the wider world. This book records just such an occasion. It brings together 28 papers from an international spread of authors and represents the proceedings of a workshop held in Seattle, Washington, in September 2000. Initially the organisers expected about 30 participants but were pleasantly surprised to be able to put on 54 oral and poster presentations. The papers in the volume are an attractive mix on the morphology and distinctive mass balance of debris-covered glaciers, the response of the latter to climatic change, and the use of field and modelling approaches.

The overall aim of the book is to draw attention to debris-covered glaciers and particularly the effect of surface debris on the ablation of ice. This latter variable is fundamental to understanding mass balance relationships, the response to climatic variations and the production of water run off. In addition, the distinctive ablation processes commonly lead to the development of supra-glacial lakes which, if they drain suddenly, are a potential hazard. Finally, there is need to focus on debris-covered glaciers as an end member of the spectrum of glaciers in order to contribute to the debate on the origin of rock glaciers; the latter are regarded by some periglacial geomorphologists as distinct from glaciers.

The papers are grouped under the headings *Distribution and setting* (2 papers), *Mass and energy balance* (11 papers), *Origin and transport* (3 papers), *Supraglacial lakes* (4 papers), *Climatic variations* (6 papers), *and Biology and hydrology* (2 papers). One overriding theme is the significant effect of debris in reducing ablation commonly by amounts of 25-40% (Mattson; Pelto; Takeuchi *et al.*). This reduction in surface ablation affects the response of debris-covered glaciers to climatic change. It means that such glaciers have distinctive Accumulation Area Ratios and extend to lower altitudes than normal. Also, in a period of declining mass balance the surface debris may increase and lead to a cumulative advance of the snout, in contrast to adjacent exposed glaciers that experience retreat (Kirkbride). Even more surprising, the reduction of ablation reduces the diffusion of kinematic waves in the ablation area and this may make the snouts of debris-covered glaciers more sensitive to decadal mass-balance changes than ordinary glaciers (Smiraglia *et al.*).

A second important theme concerns the development of lakes on the lower reaches of debris-covered glaciers, especially where surface gradients are small (Reynolds). Such lakes are particularly common in the Himalayas where there has been a period of overall recession; they form rapidly and further enhance the rate of ablation (Benn *et al.)*. A third theme focuses on processes by which subglacial debris may be raised to the glacier surface and supplement the more common rockfall debris. Thus a switch from subglacial to englacial meltwater conduits in overdeepened glacier basins in Iceland transfers sediment to the glacier surface and leads to large moraines at the expense of outwash heads (Spedding). Subglacial debris emerging at the surface of Storglaciären in Sweden is related to shearing in clear ice and not to thrusting (Jansson *et al.*). A fourth theme concerns the use of models as an aid to understanding. What is interesting is to see the value of a range of theoretically and empirically based attempts to model processses in areas where there is little detailed information. Thus there are effective hydrological models of mass balance in a catchment based on a single meteorological station (Tangborn & Rana) and regional models based on theory and scattered field measurements (Konovalov). There are numerical models of glacier extent (Naito *et al.*, Konrad & Humphrey) and an elegant model of the drainage of supraglacial lakes via spillways cut in ice (Raymond & Nolan). Finally, there are two papers illustrating the potential and success of radio-echo sounding and ground penetrating radar in mapping ice thicknesses in a debris-rich environment (Gades *et al.*, Richardson & Reynolds). All the papers are informative and many open our eyes to a new way of looking at debris-covered glaciers. Congratulations all round!

DAVID SUGDEN