

Book Reviews

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Tectonic, climatic, cryospheric evolution of the Antarctic Peninsula

AGU Special Publication 063
Edited by John B. Anderson & Julia S. Wellner
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Increased awareness that improved understanding of the Antarctic ice sheets requires more detailed records of the continent's Cenozoic climate and glacial history has spurred a number of initiatives in recent years to drill the continental shelf to recover geological archives now covered by ice or sea. The objective of this AGU special publication is to showcase some of the results from the SHALDRIL program that came to fruition with drilling in 2005–06. The volume contains nine research articles introduced by the editors John Anderson & Julia Wellner with an outline of the history of SHALDRIL and motivation for the special publication. Although each paper is a stand-alone study, the chapters have been ordered in a meaningful way so that they broadly connect. They start with consideration of the regional tectonics, to place temporal constraints on the development of ocean gateways and mountainous topography, followed by SHALDRIL results on seismic stratigraphy, biostratigraphic age models, and palaeoenvironments. The articles are generally well written and presented, and suitably referenced. Reproduction of figures, photomicrographs and maps (colour and black and white) is generally very good although for the smaller maps in one or two cases I struggled to read all of the details.

Chapter 1, by Lawver, Gahagan & Dalziel, provides an excellent background to proceedings with a review of the evidence for timing and development of the ocean gateways, using plate reconstructions that set the conditions for climate change and initiation of the East Antarctic Ice Sheet. Although much of this chapter deals with the separation between Australia and East Antarctica the last section discusses the evidence for opening of the Drake Passage, which is more relevant to SHALDRIL. Some of the figure captions lacked descriptions of the notations used on the plate reconstructions, but this was a minor annoyance.

The weakest contribution is found in Chapter 2, which reviews the exhumation history of the marginal regions of the Drake Passage and touches on sediment provenance. Beyond serving as a reference resource of published exhumation studies in the region I was not convinced that this review presented anything meaningful in relation to SHALDRIL. The treatment and summary of the regional exhumation data, as shown in Fig. 2, is misleading in that it has been based on closure temperatures rather than modelled thermal histories,

which can mask stages of rapid cooling (episodes of rock uplift and exhumation). The author knows this and lists four caveats as to why such plots have limited value and at the end of the section even refers the reader to the original papers that better describe the range of t-T pathways, which begs the question as to why the data were plotted in this simplistic way in the first place. Another error (mistype?) of the plots in Fig. 2 is the label “tectonic denudation” on the y-axis alongside the range of cooling ages. Tectonic denudation refers to extensional unroofing whereas the denudation experienced across most of the margins of the Drake Passage has been due to erosion. In either case a denudation label seems inappropriate. By contrast, I found the end section on sediment provenance useful. Although it is only based on interpretations of detrital zircon U-Pb data, it does have some direct bearing on future drill core studies.

The following chapter considers seismic data from the Joinville Plateau, part of a back-arc basin, collected during SHALDRIL II. Ground truthing of the inferred ages of the stratigraphic units is described in the follow-on chapter that documents the key microfossils used in the biostratigraphic interpretations. The value of these special publications is that they allow for full reporting of data and so it was pleasing to see the accompanying appendix provide a detailed list of studied taxa. The next four chapters focus more on palaeoenvironmental information to pinpoint onset of glaciations, ranging from magnetic properties of cored sediments to elucidate the extent of periodic forcing, to clay and mineralogical changes, and include an interesting chapter by Kirshner & Anderson on microtextures of quartz sand grains. The final two chapters, by Warny & Askin, examine the demise of vegetation with ice expansion. These articles, which are nicely illustrated with colour photomicrographs of key species, end with a useful discussion on links to global climate change that include some key results that span the late Eocene reduction in atmospheric CO₂.

If I have a gripe with this book, it is lack of a summary chapter that integrates the results from the SHALDRIL studies into a more coherent picture of regional climate evolution, linked to the introductory chapters. Although discontinuous core records have hampered SHALDRIL interpretations, the studies presented in this special publication do offer new insights that impact on our understanding of Antarctic Peninsula palaeoenvironments. The benefit of a summary chapter would have been to draw attention to key results and to justify and motivate for future programmes, by demonstrating why future drilling is essential. In this regard I felt the organization of this book represented a lost opportunity. Nevertheless this is a useful contribution to Antarctic research and will be of benefit to researchers studying the Antarctic Peninsula.

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