Marginal Basin Geology

Volcanic and associated sedimentary
and tectonic processes in modern and ancient
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Contents

Page

Preface: KOKELAAR, B. P. & HOWELLS, M. F. 1

PROCESSES

FISHER, R. V. Submarine volcaniclastic rocks 5
YAMADA, E. Subaqueous pyroclastic flows: their development and their deposits 29
CAREY, S & SIGURDSSON, H. A model of volcanogenic sedimentation in marginal basins 37
SAUNDERS, A. D. & TARNEY, J. Geochemical characteristics of basaltic volcanism within back-arc basins 59
PEARCE, J. A., LIPPARD, S. J. & ROBERTS, S. Characteristics and tectonic significance of supra-subduction zone ophiolites 77

WESTERN PACIFIC REGION

LEITCH, E. C. Marginal basins of the SW Pacific and the preservation and recognition of their ancient analogues: a review 97
COLE, J. W. Taupo-Rotorua Depression: an ensialic marginal basin of the North Island, New Zealand 109
LEWIS, K. B. & PANTIN, H. M. Intersection of a marginal basin with a continent: structure and sediments of the Bay of Plenty, New Zealand 121
CRONAN, D. S., MOORBY, S. A., GLASBY, G. P., KNEDLER, K., THOMSON, J. & HODKINSON, R. Hydrothermal and volcaniclastic sedimentation on the Tonga-Kermadec Ridge and in its adjacent marginal basins 137
COLLEY, H. & HINDLE, W. H. Volcano-tectonic evolution of Fiji and adjoining marginal basins 151
SMITH, I. E. & MILSOM, J. S. Late Cenozoic volcanism and extension in Eastern Papua .. 163
SYCHEV, P. M. & SHARASKIN, A. Y. Heat flow and magmatism in the NW Pacific back-arc basins 173

SOUTH AMERICA AND ANTARCTICA

ÅBERG, G., AGUIRRE, L., LEVI, B. & NYSTRÖM, J. O. Spreading-subsidence and generation of ensialic marginal basins: an example from the early Cretaceous of central Chile .. 185
BARTHOLOMEW, D. S. & TARNEY, J. Crustal extension in the Southern Andes (45–46°S) 195
STOREY, B. C. & MACDONALD, D. I. M. Processes of formation and filling of a Mesozoic back-arc basin on the island of South Georgia 207
FARQUHARSON, G. W., HAMER, R. D. & INESON, J. R. Proximal volcaniclastic sedimentation in a Cretaceous back-arc basin, northern Antarctic Peninsula 219

LOWER PALAEOZOIC

ROBERTS, D., GRENNE, T. & RYAN, P. D. Ordovician marginal basin development in the central Norwegian Caledonides 233
KOKELAAR, B. P., HOWELLS, M. F., BEVINS, R. E., ROACH, R. A. & DUNKLEY, P. N. The Ordovician marginal basin of Wales 245
LORENZ, B. E. Mud–magma interactions in the Dunnage Mélange, Newfoundland 271
PAN GUOQIANG. The Late Precambrian and early Palaeozoic marginal basins of South China . 279
ZHANG ZHIJIN. Lower Palaeozoic volcanism of northern Qilianshan, NW China 285
KOKELAAR, B. P., HOWELLS, M. F., BEVINS, R. E. & ROACH, R. A. Volcanic and associated sedimentary and tectonic processes in the Ordovician marginal basin of Wales: a field guide 291

Preface

Relatively small semi-isolated oceanic basins, spatially associated with active or inactive volcanic-arc and trench systems, are common features at the margins of major oceans. Many such marginal basins clearly show evidence of development by crustal extension during subduction of oceanic lithosphere, commonly in a position above the descending slab. The extension may occur before the development of an arc or be initiated in a fore-arc, intra-arc or back-arc position. Some basins, however, are not directly related to subduction but develop due to irregular and complex motions within a system of small plates, caused by movements of major plates outside the system. Other basins occur which are trapped fragments of major ocean lithosphere, for example where an oceanic transform boundary has changed to a trench with active subduction.

Basins developed within continental crust at destructive plate margins are also widely recognized but are less common. These ensialic marginal basins may show slight to marked crustal thinning, with or without complete rifting and subsequent emplacement of oceanic lithosphere.

The apparent paradox of the occurrence of extensional tectonism in destructive plate margin environments has been considered widely and was discussed in some detail at a meeting of the Royal Society in 1980 (*Phil. Trans. R. Soc. London*, **A300**, 1981). Various models have been proposed to account for the major features of marginal basins, and the results from deep-sea drilling and geophysical surveys have been of paramount importance in their formulation.

The determination of plate tectonic environments and processes is more difficult in older rocks. The spatial relationships and tectonic settings become increasingly obscured by deformation, metamorphism and erosion in long-lived orogenic belts, and by such modification in successive orogenies. Commonly, in studies of Lower Palaeozoic rocks for example, the original environment has to be reconstructed after it has been fragmented, with many of the fragments well removed from their initial positions, some lost and perhaps with a large proportion of the remainder being obscured by younger strata. In addition, the rock chemistry may be substantially changed. However, despite these factors, most types of extant marginal basins have been recognized in the geological record, generally as variously deformed tectonic slices, with numerous examples from the Cenozoic and Mesozoic, and increasing numbers from the Palaeozoic. Also, it has become apparent that many ophiolite complexes originated in marginal basin settings.

Because of the wealth of data available from modern basins and the wide recognition of ancient analogues, it seemed timely in 1982 to convene a meeting to consider marginal basins with emphasis on rock types, associations and processes. The aim was to establish a dialogue between researchers studying modern and ancient environments wherein the data from the modern basins would provide a framework for more precise determination of the origin of the ancient rocks, and also detailed studies from the geological record would facilitate improved understanding of the widely spaced deep-sea samples and geophysical profiles. The meeting held on the 9th and 10th September 1982 at Keele University, was organized by the Volcanic Studies Group of the Geological Society. This volume consists largely of papers presented at the meeting and includes a modified version of a field guide prepared for the pre-conference field discussion meeting (1–8 September 1982). Although by no means exhaustive, the volume reflects the state of research into marginal basin geology and emphasizes the need to integrate observations from modern and ancient basins. Hopefully, in the diverse topics and approaches, the interested reader will find new perspectives and stimulation for future research.

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