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Preface

Making and breaking the arc: A volume in honour of Professor John Gamble

Subduction zones, barely recognised when the person to whom this volume is dedicated was born, are now seen as an essential key to understanding the dynamics of continental crustal growth and element cycling in the Earth. A simplistic life cycle of the volcanic arcs associated with subduction begins with an oceanic plate subducting beneath another plate, and magmatism being produced by the flux of fluids and melts from the subducting plate into the ambient mantle wedge. In turn, rifting of the overlying plate can occur, leading at one extreme to seafloor spreading. The eventual cessation of subduction can then be due to a variety of factors such as arc–continent collision, or roll-back of the subducting plate to create a new arc. The dynamics of these systems, however, are made complex by many factors that are a challenge to quantify. In a 30-year career, Professor John Gamble has made many diverse and fundamental contributions to our understanding of arc-related magmatic and volcanic systems, both in New Zealand and globally. As Guest Editors we would like to dedicate this volume to John in recognition of his substantial contribution to both this journal and the geosciences. Many of the authors that have contributed to this issue are past or present colleagues of John and have submitted papers here in appreciation of his legacy.

With regard to the science covered in this volume, the questions that are easy to pose but difficult to approach are numerous, and include the following. What is subduction volcanism, and how does it interact with the pre-existing lithosphere, both magmatically and structurally? Why and how do arcs develop and change their orientation leading to complex arc systems such as are present in the Southwest Pacific? What is the structure of the arc lithosphere, particularly at oceanic–continental boundaries? How are volcanoes and calderas formed, how do they collapse? Is there always a relationship between volcanism and faulting? What causes the lithosphere to rupture, what is the role of fluids in this, and how is strain partitioned in an oceanic and a continental arc? These aspects of subduction systems, and more, are the subject of studies on arcs worldwide, many of which investigate one or several aspects in detail. However, a coherent broad examination of the life cycle of arcs from inception to rifting in one single volume is lacking.

An opportunity arose for a multi-disciplinary collection of papers detailing these aspects of the life cycle of arcs at *Geosciences'07*, the joint Annual Conference of the Geological Society of New Zealand and New Zealand Geophysical Society in Tauranga, New Zealand (26–29 November 2007). Two symposia in particular examined geochemical, geophysical and structural aspects of arc evolution: 'Arc volcanism at SW Pacific convergent margins: a symposium honouring Professor John Gamble' and 'Tearing the arcs apart – rifting in the Taupo Volcanic Zone and Havre Trough'. This special issue, 'Making and breaking the arc', is a selection of papers from these two symposia which, together with some invited papers, explore multiple aspects of arc development. Reflecting the conference symposia topics, geochemically orientated papers in this volume investigate the mantle sources, and magmatic and explosive volcanic processes in arcs that span most of the western Pacific. In contrast, papers investigating rifting of arcs are mostly geophysical and structural in nature and focused on the Havre Trough and continental Taupo Volcanic Zone of New Zealand. This narrower focus allows a more complete view of the dynamics of 'tearing the arc apart', as the initiation of rifting and its relationship with volcanism can be more easily identified in a young arc than in more mature arcs where these relationships are easily obscured.

The editors would like to take this opportunity to thank John for his many diverse contributions to the geosciences, and hope that he enjoys and appreciates the range of topics that his work has nurtured or encouraged. We would also like to extend our appreciation to the editorial staff of the Journal of Volcanology and Geothermal Research and the referees for the opportunity to assemble this volume and their assistance in the review process, respectively.

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