

# Preface

This book presents an analysis of our current knowledge on the origin of the Earth's continental crust. There are two aspects to consider: tectonic and igneous processes. Tectonic aspects include sedimentary accretion, terrane accretion, and continental collision at continental margins, in association with plate subduction. These processes result in the formation of large mountain belts, the building up of which literally grows the continents. However, these tectonic aspects are concerned with material recycling within the crust, and hence do not contribute to volumetric growth of continental crust. Igneous processes concern separation of continental crust from the mantle and result in the volumetric growth of continental crust. Therefore, the main focus of this book is to systematically examine why and how the Earth's continental crust forms, by evaluating magmatic processes at island arcs where new continental crust forms.

Over years of research, it has been discovered that the chemical composition of the upper continental crust provides clues to the mechanism by which the Earth's continental crust develops from the primitive mantle. Although rock configurations are complex, the chemical composition of the upper continental crust has been uniform following the Archean, regardless of which continent or their ages. Through my research, and that of many colleagues, the structure of magma chambers have come to be understood, and we have recognized their functional similarities to island arc volcanoes. This is evident because continental crust is born beneath island arc volcanoes. This book outlines the research directions that have allowed us to reach this conclusion.

Chapters 1–3 constitute an introduction to the topic. Chapter 1 addresses tectonic sites where continental crust forms from the mantle; Chap. 2 presents chemical compositions of both continental crust and the primitive mantle from which continental crust separates; and Chap. 3 is a brief introduction to the history of igneous petrology relevant to genesis of continental crust. Chapters 4–7 present explanations regarding how the origin of continental crust has been elucidated. Chapter 8 shows how the geology and topography of island arcs are related to the formation processes for continental crust.

The construction of a consistent theory on the origin of continental crust is well underway. It is, however, still incomplete. I hope that the research process that is presented in this short book may stimulate future research development in this field. It would give me great pleasure if this is achieved, even just a little.

This book is the English version of one entitled “Island Arc Volcanoes and the Earth’s Continental Crust”, which was written in Japanese and published by Kyushu University Press in 2008. Chapter 9 of the original book is not included here, which described the crust of the Moon and terrestrial planets. In addition, minor changes have been made to this version, and the references updated.

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Arc Volcano of Japan

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