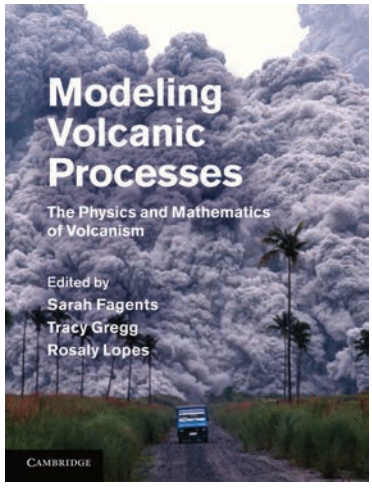
Book Review

MODELING VOLCANIC PROCESSES: THE PHYSICS AND MATHEMATICS OF VOLCANISM Edited by Sarah A. Fagents, Tracy K.P. Gregg, and Rosaly M.C. Lopes. (2013) Cambridge University Press, U.K., 431 p. $80.00 (hardback). ISBN 978-0-521-89543-9. $62.00 Adobe eBook also available.



Modeling Volcanic Processes is a collection of 17 chapters, each written by different expert(s), which together cover a broad range of physical processes from magma chamber dynamics to tephra sedimentation to volcano acoustics. The perspective is physical with a focus on modeling. Each chapter not only provides a clear and accessible introduction to the topic before moving on to more quantitative aspects, but also brings the reader up to date and considers future directions in the field. All the material is well referenced, which allows the reader to follow-up on particular facts and topics; there are also exercises to try, with solutions provided along with other supporting material on a website supported by Cambridge University Press.

When I first flipped through the book and spotted the exercises at the end of each chapter, I thought that it was probably aimed at students and asked a few Ph.D. students to let me know their impressions of individual chapters. These students all found the level about right for them, which given that they read the chapter that is most aligned with their individual research projects, reflects that the book is up to date and more advanced than texts aimed specifically at undergraduates. The book would work well for a graduate-level course or reading group, for instance meeting weekly to discuss another chapter. I will recommend several chapters as supplementary reading for my third-year undergraduate physical volcanology students, and go through a few of the exercises with them; however, overall most of the book was too advanced for it to be the backbone of the course.

The book is particularly suited to a researcher who is familiar with a topic or volcanic process but is not (yet) a modeler. For instance, one of the Ph.D. students who read a chapter said: "I am most definitely not a numerical modeler. Occasionally, I would get lost for a few paragraphs, but to the credit of the authors, usually managed to then find my feet again later in the page. … it has definitely helped remove a bit of the mystery for me as to how the models that I read the results of are developed!" As I sat down to read the book myself I realized that *Modeling Volcanic Processes* is also a useful resource for more seasoned volcanologists, and that I (a relatively quantitative geologist with broad research interests in physical volcanology) am part of the target audience, despite my initial reaction on seeing exercises. Indeed, how wonderful it would be if at the end of journal publications we included a couple of exercises designed to help the reader understand the key points or most challenging science in the paper!

As a reviewer, I went through the book systematically rather than dipping into a particular chapter of interest, which is how I would naturally use the book. This emphasized the differences between chapters that are a consequence of each chapter having different authors (as well as the range of topics covered), including the level of difficulty of the material, the quantitative background required to understand it, whether caveats of approaches are explicitly discussed, the extent to which the exercises help the reader understand the chapter, and the non-uniform definitions of symbols. This is ameliorated by a consistent structure; for example each chapter has a list of symbols just before the list of references. Each chapter also refers to other chapters, although this was typically about the scope of topics covered rather than helping the reader to understand connections between specific physical principles or assumptions common to modeling different volcanic processes. Of course the advantage of having contributions from 34 authors is that each topic is covered by active researchers who are familiar with the state of the art and have insights into future directions in their own fields.

During the careers of the volcanologists retiring today, the field of volcanology, as well as the computational power available have advanced enormously, and it is essential that the next generation of volcanologists develop quantitative skills. *Modeling Volcanic Processes: The Physics and Mathematics of Volcanism* has definitely filled a gap in bringing together accessible quantitative reviews of physical modelling of volcanic processes. I will be pulling it off my shelf on a regular basis for both research and teaching.

Alison Rust
School of Earth Sciences
Wills Memorial Building
Queen's Road
Bristol BS8 1RJ, U.K.

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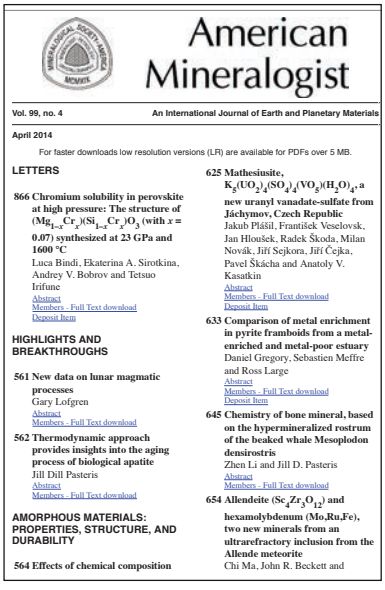

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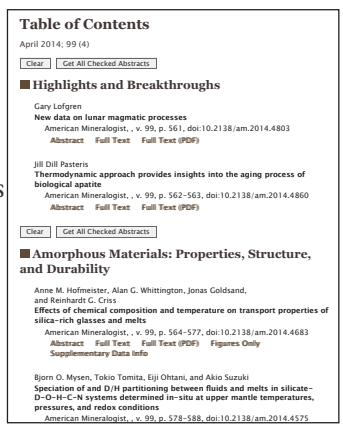

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