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Book Review

"Dynamics of Crustal Magma Transfer, Storage and Differentiation", eds. Catherine Annen and Georg F. Zellmer, Geological Society Special Publication N. 304, The Geological Society London, 2008; ISBN: 978-1-86239-258-8

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Magmatic systems involve the interaction of chemical, mechanical and thermal processes over a wide range of length and time scales. It is, thus, not surprising that magmatic phenomena are complex and many basic processes remain poorly understood after more than a century of intensive study. The aim of this compilation of papers is to understand magmatic processes that occur within the crust and, hence, link the mantle to the volcanism we see at Earth's surface. How fast does magma rise? How long is it stored within the crust? What is the physical nature and temporal evolution of magma storage bodies? How does magma interact with the rocks and fluids in the surrounding crust? What is the relationship between volcanism and deep magmatic processes? These are all simple questions, but quantitative answers are lacking or are often controversial.

The papers collected in the volume are based on presentations given at a special session at the Fall 2006 American Geophysical Union meeting. The title of the session was the same as the book with the addition of "integrating geochemical and geophysical constraints". This is an ambitious task, and, hence, it is not surprising that most of the papers do not focus on such integration. Several papers stand out for being pedagogic, integrative and identifying future research directions and challenges. Zellmer and Annen have a nice introduction to this volume and highlight the relationship between maturity of magmatic systems, the flux of melt through the system, and the nature of magma storage and ascent. Jerram and Martin provide a clear review of how attributes of crystals can be used to probe magmatic processes. This paper highlights the complexity that arises at the smallest scales from the chemical, thermal and physical interactions within magmas. Leeman et al. integrate geochemical and isotopic measurements on Snake River Plain rhyolites with thermal models to quantify intrusive (hidden) magmatic processes.

Most papers provide a compilation of observations, rather than a synthesis of geophysical observations and geochemical data with models. Zellmer compiles geochemical measurements from arc lavas to identify which features are correlated with subduction parameters such as subduction rate. Cigolini et al. compile a broad range of observations, from mantle depths to the surface, that accompany eruptions at Stromboli. Pozzo et al. compare magnetic signatures at Popocateptl with other measurements and identify some intriguing magnetic precursors to the 2006 eruption. Straub uses the geochemistry of Izu Bonin erupted melts over the past ~ 50 Ma to show that there is no clear relationship between crustal growth and evolution of the arc system. Most of the other papers are case studies of a specific process (e.g. dike formation) or single system (e.g. a single batholith or intrusive suite). These are fine research papers but the scope is of course more limited. Overall, this collection of papers is not significantly more broad and visionary than typical issues of *Journal of Volcanology ad Geothermal Research*, *Bulletin of Vocanology*, or *Journal of Petrology*. The limited synthesis does

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not make this collection of papers significantly better than the sum of its parts, and it would not be useful, say, as a text for a class. Nevertheless, I am glad our library has a copy of this volume so that we have access to the research papers.