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# Preface

Without any doubt, computation, as a third branch of science, has really taken off gracefully since the beginning of the new millennium. Indeed, we can witness this fascinating phenomenon by the establishment of many new institutes and initiatives around the world with special emphasis devoted to high-performance computing and its ancillary efforts, such as visualization and grid computing. Examples of these fresh sprouts of growth can be found in the establishment of novel vigorous programs, such as GEON, PRAGMA, CIG and the VLAB in the United States, the Laboratory of Computational Geodynamics in Beijing, the Earth Simulator Center in Japan, ACCESS and VPAC in Australia. An important summary of the needs of computational requirements in the solid-earth geosciences has been compiled by Ron Cohen (2005).

With the shadows of petascale computing looming above us, it is indeed high time for a volume devoted to high-end computing to appear in a mainstream geophysical journal in order to call our attention to the challenging times lying ahead of us. Hopefully this intriguing volume should seize the attention of younger scientists, who would be enticed to take up the new gauntlet in computational geosciences.

This volume had its roots in the Western Pacific AGU held in July 2006 in Beijing. We had a session there on computations in the geosciences. Stimulated by the encouragements of Editor Keke Zhang in a lunch on 26 July 2006, we then decided to embark on this project, which soon grew beyond its original borders of the AGU session and soon received outside support from many individuals in the community.

Here we have assembled two dozen articles with various degrees of computational significance, but together they span a broad enough spectrum to give the community enough of a perspective of the fruits to be reaped in the computational arena. We have included new developments in (1) software tools for facilitating parallel computing, (2) scientific visualization of large data sets, (3) algorithmic challenges of various sorts and (4) grid computing and web services. At the same time we have also brought in many interesting applications, as exemplified by tsunami waves, small-scale convection, global seismology, finite-element modelling of multiscale deformation in tectonics and geodynamo simulations, earthquake forecasting, mineral physics with multiple scales, over both the micro- and the macro-lengths.

We hope this issue will be relevant and valuable to the geoscience community at least until the advent of petascale computing era in the next decade.

## Reference

Cohen, R.E. (Ed.), 2005. High-Performance Computing Requirements for the Computational Solid-Earth Sciences, http://www.geo-prose.com/computational_SES.html.

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