Prologue

The current volume of *Física de la Tierra* will be concerning with the quantitative study of Solid-Earth processes operating over a wide range of time and spatial scales: from the inner core to the surface. This requires an integrative multidisciplinary approach connecting research in the sub-disciplines of geology, geophysics, geochemistry and mathematics in order to tackle common challenges. An inside-out overview of our Planet is here provided to the reader through thirteen peer-reviewed papers.

The Earth's core is the most remote and dynamic part of our Planet. As a matter of fact, drilling into the Earth's interior turns out to be much more demanding than flying into outer space. Therefore, we not only have no samples from the core but we even do not expect to get any. To date, seismology, together with experimental and theoretical mineral physics, has provided the most important perspectives on core structure and its mineralogy. There's no doubt that seismology, high-pressure and high-temperature mineral physics, geochemistry and *first-principles* calculations are disciplines through which scientists can investigate core structure, composition and dynamics.

In an effort to promote this interdisciplinary approach, we have prepared this issue to provide, for the first time in the history of this journal, an overview of what we presently know about the Earth's core through various research papers.

This volume also includes applications of new generation numerical models which have superseded the classical seismic and gravimetric models. Ambiguity and equivalence problems are greatly improved by these new approaches since they integrate a number of geophysical and geological observations. In particular, the method used by Tunini et al. and Carballo et al. combines elevation, gravity, geoid, surface heat flow, seismic and petrological data. Moreover, the characteristic depth range expands to include the entire upper mantle until the transition zone, thus highlighting the importance of connecting near-surface processes with those occurring deep into the Earth. The model-predicted present-day lithospheric structure is a useful constraint for geodynamic time-evolving models (e.g. Valera and Negredo). In the particular case of volcanic areas, deformation of the Earth's surface reflects tectonic, magmatic and hydrothermal processes at depth. In this sense, the study by Charco and Galán del Sastre shows that the prediction of volcanic deformation through physical modeling provides a link between surface observations and depth interior processes, which could be crucial for volcanic hazards assessment.

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