Indian Continental Lithosphere: Emerging Research Trends. T. M. Mahadevan, B. R. Arora and K. R. Gupta (eds). Memoir 53. Geological Society of India, Bangalore. 2003. 497 pp. ISBN: 81-85867-58-5.

This volume, published in the Memoir series of the Geological Society of India is both topical and important as it presents a summary account of the work done by different groups on deep continental studies in various parts of the Indian subcontinent in the past decade or so. What is the lithosphere and why is it important to study it? Just as much as the interior of the Earth is *compositionally layered* into a core, mantle, and crust, it is also *mechanically layered* into a lithosphere, asthenosphere, mesophere, outer core and inner core. The mechanical layering within the mantle is recognized from gradual changes in seismic velocity reflecting changes in pressure and temperature conditions and in turn reflecting changes in the mechanical properties of rocks without change in their chemical composition. In the upper mantle, a low velocity zone (based on seismic waves) is consistent with mantle material at or near its melting point. Above this low-velocity zone, the mantle is relatively cool and rigid; it is this part of the earth, constituted of the uppermost part of the mantle and crust, that acts as a brittle layer and is composed of lithospheric plates in relative motion with each other. The thickness of lithospheric plates is commonly between 80 and 125 km, compared to an average crustal thickness of 35 km beneath continents and 7 km under the oceans. The base of the lithosphere is defined by the thermal boundary; viscous flow of material takes place in the underlying asthenosphere.

Why is it of importance to advance knowledge and understanding of the Indian lithosphere on a continuous basis? Simply because it is a significant input for (a) understanding the geodynamics of the Indian plate, (b) understanding the nature and histories of movements along the major tectonic discontinuities of both peninsular and extra-peninsular India, (c) understanding the stress and strain distribution in the Indian plate, (d) understanding the history of erosion and sediment transfer from the Himalayan orogen, and (e) for developing strategies for coping with natural disasters, particularly earthquakes and landslides.

The Department of Science and Technology has helped in focusing attention on deep continental studies by supporting integrated geological and geophysical researches along selected transect corridors. In recent years, geological–geophysical studies have been completed in (a) Nagaur–Jhalawar transect – 400 km long across the NW Indian shield, (b) Mangwani–Katangi–Kalimati transect – 155 km long across Central Indian Shield and (c) Kuppam–Palani transect – 300 km long across the South Indian Shield. Mahadevan, Arora and Gupta in their preface have stated that 'controlled seismic experiments have been combined with potential field studies and magneto-telluric experiments along the various transects' to unveil the deep structures of the crust and upper mantle. The results are further integrated with geological, geochemical and geochronological data, already known or generated along the transects, to trace the evolutionary models of different tectonic blocks. The first six papers deal primarily with these and other related transect programs. Eight papers deal with regional studies that have a bearing on various facets of the Indian continental lithosphere. In the third section on Thermal structure and numerical modelling; plume–lithosphere interactions, an important aspect of the Indian lithosphere, is specifically discussed in two papers. This section also includes papers on different aspects of the thermal structure and two papers on numerical modeling.

This volume consisting of nineteen papers is a useful compilation of new and existing data on various aspects of the Indian continental lithosphere. These papers are preceded by an Editor's Introduction that provides a summary of the main findings of the papers published in this volume. Despite the serious attempt(s) made to advance our understanding of the Indian continental lithosphere, the editors candidly point out that 'the new data presented in and exemplified by the papers in this volume have a great potential for further processing and refinement and even re-interpretations in the light of new models.' . . .

In concluding this review, I would like to emphasize that the importance of this volume is in the integration of geological/geochemical and geophysical data for gaining insights into the structure and evolution of the Indian continental lithosphere. In his foreword to this volume, B. P. Radhakrishna, the doyen of Indian geology has remarked that 'It is not unusual to find a big gulf between the proponents of the two disciplines'. This memoir attempts to narrow this gulf, even if only in a small way, and demonstrates clearly the need and utility of adopting integrated approaches for learning about the Indian continental lithosphere. We have a long way to go in the integration of geological and geophysical data. Publications such as this memoir show that small beginnings have been made in the task of integrating geological/geochemical and geophysical data for understanding the Indian continental lithosphere. The Earth System Sciences Division of the Department of Science and Technology, New Delhi, needs to be complimented not only for providing financial support for the publication of the book but more importantly for providing a common platform for bringing together scientists of different specializations under the umbrella of the Deep Continental Studies Program. The papers put together in this memoir should be of considerable interest to both geologists and geophysicists.

S. K. TANDON

Department of Geology,
University of Delhi,
Delhi 110 007, India
e-mail: sktand@nda.vsnl.net.in