

International Lithosphere Project

An organizational meeting of the Indian section of the ILP task group II-4 and a seminar on 'Three-dimensional mapping of the lithosphere' was held at the Indian Institute of Technology, Kanpur, on 30 March to 1 April 1995. The meeting and the seminar were attended by scientists from a number of research and academic institutions in India. In the inaugural lecture, Vinod Gaur (CMMACS, Bangalore) discussed the structure and kinematics of the Indian continental lithosphere, including his recent work on GPS-derived strain rate in the southern Indian peninsula. A panel discussion chaired by K. N. Khattri (Dehra Dun) was also organized during this meeting to articulate significant new directions in the studies of the lithosphere.

The panel emphasized the fundamental importance of investigating the geodynamic processes at work in the Indian lithosphere. A better understanding of this basic process is essential for the design of illuminating scientific approaches to a host of important societal problems, notably, quantification of hazards posed by earthquakes, landslides and degrading environments of our resource bases such as ground water aquifers, hill and coastal terranes and biodiversity.

These problems being necessarily complex call for a systematic and synergistic application of investigative tools and approaches from a wide spectrum of earth science disciplines: geological structure and tectonics, geochemistry, geomorphology, geochronology, geothermics, and deep geophysical probes of geodesy, seismology and electromagnetics. In turn, it would be necessary to employ the most incisive statistical and information-theoretic approaches for the analysis and interpretation of a highly diverse yet related data sets.

However, whilst the desirability of investigating the key elements of the entire Indian lithosphere is quite clear, it would be prudent to concentrate the

first systematic integrated efforts in defining the structure of its northern boundary – the Himalayan region – and the style and rate of geodynamic processes operating there. For, the grand scale of the tectonic processes in the Himalayas, providing a fast rate of information flow, not only offer an extraordinary opportunity for investigating their nature in a relatively shorter period but also mark this region, with dense population at its southern boundary, as one facing the highest degree of natural hazard. Creation of illuminating knowledge bases to address this problem of great social concern is, therefore, manifestly urgent.

The databases in various disciplines mentioned above are being developed by various National agencies: the IMD, GSI, NGRI, WIHG and university departments of geosciences. The creation of a modern data information system with exchange facilities would greatly facilitate integrated analysis of this data set and promote its wider simultaneous use for greater purpose by diverse groups of scientists in the country. Also, high-quality data sets generated by several international agencies, notably, digital wide-band, wide-dynamic-range seismograms and gravity and magnetic data measured from satellites, could then be progressively added to this system to foster creative approaches to the study of geodynamics of the Indian lithosphere. The panel accordingly recommended creation of a National Geoscience Information System for abstracting, structuring, quality testing and archiving the corpus of data available from national and international agencies, and facilitating its use by Indian scientists to address urgent problems of development and hazard mitigation. Such a system is conceived as being comprised of a number of component data centres in appropriate institutions equipped with quality control and archiving facilities, but integrated with a communication link. It was fur-

ther recommended that collaborative programmes for developing new conceptual models be formulated, backed by incisive experiment design for generating new data sets. These proposals may then be submitted to DST, UGC, AICTE, etc., for funding. It was also recommended that some centres may be identified and supported for intensified research programmes in the new developing approaches using mathematical modelling and computer simulation.

Some approaches suggested for an effective implementation of these programmes are given below:

- Design of integrated geoscientific investigations to define the structure and tectonics of critical segments of the Indian lithosphere, with immediate focus on its northern collision boundary, using various tomographic approaches, and modelling of geomorphic, magmatic and tectonic processes.
- Development of adequate scientific expertise in the use of wide-band-wide-dynamic-range seismological data and their analysis using waveform modelling techniques.
- Development of nonlinear models of lithospheric processes and their implications to those in the crustal layer.
- Systematic deformation monitoring in critical areas of the Indian crust using GPS, and delineation of areas of anomalous strain accumulation and potential seismicity as well as quantification of strain rates.
- Nucleation of computer-aided Geoscience Information Systems at local scales in various institutions as a prelude to their subsequent integration into a National Geoscience Information System.

Ramesh P. Singh, Indian Institute of Technology, Kanpur.