TECTONOMAGMATISM, GEOCHEMISTRY AND METAMORPHISM OF PRECAMBRIAN TERRAINS, Editors K.C. Gyani and P. Kataria, published by the Department of Geology, M.L. Sukhadia University, Udaipur - 313 002, 2000, p.iv+438.

This book comprises 28 papers relating to several regional and some local aspects of Precambrian evolution of the Peninsular Indian Shield. The papers are among those presented at a National Seminar held on December 16-19, 1997 at the Department of Geology at Udaipur. The contributions relate to some general concepts of crustal evolution (3 papers); Precambrian geology of Rajasthan and north Gujarat (9 papers), Central Indian region (3 papers), Andhra Pradesh (2 papers) and Maharashtra (1 paper); geochemical enrichment of metals (metallogeny) in several parts of the shield (8 papers); palaeomagnetic record in the Vindhyan basin (1 paper) and aerogeophysical signatures in Eastern Dharwar craton (1 paper). Several interesting aspects of crustal evolution that would be of interest to earth scientists emerge from these papers and some of the significant aspects are reviewed here.

Drawing on the impact of episodes of plume and plate tectonics, coeval or in succession, Raval presents a model of Precambrian crustal evolution. Several regional geological, geophysical and geochemical features are, according to Raval, consistent with the differential response of cratonic and mobile lithospheric regimes to both horizontal and vertical thermomechanical forces and a preferential reactivation along mobile belts. Tracing the evolution of the Precambrian crust from Hadean, A.B. Roy favours a trend of crustal evolution beginning with early formed continental nuclei growing rather unidirectionally towards the formation of large plates by the Meso- to Neoproterozoic times, thereby providing a milieu favourable for plate tectonics. The need to view the accretion and growth of the extensive granulite domains of the Peninsular shield in the larger context of continental evolution, and not as individual belts, is stressed by Rammohana Rao.

Discussions on Rajasthan geology relate to a structural unity in the tectonic fabric of the Aravalli and the Delhi (Biswal) and an Archaean "greenstone-like" association of quartzite-amphibolite supracrustals within gneissic-granitic rocks around Rakhiawal, east of Udaipur (Roy et al.). Statistical method of cluster analysis of the chemistry of the Mewar Gneiss represented by the Archaean granitoid rocks of Jagat, Udaipur, leads to identification of four groups, that may be a cogenetic suite related by fractional crystallization, but emplaced at different times (Upadhyaya et al.). A consistency of results with the available zircon ages of the granitoids is emphasized. Goel et al. infer three phases of deformation culminating in a protracted phase of regional metamorphism in the Banded Gneissic Complex and the Aravalli of Bagdunda area, NW of Udaipur. Progressive metamorphism leads to amphibolite facies in the core of Bagdunda dome, which is possibly both a structural and a thermal dome. A late shearing event corresponds to retrogressive greenschist facies metamorphism. Occurrences of cordierite-quartz-K felspar plumose symplectites are reported from among the pelitic granulites of Balaram area of north Gujarat by Srikarni et al. An osumilite parentage for the reaction products is suggested. The pre-Delhi granulites occur as tectonic slivers along the tectonic contact of Delhi Supergroup. The P-T-t paths of the granulites of the Banded Gneissic Complex of central Rajasthan are traced by Gyani et al. based on EPMA data on mineral associations and textures.

Three contributions emphasise the great interest the Malani volcanics have invoked. A volcano-stratigraphic sequence has been worked out for the Malani and Marwar Supergroups near Jodhpur by Paliwal and Rathore. Flow stratigraphy of nine felsic flows with an outcrop thickness of 2590 m exposed in the Kankani area south of Jodhpur, is presented by Bhushan and Chittora. Mixing of co-existing basaltic and ultra-potassic rhyolite magmas is invoked by S. Misra to account for the basalt-andesite-dacite-rhyolite association in the Malani igneous province.

The Central Indian region has attracted much attention in the recent past because of the tectonic significance assigned to the Central Indian Suture. The two contributions relating to this region constrain tectonics using largely the geochemical data. Subba Rao et al. suggest that the protoliths of the Tirodi Gneiss occurring in close association with the Sausar Group is characterized by A-2 type granites, that may have formed possibly in a rifted back arc environment. Divakara Rao et al. discuss the overall geochemical milieu of the formations of Central Indian region. They suggest a two-stage evolution, one of the early rifting and separation of the blocks along the northern fringes of the Dharwar craton and a second phase of collision between the separated northern block and the Dharwar craton along the Central Indian Suture. In yet another paper, the Jhirgadandi granitoid that is intrusive into the basal Mahakoshal Group is geochemically

characterized by Srivastava et al. as a post-orogenic hybrid type which evolved by partial melting of the deep crust.

The exhumed lower crust of the Eastern Ghat Mobile Belt (EGMB) has received much attention in recent times. Rammohana Rao and R.R. Rao trace the retrogressive metamorphic facies variations in the granulites of Ramakuru at the southern tip of the EGMB, as they evolve from deep to the shallow crust. The Chimalpahad anorthosite complex emplaced into the Dharwar rocks near Khammam, along the fringes of the EGMB, according to Rammohana Rao and Raju were emplaced during early phases of rifting. This was followed by collision and folding, involving the EGMB and imposing a greenschist facies mineralogy.

Several tectonic features of the northern extension of the Eastern Dharwar craton into Andhra Pradesh and the interrelationships between the Dharwar supracrustals of the region are brought out in a synthesis of aero-geophysical data with satellite imageries (Sarma et al.). The potash-rich Deglur granites of Nanded District, Maharashtra are characterized as A-type and dated 2074±55 Ma with Sr_i of 0.7152±0.0056 by Wasanekar and Patil.

Palaeomagnetic studies carried out on the Vindhyan Supergroup are reviewed by Poornachandra Rao et al. who trace the temporal changes in the palaeopositions of the Indian shield and also attempt a geomagnetic polarity scale.

The boundary between geochemistry and metallogeny is rather diffuse and it is not surprising that, in this volume, eight papers address problems of enrichment of metals and metallogenesis. The stratiform massive Cu-Zn sulphide deposits, notably devoid of Pb, in a largely metavolcanic sequence in the Basantgarh-Waltera belt of Sirohi District are described by Pandya et al. The massive sulphides show rhythmic banding and are hosted by mafic rocks of a tholeiitic composition, forming part of the Delhi Supergroup. The ore bodies are viewed in the context of discharge vents of submarine hydrothermal systems and remobilization of syngenetic source material to form massive ores. $\delta^{34}S$ values range from 5.5 to 8.1 per mil, consistent with volcanogenic metallic sulphides. Polymetallic Cu-Zn mineralisation is also noted in the metasedimentary bands associated with felsic (rhyolite) tuffs of a bi-modal volcanic sequence near Kherli Bazar in the Betul-Chhindwara belt of Madhya Pradesh. Mahakund et al. ascribe a submarine volcanic exhalation origin for the ores. Strata-bound and remobilized vein type gold-sulphide mineralisation is described by Ray et al. from the Proterozoic schist belt of Sonakhan in the Raipur District, Chattisgarh. Bharadwaj and Rayudu discuss the geochemical and metallogenic aspects of sulphide mineralisation in the Singhbhum Copper Belt. Shekhawat and Bharadwaj discuss the origin of talc deposits resulting from alteration of dolomite near Udaipur. Three papers exemplify the efforts being made to locate uranium deposits in the extensive granitic terrains of Peninsular shield. Goyal et al. highlight the U-Th concentrations observed in the Godhra granitoid. Yadav et al. describe the association of uranium mineralisation with albitite intrusives emplaced into Middle Proterozoic North Delhi fold belt in a 50 km long zone extending to the SW of Mewara in the well known Khetri basin. The geochemical and petrochemical features of the uranium mineralized zones in the western extensions of the Chotanagpur Gneissic Complex in the Rihand valley of Uttar Pradesh compliment the already known Jajawal mineralisation, are discussed by Gore Khan et al.

The volume is well printed with a large number of useful illustrations of fair standard. As the symposium was organized in Rajasthan, there is naturally a larger representation of papers on this region. Researches on the Precambrian evolution of the eastern and southern parts of the Indian shield and the Himalaya remain totally unrepresented. These may be due to organizational limitations. One striking shortfall is the lack of thematic organization of papers in the volume. The papers, however, bring out a large mass of new data and several models of evolution that should be welcomed by all earth scientists interested in addressing the intriguing and challenging questions of Precambrian continental evolution in general and of the Indian Peninsular Shield in particular. The book would be a useful addition to earth science libraries.

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