STRUCTURE AND PETROLOGY OF 'TURBIDITE' SEQUENCE AND ASSOCIATED ROCKS OF THE PARSOI AREA, MIRZAPUR DISTRICT, UTTAR PRADESH

ABSTRACT

The Bijawar rocks around Parsoi area, covering nearly 260 sq. kms. have been mapped and studied with an emphasis on structure, petrology and sedimentation. The metasediments of the area are divided into two distinct formations, lower and upper. Lithologically the lower formation is characterised by phyllites, quartz-mica schist, banded argillite intercalated with metasandstones and thick bedded sandstones. It is conformably overlain by the upper formation, composed of carbonate rocks, banded-haematite-quartzite and brecciated quartzite. New names have been informally suggested for these two formations namely, 'Parsoi phyllite' and 'Tatapahar quartzite', for the lower and upper formations respectively replacing the term "Parsoi Group" applied earlier by S.M.Mathur for the entire succession. The code recommended by the American Commission on Stratigraphic Nomenclature (1961) has been used as a basis for lithostratigraphic classification of rocks. Lithologically the 'Tatapahar quartzite' is similar to the Bijawar Series of the type area. Age determinations by Crawford (1969), suggest that there was simultaneous effusive volcanic activity in both these areas. Thus, the two areas could have been parts of the same geosyncline. This may justify their correlation, albeit with reservation.

The detailed structural analysis indicates a complex tectonic history. To work out the structure, minor secondary structures—bedding ($S_1$), axial plane cleavage ($S_2$), slip cleavage ($S_3$), lineations produced by the intersection of bedding and cleavages, mineral lineation, and minor fold axes—were made use of. $\pi S_1$, $\pi S_2$, $\beta S_1$ and B-diagrams have been prepared by dividing the entire area into eight sub-areas. An attempt has been made to determine the movements that gave rise to the observed geometry of the folds. It is apparent from this study that the area seems to have undergone two or possibly three phases of deformation. It is probable that the major folds with their co-axial minor folds, trending in an east-west direction, are the earliest folds ($B_1$). These folds are tightly appressed, sometimes overturned towards the north, and are thought to be produced by subhorizontal compressive stress in a north-south direction. Westerly plunging folds ($B_2$) have been produced by a second compressive stress with a direction oblique to the N-S compressive stress. During the late stage of deformation these earlier folds were deformed by slip cleavage which forms axial plane for the cross folds trending N-S to NW-SE direction. The movements which were responsible for the present structural configuration appear to indicate different phases of a single orogenic movement which, probably, is the Satpura Orogeny ($955\pm40$ m.y.).
Petrographic studies have been made for all the rock types. Quartz wacke sandstones are poorly sorted, fine-grained and is composed of quartz, feldspars, quartzitic and phyllitic rock fragments embedded in a micaceous matrix. The heavy mineral suite is rich in tourmaline and zircon. Matrix, volumetrically, range upto 40%. Considering the light mineral composition and textural characters, the quartz-wacke sandstones appear to be immature. But high content of resistant heavy minerals like tourmaline and zircon and fresh feldspars reflect high maturity. This contrasting feature is referred to as 'inverted maturity' (Stanley, 1966). It is suggested that the high amount of tourmaline and zircon in quartz-wacke sandstones is probably due to lack of diversity of heavy minerals in source rocks themselves. Light and heavy mineral compositions in quartz wacke sandstones reveal that they were probably derived from granite, pegmatite and metamorphic rocks of sedimentary parentage. Metamorphosed quartz wacke sandstones are classified into phyllitic and schistose quartz wackes depending upon the degrees of metamorphic recrystallization and metamorphic structures.

Phyllite, argillite and quartz-mica schist have undergone low-grade metamorphism under the conditions of muscovite-chlorite subfacies of the greenschist facies. Petrographically carbonate rocks are represented by recrystallised and partly recrystallised limestones and dolomites, tremolite marble and calcitic marble. The limestones and dolomites have been converted into marble where they are in immediate contact with the lava flows. The micritic character of calcite in partly recrystallised limestones and dolomites suggest chemical origin. Further, there was no evidence of detrital origin either for calcite or for dolomite minerals. The banded-hematite-quartzite is composed of alternating bands of hematite and cherty quartz and is considered to be chemically precipitated sediment, under marine environments.

The metasediments of the 'Parsoi phyllite' exhibit several varieties of sedimentary structures such as ripple-drift cross-laminations, graded bedding, laminations, convolute laminations, ripple marks, flute casts and load casts etc. These sedimentary structures are characteristic of turbidity current origin. The turbidites are interbedded with pelagic shales (now phyllites). Distal turbidite environments (Walker, 1967), suggested by the dominance of turbidite structures typical of the lower flow regime as also by their pelitic nature have been interpreted for the metasediments of the northern part of the area. Proximal turbidite environments are on the other hand, indicated by the thick-bedded sandstones, relatively coarse-grained texture, poor sorting and sharp contacts between sandstones and phyllites for the metasediments occurring in the southern part of the area. Paleocurrent studies indicate westerly source of sediment transport.

Basic igneous activity of post-Bijawar age in the area is manifested as lava flows, sills, and dykes. The intrusives came