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fold having low amplitude in the eastern part. The overall disposition of the Belt is controlled by D2 deformation. The \( F_1 \) and \( F_2 \) are near coaxial and their superposition has resulted in hook shaped interference pattern. A pervasive planar fabric parallel to axial plane of \( F_2 \) folds has a NNE-SSW trend with moderate to steep northwesterly dips. The last formational event \( (D_3) \) has resulted in open \( F_3 \) folds and an axial planar cleavage having NW-SE trends with steep dips on either side. Superposition of \( F_3 \) over \( F_2 \) has led to dome and basin interference pattern and reversal of plunge of \( F_2 \) folds in some sectors.

The overall disposition of the 'horse shoe synclinorium' is interpreted to be a series of NNE-SSW trending \( F_2 \) synclines and anticlines with shallow plunges. Geomorphology of the area conforms to this interpretation and is manifested by synclinal ridges and anticlinal valley. The so called western limb of this synclinorium manifested by the Kiriburu-Barasuan ridge on the western part is itself a \( F_2 \) syncline having shallow northerly plunge in the southern part near Barsuan and sub-horizontal to shallow southerly plunge in the northern part near Kiriburu. This syncline is overturned towards SE in the Barsuan sector and the overturning gradually changes to inclined nature in the northern part near Kiriburu. The eastern limb of the synclinorium, represented by dissected highlands near Joda-east and Thakurani pahar area are in fact open to relatively gentle upright \( F_2 \) synformal structure. The dissection is primarily due to a series of post-D2 faults. The Jamda-Koiria valley is dominantly occupied by shale/phylite sequence with isolated BIF ridges preserved in \( F_2 \) synclinal keels, hence understanding the structure is crucial for determining the stratigraphic position of shale/phylite with respect to the BIF horizon. Occurrence of phylitic sequences stratigraphically younger to this BIF is recorded in Kiriburu, Kadalia and several other places clearly overlying the BIF. Lotapani volcanic suite in the central parts of the Jamda-Koiria valley occurs along a \( F_2 \) anticlinal axial trace and hence interpreted to be older to the phyllitic sequence and BIF surrounding it. Thus this volcanic unit can be correlated with the basal volcanic suite of the IOG.

Mesoproterozoic Lakhna Dyke Swarm, Bastar Craton & Its Tectonic Implication

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Abstract

Lakhna dyke swarm occurs within the granites \((\sim 2.5 \text{ Ga})\) and TTG \((\sim 3.5 \text{ Ga})\) of the Bastar Craton close to Nawapada town of western Orissa. The dykes are undeformed and unmetamorphosed; however, one of the dykes in the eastern part of the swarm is deformed by shearing along the Terrane Boundary Shear Zone that defines the tectonic margin of the Eastern Ghats Mobile Belt with the Bastar Craton. The dykes show variable composition from rhyolite, trachyte, feldspar porphyry, gabbro to dolerite and runs predominantly in N-S direction while a few (mostly dolerite) are in WNW-ENE direction. However, it is not yet conclusive regarding the relative age of the two sets of dykes.

Petrographic study of the dykes shows the rhyolite is typical pink in color, medium to fine grained and porphyritic in nature with quite a number of rounded quartz and K-feldspar phenocrysts along with euhedral crystals. Magmatic corrosion has given rise to rounded shape of the phenocrysts. Trachytes show flow structures defined by plagioclase and potash feldspars. Dolerites are fine to medium grained composed of plagioclase and clinopyroxene and show ophitic to subophitic texture. Gabbro is medium to coarse grained, show ophitic to subophitic texture and deformed by shearing. Feldspar porphyry dyke contains abundant glomeroporphyritic to porphyritic feldspar crystals inside the fine grained greenish groundmass that carries hornblende crystals. The major and trace elemental composition of the dykes have been studied and it is found that dykes present contrasting major element behavior as evident in their mineralogical composition. The composition spreads from basalt to
trachyandesite, trachyte to rhyolite in TAS diagram and in AFM plot it shows dominantly calc-alkaline trend. Few lie in the alkaline to sub alkaline field. Mg-number varies as in rhyolite 32-50, trachyte 60-61, feldspar porphyry 33-45 and dolerite 44-60. Similarly, FeOT/MgO ratios varies as in rhyolite 2-5, trachyte 1.5-1.6, feldspar porphyry 3-8, gabbro 36-38 and dolerite 1.2-2.7. All these data suggest highly fractionated nature of the magma to give rise to such wide variety of rocks. Association of alkali rocks with saturated rocks (rhyolite, basalt etc) attribute to two different types of parental magma. The TiO$_2$-K$_2$O-P$_2$O$_5$ discrimination plot shows both continental and oceanic affinity of Lakhna dyke swarms.

The U-Pb zircon SHRIMP age of Lakhna dykes has been found to be 1450 ± 22 Ma with xenocrystic age of 2563 ± 22 and 3726 ± 22 Ma (Ratre et al., 2010). The xenocrystic age reflect the age of granites and TTG respectively.

Emplacement of dykes indicates an extensional setting. The dominantly N-S trending Lakhna dyke swarm suggests a E-W extension that occurred at around 1.4 Ga which gave rise to such magmatism in form of dykes. The E-W dykes may belong to a different episode or could represent a conjugate set to N-S dykes. The extension in the Bastar Craton not only resulted in Lakhna dyke swarm but formation of Purana basins namely Khariar basin in the close vicinity of the Lakhna dyke swarms. In rare instances it has been found the Purana platform rocks unconformable overlie the Lakhna dykes. Not only that, at the same time or little prior to that the Eastern Ghats Mobile Belt basin was formed as a result of such extensional setting. However, the Eastern Ghats Mobile Belt orogeny occurred during 1.0 GB and culminated during Pan African orogeny period (517 Ma) in the formation of nappe belts in the NW margin (Biswa et al., 2007). The deposition in the Purana basin had continued till such time suggesting the fact that part of the basin represents the foreland basin of the mobile belt.

References


A note on the Geology of the area between Rairangpur-Gorumahisani, Mayurbhanj district, Orissa

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Abstract

The Iron Ore Supergroup of Singhbhum Craton is exposed in three type localities. In the west it is Jamda-Koira Belt, the southern exposure is known as Tomka, Daitari & Malayagiri Belt and in the eastern most one is Badampahar-Gorumahisani Belt. The Badampahar-Gorumahisani belt consists of Badampahar/Gorumahisani Group which is a major part of the Singhbhum North Orissa Province. It comprises a sequence of greenschist comprising meta-sedimentary like quartzite, chemogenic precipitates as banded iron formation and chert and meta-volcanics occurring in the form of an arcuate belt flanked on either side by the Singhbhum Granite. The paper outlines the different litho-units, the inter-relationship amongst those units and the major structures exposed in the area.