Geological setting of the Siang Dome located at the Eastern Himalayan Syntaxis

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The Siang Dome located at the Eastern Himalayan Syntaxis is a large structure involving entire Himalayan packet from the Paleogene rocks to the south at the core of the Siang Window to the ophiolitic suture rocks and the Trans-Himalayan granitoids around Tuting at its northern periphery. About a kilometer thick shear zone with intense granitic injection is exposed in the Siang River section located at the tectonic base of the Yang Sang Chu Fm., overriding the Central Crystallines. This zone is tentatively equated to the South Tibetan Detachment. Marcoscopically the Himalayan thrust pile at the Siang Dome has a prominent orogen-transverse antiformal structure trending NW-NNW. It is truncated to the west by the N to NE trending Tuting-Basar dextral fault. The Siang Window at the core exposes a duplex antiform of Paleogene rocks that are placed beneath the low grade Proterozoic Himalayan rocks tectonically separated by the arched splay of the MBT roof-thrust.

Two structurally discordant units frame the Siang Window. The crystalline thrust packet and the subjacent Lesser Himalayan thrust sheets of low-grade Proterozoic and locally present Permian metasediments on the hanging wall of the arched MBT to the north constitute one congruous unit and preserve identical structure. The duplex antiform of the Paleogene rocks beneath the arched MBT, which are further truncated to the south against the Neogene Siwalik Sub-Himalayas by the ENE-SSW trending and north dipping frontal MBT and North Pashighat Trust (NPT) represent the other tectonic unit. The antiform of Paleogene rocks are dissected by subsidiary imbricate faults that are oblique to both MBT at the roof and NPT at the floor, truncating and dislocating MBT, but remaining asymptotic to NPT. These are responsible for generating the Siang duplex antiform and its northern fault bend antiformal closure (Figure 1, 2). Tuting-Basar tear fault also breeches folded thrusts, and off sets the Siang and the Namche Barwa Domes at its northeastern end, whereas, to the south the frontal Gondwana thrust belt, frontal belt MBT and MFT remain unaffected, and therefore represent the youngest thrust structures.

The lower unit of the Paleogene sequence at the Siang Window, the base of which is not yet well defined, is mainly composed of white to pink colored, skolitho-bearing and mature Miri like quartzite. It is also frequently intruded by dykes and sills feeding the overlying Abor Volcanics. The stratigraphic base of this quartzite with type Miri Quartzite is yet to be defined. Calcareous bands or limestones occurring at the upper part of this quartzite and at the lower parts of the Abor Volcanics have yielded rich larger foraminifera record characterized by *Assilina depressa, A. regularia, Orbitosiphon cf. tibetica, Nummulites thalicus* etc., indicating Late Paleocene to Early Eocene age. The Yinkiong Formation overlying the volcanics consists of mainly argillo-arenaceous volcanisediments with marl and limestone intercalations. Foraminifera assemblage in these, characterized by *Nummulites atacicus, N. maculatus, Assilina spira, A. daviesi, A. subassamica,* indicate Early to Mid Eocene age (Acharyya 1994, 2007). The MBT zone between the early Paleogene rocks and the overriding pre-Tertiary rocks, particularly the Permian Gondwana rocks, Proterozoic quartzite-dolostone bearing Buxa like rocks, often develop mélange with tectonic assemblage of these rocks. Narrow zones of intermixed Permian and Eocene fossils are recorded from frontal belt MBT zones, which extend over 250 km (Acharyya 1994).

The Himalayan crystalline thrust tectonically floored by the MCT has many similarities with typical features of the Type-C crystalline Thrust Sheets as recognized by Hatcher and Hooper (1992). The foreland thrusts are driven ahead of Type C sheets as crystalline and foreland thrust merge into the Coulomb wedge of the foreland. At the Eastern and NE Himalayas located in Darjeeling-Sikkim area and Arunachal Pradesh, the pile of thrust sheets, from higher to lower structural levels comprising the crystalline, the low-grade Proterozoic metamorphic rocks, Late Paleozoic metasediments and the Neogene floor sediments, are cofolded together. The macroscopic folds in the former area have orogen-parallel and transverse trends. In the present area, the latter are the dominant fold style. In mesoscopic scale four generations of folds have been recognized from the former area and broadly similar fold styles are also inferred from the Siang Dome, but here the orogen parallel early folds are generally rotated to orogen-transverse orientation. The earliest F1 folds are tight isoclinal with axial plane cleavage which is the main cleavage/schistocity S1. Fold axes generally trend northward. Stretching lineation and mullions denoting transport direction of thrusts are developed parallel to F1 axes, but the latter often show variable trends. The F1 are well developed in the Paleogene rocks, particularly in the Yinkiong Formation. F2 folds developed on S1 are generally asymmetric, upright, inclined to recumbent in geometry. Often there is development of spaced cleavage S2, and striping, and mineral lineation. F3 fold are open, upright and trend NW-NNW. In the present area because of superposition, F2 and F3 fold axes are both transversely oriented and are thus often difficult to differentiate. Evidence of F2-F3 cross folding in the Paleogene rocks of the Siang Window is revealed by the presence of well formed dome structures at the top section of the Miri Quartzite *(sensu lato)* and basal sections of the Abor Volcanics (Figure 1, 2). The presence of co-axial folding of F1 by F3 is recorded from single outcrops. The latest F4 fold structures are generally orogen-parallel in trend, but have recumbent geometry with subhorizontal axial plane. These are better developed in zones of steeply dipping sheet schistosity and bedding. The F4 folds are not recorded from the Tertiary sediments, whereas, F1 to F4 affect the thrust pile of Proterozoic, Late Paleozoic and Paleogene rocks. Therefore, F1 to F4 folds are late- to post-thrust structures (Acharyya 2007).

The buried basement ridge of the Shillong-Mikir massif in NE India, trends NE-N-ward and finally plunges beneath the Siang Window. Regional trend and depths to basement immediately south of the Siang Window are obtained from seismic reflection data (Baruah et al. 1992). The Paleogene rocks in the Siang Window are trust over the Neogene pile and older sediments overlying the basement (Figure 1). Some test wells on north bank of Brahmaputra River have also confirmed the presence of late Paleocene-early Eocene marine shelf sediments. Lateral continuity and thickening sequence of the Eocene marine shelf in Arunachal Sub-Himalayas, around the Siang Window is strongly indicated by the presence of thrust slivers of Eocene sediments and presence of similar marine fauna in them, which occur close to and beneath MBT zone from widely separated sections. The thrust arcuation of the Siang Window located at the Eastern Himalayan Syntaxis was therefore influenced initially by the involvement of the subsurface indenture of the NE leading edge of Indian continent, which acted as an oblique crustal ramp over which the pile of Himalayan nappes climbed. A basement saddle and depression occurs instead south of western part of the Siang Window and the complementary synform located further west (Acharyya 2007). The geometry of the Siang Dome was modified subsequently by ductile deformations.

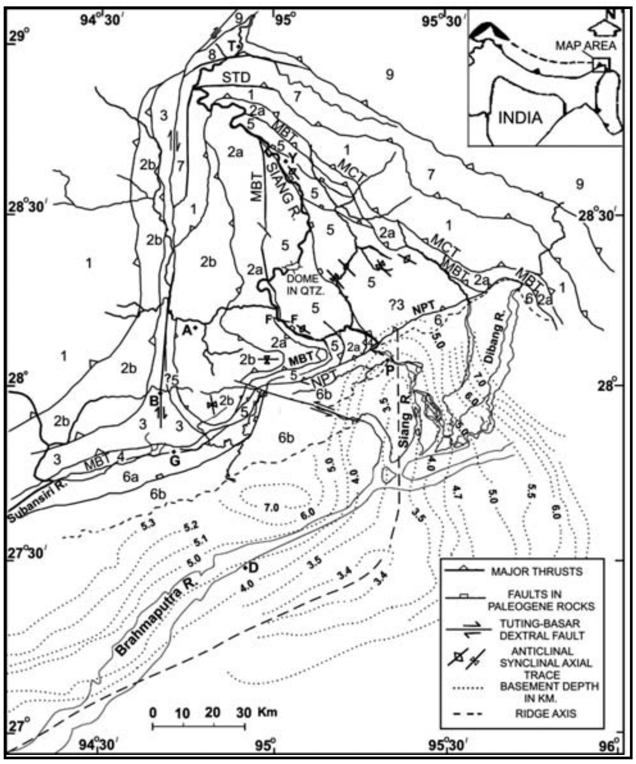

FIGURE 1. Simplified geological map of the Siang Dome and foothill plains. Regional Depth contours in km close to basement in the foothill plains and Basement Ridge Axis are based on reflection seismic data after Baruah et al., 1992. – 1-High-grade rocks and gneisses (Central Crystallines), 2a- Low-grade quartzite-dolomite metasedimets (Buxa Fm., equivalent, Proterozoic), 2b- Low-medium grade meta-argillite (Proterozoic), 3- Miri Quartzite (? Early Paleozoic), 4- Late Plaeozoic Gondwana equivalent metasediments, 5- Paleogene rocks, 6a- Tectonised early Neogene sediments in the northern belt (Lower Siwalik), 6b- Late Neogene (Upper and Middle Siwalik) in the southern belt, 7- Low- to high-grade graphitic metasediments (Yang Sang Chu Fm.), 8- Mafic and ultramafic rocks (Ophiolite), 9- Trans-Himalayan granitoids and gneisses. Abbreviations: MBT- Main Boundary Thrust, NPT- North Pashighat Thrust, MCT- Main Central Thrust, STD- South Tibetan Detachment, A- Along, B- Basar, D-Dibrugarh, G- Garu, P-Pashighat, T-Tuting, Y-Yinkiong.

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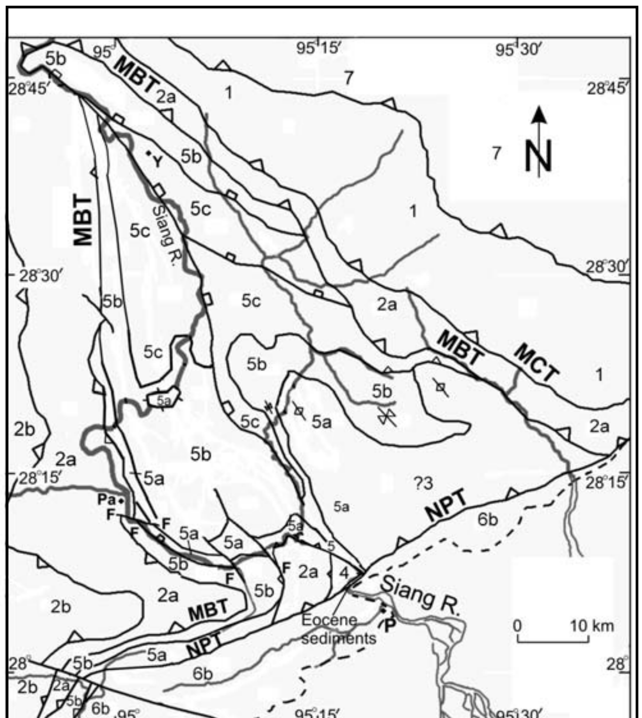

FIGURE 2. Simplified geological map of the Siang Window. Legend same as in Figure 1. Paleogene rocks differentiated to: 5a- Quartzite (Late Paleocene-Early Eocene: may include older Lower Paleozoic Miri Quartzite), 5b- Abor Volcanics, 5c- Yinkiong Fm.