The Evolution of the Asian Plate in Burma

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With 2 figures

Zusammenfassung

Die postkretazische Entwicklung der Asiatischen Platte in Burma zeigt starke Beeinflussung durch die Spreizung des östlichen Indischen Ozeans und die Drift von „Groß-Indien“ nach Norden. Der westliche Abschnitt Burmas war während des frühen Mesozoikums ein Bereich, der klastische Sedimente aufnahm. Im späten Mesozoikum wurden die östlichen Teile Burmas landfest, während die westlichen Abschnitte von einem Shelfmeer eingenommen wurden, an welches sich gegen W eine Geosynklinale (Indoburman Geosyncline) anschloß, die langsam westwärts wanderte. Oberkretazische Flysche wurden hier nachgewiesen. Die Kollision der Indischen Platte mit der Asiatischen Platte veränderte die Sedimentationsbedingungen in Burma. Die Indoburmanischen Ketten tauchten während des Miozän auf, bildeten einen Äußeren Inselbogen und ließen die Bucht von Bengalen entstehen. Die Subduktion entlang der W-Küste von Burma änderte sich im N mit der Annäherung der kontinentalen Kruste Indiens und führte zu Überschiebungen im N-Teil der Indoburmanischen Ketten. Rezent scheint Subduktion nur südlich 18° N im östlichen Teil der Bucht von Bengalen aktiv zu sein. Die Öffnung der Andamanen-See fügt sich in die dynamische Entwicklung dieses Bereiches ein.

Abstract

The Post-Cretaceous evolution of the Asian Plate in Burma is strongly influenced by the spreading of the Eastern Indian Ocean and the movement of “Greater India” northward. The Western part of Burma apparently was an area which received clastic sediments during the early mesozoic times. During the end of the mesozoic the Eastern part of Burma emerged from the ocean. The Western part formed the shelf area with a slowly westwards migrating geosyncline (Indoburman Geosyncline) to the West of it. Flysch sediments of upper Cretaceous age have been found in this area. The collision of the Indian Plate with the Asian Plate changed the sedimentary conditions in Burma. The emergence of the Indoburman Ranges happened during the Miocene, generating an Outer Island Arc and forming the Bay of Bengal. The subduction along the W coast of Burma changed in the N with the approach of continental Indian crust and led to thrusts in the N part of the Indoburman Ranges. Today subduction appears to be active only S of 18° N in the Eastern Bay of Bengal. The opening of the Andaman Sea fits into the dynamical development of the area.

Résumé

L’évolution postcrétacée de la plaque asiatique en Birmanie est fortement influencée par l’accroissement de l’Océan Indien oriental et la dérive du continent Indien vers le nord. La partie occidentale de la Birmanie fût au début du Mésozoïque une aire de réception de sédiments clastiques. A la fin du Mésozoïque les parties orientales de la Birmanie se transformèrent en terre ferme, tandis que les régions occidentales furent sub-

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mergées, formant une plate-forme continentale (shelf), à laquelle s'adjoignit vers l'ouest un géosynclinal (géosynclinal indobirman), progressant lentement vers l'ouest. Des flyschs d'âge crétacé supérieur ont été décrits dans cette zone. La collision entre la plaque Indienne et la plaque Asiatique changea les conditions de sédimentation en Birmanie. Les chaînes Indobirmanes firent leur émersion au cours du Miocène, en engendrant un arc insulaire externe, ainsi que le golfe du Bengale. La subduction le long de la côte occidentale Birmane se transforma au nord avec le rapprochement de la plaque Indienne et induisit des chevauchements dans la partie septentrionale des chaînes Indobirmanes. La subduction semble n'être active récemment qu'au sud de 18° N dans la partie orientale du golfe du Bengale. L'ouverture de la mer Andamane s'imbrique dans le développement dynamique de cette région.

Краткое содержание

Послемеловое развитие азиатской платформы в Бирме характеризуется сильным слиянием расширения восточного Индийского океана и дрейфом „великой Индии“ на север. Западная часть Бирмы была во время раннего мезозоя тем местом, куда сносились кластические осадочные породы. В позднем мезозое восточная Бирма оказалась сушей, в то время, как западную часть её заняло шельфовое море, к которому примыкала идущая на запад геосинклиналь (Индобирманская геосинклиналь), медленно сдвигающаяся на запад. Здесь установлены верхнемеловые флиши. Коллизия индийской плиты с азиатской изменила условия осадконакопления в Бирме. Во время миоцена появляются индо-бирманские цепи гор, образуя внешнюю островную дугу, в результате чего образуется Бенгальский залив. Со сближением континентальной коры Индии изменяется засасывание ее вдоль западного побережья Бирмы на севере и приводит к появлению нарушений в северной части индо-бирманских гор. В настоящее время субдукция кажется активной только на юг от 18° северной широты в восточной части Бенгальской бухты. Открытие озера Андаманен связано с динамикой развития в этой области.

Introduction

In the present paper we assume that the northward motion of India has substantially be proven by geophysical and geological observations in the Indian Ocean, the Himalayas, and the Sunda Arc. Burma, positioned in the transition zone between the Sunda Arc and the Himalayas, plays a key role to prove the validity of the concept of plate tectonics in this area. Especially the origin of the Indoburman Flysch sediments deserves some further attention. Curray & Moore (1974) pointed out that the Indoburman Flysch was deposited on the oceanic crust of the Bay of Bengal. However, palaeomagnetic data from Malaysia (McElhinny et al. 1974) and India (Klootwyk, 1979) as well as geological observations in the Himalayas (Gansser, 1964), the Andaman Islands (Karunakaran et al., 1968) and own geological observations in Burma give evidence that a geosyncline has developed between the Indian and the Asian Plate, where the Indoburman Flysch was sedimentated. The northward movement of India requires a rotation of SE-Asia (Johnson et al., 1976, Hamilton, 1979, Powell & Johnson, 1980). The concept of a paleo-Bengal-Fan (Curray & Moore, 1974) has to be abandoned for the Indoburman Flysch. Only as late as Miocene the configuration of India and Burma formed the Bay of Bengal.

Tectonic Framework

According to JOHNSON et al. (1976) the spreading of the Indian Ocean occured in four major phases:

(4):	32— 0 m. y. BP	Spreading between the united India-Australia plate and the Antarctica plate
(3):	53—32 m. y. BP	Spreading between India, Australia and Antarctica plates
(2):	80—53 m. y. BP	Spreading between the India and the Antarctica-Australia plates along a new spreading ridge. At the end of the Paleocene (53 m. y. BP) the first collision of India with the subduction zone lying off the southern margin of Asia occurred (MOORE et al., 1972)
(1):	130—80 m. y. BP	Spreading between India and the united Antarctica-Australia plates.

The reconstruction of Gondwana by JOHNSON et al. (1976) required a "Greater India" plate, to compensate for a gap between India and Australia of today. The dimension of "Greater India" presented difficulties when the northward movement of the Indian Plate was reconstructed, as during the Tertiary age the eastern parts had to move through the area of Central and Western Burma. As a consequence, JOHNSON et al. (1976) postulated that during the Tertiary age, Sunda Land (of which the Malaysian peninsula is a part) was located E of its present position. A rotation of Sunda Land brough it into its present position by overriding major parts of the Tethys sea floor and later of Indian Ocean sea floor. This Indian Ocean sea floor has occupied the former position of the greater Indian plate during its movement northward. Between the Indian and Asian plates, Burma appears to be the only part of Sunda Land close enough to the collision zone, where sufficient geological evidence has been preserved since Cretaceous times.

Paleogeographical Evolution in Burma and adjacent areas since the Triassic Age

During the Triassic age the eastern part of Burma (Shan States) were submerged and calcareous and clastic sediments deposited. To the West flysch-like clastic sediments with upper Triassic fossils are reported from the Arakan Yoma and the Chin Hills (THEOBALD, 1871: 39, MYINT LWIN THEIN, 1970, GRAMANN, 1974: 280). During the Jurassic age the same sedimentary conditions are presumed to have prevailed. Cretaceous uplifting of the Asian plate in the Shan States territory of Eastern Burma led to the deposition of terrestric sediments. To the West a shelf platform developed, with the deposition of Cenomanian limestones and sandstones predominating (CLEGG, 1941, SAHNI & SHASTRY, 1937), intercalated with andesitic lavas and tuffs. During the upper Cretaceous pelagic limestones marked the transition zone east of the Indoburman Geosyncline (BRUNNSCHWEILER, 1966, GRAMANN, 1974). The Indoburman Geosyncline received abundant clastic sediments from the uplifted Asian platform and was connected with the extension of the Indus Suture Line (GANSSER, 1964, GRAHAM et al., 1975) of the central Himalaya (Fig. 1 A, B). On the Andaman Islands ophiolitic suites were deposited in pretertiary times to form the base of Eocene-Oligocene flysch sediments.

During the lower Tertiary age the same structural pattern prevailed in Burma. Due to an increase of sediment transport from the East, clastic sediments were deposited under shallow water conditions, on a rapidly subsiding shelf platform East of the Indoburman Geosyncline. Andesitic volcanism continued in that area. The flysch trough of the Indoburman Geosyncline received the surplus of the sediments from the shelf platform. The western margin of this geosyncline remains unknown. In the flysch of the Arakan Coastal Area, on the Islands of Ramree and Cheduba (Eastern Bay of Bengal) shallow water sediments of allochthonous secondary deposition have however been found (HELMCKE & RITZKOWSKI, in press). The source of the allochthonous rocks remains open. A western or northern origin can be considered.

During the Oligocene age the center of the flysch sedimentation shifted westwards from the Indoburman Ranges into the area of todays Arakan Coastal Area. It is assumed that the subduction zone also shifted westwards relative to the continental crust in Burma. Paleogeography of Oligocene sediments of the shelf platform (Inner Burman Tertiary Basin) between Indoburman Geosyncline in the West and the Asian Plate in the East indicate a western connection with the open sea. No Oligocene sediments are so far known from Eastern part of the Indoburman Geosyncline which is upfolded today to form the Indoburman Ranges. The thickness of Oligocene sediments deposited in the Innerburman Tertiary Basins increased towards the West. At the base of the Shwezetaw sandstone of Upper Eocene to Lower Oligocene the Central Burma Salin Infra Basin (THAN NYUNT, 1979) between 19° and 22° N was apparently connected with the Chindwin Basin (between 22° and 26° N) East of the Indoburman Geosyncline. Areas of uplifting developed near 20°, 22° and 24° N. Following the deposition of Shwezetaw Formation the marine clays of Padaung Formation developed between 20° and 22° N which are no longer deposited in shallow water. They are of Middle Oligocene age (CLEGG, 1938, COTTER, 1938).

During Upper Oligocene the sandstone/shale alternations of Okhmintaung Formation was deposited. North of 22° N mostly conglomerates and sandstones developed which show an increase in sedimentation North of 24° N towards Assam. In Assam the Barail Formation with intercalated thick lignites (EVANS, 1964: 83) mark the possible end of the Indoburman Geosyncline during the collision of the continental Indian Plate with the Asian Plate in the area of todays Himalayas. Pollen associations from Central and Northern Burma are identical to those found in Assam (REIMANN & AYE THAUNG, in press) requiring a common area of deposition. West of the Innerburman Tertiary Basin in todays Arakan Coastal Area HELMCKE & RITZKOWSKI (in press) found a similar cycle in the Oligocene sediments. During Lower and Middle Oligocene mostly shaly flysch sediments with abundant olisthostrome layers were deposited. During Upper Oligocene typical flysch sandstone/clay alternations of the Yechangi Formation were deposited by currents parallel to the trough axis (today pointing 160°).

During the Miocene shallow water conditions prevailed in the shelf area of todays Inner Burman Tertiary Basin. From the beginning of the Middle Miocene, the Indoburman Ranges which represented the eastern part of the previous Indoburman Geosyncline were uplifted, thus separating the Innerburman trough from the Bay of Bengal. Evidence has been found for a continuous connection between

Assam and the Northern part of the Inner Burman Tertiary Basin during most of the Miocene age.

Between Middle and Upper Miocene times the folding of the previously deposited flysch sediments took place in the Arakan Coastal Area (HELMCKE & RITZKOWSKI, in press). Upper Miocene molasse sediments transgraded unconformably over folded Oligocene and Eocene flysch sediments which now represent a newly formed shelf margin. During this period the stage was reached that the Southern and Central Indoburman Ranges (Arakan Yoma, Chin Hills) formed a more or less continuous mountain chain, thus seperating the previous Innerburman shelf area from the geosyncline in the Gulf of Bengal area. It is assumed that the subduction zone between the Asian Plate and the combined Indian-Australian Plate moved further to the West near its present day position (STONELEY, 1974: fig. 2). Flysch sedimentation continued in the Bay of Bengal (MOORE et al., 1972). On the Andaman Islands calcareous sediments of the Archipelago Group (KARUNAKARAN et al., 1968) developed.

In Post-Miocene times sedimentation is restricted to the Bay of Bengal in the West and the Innerburman Tertiary trough in the East. The Northern Indoburman Ranges (Naga Hills, Patkai Ranges) emerged from the sea completing the seperation between the Arakan Coastal Area — Assam and the Innerburman Tertiary Basin.

In recent times large parts of the Innerburman Tertiary Basin are affected by erosion. Deposition continues in the Gulf of Martaban, where a new spreading center is developing under the Andaman Sea (PAUL & LIAN, 1975, EGUCHI et al., 1979, CURRAY et al., in press).

Discussion

In the following paragraph the attempt is made to discuss the paleogeographical schemes presented so far in respect to the plate tectonic models of the collision between the Asian and the Indian Plate.

Previously the Southeastern extension of the Himalaya was searched in the Mogok Belt of Eastern Burma. SEARL & BA THAN HAQ (1964) compared the metamorphic rocks of the Mogok Belt with similar rocks of the Higher Himalayas. The results of KARUNAKARAN (1974) and VALDIYA (1976) in the Eastern provinces of India and of BRUNNSCHWEILER (1966) in Burma could not support this theory. Lesser and Higher Himalayas are partly built up by sediments containing Gondwana flora followed by sediments of the Tethys realm. Today they are bounded to the North by the Indus Suture Line (GANSSER, 1964). Its eastward extension seems to be the straight valley of the Tsangpo (= upper Brahmaputra), where HUANG CHI-CHING (1978: 631) reported typical melange sediments together with ophiolites. Further to the East the continuation of the Indus Suture Line is yet not clear. It is cut off by faults in the West of the Lohit Himalaya. Lohit Himalaya is not part of the old Gondwana continent (Indian Plate) but part of the Tibetian plateau. Lohit and Mishmi Faults (KARUNAKARAN, 1974) can be traced on space images well into the northward extension of the Mogok Belt in Northern Burma. Recent geological research, interpretation of LANDSAT imagery as well as the newly published Geological Map of Burma (1 : 1 000 000, 1977) revealed that Mishmi Fault is lost within the metamorphics of Kumon Range (Northern

Burma). It cannot be connected with the Shan Boundary Fault of Central and Southern Burma. West and South of Kumon Range metamorphic and intrusive rocks can be observed. They are not only confined to the Mogok Belt in Burma (= Asian Plate) but can be found as far West as the Eastern Indoburman Ranges. Theobald (1871), Myint Lwin Thein (1970) and Gramann (1974) reported the triassic Daonella contained in flysch-sediments which overlie metamorphic Kanpetlet Schists, which Theobald (1871) included into his "Axials" of the Indoburman Ranges. Brunnschweiler (1966) described the Naga Metamorphic Complex overriding the Cretaceous through Tertiary flysch of the Chin and Naga Hills (Indoburman Ranges), associated with high-pressure metamorphic ophiolites (Ghose & Singh 1980). The metamorphic and mesozoic rocks of the Northern and Central Indoburman Ranges can be regarded as part of the continental crust of the Asian Plate. Consequently they have to be connected with the continental slope in the Eastern Andaman Sea (Rodolfo, 1969, Mitchell & McKerrow, 1975).

Mitchell & McKerrow (1975: 309) pointed out that Cretaceous turbidites and shallow marine sediments in the Kalaw area of the Burmese Shan Plateau might be related to the beginning of the subduction under the Asian Plate. The paleogeographical setting in Burma during Cretaceous times shows that marine sedimentation is not restricted to the area East of the Shan Boundary Fault. Orbitolina limestones of Cenomanian age have been found in the uplifted areas of the Innerburman Tertiary Basin further in the West (Clegg, 1941), where they are intercalated with andesitic lavas and tuffs. This andesitic volcanism, together with granodioritic and dioritic intrusions mark the position of a Volcanic Belt. Consequently the Wuntho Massif and its extensions to the North and the South separated a Back Arc Basin in the East, from a Front Arc Basin in the West. The shallow water sediments described by Mitchell & McKerrow (1975) from the Kalaw area can be ascribed to the Back Arc Basin. West of the Front Arc Basin pelagic limestones of Maastrichtian age are intercalated into shale/sandstone sequences of Flysch character in the Eastern Chin Hills West of Gangaw.

The Tethys occupied during the Cenomanian (Fig. 1 A) the area between Asia and Gondwana, which started to break up some time earlier. In front of the paleo-continents shelf-sediments were deposited. Flysch sedimentation occured in the trench over a subduction-zone South of the Asian continent and possibly in a postulated subduction zone North of the Indian continent. In Burma a Volcanic arc is developed, in India the Rajmahal Trapps extruded. In the Tethys a spreading center generated oceanic sea-floor, today preserved in Oman, on the Andaman Islands, and probably in the Indoburman Ranges and the Indus-Tsangpo-Suture-Line.

In the Santonian (Fig. 1 B) the Indian Plate continues her drift northwards. A rotation of Burma may have started at this time. The area of flysch deposition was enlarged towards North. This pattern prevailed during the Paleocene (Fig. 1 C): In the Tethys ocean flysch sediments derived from the Asian continent were deposited. In Burma terrestric sedimentation was bounded against shelf sedimentation in the area of the Shan Boundary Fault.

At 40 m y (Fig. 1 D; Upper Eocene — Oligocene) the northward drift of the Indian Plate slowed down due to the beginning of the collision with Asia. In the Northern Indoburman Geosyncline the Barail Series of molasse type developed

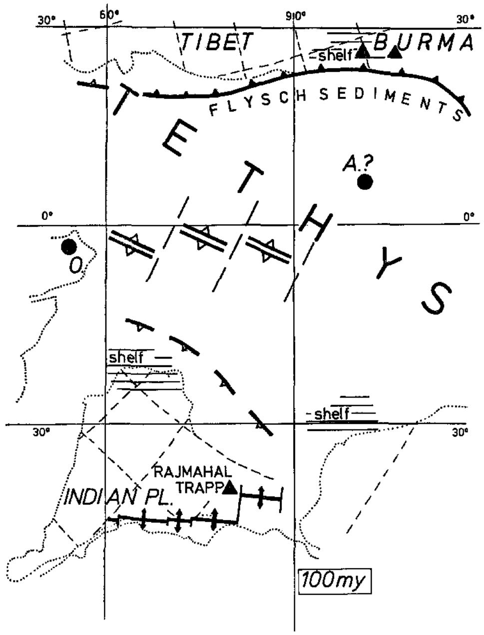


Fig. 1 A

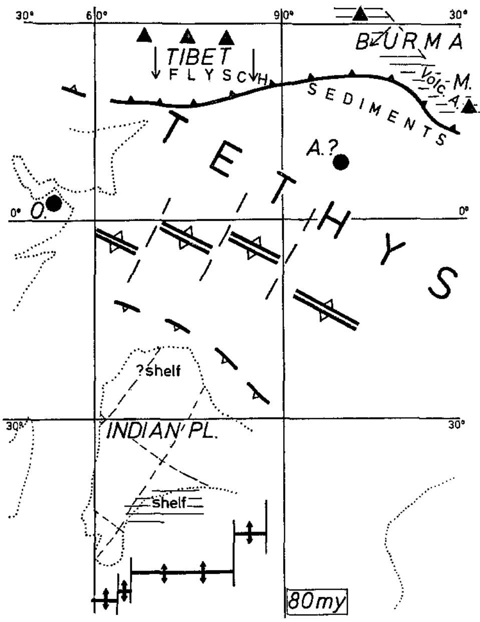
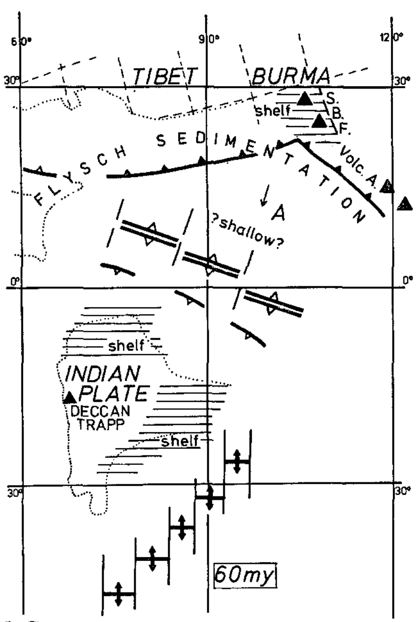


Fig. 1 B



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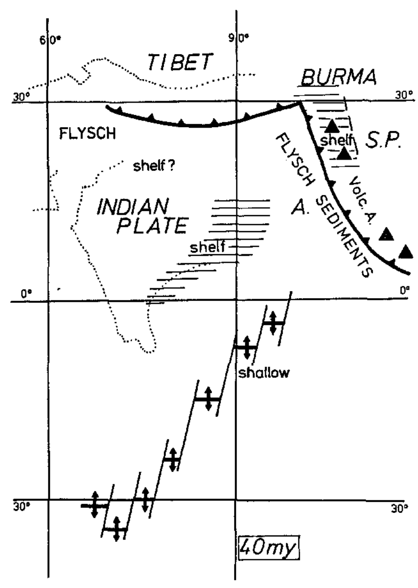


Fig. 1 D

Fig. 1: Simplified reconstruction of palaeogeography of Burma in respect to the motion of the Indian plate. — A.: Andaman Islands, M.: Malaysia, O.: Oman, B. F.: Bengal Fan S.P.: Shan Plateau, D.F.: Dauki Fault, S.B.F.: Shan Boundary Fault, I.T.S.: Indus Tsangpo Suture Line, I.V.A.: Inner Volcanic Arc, V.A.: Volcanic Arc. — 1A: Cenomanian (100 m.y. BP): The Tethys occupied the area between India/Antarctica/Australia and Asia. Shelf sediments were deposited in front of the palaeo-continents. The separation of the Indian Plate began a little earlier. Rajmahal Trapp extruded. Subduction and sea floor-spreading is postulated N of the Indian Plate. In Burma an Inner Volcanic Arc developed. — 1B: Santonian (80 m.y. BP): The Indian Plate continues its drift Northwards. Burma begins

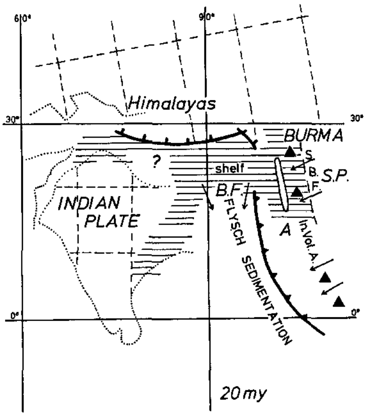
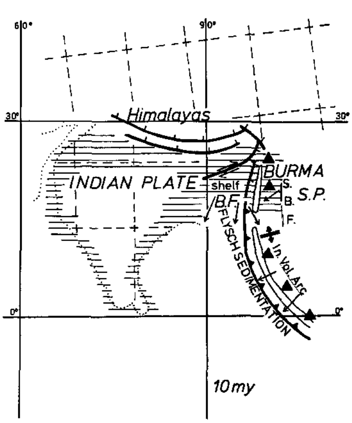


Fig. 1 E



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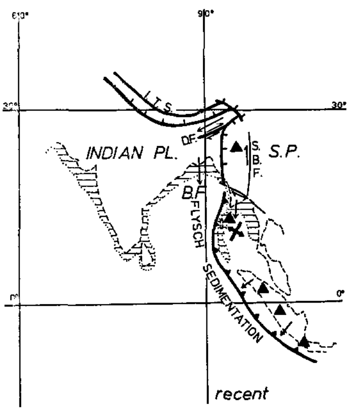


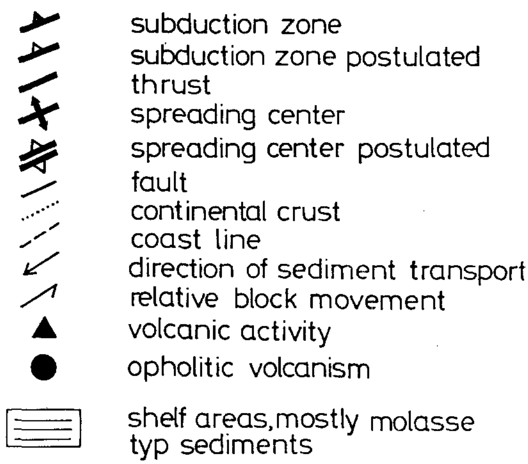
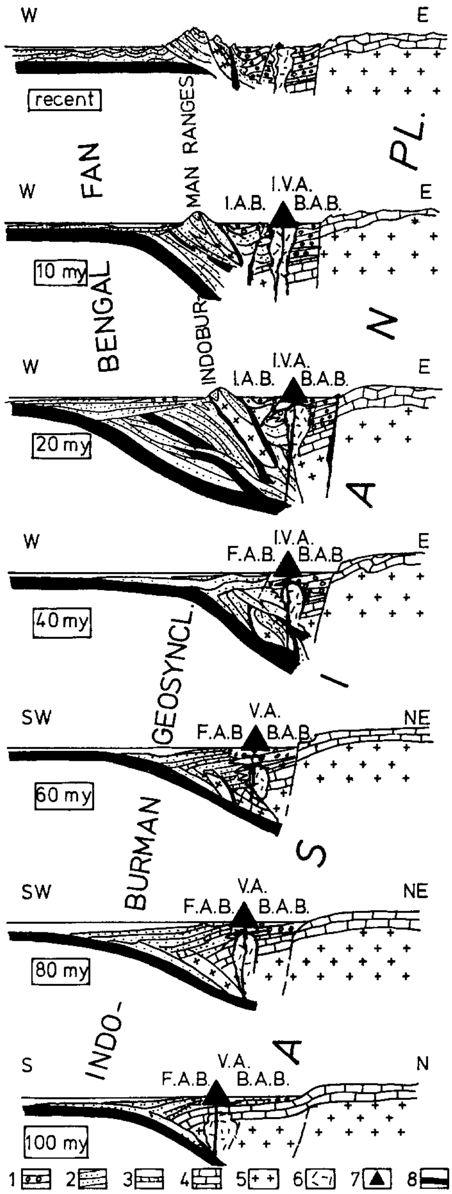


Fig. 1 G

a rotation towards the SW. In Tibet grandioritic intusions took place. — 1 C: Paleocene (60 m.y. BP): Flysch sediments, derived from the Asian Plate cover part of the oceanic Tethys sea floor and reached the Andaman Islands. The Shan Boundary Fault (S.B.F.) seperated the terrestrial from the marine area in Burma. — 1D: Upper Eocene/Oligocene (40 m.y. BP): The Northward drift of the Indian Plate slowed down due to the collision of the Tethys spreading center with the Asian Plate. Barail Series developed in the Northern Indoburman Geosyncline and with a reduced thickness on the NE-part of the Indian Plate. On the Andaman Islands the flysch sedimentation continued. In Burma marine conditions on the shelf prevailed (Yaw Formation). — 1E: Lower Miocene (20 m.y. BP): Burma arrived near its present position. The subduction zone shifted to the W of the Andaman Islands, where shelf conditions prevailed. E of the Indoburman Geosyncline the Outer Island Arc (today the Indoburman Ranges) developed. In the Arakan Foreland flysch sedimentation from the N indicated the influence of the Bengal Fan (B. F.). Uplifting and thrusting in the Himalayas. 1F: Upper Miocene (10 m.y. BP): Underthrusting of continental Indian Plate continued. In the Arakan Foreland molasse sedimentation followed the flysch sediments. Indoburman Ranges and Andaman Islands formed the Outer Island Arc. In the Andaman Sea sea floor spreading occured East of the subduction zone. Westward thrusting in the Northern Indoburman Ranges. Begin of Eastward movement of Shillong-Mikir Block North of Dauki Fault. — 1G: Recent: Thrusting and faulting in NE-India continues with Eastward movement of Shillong-Mikir Block along Dauki Fault (D.F.) and under the Northern Indoburman Ranges. Spreading in the Andaman Sea leads to a new Back Arc Basin. To the N of it a NW—SE transformal fault limits the spreading and lateral movements. Flysch sediments are deposited by the Bengal Fan and from the Sumatra area.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and with a reduced thickness also on the northern parts of the Indian Plate. In the Southern Indoburman Geosyncline flysch sedimentation prevailed. In the Inner Burman Tertiary Basin shelf sedimentation (Yaw- and Shwezetaw Formation) continued.

In the Lower Miocene (Fig. 1 E) the continental part of the Indian Plate bypassed the region of Burma and due to the rotation of SE-Asia Burma arrived near its present position. The subduction zone shifted to the West of the Andaman Islands and the Southern Arakan Yoma. Subduction of the oceanic crust of the Bay of Bengal started. The Indoburman Geosyncline developed into an Outer Island Arc and flysch sedimentation was bounded to the Arakan Coastal Area and further to the West. Sedimentation from the North indicated the start of the Bengal Fan. The disruption of the previous Tethyan flysch trough was completed and left the Indus Flysch disconnected from the Indoburman Flysch.

During the Upper Miocene (Fig. 1 F) underthrusting of the continental Indian Plate continued. In the Arakan Coastal Area molasse sedimentation followed the flysch sedimentation. The Indoburman Ranges and the Andaman Islands still formed the Outer Island Arc. In the Andaman Sea sea-floor spreading created a marginal sea East of the subduction zone. In the Northern Indoburman Ranges westward thrusting started and the Shillong-Mikir Block began its eastward movement North of Dauki Fault.

Fig. 1 G shows the present stage of collision: The thrusting and faulting in NE-India still continues with eastward movement of the Shillong-Mikir Block along the Dauki Fault under Lohit Himalaya. The spreading in the Andaman Sea created a marginal sea, which is limited to the North along a NW-SE striking

Fig. 2: Simplified geological cross-sections through Central and Western Burma near 20° N (not to scale). — 1: Molasse sediments, 2: Flysch sediments, 3: Mesozoic limestones, 4: Paleozoic shelf sediments, 5: Crystalline rocks of Asian Plate, 6: Granodioritic intrusions, 7: Volcanic activity of Inner Volcanic Arc, 8: Oceanic sea-floor and ultrabasic rocks. — A.P.: Asian Plate, B.A.B.: Back Arc Basin, F.A.B.: Front Arc Basin, I.A.B.: Inner Arc Basin, I.V.A.: Inner Volcanic Arc, V.A.: Volcanic Arc, I.B.R.: Indoburman Ranges, I.B.G.: Indoburman Geosyncline. — Cenomanian (100 m.y. BP): Subduction of Tethyan oceanic sea-floor and sediments under the continental Asian Plate. Development of a Back Arc Basin (shelf sediments) N of the Volcanic Arc (andesitic volcanism and granodioritic intrusions). In the Front Arc Area limestones were deposited. The Indoburman Geosyncline (Tethys) recieved flysch sediments. — Santonian (80 m.y. BP): Subduction continues. Begin of rotation of Burma towards the SW. — Paleocene (60 m.y. BP): Rotation and subduction continues. Flysch sediments were deposited at the Eastern part of the Front Arc Basin. Locally conglomerates are intercalated (Paunggyi Conglomerates). Upper Eocene/Oligocene (40 m.y. BP): Collision of the postulated Tethys spreading center with the Asian Plate. Development of an Outer Island Arc along the E-side of the Indoburman Geosyncline begins. Later the subduction zone jumps to the West. — Lower Miocene (20 m.y. BP): Indoburman Ranges form an Outer Island Arc and deliver sediments to the E and W. Sanding-up of the Interarc Basin and the Back Arc Basin. Flysch deposition in the Bay of Bengal (Bengal Fan). Subduction of Indian Ocean crust. — Upper Miocene (10 m.y. BP): Folding in the Arakan Foreland. Deposition of molasse sediments. Begin of spreading in the Back Arc Basin of the Andaman Sea. — Recent: Subduction W of the Northern Indoburman Ranges ceased in favour of thrusting. No magmatic activity along the Inner Volcanic Arc in Burma. Bengal Fan is growing.

transformal fault. Along the Shan Boundary Fault strike-slip movements occur. The flysch-sedimentation is limited to the Bengal Fan and fills the trench above the subduction zone West of the Southern Arakan Yoma.

Conclusions

From the above discussed evolution the following conclusions can be drawn:

— Eastern Burma (Shan States) is connected with the Lohit Himalaya and the Tibetian region. Since Paleozoic times they were part of the Eurasian continent. Continental crust of Gondwana origin cannot be found East of the Tsangpo gorge in Arunachal Pradesh.

— The occurences of ultrabasic rocks in Northern Burma (HUTCHINSON, 1975) and along the Lohit-thrust may suggest an older (? jurassic) subduction zone between the Eurasian Plate and the old Tethys ocean, They can not be connected with the ophiolites and melanges of the Indus-Tsangpo-Suture.

— The metamorphic rocks of the Mt. Victoria region, the Naga Hills and at 26° N/94° E indicate that continental crust of the Eurasian Plate streches up to these regions in Western Burma.

— The ultrabasic rocks of the Naga and Chin Hills and of the Arakan Yoma are traces of oceanic crust and might show the position of a Tertiary subduction zone. They could be remnants of the old Tethys sea floor and witness subduction of the Tethys sea under the Eurasian Plate. The Cretaceous and Tertiary Flysch series of the Arakan Yoma, the Chin and Naga Hills were deposited in the associated trench of the Tethys ocean and cannot be derived from India and deposited on the newly generated oceanic crust of the Indian Ocean South of India.

— At present an active subduction zone is developed West of the Southern Arakan Yoma. Further to the North recent thrusting of the Chin and Naga Ranges upon continental crust of India takes place.

— The present geological configuration in Burma cannot be explained without a rotation of SE-Asia.

— The opening of the Andaman Sea caused the strike-slip movements along the Shan Boundary Fault and the distortion of the Southern Arakan Yoma into an arc, konvex to the West.

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