CHAPTER IV

LITHOSTRATIGRAPHY AND TECTONIC SEDIMENTATION

Generally, the approach to facies analysis relies heavily on the reconstruction of basin morphology and bedding architecture, determination of gross lithology, and recognition of vertical and lateral succession of facies association. The facies distribution and changes in distribution are dependent upon a number of interrelated controlling factors, notably, sedimentary process, sediment supply, climate, tectonics, sea level changes, biological activity, water chemistry, and volcanism. The relative significance of these factors, however, varies between different depositional environments. Amongst these, climate and tectonics are very important in the continental environments.

It is apparent that the early development of a sedimentary basin, its internal structural cofiguration during growth and its subsequent solid geometry, following its depositional history and the period of uplifting and erosion, will be strongly influenced by movements of the basement floor underlying the basin. The structural framework of a sedimentary basin thus depends primarily on the structural patterns of basement.

All basins studies involving lithostratigraphic analysis of the entire basin logically begin at the base of the sequence and trace the development of the final record of the history. The structural evolution of the basement during this interval of time is an essential component of the basin's history and a controlling factors in its structural frameworks.

In this chapter, an attemt is being made to define the lithostratigraphy of Cenozoic sedimentary sequence of the Fang basin on the informal basis, and to reconstruct the history on tectonics and sedimentation of Cenozoic sediments of the Fang intermontane basin.

4.1 Proposed Lithostratigraphy of the Fang Basin

Prior to the discussion on the geological history of the Cenozoic sedimentation and the relation of sedimentation to tectonic activity of the Fang basin, an attempt is made to define the informal lithostratigraphy of the area based on facies analysis previous described. The informal lithostratigraphic classification and nomenclature of the Cenozoic sequence in the present investigation have been proposed for the referrence purpose. Previous stratigraphic classifications and nomenclatures have already been reviewed earlier under the heading 2.4.2. The pretroleum exploration best illustrates the utility of approaching sedimentary sequences by means of lithostratigraphy. If the goal of the stratigraphic analysis is to predict the pattern of a specific lithology that may have economic significance, then observations relating to boundary conditions during the deposition have particular importance.

In this study, the Cenozoic sedimentary sequence within the Fang basin has been classified into the following lithostratigraphic levels, notably, group, formation, and member. Besides, arbitary nomenclature of various lithostrtigraphic units has been proposed as informal name to serve the discussion.

The following discussion will be focussing upon the proposed classification, tetative nomenclature, and brief description of various lithostratigraphic units of sedimentary sequence of the Fang basin. It is, however, essential to begin with the proposed of the largest lithostratigraphic unit of the Cenozoic sedimentary sequence of the Fang basin as the "Fang Group" to serve the discussion in this context. Therefore, local lithostratigraphic subdivisions in the Fang basin will fall within the "Fang Group".

4.1.1 A-Formation

The lower most lithostratigraphic unit of the "Fang Group" is referred to as "A-Formation" which in all cases unconformably overlies the pre-Cenozoic basement rocks. The type of this unconformity is believed to be either angular unconformity or nonconformity. Due to the unexposed nature of the formation, the classification of the "A-Formation" depends entirely on subsurface data. However, at least the drill-hole data indicate that the "A-Formation" is present in the following areas, namely, Chaiprakarn, Mae Soon, Pong Nok, Pa Ngew, Huai Bon, Pa Daeng, and Nong Khwang . Amongst these areas, only the lithological succession at the Pong Nok and Pa Ngew areas are avialable for the subdivision of the "A-Formation" into five members which will be referred to as "A-1, A-2, A-3, A-4, and A-5 Members" in ascending order, respectively.

The lithological characteristics of the "A-Formation" is mainly sandstone interbedding with shale of meandering fluviatile and fluvio-lacustrine facies. However, for the Pong Nok area, coal swamp facies have been associated in this lithological succession.

Detailed lithostratigraphic unit of the "A-Formation" in the Pong Nok area can be subdivided into the "A-1 Member" of the meandering fluviatile facies, the "A-2 Member" of the lacustrine facies, the "A-3 Member" of coal swamp facies, the "A-4 Member" of lacustrine facies, and "A-5 Member" of fluvio-lacustrine and/or meandering fluviatile facies in ascending order, respectively. For Chaiprakarn area, no attempt has been made to subdivide the "A-Formation" which is represented by the meandering fluviatile and/or fluvio-lacustrine facies into different member due to the limited of reliable subsurface data.

With respect to the Mae Soon area, the uppermost of the "A-Formation" is characterized by the lacustrine facies, whereas the lower part of the succession has not been penetrated by any drill-hole. For Pa Ngew area, the subdivision of the "A-Formation" is nearly similar to that of Pong Nok area.

The lithostatigraphy of the "A-Formation" and its subdivision of Chaiprakarn, Mae Soon, Pong Nok, Pa Ngew, Huai Bon, Pa Daeng,and Nong Khwang areas are summarized in Table 4.1.1.

4.1.2 B-Formation

This formation is predominantly characterized by fine-grained clastic sediments with only subordinate amount of sandstone of lacustrine and/or fluvio-lacustrine facies. The "B-Formation" overlies conformably the "A-Formation" with abrupt change in lithological characteristics. The sedimentary succession of the "B-Formation" has been recognized from the subsurface data in the Chaiprakarn, Mae Soon, Pong Nok, Pa Ngew, and Huai Bon areas. The only differences are some lithological association and thickness. However, no attempt has been made to subdivide the "B-Formation" into member due to the rather homogeneous and monotonous lithological characteristics. It is noted that the lacustrine and/or fluvio-lacutrine facies of the "B-Formation" in the Chaiprakarn and Mae Soon area show the associated marginal

Table 4.1.1 Lithostratigraphy and sedimentary facies of the lower most, "A-Formation", of the Fang basin.

AREA / FORMATION	CHAIPRAKARN *	MAE SOON *	PONG NOK	HUAI BON *	PA NGEW	PA DAENG *	NONG KHWANG *
A-FORMATION	(MEANDERING FLUVIATILE) [380 m.]	(LACUSTRINE) [>400 m.]	A-5 MEMBER (FLUVIO-LACUSTRINE and/or MEANDERING FLUVIATILE) [170 m.]	(FLUVIO-LACUSTRINE) [440 m.]	A-5 MEMBER (MEANDERING FLUVIATILE) [75 m.]	(FLUVIO-LACUSTRINE) [400 m.]	(MEANDERING and/or BRAIDED FLUVIATILE) [100 m.]
			A-4 MEMBER (LACUSTRINE) [90 m.]		A-4 MEMBER (FLUVIO-LACUSTRINE) [425 m.]		(LACUSTRINE) [45 m.]
			A-3 MEMBER (COAL SWAMP) [25 m.]		A-3 MEMBER (COAL SWAMP) [25 m.]		
			A-2 MEMBER (LACUSTRINE) [30 m.]		A-2 MEMBER (FLUVIO-LACUSTRINE) [180 m.]		
	(LACUSTRINE and/or FLUVIO-LACUSTRINE) [200 m.]	----- ? ----- (FLUVIATILE) ?	A-1 MEMBER (MEANDERING FLUVIATILE) [300 m.]		A-1 MEMBER (MEANDERING and/or BRAIDED FLUVIATILE) [200 m.]		(FLUVIO-LACUSTRINE) [50 m.]
UNCONFORMITY							
PRE-TERTIARY BASEMENT							

* Lithostratigraphically unclassified

lacustrine character of lacustrine delta with distinctive coarsening upward nature.

The lithostratigraphy of the "B-Formation" of Chaiprakarn, Mae Soon, Pong Nok, Pa Ngew, Huai Bon, Pa daeng, and Nong Khwang areas are summarized in Table 4.1.2.

4.1.3 C-Formation

The "C-Formation" is the uppermost lithostrtigraphic unit of the "Fang Group". It overlies unconformably the "B-Formation" and is generally characterized by the association of braided/meandering fluviatile and fluvio-lacustrine facies. Lithologically, it is mainly medium- to coarse-grained sand with some fine-grained clastics.

Detailed subdivision of the "C-Formation" can be clearly represented in the Mae Soon area where four members can be recognized. They are the "C-1 Member" of braided fluviatile facies, the "C-2 Member" of the fluvio-lacustrine facies, the "C-3 Member" of braided fluviatile facies, and the "C-4 Member" of the fluviatile facies of probably braided system. The local unconformity is partly present between the "C-3 Membver" and the "C-4 Member".

The lithostratigraphy of the "C-Formation" which almost essentially underlies all parts of the basinal areas is summarized in Table 4.1.3.a.

Table 4.1.2 Lithostratigraphy and sedimentary facies of the middle part, "B-Formation", of the Fang basin.

FORMATION \ AREA	CHAIPRAKARN*	MAE SOON	PONG NOK	HUAI BON	PA NGEW	PA DAENG	NONG KHWANG
B-FORMATION	(FLUVIO-LACUSTRINE) [up to 80 m.] / (LACUSTRINE) [up to 200 m.]	(FLUVIO-LACUSTRINE) [up to 500 m.]	(LACUSTRINE) [330 m.]	(LACUSTRINE) [150 m.]	(LACUSTRINE) [250 m.]	(MEANDERING FLUVIATILE) [140 m.]	(LACUSTRINE) [50 m.]
A-FORMATION							

* Lithostratigraphically unclassified

Table 4.1.3.a Lithostratigraphy and sedimentary facies of the uppermost part, "C-Formation", of the Fang basin.

FORMATION \ AREA	CHAIPRAKARN*	MAE SOON	PONG NOK*	HUAI BON*	PA NGEW*	PA DAENG*	NONG KHWANG*
C-FORMATION	(MEANDERING and/or BRAIDED FLUVIATILE) [up to 150 m.]	C-4 MEMBER (BRAIDED ? FLUVIATILE) [50 m.] C-3 MEMBER (BRAIDED FLUVIATILE) [50 m.] C-2 MEMBER (FLUVIO-LACUSTRINE) [270 m.] C-1 MEMBER (BRAIDED FLUVIATILE) [45 m.]	(BRAIDED FLUVIATILE) [55 m.] (BRAIDED FLUVIATILE) [170 m.]	(BRAIDED FLUVIATILE) [150 m.]	(BRAIDED FLUVIATILE) [110 m.] (MEANDERING FLUVIATILE) [190 m.] (BRAIDED FLUVIATILE) [45 m.]	(BRAIDED FLUVIATILE) [140 m.]	(ALLUVIAL FAN or FLUVIATILE) [50 m.] (ALLUVIAL FAN) [65 m.] (MEANDERING FLUVIATILE) [105 m.] (BRAIDED FLUVIATILE) [70 m.] (ALLUVIAL FAN) [150 m.]
	UNCONFORMITY						
B-FORMATION							

*Lithostratigraphically unclassified

The proposed lithological classification and nomenclature of the Fang basin under the present investigation as compared with previous works have been summarized and presented in Table 4.1.3.b.

Despite the fact that some Cenozoic basins in Thailand are now individually separated over a long distance, there seems to be some similarity in the Cenozoic facies characteristics. An attempt has been made in this study to compare and possibly to correlate the gross lithological sequence amongst these selected basins, notably, Fang, Phitsanulok, Mae Sot, and Patani basins. For the Phitsanulok basin, the finding is based on the work of Knox and Wakefield (1983); for Mae Sot basin, the finding is based on the work of Thanomsap (1985), and for the Pattani basin, the finding is based on the work of Lian and Bradley (1986).

The characteristrics of the pre-Cenozoic basement underlying these basins are different from basin to basin depending upon the geological setting of each individual basin. The similarities are the unconformity between the pre-Cenozoic basement rock and basin-filled Tertiary sediments and structurally controlled basin type.

Due to the limited biostratigraphic control for age assignment of the Cenozoic sequence in these four basins, therefore, no attempt will be made to correlate these sequences chronostratigraphically. Tentative correlation of Cenozoic sequence is being made on the

Table 4.1.3.b Comparative stratigraphic classifications and nomenclatures of Cenozoic deposits of the Fang basin.

Study	Age (top to bottom)	Rock units (top to bottom)	Underlying
Lee (1923, 1927)	PLEISTOCENE	Gravel, sand, clay, coal (> 216 m.)	TRIASSIC ROCKS
Brown et al., (1951)	TERTIARY OR QUATERNARY	Gravel, sand, clay, coal	TRIASSIC ROCKS
Sherman, (1956)	QUATERNARY UPPER TERTIARY	Terrace MAE SOT SR. (900 m.)	J KHORAT Sr.
RALB, (1959)	QUATERNARY MIOCENE - PLIOCENE	Terrace MAE FANG Fm. (90-600 ft.) MAE SOT Fm.: UPPER MEMBER (300 ft.); LOWER MEMBER (CHIPRAKARN SAND) (900 ft.)	KHORAT & KANCHANABURI Sr.
Buravas, (1970)	PLEISTOCENE MIOCENE - PLIOCENE OLIGOCENE PALEOCENE	MAE FANG Fm.: UPPER (200 ft.); lower (1000 ft.) TRANSITION ZONE (300 - 400 ft.) MAE SOT Sr.: MAE SOT SHALE & CLAY Mem. (900 ft.); CHAIPRAKARN SAND Mem. (.310 ft.); MAE MOH Mem. (200-240ft.) LI Sr. (300-400 ft.) BASAL CONGLOMERATE (400-500 ft.)	KHORAT Sr.
Buravas (1973)	R PLEISTOCENE PLIOCENE MIOCENE OLIGOCENE PALEOCENE	CHAO PHAYA Fm. (239ft.) MAE FANG Fm. (2625 ft.) MAE SOT Fm. (1550 ft.) MAE MOH Fm. (240 ft.) LI Fm. (360 ft.) NAM PAT Fm. (600 ft.)	KHORAT Sr.
Pryasin, (1979)	PLEISTOCENE MIOCENE - PLIOCENE	MAE FANG Fm.: UPPER; LOWER MAE SOT Fm.	
Dutescu & Enache, (1980)	PLEISTOCENE MIOCENE - PLIOCENE	UPPER Fm. LOWER Fm.	
Dutescu & Enache , (1981)	PLEISTOCENE MIOCENE - PLIOCENE	ARKOSIC SAND Fm. ? UPPER PETROLIFEROUS Fm. CARBONACEOUS and BITUMINOUS Fm. LOWER PETROLIFEROUS Fm.	
Dutescu, (1981)	PLEISTOCENE MIOCENE - PLIOCENE	MAE FANG Fm. (440 ft.) MAE SOT Fm. (?): UPPER CLAY Mem. (884ft.); MIDDLE RED CLAY Mem. (717ft.); LOWER SHALE Mem. (332ft.)	
Snansiang et al., (1983)	UPPER PLEITO - HOLOCENE LOWER PLEISTOCENE MIOCENE - PLIOCENE	ALLUVIAL TERRACE (300m.) MAE FANG Fm. (MAE TANG Fm.?) (300 m.) MAE SOT Fm. (MAE MOH Fm.?) (2000 m.)	
Sethakul et al., (1984)	PLEISTOCENE - RECENT TERTIARY	MAE FANG Fm. (150-1250 ft.) MAE SOT Fm.: UPPPER MAE -SOT Mem. (600-1230ft.); MIDDLE MAE - SOT Mem. (830-1260ft.); LOWER MAE - SOT Mem. (upto1650ft.)	
Sethakul, (1985)	PLEISTOCENE - RECENT TERTIARY	MAE FANG Fm. (1100-1500ft.) MAE SOT Fm. (upto 3500ft. or more)	
Present Study		C-Fm.: C-4 Mem. (50m.); C-3 Mem. (50m.); C-2 Mem. (270 m.); C-1 Mem. (45m.) B-Fm. (330m.) A-Fm.: A-5 Mem. (170 m.); A-4 Mem. (90m.); A-3 Mem. (25m.); A-2 Mem. (30m.); A-1 Mem. (300 m.)	pre-Tertiary Basement

basis of lithostratigraphy/tectonostratigraphy only. The Fang, Phitsanulok, and Mae Sot basins contain section of non-marine clastic sequences, whereas, the Pattani basin shows some marine influences. The proposed corelation chart of Cenozoic sequences of these four basins are summarized in Table 4.1.3.c.

4.2 Major-Tectonic Framework of the pre-Tertiary Period

The continent-continent collision of Shan-Thai and Indochina Blocks, Indosinian Orogeny in Triassic, marked the termination of marine deposit in Thailand almost permanently, and the formation of two important fold-belts, namely, Sukhothai and Loei or Phitsanuloke of thick mainly marine paleozoic to Traiassic sediments and theleitic volcanic rocks (Bunopas, 1981; Bunopas and Vella, 1983). During the Jurassic to Cretaceous Periods, this region was characterized as a period of relative tectonic quiescene, and the deposition of mainly thick continental mollasc facies.

The Tertiary Period has long been recognized to be a period of resumed instability with block and strike-slip faulting (Burton 1965, Hutchimson,1982). The collision of the India and Eurasia in Eocene to early Miocence, Himalayan Orogeny, is believed to be responsible for the formation of grabens or lilted-fault blocks, in the northern part of Thailand which are expressed geomorphologically as intermontane basin. The Fang basin

Table 4.1.3.c Tentative lithostratigraphic correlation of the Fang, Mae Sot, Phitsanulok, and Pattani basins.

FANG BASIN (Present Study)

Formation	Unit
C-FORMATION	FLUVIATILE (50 m.)
C-FORMATION	BRAIDED FLUVIATILE (50 m.)
C-FORMATION	FLUVIO-LACUSTRINE (270 m.)
C-FORMATION	BRAIDED FLUVIATILE (45 m.)
UNCONFORMITY	
B-FORMATION	LACUSTRINE (330 m.)
A-FORMATION	FLUVIO-LACUSTRINE (170 m.)
A-FORMATION	LACUSTRINE (90 m.)
A-FORMATION	COAL SWAMP (25 m.)
A-FORMATION	LACUSTRINE (30 m.)
A-FORMATION	MEANDERING FLUVIATILE (300 m.)
UNCONFORMITY	
PRE-TERTIARY BASEMENT	

MAE SOT BASIN (Thanomsap, 1985)

Formation	Unit
	MOEI RIVER
	GRAVEL BED
UNCONFORMITY	
MAE SOT FORMATION	CENTRAL LACUSTRINE with SPORADIC FLUVIATILE (867 m.)
MAE SOT FORMATION	FLUVIO-LACUSTRINE (355 m.)
MAE PA FORMATION	MARGINAL LACUSTRINE (1,325 m.)
MAE RAMAT FORMATION	ALLUVIAL FAN and ALLUVIAL PLAIN (>600 m.)
UNCONFORMITY	
PRE-TERTIARY BASEMENT	

PHITSANULOK BASIN (Knox & Wakefield, 1983)

Formation	Unit
PING FORMATION	HIGH ENERGY FLUVIATILE (1,250 m.)
YOM FORMATION	FLUVIATILE (1,000m.)
UNCONFORMITY	
PRATU TAO FORMATION (1,800 m.)	ALLUVIAL PLAIN
PRATU TAO FORMATION (1,800 m.)	EPHIMERAL LACUSTRINE and MEANDERING FLUVIATILE
LAN KRABU FORMATION (2,000 m.)	REDUCING LACUSTRINE
LAN KRABU FORMATION (2,000 m.)	FLUVIO-LACUSTRINE
LAN KRABU FORMATION (2,000 m.)	REDUCING-OXIDIZING LACUSTRINE
NONG BUA FORMATION	ALLUVIAL PLAIN (1,000 m.)
UNCONFORMITY	
PRE-TERTIARY BASEMENT	

PATTANI BASIN (Lian & Bradley, 1986)

Unit	Environment
UNIT IV	MANGROVE SWAMP and MARINE (1,700 m.)
UNCONFORMITY	
UNIT III	DELTA FRONT, LOCAL LAGOON, MARSH, and MANGROVE SWAMP (1,200 m.)
UNIT II	DISTAL DELTA and LAGOON (800 m.)
UNIT I	FLUVIATILE, PALUDAL, and LACUSTRINE (up to 5,000 m.)
UNCONFORMITY	
PRE-TERTIARY BASEMENT	

began to form in Oligocene time (?) by relative movement of the Chiang San Fault Zone and Mae Tha Fault Zone respective to order of time. As extension occurred on the basin floor of mostly Paleozoic rocks downwaped by the tilted fault blocks to create the space for the subsequent sedimentary fills.

4.3 Formation and Classification of the Fang Basin

The near-triangular geometry of the Fang intermontane basin is considered to be originated from the tilted block-faults of the Chiang San Fault Zone in the north and the Mae Tha Fault Zone extension in the west. The main basin development was the response to extensional regime during Tertiary period.

Generally, most sedimentary basins can be classified in terms of three criteria:

a) the type of crust on which the basin rests,

b) the position of the basin relative to plate margin, and

c) where the basin lies close to the plate margin, the type of plate interaction occurring during sedimentation. Plate tectonics theory has shown that all three of these parameters can change with time (Miall, 1984).

Sedimentary basins in the Southeast Asia region, which are potential sites for the generation and accumulation of mobile hydrocarbons, have been classified according to their relationships to the present tectonic elements (Fletcher and Soepajada, 1976; Nayoan et al., 1979), into (1) forearc basin, (2) backarc basin, (3) intracratonic basins and (4) continental margins. A further category of the prospective region is recognized in this account where continental margin sediments are involved in (5) collision zones. The majority of the basins are of a single tectonic setting, resulting from combination of extensional and wrench faulting.

The Fang basin is considered to be the intracratonic basin where sedimentary sequence in this basin records of the initial isostatic subsidence followed by a thick sedimentary infill history (Dutescu and Enache, 1980 ; Barber, 1985).

After the tectonic activities especially faulting which marked the formation of the Fang basin, the area has continued to be tectonically active throughout Cenozoic Era as evidenced from the thick Cenozoic succession in the basin of approximately 2.5 kilometres and numerous intrabasinal faults, particulary those basement involved ones as well as some probably basement detached ones. Although the Cenozoic sedimentary sequence shows no age-diagnostic flora and fauna, there is at least one clear identifiable unconformity of presumably Mio-Pliocene wide-spreadly occurred throughout the basin. The unconformity appears to represent a major episode of the uplifting, erosion followed by an influx of coarse clastics.

4.4 Fang Basin Evolution

Many lines of evidence indicats that the oldest sediment in the Fang basin is of Oligo-Miocene age. Sediments in the Fang basin are mainly non-marine clastics of Neogene age with thickness of approximately 2.5 kilometres in the deepest part of the basin.

The Cenozoic sedimentary succession of the Fang basin can generally be subdivided into three main sequences. The lower most sequence is represented by the alluvial fan and fluviatile facies with some ephimeral lacustrine facies overlying unconformably the pre-Cenozoic basement rocks. The sequence is generally characterized by the association of coarse- and medium-grained clastic deposits thickening westwardly. However, very little biostratigraphic control is available, mainly due to the continental, tropical setting and dominance of oxidizing conditions in the basin. Early depositional episode was restricted to the tilted fault block depression in the northwestern and western margins after the basin was initiated during Paleogene time.

During early to middle Miocene time, there was the wide spread paleo-lake developed in the Fang basin. This development is believed to be associated with the increases structural activities, especially the reactivation of existing major faults which culminated a depression of limnic condition. The sedimentary sequence deposited during this period is characterized by fine-grained clastics, coal, and medium-grained clastics of fluvio-lacustrine facies. The overall sequence appears to be thickening westwardly with a strong tendency of medium-grained clastics of fluviatile facies to be influxed from the east and west. Besides, the faunal and floral assemblages in this fluvio-lacustrine facies seem to be relatively more diverse and abundant. The general pattern of westward thickening of the succession is believed to be caused by the sedimentation during the reactivation of the major faults in the west.

Towards the top of the fluvio-lacustrine facies, the major change in tectonic and/or climatic conditions took place which was marked by the abrupt disappearance of the paleo-lake, the presence of basin wide unconformity at presumably the base of Upper Miocene. It is believed that an epeirogeny associated with widely distributed alkaline basalts elsewhere outside the Fang basin (Barr and macdonal, 1981; Knox and Wakefield, 1983; Lian and bradley, 1986) caused the younger sediments to rest unconformably on the older sequence.

The uppermost sequence overlying the unconformity is characterized by medium- to coares-grained clastics of high energy fluviatile facies. The association of basal conglomerate above the unconformity, channel sands with distal alluvial fan, and local ephimeral lacustrine sediments are well developed throughout the basin. In addition, the disappearance of extensive permanent lake was most diagnostic. Therefore, it is interpreted that this sequence was deposited under the renewed tectonics activities which led to the expression of positive features at margin of the basin, reactivation of tilted faults. With respect to the surficial deposits of the Fang basin, namely, terrace gravel deposit, and flood plain deposit, they indicate that the tectonic activity is still active throughout Holocene Epoch.

Due to the fact that overall configuration of the Fang basin is not a simple one, but compicated by different architecture of sub-basins within the basin. Therefore, sedimentation pattern and depositional environment within the Fang basin vary considerably from place to place. However, it is noted that the broad pattern of sedimentary facies of the Cenozoic sequence within basin reveals that the facies are generally thickening westwardly and the influence of paleo-lake sedimentation are confined essentially to the western margin of the basin. These lines of evidence indicate that the major faults in the northwestern and western margins have been intermittenly reactivated througout the basin-filled history.

Besides, the sedimentation pattern, sedimentary environment ,and sedimentary facies of the Cenozoic sequence are further complicated by a series of intrabasinal faultings of both syn- and post-depositional origins induced by the activities epecially of growth faults. Local subsidence and uplifting are also recognized from the pattern vertical and lateral facies changes which are believed to be partially responsible by the differential, post-depositional, compactionally induced subsidence, and tectonic faulting.

In conclusion, amongst one of the important controlling factors for sedimentation is the faulting and/or subsidence of both tectonically controlled and compactionally induced origins. The geological evolution of Fang basin in terms of tectonic sedimentation is summarized and presented in Figure 4.4.a.

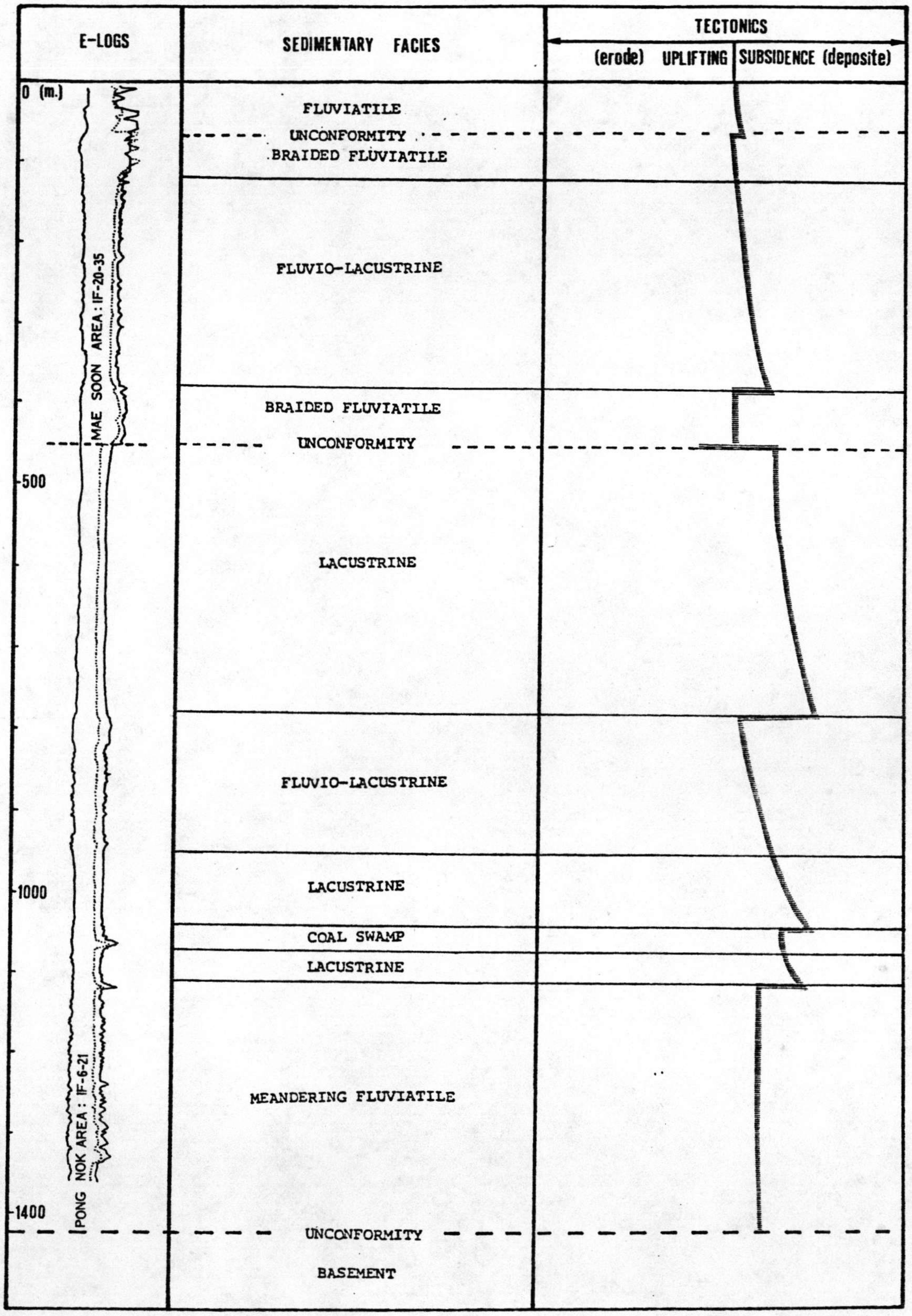

Figure 4.4.a The geological evolution of the Fang basin in terms of tectonic sedimentation.