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I. INTRODUCTION

Over the vast Chinese mainland, one of the most interesting and dynamic regions of the world, complex tectonics, coupled with extremely diversified structures, suggest the existance of a great wealth of information regarding the evolution of global plates. Situated between the west Pacific and the Alpine-Himalaya tectonic belts, the multitude of Chinese tectonic complexities is evident from its enormous topographic relief and geomorphologic features. A surface-wave study of the crust and upper mantle of China is greatly enhanced when appropriate attention is given to the basic subdividions and the evolution of the mainland China plate. This report outlines the progress of our effort in synthesizing the presently known information from the People's Republic of China regarding the major tectonic subdivisions of mainland China. Results of this effort will form an essential input into our surface-wave study.

During the past 20 years, extensive geological and geophysical investigations provided abundant new information that permits a rather thorough synthesis on the geotectonics of China. Meanwhile, the theory of plate tectonics has cast new light on some of the long-standing geological problems such as the origin of the Chinling geo-axis (see Section 3), the massive zonal distribution of ultrabasic rocks of marine origins, and the historical evolution of the Tibetan highland. Much geological evidence has been sorted out which suggests and delineates several fossil subduction zones where ancient oceanic plates down-thrusted into the continental plates, as well as the collision zones where ancient continents converged. These lines of evidence constitute the basic elements on which a plate tectonic model of China is constructed.

In the following sections, we will give an overall description on the basic tectonic elements of China (Section I), the subduction and collision fault zones (Section II) and the available geophysical information (Section IV). Then we will make a plausible tectonic subdivision from the point of view of surface wave studies, and finally try to point out some outstanding problems of particular interest (Section V). It should be noted that the present report only represents a preliminary summary that shows our research progress. A more comprehensive study is an on-going part of this contract research.

II. THE BASIC TECTONIC FEATURES OF CHINA

The basic tectonic features of China are still under study. Various viewpoints, each with its share of unanswered questions, have been developed by different groups, but no unanimous conclusion has yet been reached. In the following, we have tentatively decided to use the presentations of the Tectonic Map Compiling Group of the Institute of Geology, Chinese Academy of Sciences, as the main source of reference. They place more emphasis on the fundamental structures, which are more relevant to surface wave studies. Additional information is being gathered for further analyses.

(1) The fundamental characteristic of China's geotectonics is the fault block movement. The fault blocks can be classified into the following three types:

Faulting Blocks. Faulting blocks are the old continental crust formed before the Sinian time. They were later more or less covered by strata of different periods, metamorphozed and folded (in case of weak metamorphism) or faulted (in case of strong metamorphism). They are now quite stable.

Folding Blocks and Warping Blocks. Folding blocks and warping blocks both developed during or after the Sinian time. The former evolved from the transitional crust (i.e., miogeosyncline) and later underwent weak metamorphism and folding. They have indistinct linear foldings, and are relatively stable. The latter evolved from the oceanic crust (i.e., eugeosyncline) and underwent strong metamorphism and folding. They have distinct linear foldings and are quite unstable.

(2) There have been five tectonic cycles and ten orogenic periods in the formation of the fault blocks of China. Their names and time intervals, together with the blocks formed during each period, are listed in Table 1. The positions of the blocks are shown in Fig. 1.

(3) The fault blocks are separated by fault zones. Three types of fault zones are shown in Fig. 2.

The Subduction fault zone, indicated by ⊥⊥⊥ in the map, separates the paleo-oceanic and continental crusts and, therefore, represents the remains of earlier subduction. This type of fault zones cuts through the lithosphere into the asthenosphere of the upper mantle, and is of special interest to surface wave studies (see Section III).

The Collision fault zone, shown by heavy lines in the map, may have resulted from the collision of two continental plates. This kind of fault will cut through the crust, deep into the top of the mantle. Along the fault, there are frequent intrusions of basic and ultrabasic rocks, as well as abnormal gravitational gradients. Some of the more important collision faults are the Tan-Lu Fault (in East China), the Yinshan-Yanshan Fault, the fault along the eastern border of Tai-Hang mountain, and the fault at the western border of Ordos.

The Fissuring fault zone has developed within the basement rock under sharply folded covering strata. This type of faults does not penetrate the crust. On the surface along such a fault, acidic intrusions (distributed in belts), magnetic anomalies, and hot springs can often be found.

TABLE 1. Listing of the orogenic phases and the fault blocks.

Tectonic Cycle	Orogenic Period	Time (m.y.)	Fault blocks formed ID#	Name
V	Neotectonic (N)	26 - recent		
IV	Himalaya (H)	65 - 26	23	Himalaya warping block
			22	Taiwan warping block
	Yanshan (Y)	180 - 65	21	Kailas folding block
			20	Natahadalin folding block
	Indochina (I)	230 - 180	19	Chin-Kang folding block
III	Variscian (V) (Hersinian)	400 - 230	18	Altai warping block
			17	Tian Shan warping block
			16	North Mountain-great Khingan Range warping block
			15	East China Range warping block
			14	Kirin-Heilungkiang folding block
			13	Chiangtang folding block
			12	Fukien-Chekiang folding block
	Caledonian (C)	570 ~ 400	11	West Kunlun warping block
			10	North Chilian warping block
			9	A-Erh-Chin-South Chilean folding block
			8	Southeast folding block
	Sinian (Z)	950±50 - 570	7	Southwestern Yunan and Jolmo Lungma folding block
II.	Jinning (J)	1300±50 ~ 950±50	6	Yantze faulting block
			5	Tarim faulting block
	TaiHang (T)	2400 -1300±50	4	TaHang faulting block
			3	Jiao-Liao faulting block
I.	Sangkan (S)	>2400	2	Ji-Lu faulting block
			1	Ordons faulting block

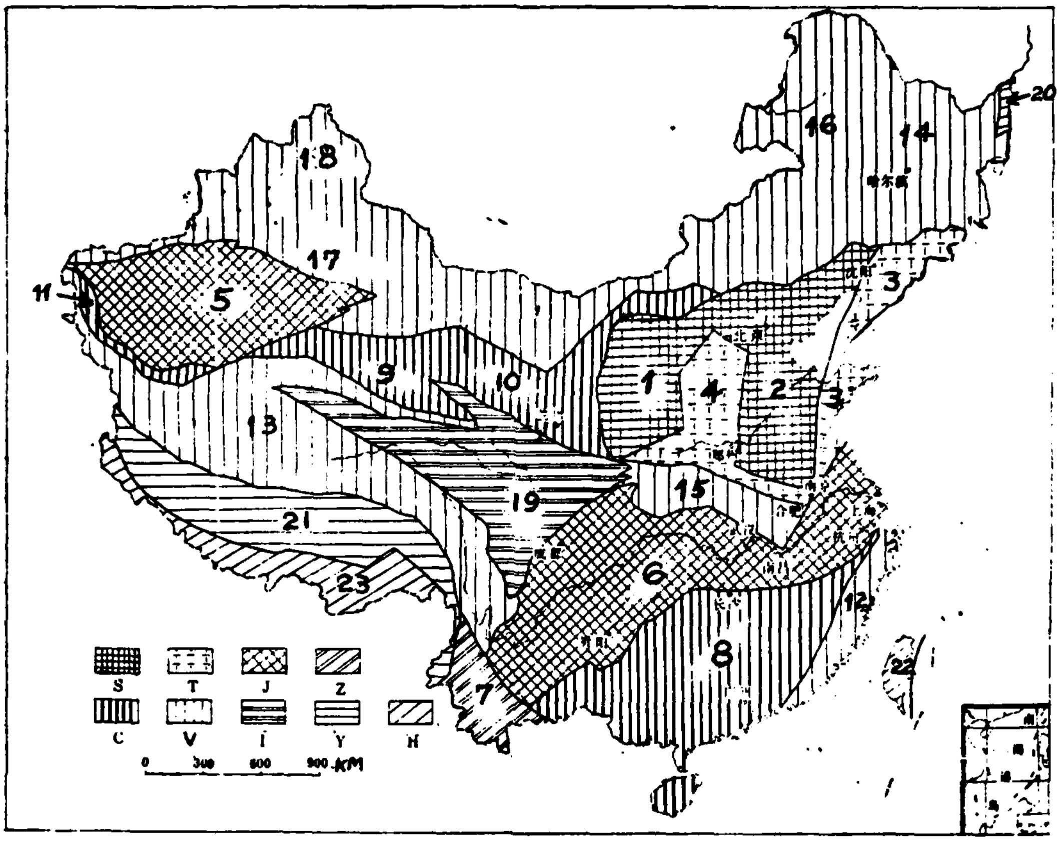
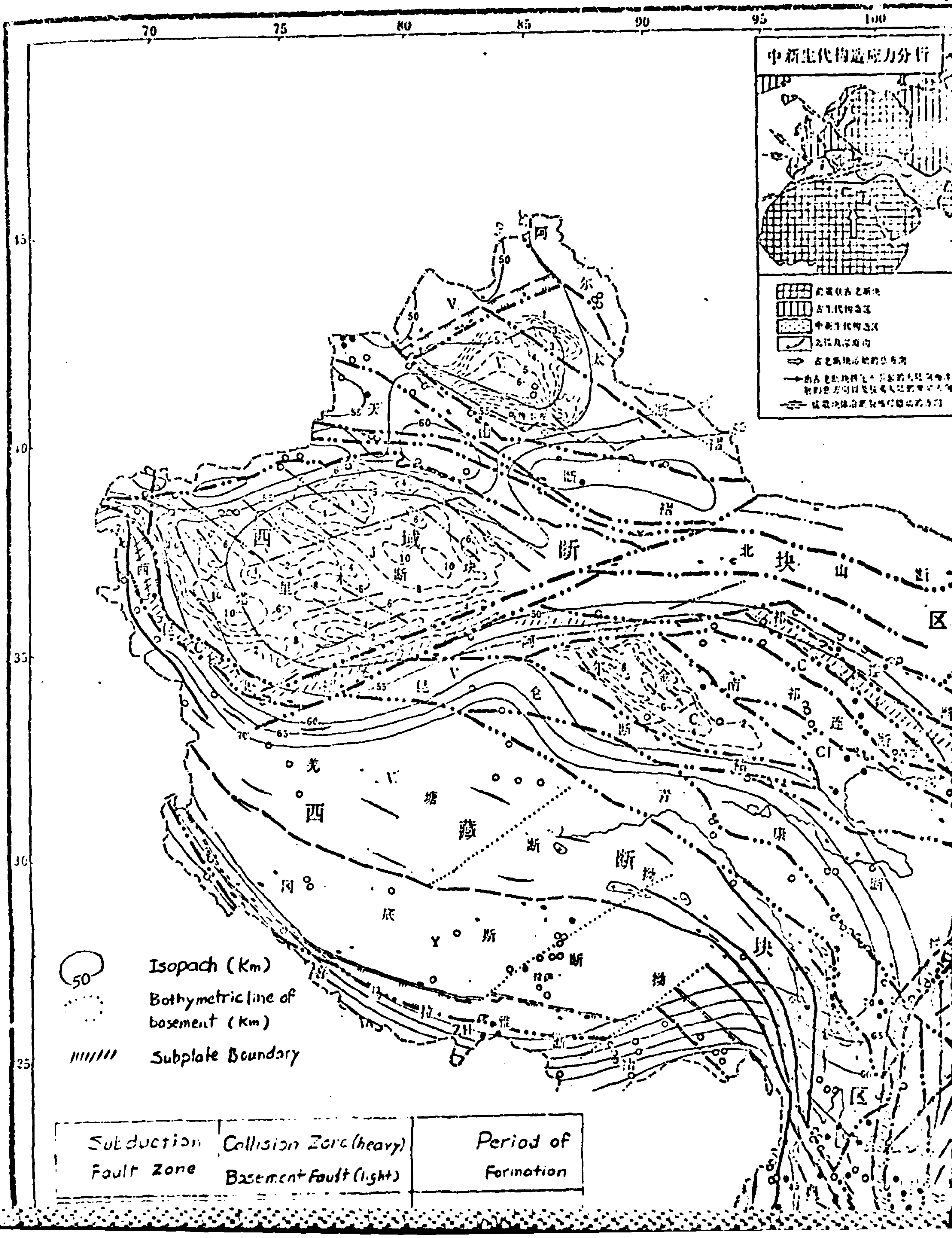


Fig. 1. Fault block subdivisions of China.[1]
(Letters: orogenic phases. Numbers: block identifications. See Table 1.)

(1)

Fig.2 Schematic Diag



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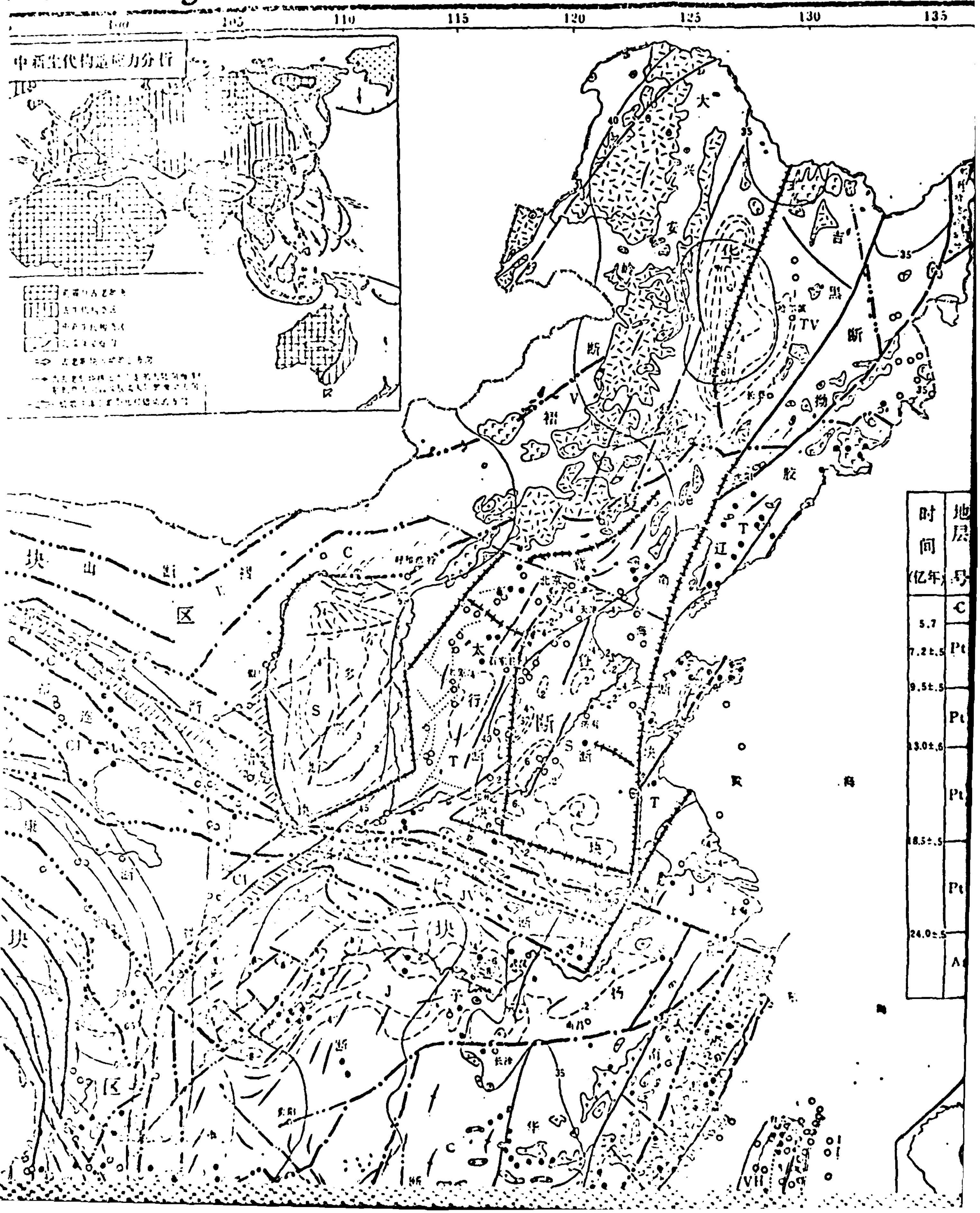
...tic Diagram for Chinese Tectonics



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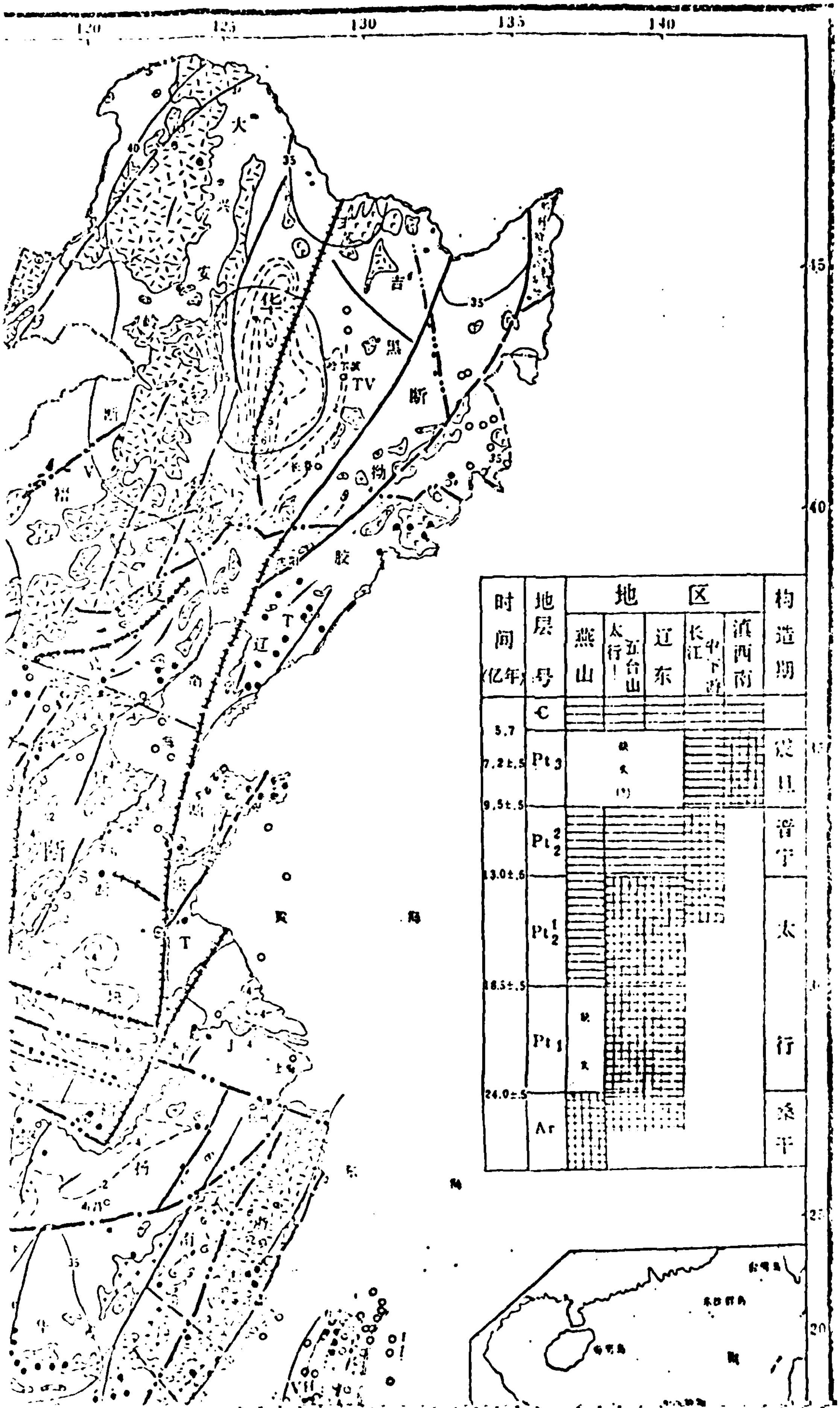

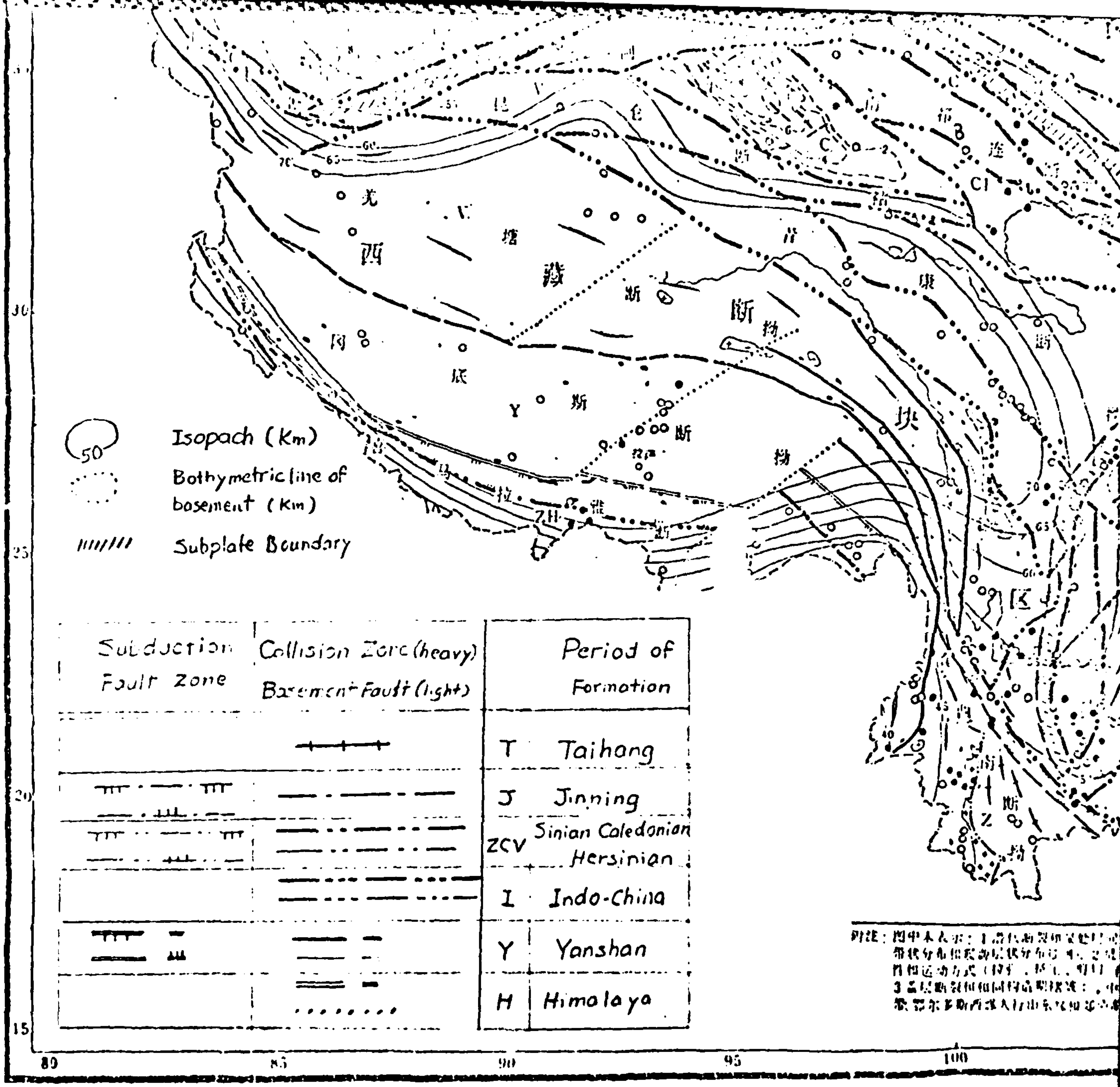

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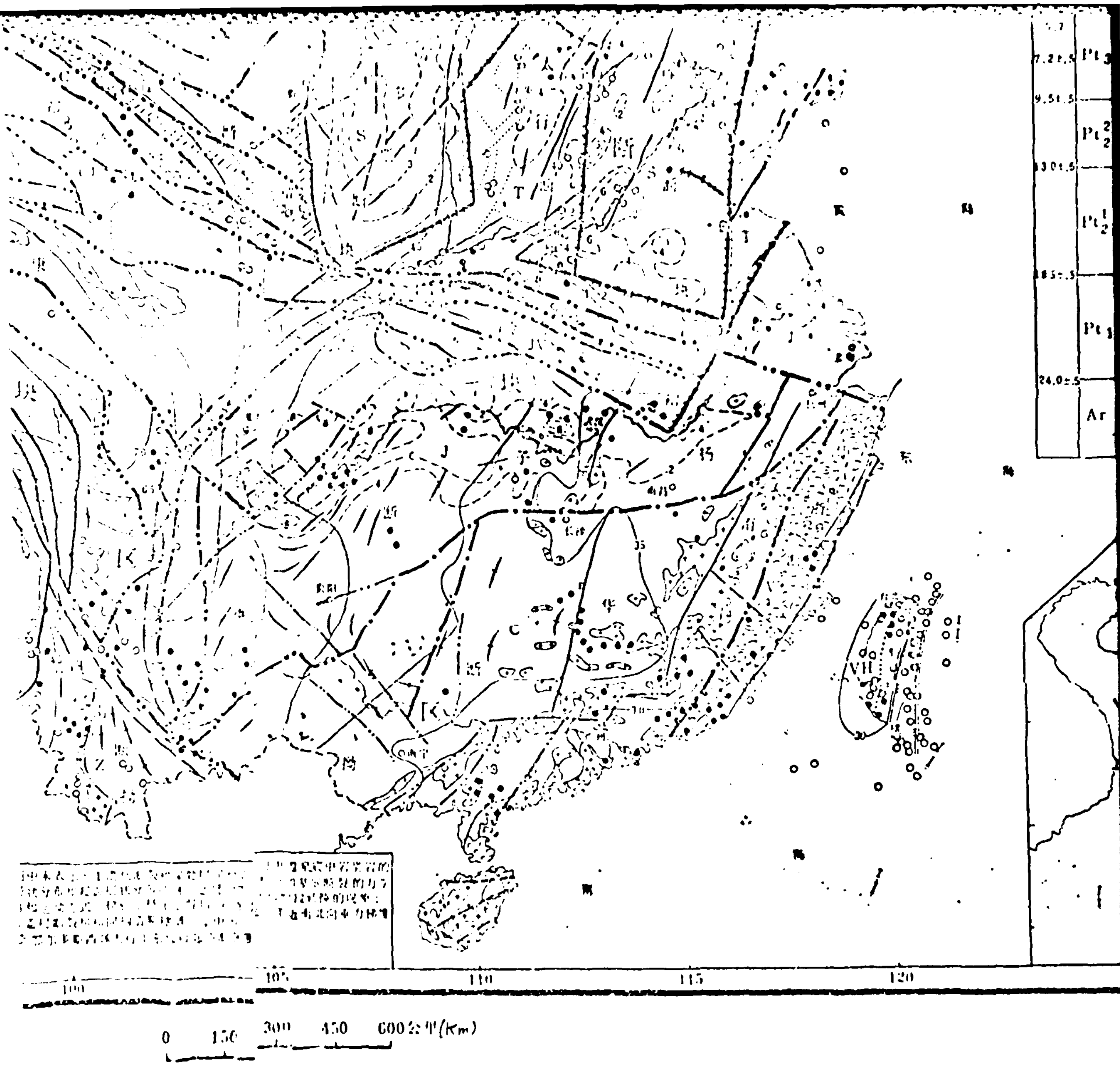

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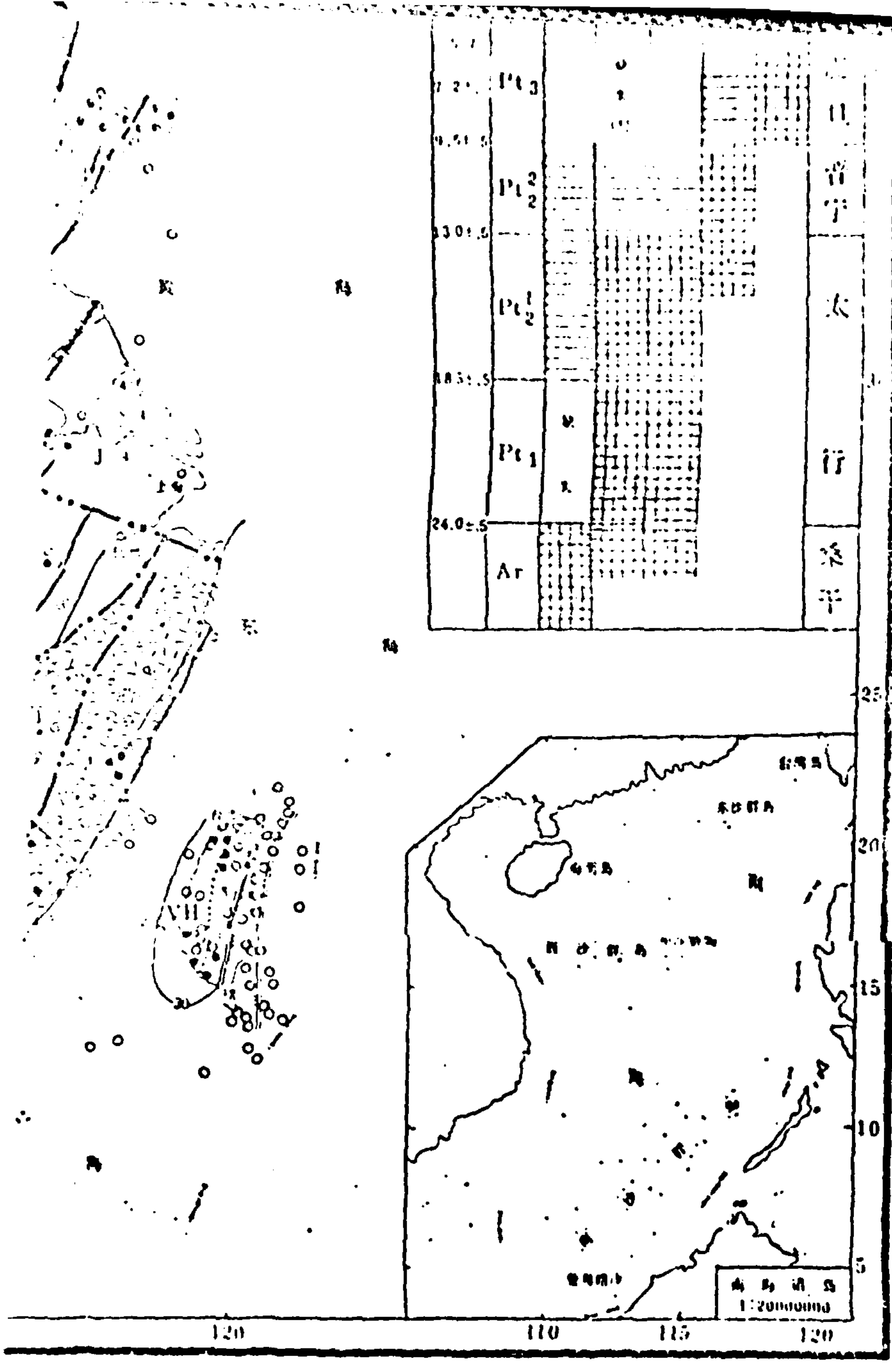

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III. SUBDUCTION ZONES

Subduction zones are of particular interest because they are sandwiched between the ancient oceanic crust and the continental crust, and they penetrate through the lithosphere, and sometimes deep into the asthenosphere. In addition, fossil subduction zones are manifestations of paleo plate tectonic movements, hence important for the studies on geotectonics. Based on presently available information, the following zones have tentatively been identified to be fossil subduction zones: (Fig. 3, Evidence of Subduction Zones).

(1) The Chilien tectonic complex (1, 2, 10). The Chilien range area is situated between the Alashan block and the Tsaidam-Eulublunk Block, both of which are pre-Sinian metamorphic basements covered with mesozoic and cenozoic continental sediments. It is delimited by the Arjin fault on the northwest, and by the western border of the Ordos block on the southeast. (Accourding to Lee Chun-Yü, however, the southern Chilien range, passing through the southeast of Sian, continues into Honan province, Fig. 4.) According to Wang Chuan and Liu Shue-ya of the Second Regional Mapping Brigade of Kangsu province, multiple evidence from surface geology indicates the following history of the Chilien range (Fig. 5): During the Sinian and early Paleozoic period, this area was a broad sea, bordered by the Alashan block on the northeast, and the Tsaidam-Eulublunk block on the southwest. Some of the peaks in the present middle Chilien range used to be an island arc running in the general direction of west

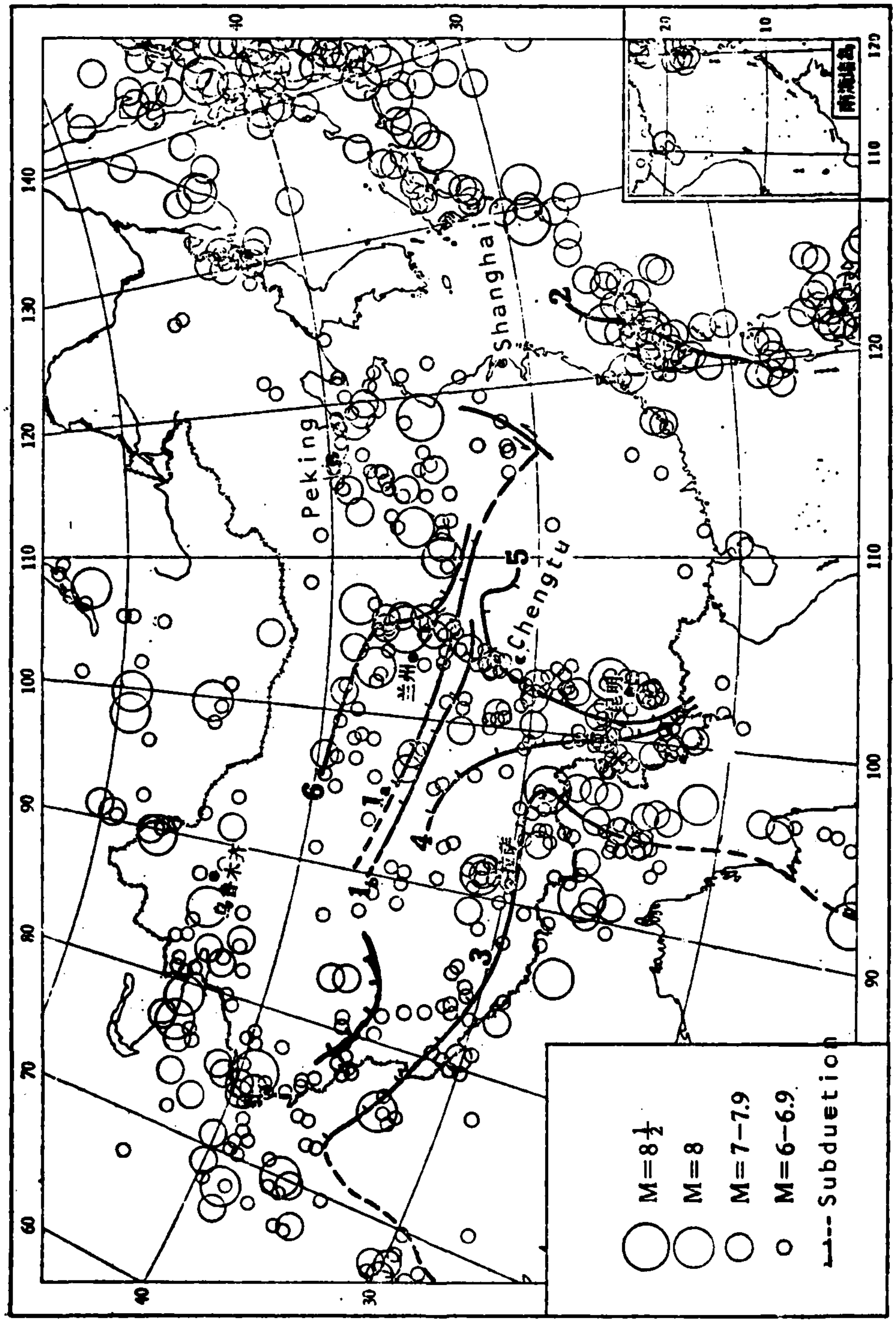

Fig. 3 Evidence of subduction (2)

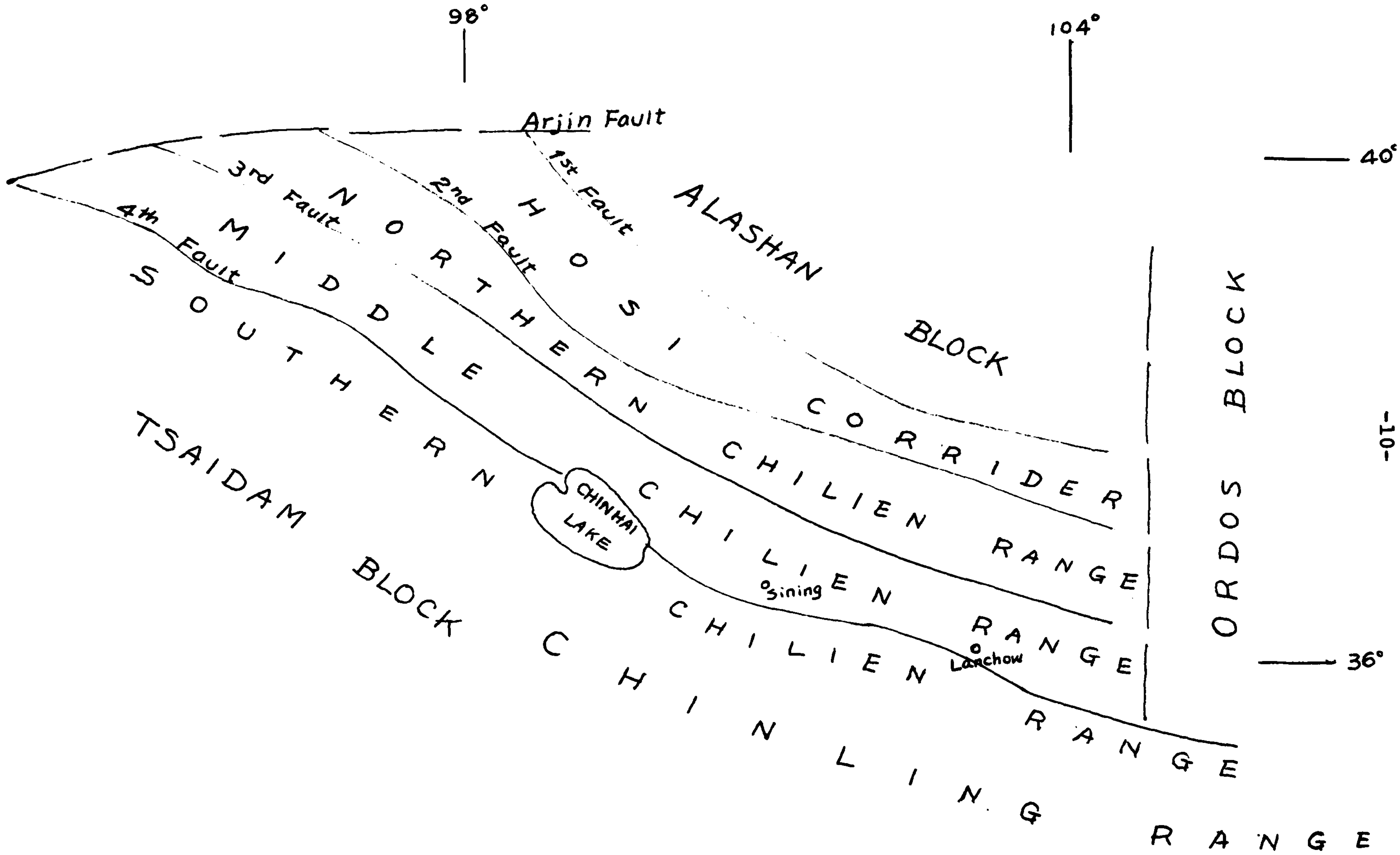

Fig. 4. Schematic diagram of Chilien area.[10]

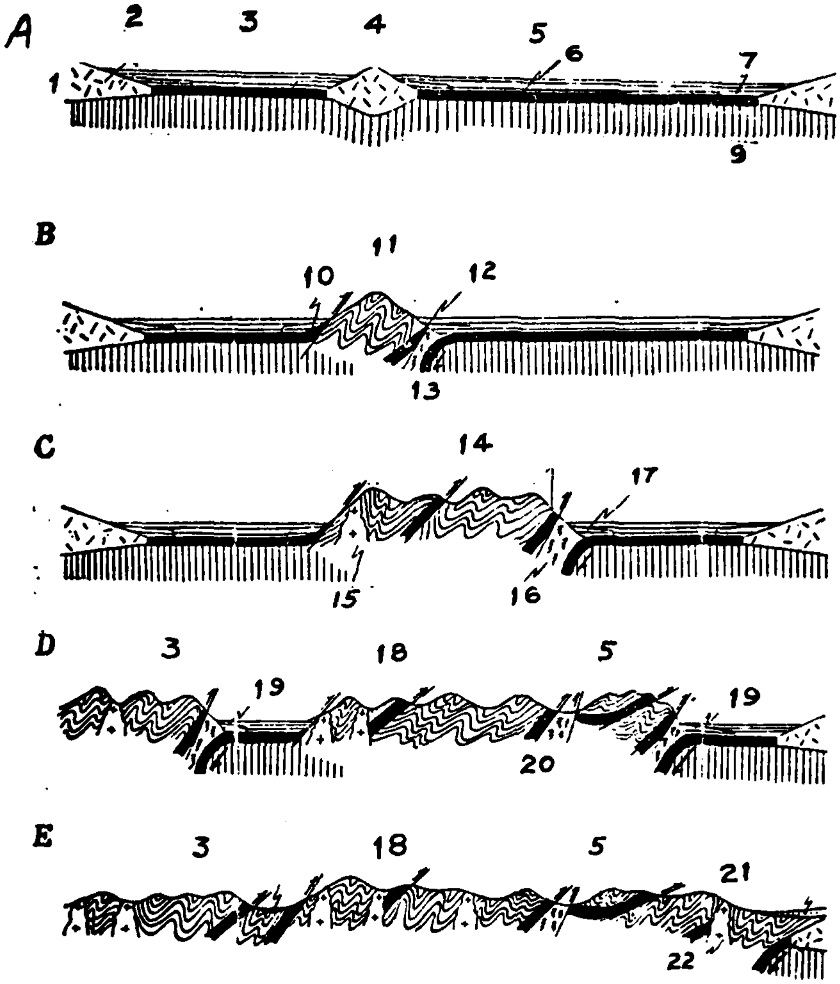

Fig. 5. Tectonic evolution of Chilien (western section).(10)
A. The Sinian paleography and the formation of its oceanic crust. B. During the early Caledonian movement, the first episode: The oceanic plate broke at the northern border of the Middle Chilien Island Arc. C. The second episode: the oceanic crust twice plunged southwards along the northern border of the Middle Chilien upwarping zone. Along the deep ocean trench, middle and upper ordovician flysch deposits formed. D. Third episode: The oceanic plates plunged for the third time southwards along the northern borders of the Southern and the Northern Chiliens separately, and the Silurium strata were formed along these two lines. E. The fourth episode involved the collision of the Alashan block against the Eulublunk uplift and its epicontinental mountains, and formed Devonian Mullite deposits at the northern border of the Northern Chilien range.

1. Continental crust. 2. Northern border of the Tsaidam-Eulublunk uplift. 3. Southern Chilien. 4. Mid. Chilien Island Arc. 5. Northern Chilien. 6. Ocean crust. 7. Shelf. 8. Alashan block. 9. Mantle. 10. Upthrust zone. 11. Chilien central uplift. 12. Residual Sinian ocean crust. 13. Subduction zone. 14. Cambrian, Ordovician oceanic crust residue. 15. Caledonian granite. 16. PreOrdovician melange deposit. 17. mid and upper Ordovician flysch deposit. 18. M. Chilien. 19. Silurian. 20. Ordovician oceanic crust remnant. 21. Devonian Mullite deposit. 22. Caledonian granite.

northwest. Between the middle Chilien range and the Alashan block was the eugeosyncline. Between the middle Chilien range and the Tsaidam-Eulublunk block was the miogeosyncline. During each of the four tectonic episodes in the Caledonian period, the oceanic crust thrusted and sometimes spread towards the southwest border. The miogeosyncline plunged towards the Tsaidam-Eulublunk block, folding into the southern Chilien range. The Eugeosyncline plunged towards the middle Chilien island arc, folding into the northern Chilien range. Towards the end of the Silurian period, the ocean disappeared, and the Alashan block collided with the Tsaidam-Eulublunk block along where the Hosi Corridor lies today, (after ingression of the late Paleozoic and Triassic period, the southern Chilien range formed tight foldings), resulting in mountain peaks reaching above 4 km high and the Hosi Corridor.

Results from studies on the outcrop studies and aeromagnetic surveys indicate that the four big fault zones and the four Ophiolite Suite belts (Fig. 4, Fig. 6) formed after separate subduction stages are mainly composed of basic and ultrabasic rocks and ueabyssite. The paleo oceanic crusts formed the hanging wall of each fault zone, whereas its foot wall connects directly with the deep fault. Radiometric dating has further demonstrated a general decrease in the age of the four paleo oceanic crusts from the middle Chilien range towards the Alashan block. Melanges and glaucophane schists, as well as pairs of metamorphic zones, are found along the fault zone

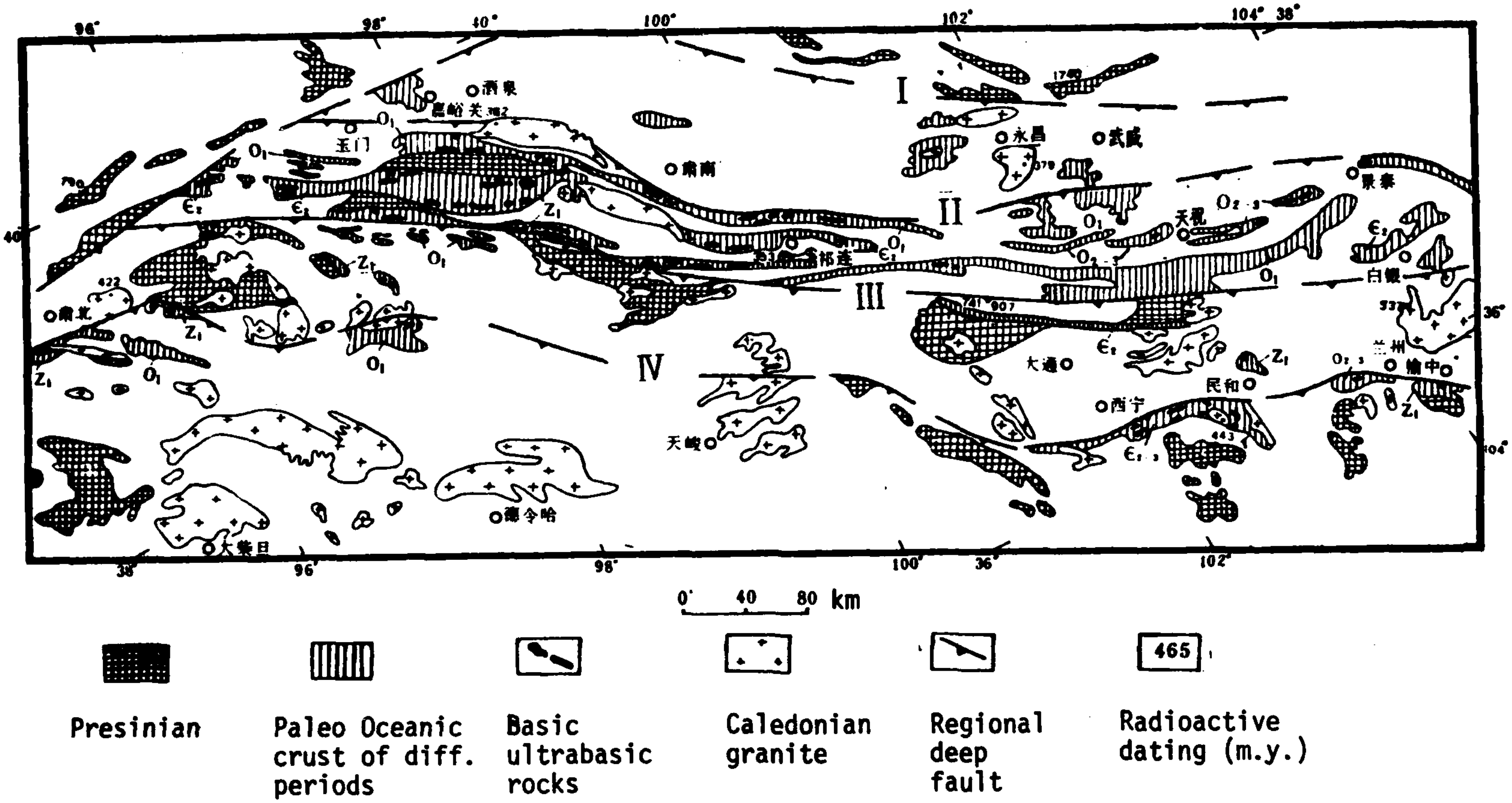

Fig. 6. Distribution of Paleo-oceanic crust and regional deep faults in Chilien Range area. I. Deep fault to the northern border of Hosi corrider. II. Deep fault to the northern border of Northern Chilien range. III. Deep fault to the northern border of Middle Chilien range. IV. Deep fault to the northern border of Southern Chilien range. On the hanging wall of each deep fault there is a ophiolite suite zone. From north to south, they are in order: Corrider Zone, Northern Chilien Zone, Middle Chilien Zone, Southern Chilien Zone.

(Fig. 7). Furthermore, the ages of the granite in the whole Chilien range also show a decreasing gradient towards the Alashan block, comparable to the ages of the respective faulting periods.

(2) The Chinling tectonic complex. Starting at the west end from the south bank of the Chinhai lake and ending in the east at the Yanze River, the Chinling fault zone spans 1,700 km. It corsses the Northsouth tectonic zone at Wutu- Kansu, and is divided into an east and a west section at this point. The sedimentation south of Chinling is geosynclinal and contains fossils of the Southern China facies. The sedimentation to the north is geoanticlinal and contains fossils of northern China facies. These observations had led to an earlier speculation that Chinling was a pre-Cambrian land crest called the Chinling Geoaxis. However, this speculation has been disproved by recent discoveries of fossils from different periods on Chinling, including Sinian and Paleozoic marine deposits.

Soon after the introduction of plate tectonics into China, the formation of Chinling received a new interpretation. According to Lee Chun-yu, among others, Chinling is a zone of plate contact. Its geosyncline plunged northward, which occurred during the Indo-China orogenic period, after the Triassic and lasting until the late Mesozoic. The disintegration on the west Chinling was relatively mild, only Melange is seen. The disintegration on the east Chinling was more thorough, one sees much

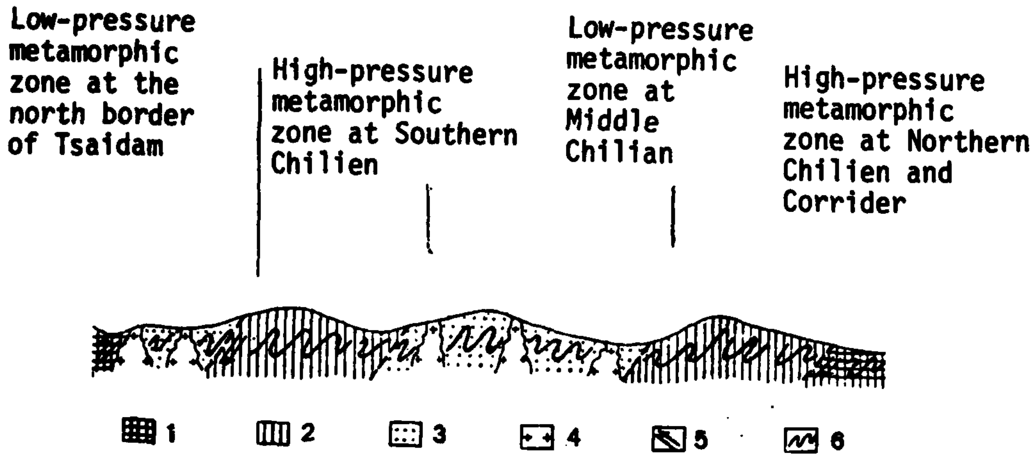

Fig. 7. Metamorphic facies system of the western section of the Chilien range.[10] 1. Presinian crystal shist, diaphthoresised during Devonian formed some mylonite zone. 2. Green shist facies consisting of Sinian, Cambrian, Ordovician. 3. Greenlandite diorite facies or hornblendite hornstone facies, Presinian and Sinian. 4. Caledonian granite. 5. Mylonite and its lamination direction. 6. Original folding.

deeper into its deep crustal rocks, which have been subjected to a high degree of high pressure-low temperature metamorphism. The Chinling tectonic complex is facetted by the Tan-Lu collision fault zone east of the Tapie Mountain. The latter appears to be a transform fault. The strata to the east of the transform fault has moved northward for several tens of miles.

The Chinling tectonic complex consists of two zones. The south zone is separated from the north zone by about 150 to 180 km (Fig. 4). The evidences for subduction are: (i) Melange: The distribution outcrops sometimes reaches 500 km by 20-40 km. (Fig. 4). There are two types of melange in Chinling, as shown in Fig. 8 and Fig. 9. The development of melange is shown in Fig. 9. (ii) Ophiolite Suite: The outcrops can be as long as 30-70 km. (iii) Blueschist Belt: In east Chinling, more than 200 km in length, with other high pressure-low temperature minerals distributed along the belt. (iv) The Potassium Content: The potassium content of intrusives and extrusives increases from the fault zone to the north.

(3) The Lungmenshan and Kangtien Old Land tectonic complexes. The Lungmenshan deep fault runs from the southwest corner of Shensi province in a southwest direction along the western border of the Szechwan basin to Kangtin. From Kangdin it turns southward into Yunnan, then continues along the Yan River into Vietnam. Along the way there are the King River faulting and the Yan

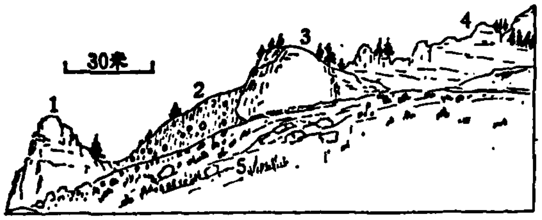

Fig. 8. Sketch of the first kind of Mèlange in Chinling, at Tsaiho, Kansu.[2] 1,3,4: Massive limestone of lower Permian; stratification nearly horizontal, forming the allochthon. 2: Mixed xalsonte. Gravel composition mainly of limestone, plus some sand stone and some dark-gray slate. 5: Dark-gray slate, northwestern strike, belonging to the upper Permian. Usually covered by regolith.

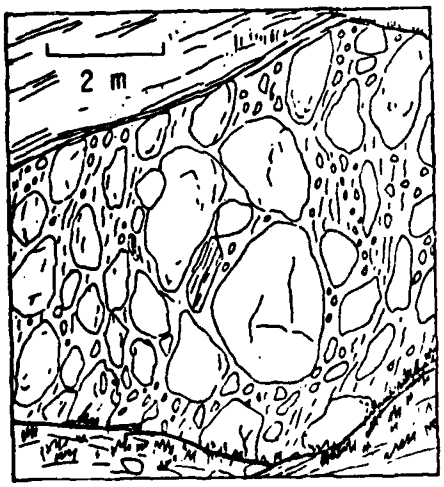

Fig. 9. Sketch of the second kind of Mèlange in Chinling, at Hozuo, Kansu.[2]

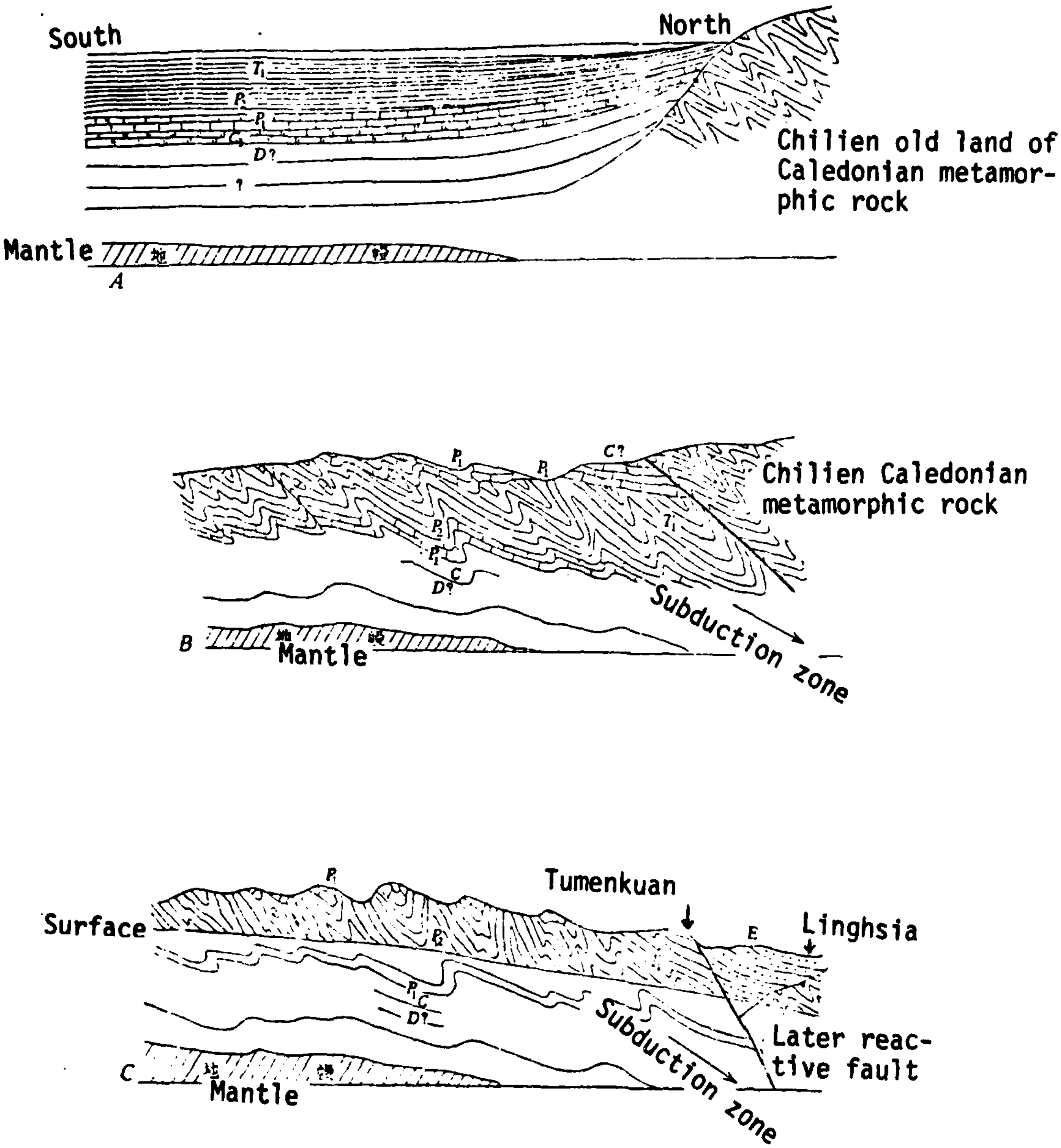

Fig. 10. Constructed profile of the production and development of Mèlange at the northern part of West Chilien.

River faulting (Fig. 11). To the east of the arc formed by the three faultings are the Szechwan basin and the Kantien old land, both being preSinian basement overlaid with Paleozoic and Mesozoic coverings. To the northwest of the arc is the Kantze geosyncline, and to the southwest of the arc is the SanKiang geosyncline. The strata on the east of the arc is quite different from that on the west. In 1974, Lee Chung-Yü suggested that the whole arc is a fossil subduction zone. The same viewpoint was held by the Institute of Geology of the Chinese Academia of Science. In 1975, the 106 Brigade of Szechwan published detailed data about this area, and further analyses were made by Li Ping and Wang Liang-mon. As an example, the following analysis about the middle section of Kangtien old land is based on the report by the 106 Brigade.

The Kantien old land is situated on the western border of the Yantze faulting block. From the west to the east in order are the Yanpian group, the Kangding complex, and the Huili group, each in a band-like distribution along the north-south direction (Fig. 12). During Sinian, the Kangtien old land lay between the eastern old land (i.e., the Yantze faulting block) and the western paleo ocean (Fig. 13).

(4) The Taiwan, East China, and Central China complex.

a. A major NS-trending fault, parallel to the east coast of Taiwan and following the Longitudinal Valley, marks a subduction zone of Mesozoic or Cenozoic age. Outcropping along this fault zone are (i) the Yüli

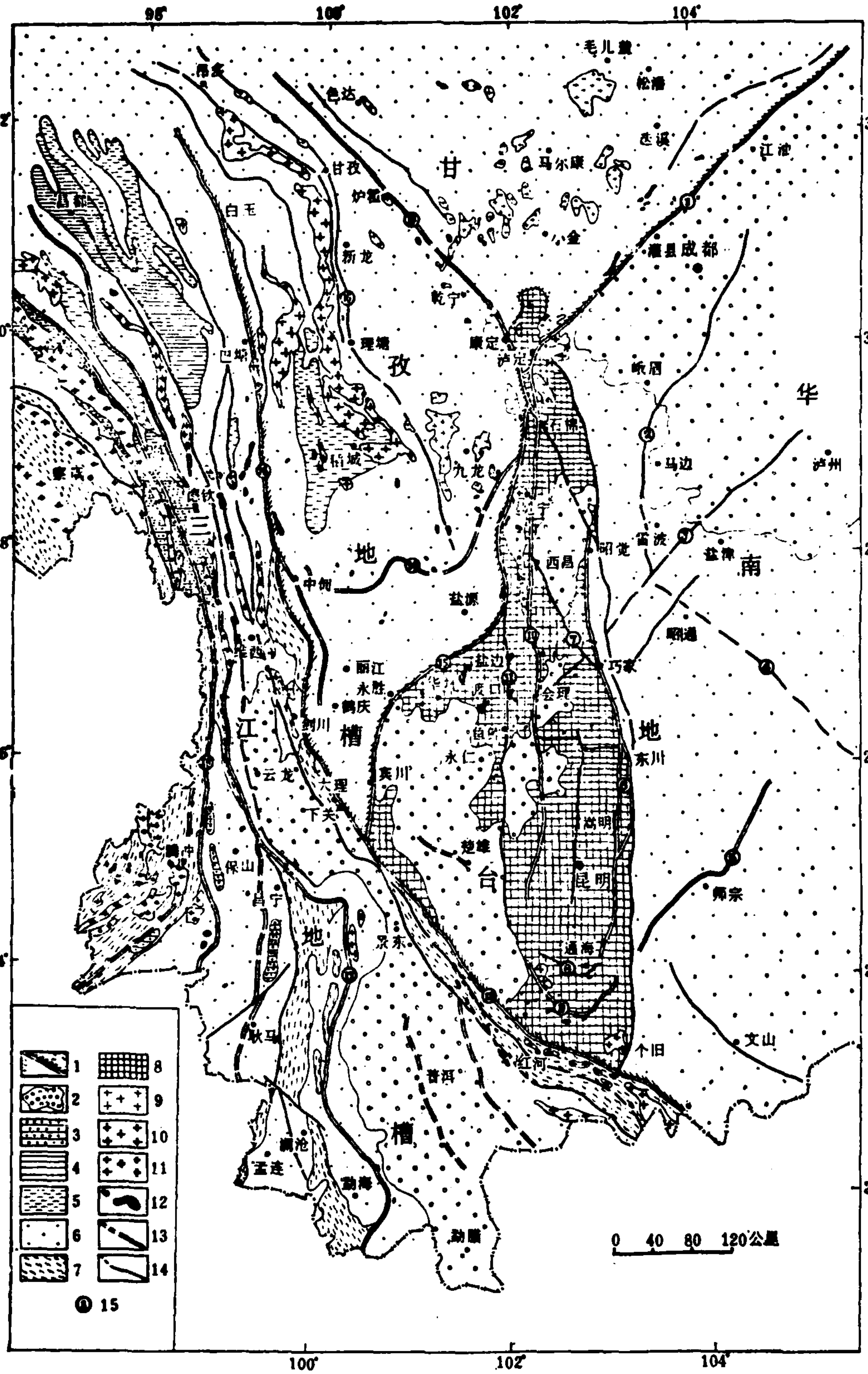

Fig. 11. Simplified geologic and tectonic map of Yunnan and western Szechwan. (Legend on the following page).

Legend for Fig. 11.

1. Demarcation line of tectonic units.
2. Continental deposit in messozoic basin.
3. Messozoic (J_2 - J_3) marine deposit.
4. Messozoic (J_1-J_2) marine deposit.
5. Messozoic (J_3 - T_1) marine deposit.
6. Strata of Triassic to Paleozoic.
7. Ancient metamorphic rocks.
8. Kangtien old land.
9. Indo-China intermediate-acidic intrusives.
10. Early Yanshan period intermediate-acidic intrusives.
11. Late Yanshan period intermediate-acidic intrusives.
12. Basic-Ultrabasic intrusives.
13. Deep fault and speculated deep fault.
14. Fig fracture and speculated ones.
15. No. of fracture zones:
    1. Lungmenshan fault.
    2. Omei-Kinyang fault.
    3. Lianfong-Chiaojia fault.
    4. Yiliang-Suichen fault.
    5. Miller-Shitzong fault.
    6. Shiaojiang fault.
    7. Tzemuho fault.
    8. Chujiang fault.
    9. Shiping-Jiansui fault.
    10. Anningho fault.
    11. Luyejiang fault.
    12. Yuan fault.
    13. Shiansuiho fault.
    14. Shiaojinho fault.
    15. Jinho-Yongsheng-Bingtzuan fault
    16. Litangho fault.
    17. Lantzangjang fault.
    18. Jinshajang fault.
    19. Nujang fault.

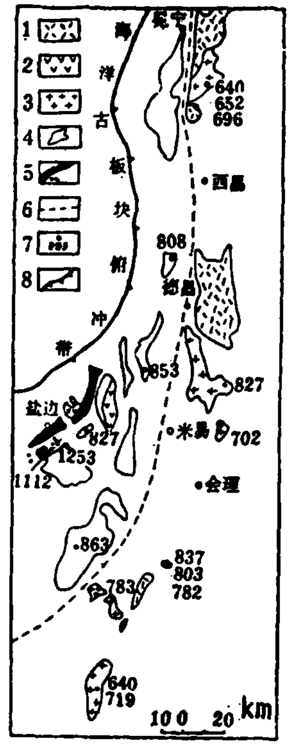

Fig. 12. Distribution o
Precambrian intrusives and extrusives at Kangtien Kern. (1

1. Acidic volcanic rocks.
2. Interm. volcanic rocks.
3. Granite.
4. Quartz diorite batholith.
5. Ophiolite suite.
6. Quartz diorite line.
7. Radioactive dating.
8. Deep fault zone.

formation, which contains glaucophane and represents a low temperature-high pressure metamorphic phase, and (ii) the Lichie formation which is identified to be a typical melange.

b. The region that consists of the five eastern China provinces (Fuchien, Kwantung, Chiekiang, Kiangsu, Anhwai, and Kiangsi) is covered by large-scale volcanic intrusions of Mesozoic age. It is believed that these intrusions were originated from the same magma source as a consequence of melting and ascending of the subducted Pacific plate. There is a NW trending direction along which the increase of acidity and potassium content is noted.

c. The NWW trending compressive stress from the Pacific plate has resulted in a series of folding zones with NE trending strikes.

(5) Yalu-Kunlun tectonic complex. In the west Kunlun mountain ranges, there exists a wide distribution of Sinian to early Paleozoic eugeosynclinal deep sea sediments. The underlying archeozoic metamorphic basement contains jadeite and ophiolite.[1]

The north slope of the Himalaya and the Yalütsanpu River Valley represents a Cenozoic subduction zone. The Tethys geosynclinal sediments occur along a belt between the Himalaya and Kantis Mountain ranges. The subduction process has folded these sediments and caused a 70 km thick crust along the Yalutsanpu River Valley. Based on the radiometric dates from the Kuiyang Geochemistry Institute, Chang and Zhen give a geological profile (Fig. 13) describing a sequence of subductions that have resulted in the present south Tibet tectonic zone.

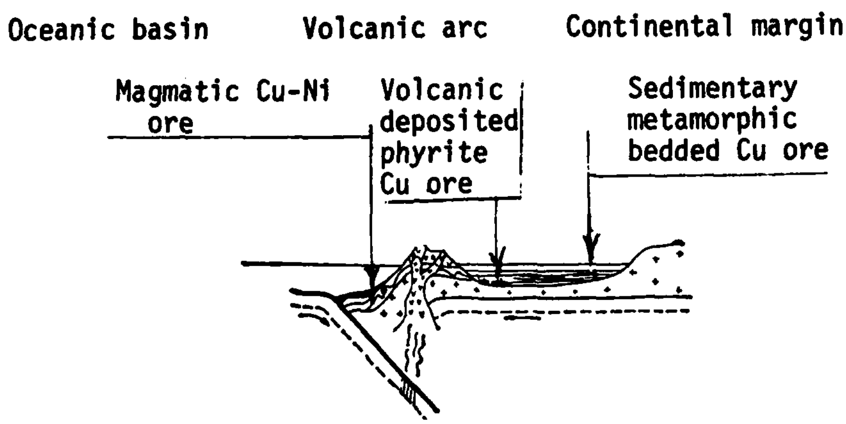

Fig. 13. The relationship between plate border circustance and the Presinian sulfide ores at mid Kangtien kern.[7]

Li and Wang suggest that this Tiebetan tectonic zone perhaps extends further to western Yünan and Szechwan with the following characteristics:

a. Several belts of Alps-type ophiolite suites form a sequence of envelopes bordering the north and east boundary of the Indian plate (Fig. 15). These belts are more or less parallel, consist of similar rock types, and become progressively older towards the Indian plate. This similarity suggests a common mode of origin for these belts which are most likely the fossil plate boundaries of different ages.

b. Acidic igneous rocks of the same age mostly are sandwiched between these ophiolite belts, and the ages of these acidic igneous rocks are consistent with the ages of these fossil plate boundaries.

(3) Chang and Zhen further suggest that in the early stage of the Erasia plate, there were in its surroundings a number of small plates which are separated from the main Eurasia plate by oceanic crust of varying extents. During a series of global tectonic movements, the India plate was migrating northward and drove these small plates to collide with the Eurasia plate. By Cenozoic, the Indian plate finally came in contact with the Eurasian continent. This whole sequence of collisions probably produced the present Tibetan Highland.

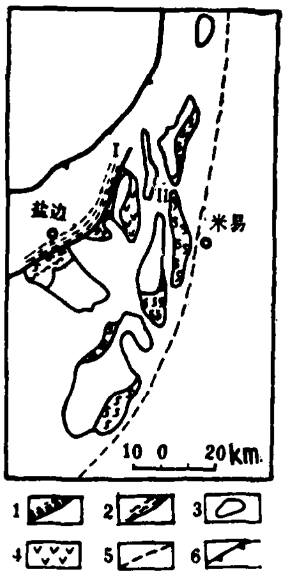

Fig. 14. Metamorphism zone in pairs at Yanbian-Miyi.[7]

1. Green shist belt.
2. Metamorphic complex.
3. Gneissose quartz diorite.
4. Andesite Porphyrite.
5. Quartz diorite line.
6. Deep fault zone.

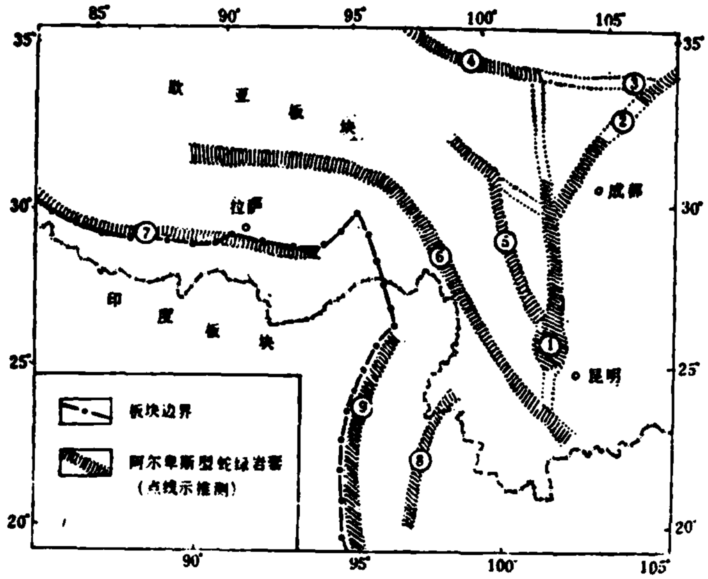

Fig. 15. Schematic map of the ophiolite suite distributions in the Tibet-Yunan vicinity Ophiolite suite belts: 1. Kandin-Yuanmou best (Precambrium-Hersinian). 2. Lungmenshan belt (Caledonian). 3. Mienlio belt (Hersinian). 4. Putzinshan-Chishishan belt (Hersinian). 5. Kantzi-Muli belt (Indo-China). 6. North Tibet-Mochiang-Ailawshan belt (Indo-China-Yanshan). 7. Yalutsanpu river belt (Himalaya). 8. Santaishan belt (Himalaya). 9. Ilowati river belt (Himalaya).

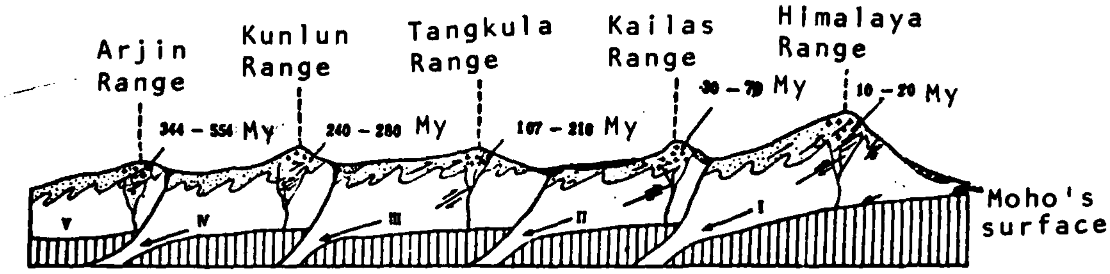

Fig.16 Arjin-Himalaya tectonic crossection

Sedimentary strata	I India plate
Mullite	II Southern Tibet plate
Flysch rock	III Northern Tibet plate
Volcanic rock	IV Changtang plate
Granite	V Tsadam plate
Ophiolite	
Continental crust	
Lithosphere	

IV. GEOPHYSICAL INFORMATION

(1) Elevation.

The elevation of China increases from the east to the west. In general, to the east of the Yintsuan-Tienshui-Kunming north-south fracture zone (it has been named the "North-South Tectonic Zone" recently in China), the elevation is below 2,000 m. It is above 2,000 m to the west. The following two features are noteworthy: (i) The 4,000-5,000 m contour almost coincides with the West Kunlun-Arkin-North Chilien-Lungmen-Kantien subduction zone. (ii) The elevation of the Tienshan range is above 4,000 m but its peak reaches 7,439 m. On the other hand, the Turfan depression is 154 m. below sea level. On the south side of the east segment of Tienshan, there are a series of depressions. The causes of their formation remain to be determined.

(2) Gravity.

The gravitational gradient of China shows the following features: (i) It decreases from the east to the west. To the east of the North-South Tectonic zone, the gradient changes gradually from 0 to -100 mgal. To the west, it changes sharply from -200 to -450 mgal. (ii) The gravitational gradient changes abruptly at the Tan-lü deep-origin fault, the eastern border of Taihang range, and the western border of the Ordos block, indicating different conditions between the blocks on either side of the faults.

(3) Earthquake distribution.

China's earthquake distribution has been described many times already. Briefly, earthquakes tend to concentrate on several subduction zones, especially on the north-south tectonic zone. In addition, along the deep-origin fault zones in the old faulting blocks in north China, there have also been infrequent but strong earthquakes. Calculations made on the Shingtai, Haicheng, and Shansi earthquakes all indicate the foci of the quakes to be in the crystal basement or on the surface of the basaltic rock. Few earthquakes occur in south China. According to Li Chi-yi, et al, the difference can be explained by the fact that, in north China, the rocks have had more thorough metamorphozed and are harder, whereas in south China the rocks have had less thoroguh metamorphozed and are softer. It has been pointed out by Shi Chen-liang that the earthquakes from different zones show different periodicity, in the order of several hundred years in east China, several tens of years in Sinkiang, and between ten to twenty years in Taiwan. The differences in earthquake periodicity is related to the intensity of the tectonic movement.

(4) Crustal Thickness--1

The tectonic map compiled in 1973 by the Institute of Geology of the Chinese Academia of Sciences (Fig. 2) shows the following characteristics: (i) The 60-70 km isopachs almost coincides with the border of Tibet, indicating that

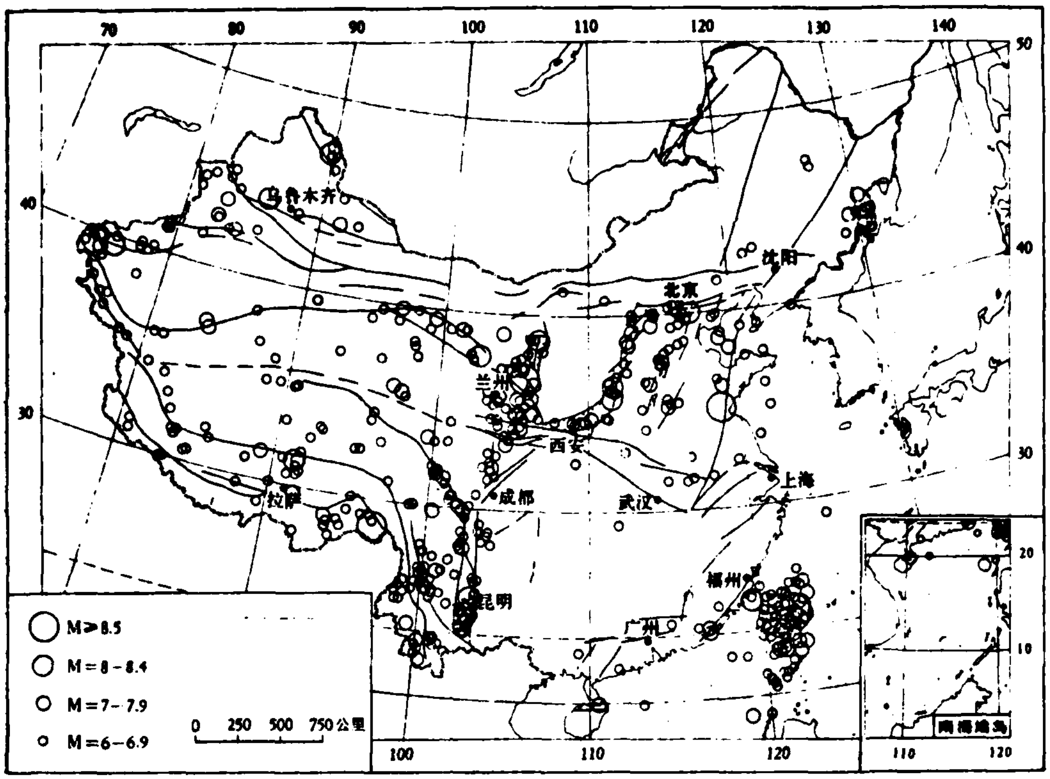

Fig. 17. Distribution of epicenters of strong earquakes (M6,7) between 780 B.C. to May, 1973.(5)

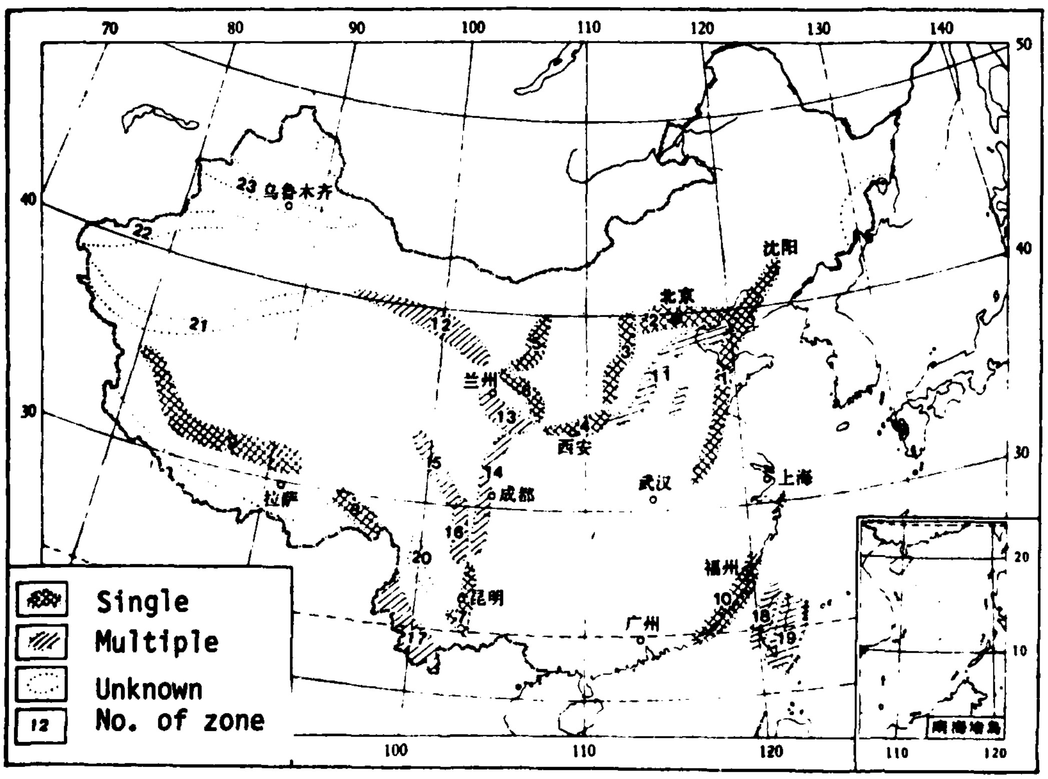

Fig. 18. Distribution of seismic activity zones of China.(5)

the Tibet subplate, 70 km in thickness, is rather flat. (ii) The 50-55 km isopack coincides with the border of the Chinhai-Tibet highland. It coincides with the West Kunlun-Arkin-North Chilien-Lungmen range-Kantien old land subduction zones, includikg Chilien and Tsaidam. (iii) The isopack lines are rather curvy in Sinkiang. The 45-50 km line connects Tarim, the eastern segment of the Tiensan range, and the Alashan and the Ordos blocks. (iv) To the east of the North-South tectonic zone, the isopachs run roughly in parallel in the direction of north northeast, decreasing from 45 km to 30 km from the west to the east.

In addition, the crust at the collision fault zone along the Yin mountain and the Yan mountain is about 5 km thicker, whereas the crust of the southern Chinling tectonic zone is thinner than its surround. Corresponding anomalies have been indicated from satallite gravity mapping.

Further, Chen Ku-da mentioned in 1975 that, information from surface wave dispersion led to the speculation that, to the east of the North-South tectonic zone, the thickness of the crust was only 30-35 km. In particular, the crust thickness of the Szechwan platform and the Ordos platform were even less than 30 km.

(5) Crustal Thickness--2

In 1963, Tseng Jung-Sheng et al calculated the thickness of the crust and the depth of Moho layer from the phase velocity of Raleigh waves (Fig. 20). In 1973, they plotted the depth of the Moho layer (Y) against the mean

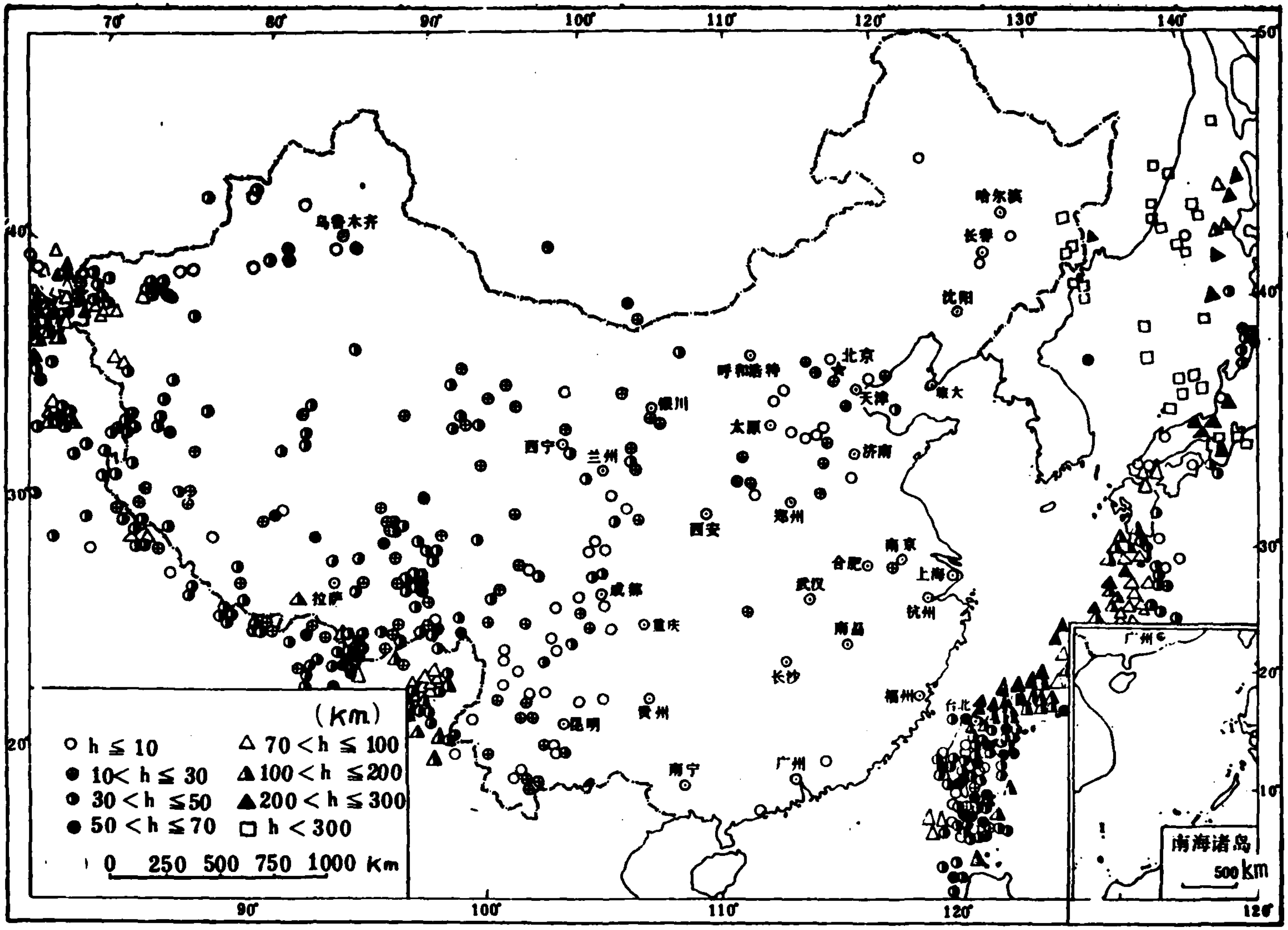

Fig. 19. Depth distribution of earthquake foci in China.

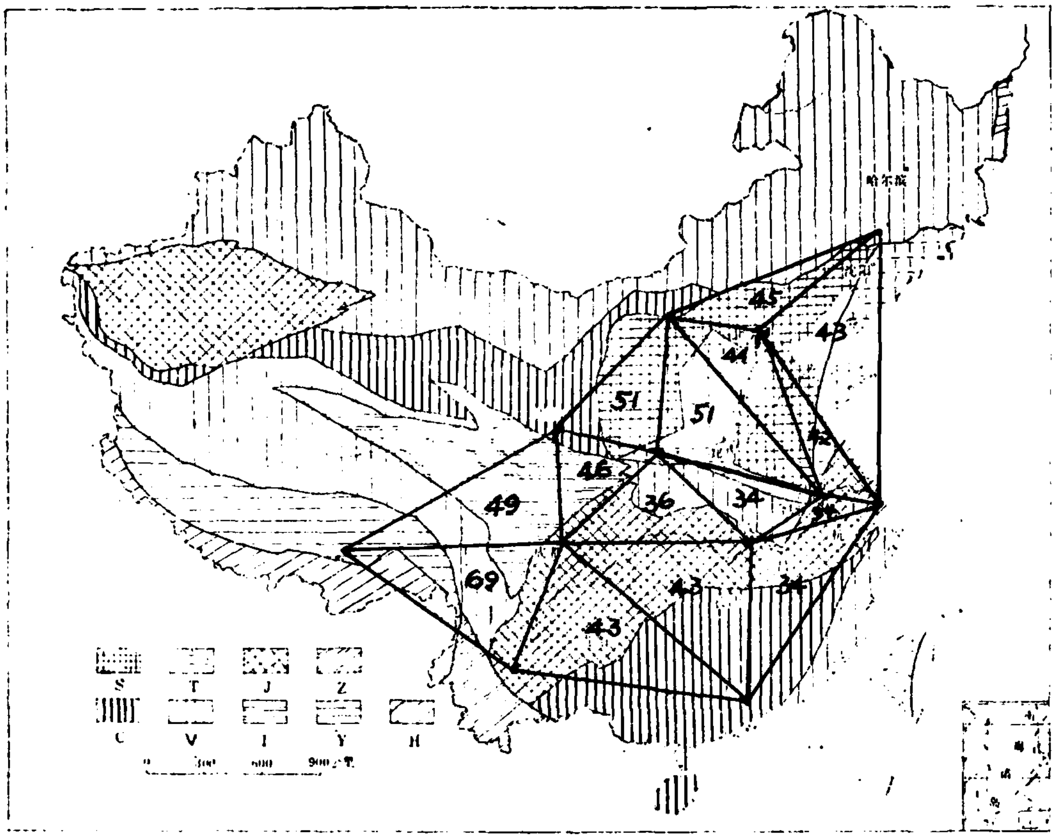

Fig.20 Depth of Moho surface calculated from surface wave (shown by the number in triangles, in km)(17)

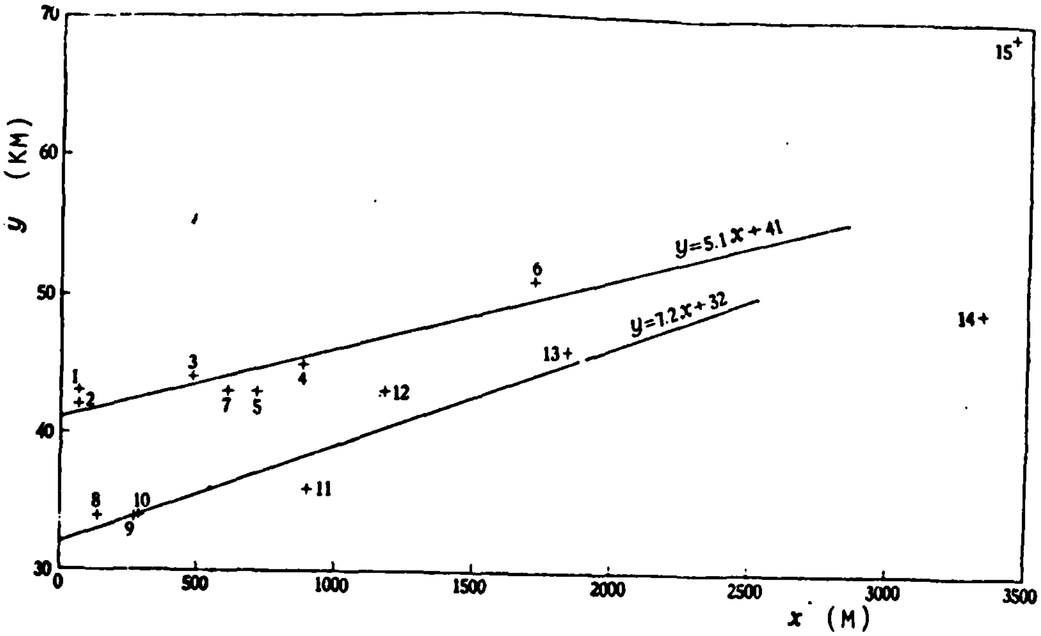

Fig.21 Moho's surface depth-altitude.(17)

elevation (X) of the area (Fig. 21), and found the resulting data points to fall into three groups. One group of the data come from the north China subplate (north of Lanchow-Nanking-Shanghai, or the Chinling tectonic zone), and satisfies Y = 5.1 X + 41 km. Another group of data come from the south China subplate (south of Lanchow-Nanking-Shanghai, east of Lanchow-Chengtu-Kunming) and satisfies Y = 7.2 X + 32 km. On the other hand, data points from the area within Lanchow-Lasa-Kunming scatter irregularly. From these data, they calculated the thickness and mean density of the north China and south China subplates, as shown in Fig. 22, and presented a new mosaic model of the crust, as shown in Fig. 23.

The depth of the Moho layer of the various blocks from Fig. 21 are presented below.

From the table, it can be noted that the crust is thinnest in the triangles No. 8, 9, and 11, which are on the Chinling tectonic zone. As mentioned above, anomalies in the corresponding area has been noted from satellite gravity mapping.

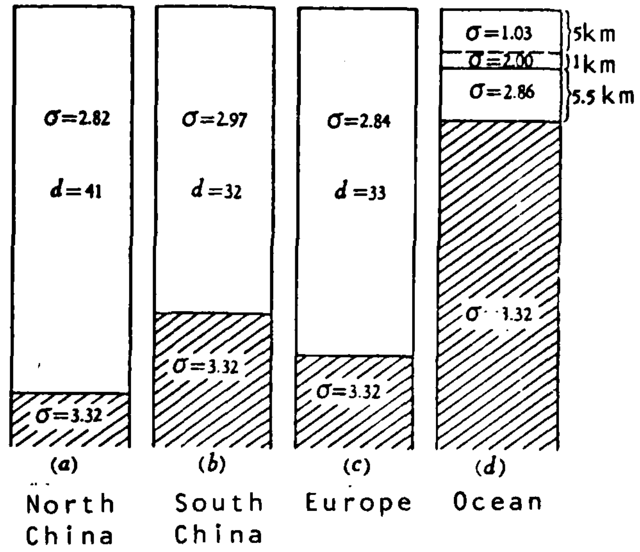

Fig.22 Crust model

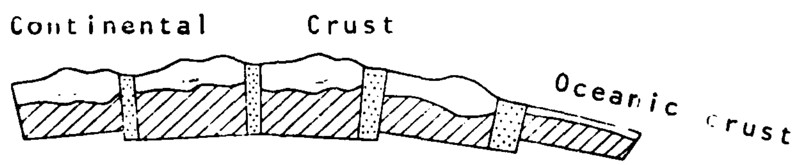

Fig.23 Mosaic model of crust

V. CONCLUDING REMARKS

(1) Relationship between the North-South and East-West Tectonic Zones.

Chinese scientists have recently pointed out the concept of a North-South tectonic zone. This zone forms a major tectonic dividing line which has separated China into two very distinct regions. The differences between these two regions include geomorphologic features, gravity anomalies, and crustal thickness. That the major seismic events of this zone seem to be inter-related suggests an integrated nature throughout the entire zone.

However, from the surface geology only East-West fracture zone (but not North-South fracture zone) is observed near the Tiensui-Wutu region. Results from regional telluric EM sounding suggest that the East-West tectonic trend is clearly existing above a depth of 17 km, and the North-South tectonic trend prevails below a depth of 27 km. The significance of this observation remains to be assessed.

From surface geology, the Chinling is a subduction zone of Indo-China age. The northern segment of the North-South tectonic zone is considered to be a fracture zone of Archeozoic age, while its southern counterpart, which may be a subduction zone has an age of Paleozoic. This may suggest that the so-called North-South tectonic zone is nothing but a spatial coincidence, and the new tectonic movements may have reactivated the two old tectonic zones of different ages.

(2) Regional Subdivisions of Mainland China

Based on our information, compilation and synthesis, a preliminary subdivision of China into three tectonic units seems to be appropriate from the standpoint of surface wave studies on the Chinese mainland.

a. Tsinhai-Tibet Subplate

b. North China Subplate

c. South China Subplate

These three subplates are separated by the two tectonic zones mentioned in Section 5.1. A more detailed discussion on these subdivisions as well as further analysis on the northwest and northeast China will be presented in a future technical report.

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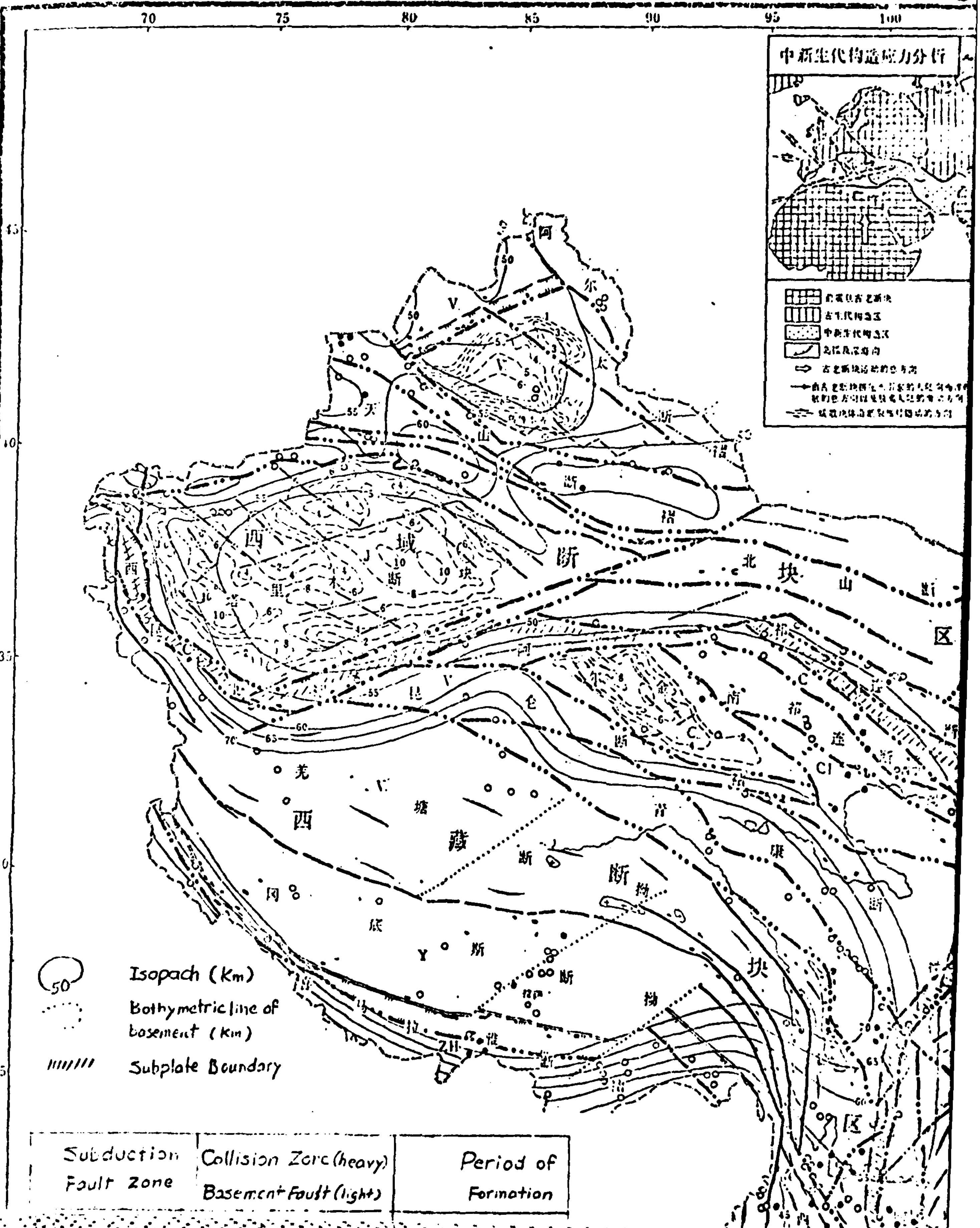
Fig.2 Schematic Diag



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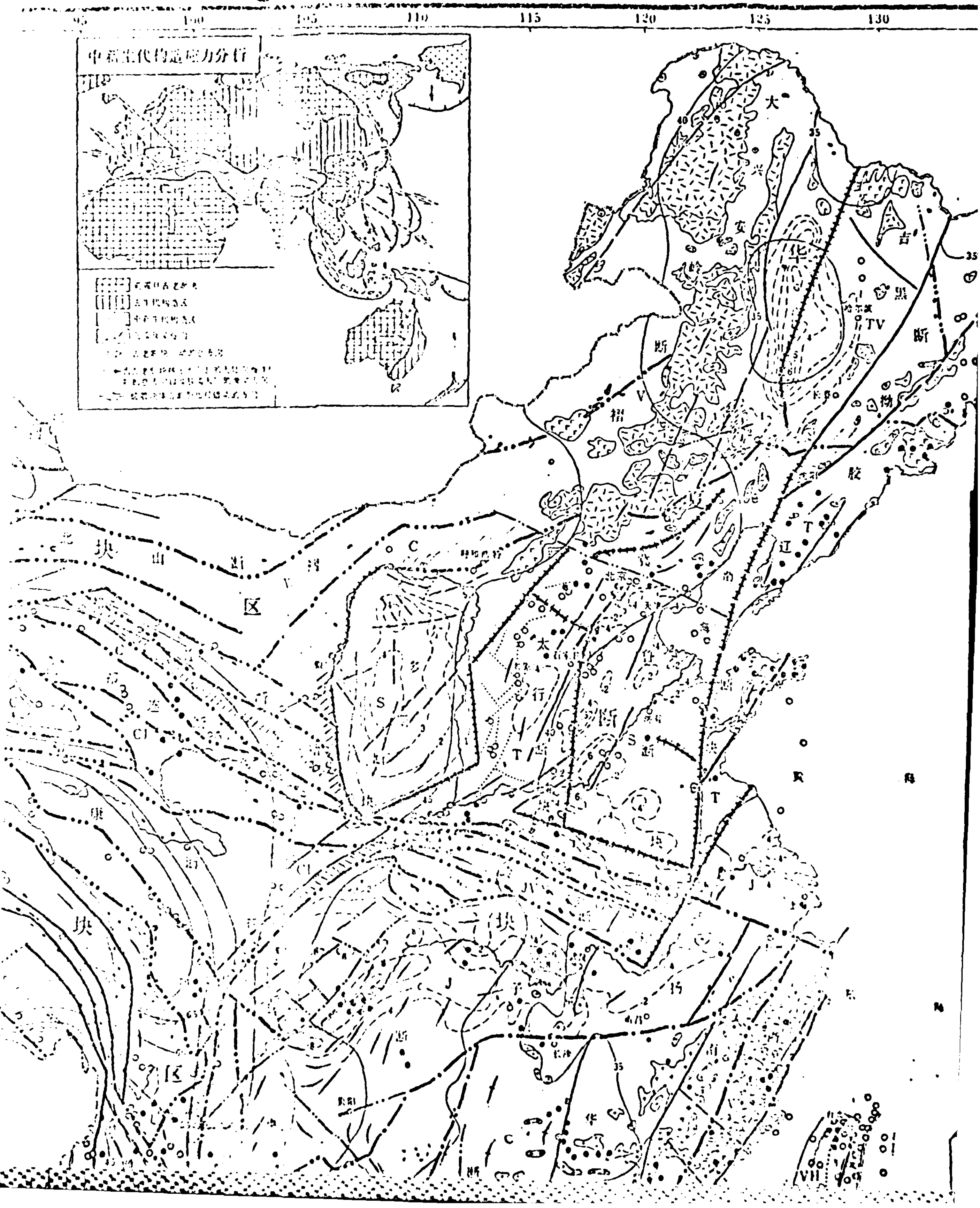
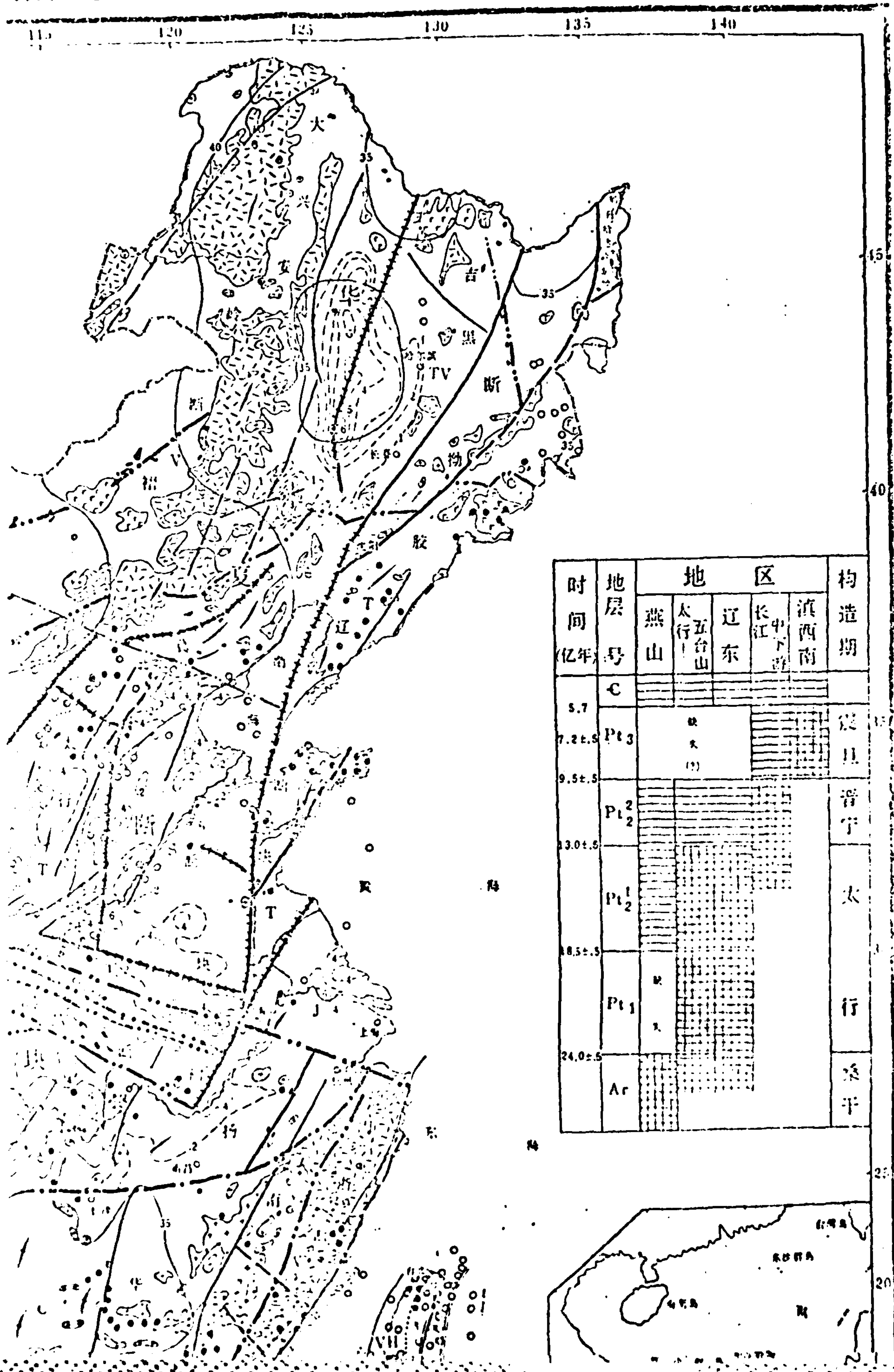
:matic Diagram for Chinese Tectonics



hinese Tectonics



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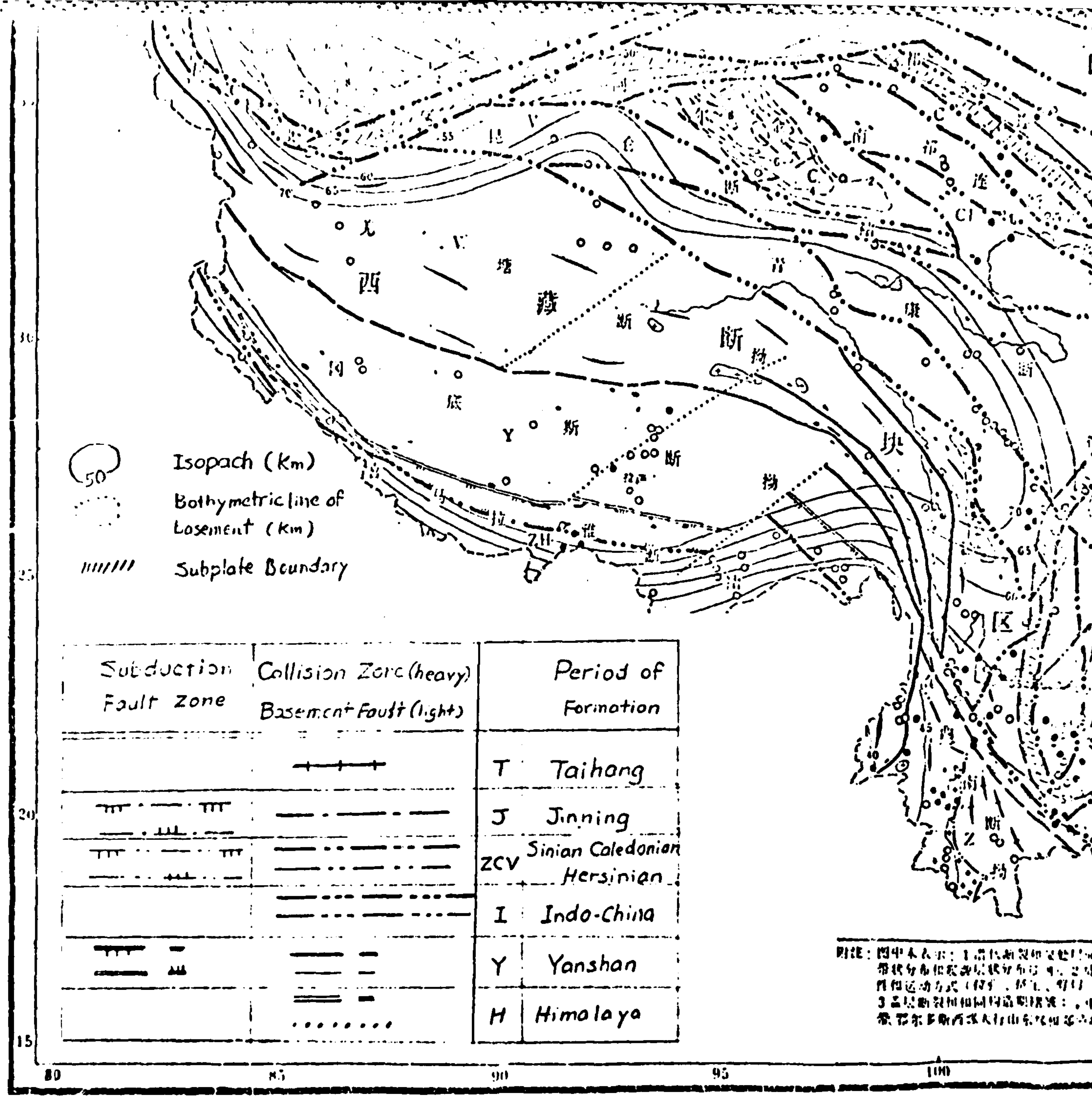
24.0±.5	Ar						阜平



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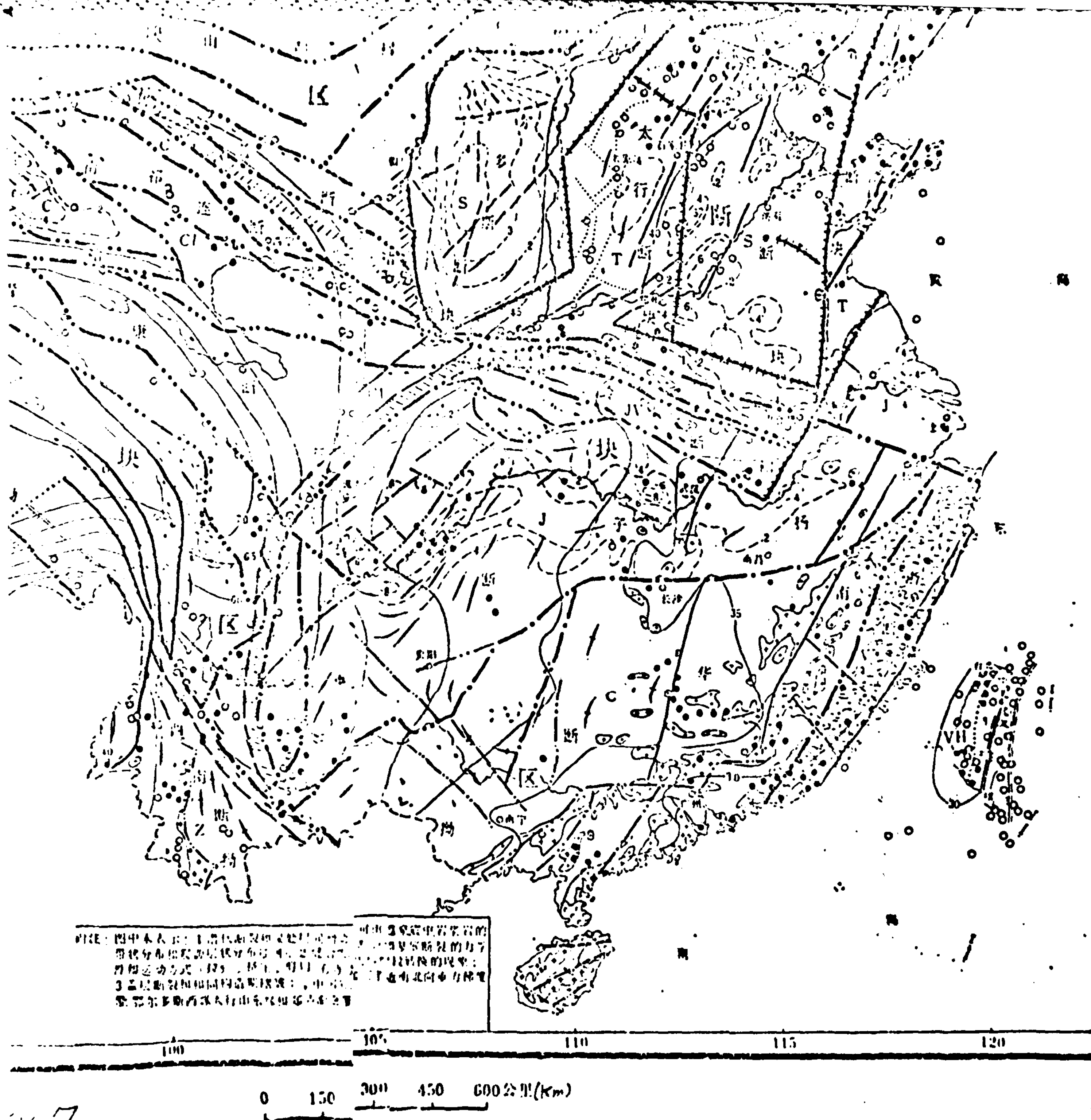

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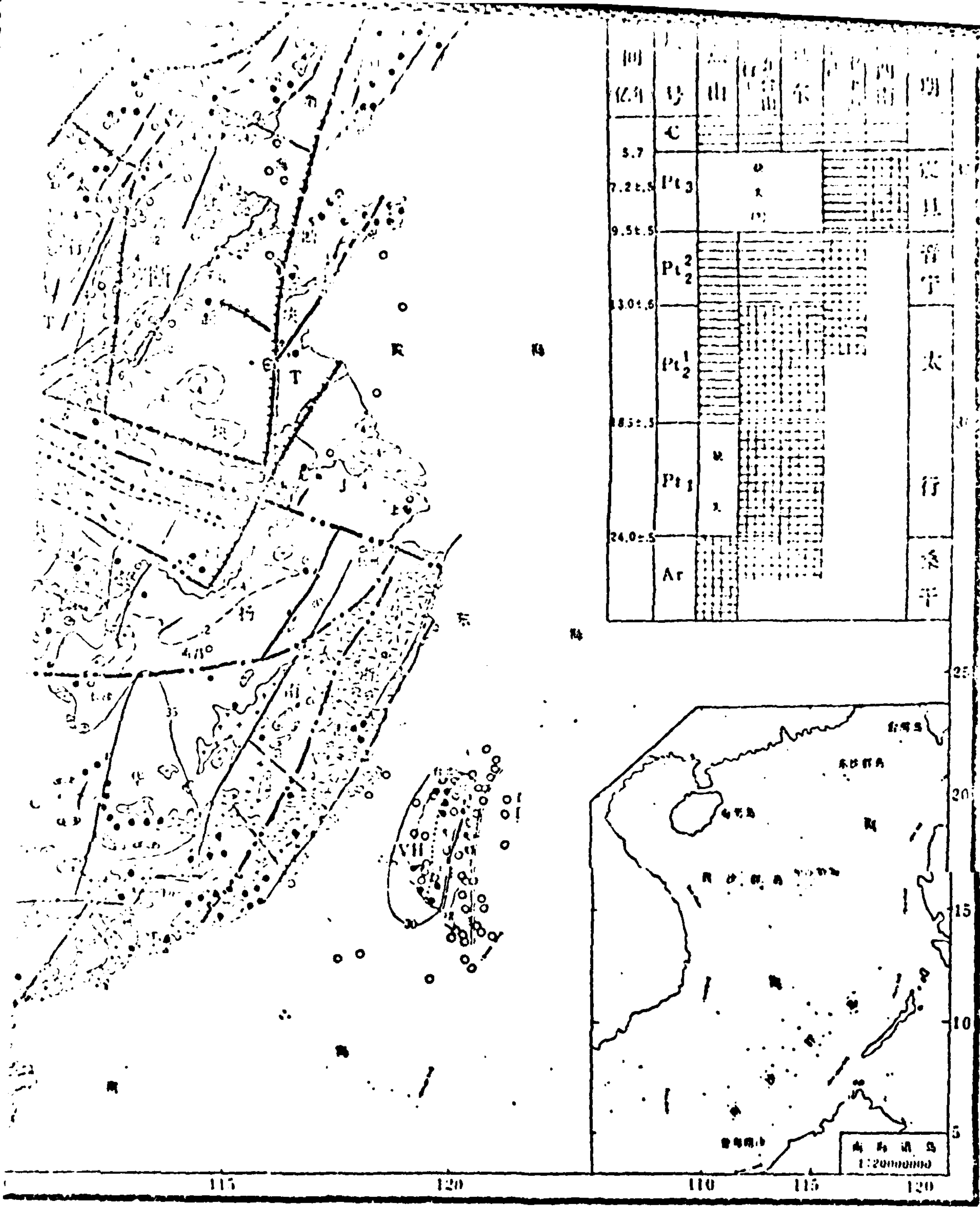

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