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ON THE SINIAN SYSTEM OF THE LIAOTUNG PENINSULA AND ITS EQUIVALENTS IN OTHER PART OF THE NORTH CHINA

P'AN KIANG

(*Museum of Geology, Ministry of Geology*)

SUMMARY

The Sinian stratigraphy of the Liaotung peninsula was studies by many Chinese and Japanese geologists. In this paper three sections of Sinian period in Lioatung peninsula and three sections of Lower and Middle Sinian period in Lioahsi area are discussed and several stratigraphical terms are assigned.

Tab. 1

O. Aoji 1928		R. Endo 1937	Matzushida 1940		Y. Wang and others 1954	H. Y. Lee 1957	Fu & Kiang 1956	C. C. Kiang 1957		Present paper 1959	
					Maoto Series	Maoto Series	Maoto Series	Maoto Series		Maoto Series	
								Nanshan Series		Chinhsien Series	
			Kangchia Series		Kangchia Series	Kangchia Series	Kangchia Series	Wuhashan Series		Wuhashan Series	
		Pohai Series	Wuhashan Series	Fuchia limestone							
				Kuchia-kao argil-claeous limestone							
Siho Series	Chiaoto quartzite	Nanshan Series	Siho Series		Chiaoto quartzite	Chiaoto quartzite	Chiaoto quartzite	Siho Series	Chiaoto formation	Siho Series	Chiaoto quartzite
	Nanfen shale	Chiaoto Series			Nanfen Series	Nanfen Series	Nanfen Series		Nanfen Formation		Nanfen group
	Tiaoyütai quartzite	Tiaoyütai Series			Tiaoyütai Series	Tiaoyütai Series	Tiaoyütai Series		Tiaoyütai Formation		Tiaoyütai quartzite

On the "Nanshan Series"

Mr. C. C. Kiang's "The Sinian Stratigraphy in the Southern part of Northeast China" published in 1957 made some contributions to the understanding of the Sinian strata in this region. On this account the Sinian system can be divided into three series by him.

Upper Sinian — Nanshan Series

Middle Sinian — Wuhashan Series

Lower Sinian — Siho Series { Chiaota formation; Nanfen formation; Tiaoyütai formation

Early in 1898, the Nanshan Series as proposed by L. Loczy, when he studies the Lower Palaozoic strata of the West China. So the name "Nanshan Series" of the Sinian system of Liaotung peninsula should be abandoned.

Since the description of the type-locality of Sinian "Nanshan Series" of this region is very obscure with no upper part of this formation evidence cited. The writer doubts whether the Upper Sinian period "Nanshan Series" of Kiang is but a member of Lower Cambrian rocks in the uppermost part of this strata and some part of Middle Sinian rocks in the lower part.

The Jinxian Series, a newly defined one as proposed by the writer is a grey thin bedded limestone and argillaceous limestone series in the upper part and the green, greenish-grey shale and sandstone series in the lower part. Hence it can be of Upper Sinian in age, that appears to be identical in almost every respect with the Chingeryü limestone and Hsiamaling shale of Prof. C. S. Kao (1934).

In the section of the Chinhsien series of the type locality consists of the following beds (see fig. 1):

I. Section of the Shanchishan, Jinxian.

Lower Cambrian (Maoto Series):

14. Thin bedded argillaceous limestone ..... 50 m+
13. Purple shale and greenish-grey shale with sandy shale in middle part, yelding *Redlichia* sp. ..... 30 m
12. Medium bedded silicarenite ..... 20 m

Upper Sinian:——Jinxian Series:

11. Grey medium and thin bedded limestone with calcite vein ..... 80 m
10. Green platy limestone and thin bedded argillaceous limestone ..... 40 m
9. Greenish-grey shale and platy lime shale ..... 8 m
8. Dike ..... 6 m
7. Purple, greenish-grey and greish-white, thin bedded argillaceous limestone, and grey thin bedded limestone ..... 15 m
6. Yellowish-grey shale and purple shale ..... 25 m
5. Green and yellowish-green shale, sandy shale and sandstone, and with lenticular silicarenite or quartzite ..... 18 m
4. Purple medium bedded quartzite ..... 25 m
3. Greenish-grey, greenish-yellow sandy shale and shale ..... 35 m

Middle Sinian——Wuhashan Series:

2. Green, purple platy argillaceous limestone and thin bedded limestone ..... 40 m
1. Grey thin bedded and medium bedded limestone, with calcite vien ..... 30 m

II. Section of the Nanshan, Chinhsien (Fig. 2)

Supper-formation: cover

Upper sinian (Lower part of Jinxian Series):

8. Dark brown and brownish-purple medium bedded quartzite ..... 25 m
7. Browish-yellow and yellowish-green sandstone and shale, with quartzite in middle part ..... 80 m

Middle Sinian (Wuhashan Series):

6. Purple lime shale and thin bedded argillaceous limestone ..... 15 m
5. Greenish-white platy thin bedded argillaceous limestone and green shale ..... 50 m
4. Greyish-purple medium bedded argillaceous limestone ..... 20 m
3. Onyx limestone ..... 22 m

2. Greyish-purple marble and purple shale yeilding *Collenian* ..... 25—30 m
1. Purple shale, limestone and leticular marble, with greenish-grey limestone in the middle part yielding *Collenia* ..... 100 m+

On the "Kangchia Series"

The rocks between the Lower Cambrian Maoto Series and Lower Sinian strata Chiaoto quartzite of the Chiaoto region, nearly Penchi, were divided into three Series by Matzushida in 1940. The succession reading from top downwards are as follows:

3. Kangchia Series
2. Fuchin limestone
1. Kuchiakou argillaceous limestone } Wuhashan Series

The term "Kangchia Series" as orginally erected by Matzushida comprises a series of greenish-yellow and greenish-grey thin bedded sandy shale. But from the study of Wang, Lu, Young, Mu and Shang pursued at Taitzuho River in 1954, this formation was all over referred by they to be named the "Kangchia Series". And has later on adopted by Fu and Kiang in 1956.

Tab. 2

Matzushida (1940)		Wang & others (1954)
Kangchia Series		Kangchia Series
Wuhashan Series	Fuchia limestone	
	Kuchiakao argillaceous limestone	

In the Summer of 1958, a section of the type locality of the "Kangchia Series" was observed by Ho and the writer from a place North of vallage Kangchiapaotzu. In this section (Fig. 3) the Cambrian and Sinian strata consists of follows beds:

Lower Cambrian—(Maoto Series):

9. Purple shale .....
8. Dark grey thin bedded limestone, with small lenticular chert in the lower part ..... 20—25 m
7. Yellowish-green sandy shale ..... 5 m
6. Yellow sandstone ..... 5 m

Middle Sinian (Wuhashan Series):

5. Greyish-yellow, greenish-grey thin bedded sandy shale, with greenish-purple color in the weathering surface of the middle and upper part ..... 50 m
4. Grey to greenish-grey thin bedded lime shale ..... 5 m
3. Dark grey argillaceous limestone, with greenish-grey platy shale in the upper part ..... 35 m
2. Grey and greenish-grey shale, sandy shale and lime shale, with argillaceous limestone in the upper and middle part ..... about 100 m

Sub-formation (Lower Sinian Chiaoto quartzite):

1. Missive and thin bedded quartzite

In 1956, H. Y. Liu advocated to take the "Kangchia Series" of Mutzushida as a lower member of Lower Cambrian formation and corrected to Chingeryü limestone and Hsiamaling shale of Yenshan. According to the observation lately made by Ho and the writer it should belong to the middle Sinian Wuhashan Series. So the term "Kangchia Series" should be abandoned.

Analytical stratigraphy of Sinian System in Peipiao, Lioahsi and its equivalents in other part of the Lioatung

Many geological thesis have been made in this region and published by many geologists, as Profs. W. H. Wong, T. K. Hung, Y. T. Chao and S. Chu in 1926—1945 and Mr. K. Fu and Mr. T. K. Wang in 1957, but owing to the incompleteness of Sinian strata or the complexity of structure of this region, it is diffcult to institute comparison and correlation. The sections dealt with in present paper were made by the writer during his geological excusion in June of 1958.

I. Section of Kuanshan to Taterkou, Northeast of Peipiao city (Fig. 4).

The detail of the succession reading from top downwards are as follows:

Super-formation (Jurassic), volcanic rocks:

～～～ unconformity ～～～

Middle Sinian——Lotoying Series:

1. Grey siliceous chert limestone ..... about 450 m
2. Grey and dark grey siliceous limestone, and greenish white and whitish-red shale, with *Collenia* in the middle part, and yielding ripple mark in the lower part ..... about 400 m
3. Grey siliceous limestone, with lenticular brownish-yellow quartzite in lower part ..... 25 m

Lower Sinian——Kuanshan Series:

4. Black platy shale ..... 60 m
5. Brown medium bedded quartzite ..... 25 m
6. Greish-brown massive and thin bedded quartzite ..... 18 m
7. Brown and greyish-purple manganese shale and fine-grained sandstone, with thin bedded or nodular chert, yielding sandstone in the middle part ..... 40 m
8. Dark grey and dark brown medium bedded and thin bedded quartzite ..... 25 m
9. Milk-white medium and thin bedde quartzite ..... 20 m
10. Brown medium quartzite ..... 15 m
11. Greyish-white medium and thin bedded quarzite ..... 2.5 m
12. Brown massive quartzite ..... 27 m
13. Milk-white massive quartzite, with brown spots in the weathering surface ..... 33 m
14. Brownish-red quartzite ..... 27 m

——— fault ———

Sub-formation: Cretaceous Sandstone

II. Section of Liutiaokou to Peipiao city (fig. 5).

Super-formation (J_1), volcanic rocks:

～～～ unconformity ～～～

1. Dark grey and greyish-white siliceous limestone, with black nodular and lenticular chert ..... about 130 m
2. Grey and greyish white siliceous limestone, with thin bedded structure in the weathering surface ..... 350 m
3. Yellowish-brown shale ..... 1.5 m
4. Fresh and dark grey thin bedded to medium bedded siliceous limestone, with fresh shale in the lower part ..... 75 m
5. Grey, pink massive to thin bedded limestone, with few yellow fine-grained limestone and pink shale ..... 57 m
6. Greyish-white and milk-white massive siliceous limestone, yielding *Collenia* ..... 45 m
7. Greyish-white thin bedded siliceous limestone, with brownish-yellow thin bedded chert ..... 80 m

8. Greyish-white massive and thin bedded siliceous limestone ..... about 200 m
9. Black platy clay shale ..... 45—55 m

Lower Sinian (Kuanshan Series):

10. Dark brown quartize ..... 4.5 m
11. Brownish-yellow quartzite, with thin bedded and lenticular siliceous limestone ..... 40 m
12. Brown manganese shale ..... 33 m
13. Brown sandstone ..... 13 m
14. Dark brown platy shale and sandstone ..... 55 m
15. White massive quartzite ..... 23 m+

fault

Sub-formation: Cretaceous Sandstone

III. Section of Lotoying, Nearly Peipiao city (fig. 6).

Super-formation (J_1), volcanic rocks

unconformity

1. Greyish-white and pink massive medium bedded and thin bedded siliceous limestone, yielding brownish-yellow lenticular chert and few purple shale, with ripple mark and sun-clack in the lower part ..... about 650 m
2. Cover ..... 500 m
3. Medium bedded siliceous limestone in the upper part, thin bedded siliceous limestone in the lower part ..... 50 m
4. Greyish-white massive limestone with *Collenia*, similar to No. 6 of section II ..... 55 m
5. Greyish-white medium bedded and thin bedded siliceous limestone ..... about 250 m
6. Pink medium to thin bedded siliceous limestone, with *Collenia* in upper and middle part.... about 150 m

fault

Sub-formation: Cretaceous sandstone

Tab. 3

age \ region		Yenshan		Lioatung Peninsula		Taitzuho River		Peipiao, Lioahsi	Huainan, Anhwei Province	
Upper Sinian Sn_3	Chingpeikou Epoch	Chingpeikou Series	Chingeryü limestone	Jinxian Series						
			Hsiamaling shale							
Middle Sinian Sn_2	Chihsien Epoch	Chihsien Series	Tiehling limestone	Wuhashan Series		Wuhashan Series		Lotoying Series	Szetingshan Series	
			Hunghsuichuang shale							
			Wumishan limestone							
			Yangchuang red shale							
			Kaoyüchuang limestone							
Lower Sinian Sn_1	Nankou Epoch	Nankou Series	Tahungyü quartzite	Siho Series	Chiaoto quartzite	Siho Series	Chiaoto quartzite	Kuanshan Series	Pakungshan Series	Upper quartzite
			Chuanlingkou shale		Nanfen group		Nanfen group			Liulaopai shale
			Changcheng quartzite		Tiaoyütai quartzite		Tiaoyütai quartzite			Lower quartzite

On the basis of the stratigraphical sequence and the lithological characters given above, two formation of the Sinian strata may be distinguished in this region:

Middle Sinian——Lotoying Series

Lower Sinian——Kuanshan Series

The terms Lotoying Series and Kuanshan Series, two newly defined named as proposed by the writer.

The total thickness of Lotoying Series in this region surveyed ranges 1000—1500 m. This series is conformable with the Kuanshan Series. It may be correlated with the Wuhashan Series of Liaotung and also may be correlated with the Chihsien Series of Yenshan as defined by Kao.

According to the lithological character, the upper and lower quartzite of Kuanshan Series is very like the Tohungyü quartzite and Changcheng quartzite of Yenshan, and also similar to Chiaoto quartzite and Tiaoyütai quartzite of Lioatung.

Conclusion

Correlation table of the principal Sinian formation of the various region of the North and Northeastern China are as above.