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ON FEATURES OF TOWN DEVELOPMENT IN THE ZHUJIANG RIVER DELTA SINCE 1978①

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ABSTRACT: since 1978, rural urbanization has been accelerated in the Zhujiang (Pearl) River Delta because of the rapid development of commodity agriculture, industrialization and tertiary industry. Its natural urban population increase had been mostly mechanical before now, and the towns have been transformed from traditional centers into those serving various functions, particularly industrial ones.

In the Zhujiang River Delta, population density and the level of economic changes are high in central areas, and low in outlying area, but on the other hand, urban population has increased slowly in central area and fast in outlying area. In the central areas more industrial towns emerge. So the gap has been greatly reduced. The reform of the construction of the region's economy, the improvement of transportation, the adjustment of the standard of town setting have promoted the distribution of the towns in the Zhujiang River Delta from being centralized to balanced.

KEY WORDS: the Zhujiang River Delta, town development, town features

Since the reforms and open policies were implemented in 1978, the quick development of commodity agriculture, rural industry and tertiary industry in the Zhujiang River Delta has accelerated rural urbanization and caused a great change to take place in the rural society[1]. In the process, towns have played a very important role. The prompt analysis of the features of town development are significant in order for us to understand the regularities of rural social and economic development, discover the related problems and to take necessary measures. Based on a great number of systematic data, the thesis will try to conclude functional numerical, spacial and temporal features of the region's town development.

In this thesis, the Zhujiang River Delta includes seven cities: Guangzhou, Shenzhen, Zhuhai, Foshan, Jiangmen, Zhongshan and Dongguan; and thirteen counties: Panyu,

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Zengcheng, Shunde, Nanhai, Sanshui, Gaoming, Taishan, Kaiping, Enping, Xinhui, Heshan, Bao'an and Doumen. The region's area is 25,300 km^2, and the population was 14.06 million in 1986. The towns are designated as the organic towns which don't include the suburban towns.

I. THE INCREASING NUMBER OF TOWNS, TOWN POPULATION AND THE RISING URBANIZATION LEVEL

First, in the Zhujiang River Delta in 1957 there were 32 towns, 24 in 1983, and 252 in 1986. (Table 1). The number of towns decreased from 1957 to 1983. This resulted from the

Table 1 Change of the number of towns in the Zhujiang River Delta

Area	1957	1980	1983	1984	1985	1986
Panyu	1	2	2	22	22	22
Zengcheng	2	2	2	6	6	14
Zhongshan	3	3	3	13	13	24
Shunde	7	7	2	16	16	12
Nanhai	2	2	2	2	17	16
Sanshui	1	1	1	4	4	11
Gaoming	2	—	—	1	10	10
Taishan	3	2	2	3	24	24
Kaiping	3	3	3	3	3	17
Enping	1	1	1	2	8	17
Xinhui	1	2	1	17	17	21
Heshan	1	1	1	1	1	9
Bao'an	1	1	0	6	6	18
Doumen	—	1	1	1	1	8
Dongguan	4	3	3	32	32	29
Total	32	31	24	129	180	252

Sources: 1. The collection of population statistical data of Guangdong Province (1949–1985) was collected by the Provincial Census Office, Statistical Bureau and Public Security Department.

2. The related data was provided by Guangdong Province's Agriculture Commission.

3. Guangdong's Statistical Yearbook, 1985.

guiding ideology of "eliminating the difference between town and country" and the unimproving town administrative system at that time. So, many villages weren't regarded as towns although they had all the standards of a town setting. When the standard of a town setting was adjusted in 1984, a great number of villages were changed into towns. There were 4 times as many towns as there had been in 1957. It increased to 129 towns. That was the first rapid growth of town numbers in the past ten years. The second growth took place

in the latter half of 1985 when townships were converted into towns owing to the reorganization of the rural administrative system. The two rapid growths made the number of towns increase seven times at an annual growth rate of 118.82% between 1983 and 1986.

Therefore, the change in determining town standards is the direct reason for the increase of town numbers. The direct reason, however, necessarily isn't its essential one. Intrinsically, the rapid town development was because the similar development of the regional economy has raised the region's endurable capacity of towns, and thus caused a demand for the increase of town numbers. The adjustment of the standards of town settings reflected that demand.

Secondly, the population of the towns was 1,037.2 thousand in 1980, and 1,796.2 thousand in 1986. During those six years, the town population increased 73.18%, at an annual growth rate of 9.58% (Table 2), which is more than twice as high as it was during the 23

Table 2 Growth of the population of towns* in the Zhujiang River Delta (1980–1986)

Area	Population			Annual growth rate	Ratio of town Population
	1980	1984	1986	1980–1986 (%)	to total in 1986
Panyu	106,146	133,683	140,127	4.74	19.69
Zengcheng	49,991	62,274	89,630	10.22	14.74
Zhongshan**	75,715	87,312	114,209	7.09	10.78
Shunde	167,181	189,324	916,699	2.75	22.90
Nanhai	108,778	122,328	133,583	3.48	15.47
Sanshui	40,560	50,500	93,354	14.91	29.83
Gaoming	15,157	29,620	47,119	20.81	20.52
Taishan	99,041	136,969	176,983	10.16	18.60
Kaiping	39,777	72,072	122,963	20.71	20.26
Enping	31,991	63,156	96,496	20.20	24.62
Xinhui	132,940	161,322	191,381	6.26	22.88
Heshan	16,459	32,016	64,488	25.56	20.21
Bao'an	12,057	35,321	110,255	44.61	42.88
Doumen	12,651	17,598	45,249	23.67	17.36
Dongguan***	128,791	166,383	173,664	5.11	14.22
Total	1,037,235	1,359,878	1,796,200	9.58	18.91

Source: The collection of data for small towns of Guangdong Province (1985), was collected by the Statistical Bureau of Guangdong Province, and the data was provided by the Statistical Bureau of various counties and cities.

Notes: * Town population includes the town's non-agricultural population, self-providing-grain population, and permanent popuation having no domicile registration.

** Shiqi Town is excluded.

*** Guangcheng Town is excluded.

years prior to 1980. If seven cities were taken into account, the city and town population of the Zhujiang River Delta in 1986 was about 6,422 thousand and made up 45.39% of the region's total population. Consequently, the urbanized level of the Zhujiang River Delta is higher than that of the national level, which is about 20%.

In addition to the growth that was caused by the increasing town numbers, the growth of the town population is chiefly the result of population reproduction and mechanical changes. From 1957 to 1978, the annual growth rate of the town population in the Zhujiang River Delta was 1.63%. Meanwhile during that period, the national population increased at an annual growth rate of 1.91%. As a result, we can see that natural growth was a chief factor of the town population growth before 1978 in the Zhujiang River Delta. In the six years from 1980 to 1986, the annual growth rate of the town population was 9.58%, much higher than the 1.56% growth rate of the region's total population. The above reveals that the increased town population has resulted mostly from mechanical growth. The town population during those six years increased by 759 thousand, which resulted from four factors.

The growth of the town numbers caused the increase of 291.2 thousand town population that accounted for 38.37% of total increase.

On a comparable basis, there were 991.1 thousand non-agricultural town residents in the region in 1980, and 1308.2 thousand in 1986. The difference between the two numbers is 317.1 thousand; 92.6 thousand of which was caused by the population's natural growth. The remaining, which made up 29.58% of the total increase, were immigrants.

Self-providing-grain population emerged for the first time in 1980. In that year, the regional population was 14.9 thousand. In 1986, it increased to 229.3 thousand. If the part caused by setting new towns is deducted, the other was 177.7 thousand, which makes a percentage of 23.41% in the total increase.

The last factor is natural growth. The natural increased town population was 65.6 thousand, and was only 8.6% of the total. So, this factor didn't play a very important part in the town population growth.

The unprecedent growth of the town population is closely related to the rapid development of commodity agriculture, rural industry and tertiary industry[2]. To prove this conclusion, three simple relative analyses were made. In these analyses, the development level of an area's industry and agriculture was specified as the gross production value of the area's industry and agriculture; the tertiary industry was expressed by the total volume of retail sales of social commodities; and the scale of rural enterprises was regarded as the employment number in rural enterprises. The three indexes are respectively related to town population. Three related coefficients are respectively 0.823, 0.948 and 0.849, having a validity level of 99%. These show that the more developed an area's industry and agriculture, tertiary industry and rural industry are, the more the town population is. There are two rea-

sons for this. On the one hand, the changes of traditional agricultural structures have brought about great structural releasing forces and led to a great number of surplus rural labor forces which are eagerly searching for new employment. On the other hand, the big increase of the region's industry and other non-agricultural sectors have created a great number of employment opportunities. As the surplus rural labor forces in the Zhujiang River Delta couldn't satisfy the demand of the labor forces, labor forces outside the Zhujiang River Delta were attracted to the region for the purpose of higher incomes. Immigrants, who were mostly employed in the town's industry and tertiary sectors, accelerated the growth of the town population.

Lastly, with the dramatic growth of the town population, the built-up area of towns has expanded rapidly. In 1980 the area was 106.06 km^2, and in 1986 350.16 km^2. The annual growth rate reached 22.03%, which is higher than the growth rate of the town population. This shows that the rural landscape is being changed to an urban landscape. The change is the expression of the region's urbanization. It is an objective regularity that the expansion of town land is quicker than the growth of the town population. But, however, it must be noticed that waste of town land has been very serious. As Table 3 shows, the average

Table 3 Change of built-up area of towns at counties in the Zhujiang River Delta (1980-1986)

Area	Built-up area of towns (km^2)				Built-up area per capita	
	1980	1986	Number of increase	Annual growth rate (%)	1980	1986
Panyu	8.57	12.08	3.51	5.89	80.74	86.21
Zengcheng	2.53	22.90	20.37	44.36	50.61	255.49
Zhongshan**	11.60	78.19	66.59	37.44	153.21	684.62
Shunde	10.55	20.00	9.45	11.25	63.11	101.68
Nanhai	8.69	18.59	9.90	13.51	79.89	139.16
Sanshui	2.12	9.05	6.93	27.37	52.27	96.94
Gaoming	3.53	9.15	5.62	17.20	232.90	194.19
Taishan	12.96	23.99	11.03	10.81	130.85	135.55
Kaiping	4.20	12.98	8.78	20.69	105.59	105.56
Enping	8.03	23.12	15.09	19.27	251.01	239.60
Xinhui	9.59	21.06	11.47	14.01	72.14	110.04
Heshan	0.82	5.58	4.76	37.66	49.82	86.53
Bao'an	4.08	18.17	14.09	28.27	338.39	164.80
Doumen	0.90	25.30	24.40	74.37	71.14	559.13
Dongguan***	17.89	45.00	27.11	16.62	138.91	259.12
Total	106.06	350.16	244.10	22.03	102.25	194.94

*, **, ***: Same as Table 2.

built-up town area per capita in the Zhujiang River Delta increased from 102.05 m^2 in 1980 to 194.94 m^2 in 1986. That surpasses the average value of national cities and towns, which is estimated to be 80–140 m^2. The Zhujiang River Delta is one of the areas in China with the highest grain production, and should have a lower average of town land per capita. The fact, however, is the exact opposite. It has been discovered that many town government didn't control the scale of requisition land very efficiently, and so a lot of problems have emerged such as: taking over more land for use than required; taking the land earlier than the time when it will be used; or even taking it for unknown purposes. These must be taken seriously. In the process of urbanization, the economization of town land should be brought to the attention of more people.

II. THE CHANGE OF TOWN FUNCTIONS FROM CENTRAL PLACES TO SPECIALIZED TOWNS

Before 1978, commodity economy was so under-developed that agricultural production was confined to a much smaller area. Almost all towns only functioned as central locations which provided primary producing and living services for their neighboring villages. The close of markets for trading produce and the prohibition of farmers' employment in industry and commerce made towns lack power of development, have simple landscapes, and basically function all as the same one another. Since the implementation of reforms and open policies, a series of reforms has been practiced in the countryside and a great number of labour forces freed from agriculture have been employed by secondary and tertiary industries. At the same time, the combination of foreign capital, installations and technology to the factory buildings of bankrupting rural enterprises has greatly accelerated the development of rural enterprises and greatly changed the region's economic structure. The ratio of industry production values to the total production values of industry and agriculture rose to 79.66% in 1986, from that of 52.69% in 1980.

Towns are the centers of the regional economy. The above changes in the regional economic structure also caused the economic structure of the towns to change. Industry has been annually increasing the economy of the towns. The rate of workers to social manpower increased to 46.5% in 1986, from that of 1980 which was 42.69% (Table 4). During that same period, town industrial values increased 3.2 times, from 2.444 billion yuan (RMB) to 9.047 billion yuan. So, a vast number of towns specializing in industry emerged in the Zhujiang River Delta.

It can also be noted that because the region's economy gradually transfers to the outgoing economy, town industry locations have completely changed past principles of both "obtaining raw materials, processing products, and selling products all them in the

very same place," and "creating industry which will satisfy regional agricultural demands, and also doing well in industry which will help the agriculture as well." Presently, new principles take economic efficiency first of all, and so, the sources of raw materials are expanded to foreign countries, and the products are exported[3]. Therefore, not only has the number of factories in the region greatly increased, but also the character of the factories has significantly changed. Many factories, which in the past produced farm tools or processed grain and other products, have begun to produce electronic equipment for family use, textiles, clothing, toys, and so on. In these factories imported advanced technology and equipment took the place of the out-of-date technology and equipment, and thus, the production scale increased.

Table 4 Change of structure of social manpower in towns in the Zhujiang River Delta (%)*

	1980	1984	1985	1986
Industry	42.69	44.82	44.06	46.50
Construction	5.62	7.75	8.02	7.26
Transportation	7.01	5.89	4.30	4.37
Commerce and services	15.92	17.97	16.15	15.93
Other	28.76	24.11	27.47	25.94
Total	100	100	100	100

* : Same as Table 2.

Based on the agglomeration and scale benefits, a number of columning products have been created in many counties. For example, "Zhongshan-a vat" (producing washing machines); "Shunde-a fan" (producing electric fans accounts for more than 20% of the national production, and makes Shunde one of the most important producing sites in China); "Xinhui-a piece of thread" (producing chemical fabrics and textiles, and also is a new site in the textile industry of Guangdong); and "Sanshui-a cup of water" (being one of the main places in Guangdong which produces a sports drink). As a result, many towns have their own specialized products, and therefore become specialized towns.

Industrial towns can be classified into two main types. One type takes the example of Shunde and Nanhai, and the other type takes the example of Dongguan and Bao'an. The former, which have a better economic base, seized the opportunity for development at the right time, and thus have developed more rapidly. Take the example of Beijiao Town in Shunde County. In the end of 1970s, the town took advantage of the engineering industry. After 1978, they made full use of this by timely, adapting to the changes in the market, and by absorbing foreign capital to promote the production of their electric fans. Now it has become one of the national productior sites. Again, for example, Guanshan Town, in

Nanhai County. The town which was once the center of a commune, is now the largest wholesale marketer of cloth in Guangdong Province. In 1986, there were 380 textile factories and about 6,000 looms. Half of the labourers there were employed in the textile industry. The revenue of the textile industry took 65% of the total revenue. 150 stores specializing in selling cloth spread throughout the entire town. Purchasing agents from outside of the town filled the hotels and hostels. Several thousand selling locations were distributed all over the nation. Like the above two towns, many other towns also have obvious specialized industry (Table 5).

The latter have the advantage of being in good geographic locations. By the means of creating "Sanlaiyibu" enterprises (which use foreign raw materials and then export their products), industrial towns are formed. The specialized towns however have no obvious columning industry. They were mainly clothing, toy production, and electronic industries, which weren't closely related to the local economy. Not only do the raw materials come from various countries, but also the products are labeled under all kinds of various trade marks.

Table 5 Examples of columning industries of towns*

Town	Columning industry		To total industrial output value (%)	
	Name	Output value in 1984 (10,000 yuan)	1980	1984
Guizhou	# 1	16,449	25.50	77.41
Beijiao	# 1	7,909	46.66	81.92
Lunjiao	# 2	5,681	75.91	52.29
Pingzhou	# 1, # 3	10,091	62.09	75.07

* Same as Table 2.

1—Electric equipment; # 2—Textile and clothing industry; and # 3—Engineering industry.

Towns specializing in industry have mainly aggregated in Taishan, Enping, Kaiping, Gaoming, Heshan and other counties. Some towns which are along main communication lines, or which are situated at the hub of communications, have specialized in construction and transportation.

III. THE CHANGE OF TOWN SPACIAL DISTRIBUTION FROM BEING CENTRALIZED TO BALANCED

Firstly, the density of towns is high in the core and low in the peripheries. But the gap has been reduced. The Zhujiang River Delta is one of the densest areas of Guangdong and China in town distribution. Its town density in 1986 was 1.146 towns per square kilometer, which was much higher than that in the rest of Guangdong Province. The density is highest

in the core such as Nanhai, Panyu and Shunde counties, and in Zhongshan City, etc. That of Sanshui, Xinhui and Bao'an counties, and Dongguan City are next. It is lowest in the peripheries such as Enping, Doumen, Zengcheng, Heshan and Gaoming counties. We selected the indexes of the population density, the total production value of industry and agriculture, and the total volume of retail sales of social commodity, and then related every index to town density of each county and city. The three regression equalities were formed respectively. The three single correlation coefficients are 0.65, 0.51 and 0.47 on the validity level of 99%, 95% and 90% respectively. The 0.71 complex correlation coefficient is even more remarkable. It shows that the higher the population density, the more developed industry and agriculture, and the more flourishing the commerce, the denser is the town distribution. Comparing the year 1986 with 1978, it was discovered that the town density in the peripheries increased more quickly than in the core. So, the spacial difference of town density has been greatly reduced. In 1978, Shunde County had the highest town density, which was 1.87 towns per square kilometer, while Gaoming County had the lowest one of 0.05. The former was 18.4 times as high as the latter. In 1986, Panyu had the highest density of 2.09 towns per square kilometer, and Taishan had the lowest one of 0.79. The former was only 2.6 times higher than the latter. In 1978, Gaoming, Enping, Bao'an and Taishan were sparcest in town distribution with a density of 0.06 town per square kilometer. In recent years, their densities have increased 12—20 times. But the counties and cities in the core such as Shunde, Nanhai and Zhongshan, have kept smaller growth rate. The gap between the core and the peripheries has been reducing.

Secondly, there is a bigger growth speed of town population in the peripheries, and a smaller one in the core. By analysing the growth speed of the town populations in every county or city, it reveals that the towns in the peripheries, such as Gaoming, Kaiping, Heshan and Bao'an, grew more rapidly at an average annual growth rate of 20.39%. Next are Sanshui, Enping, Zengcheng and Taishan, with an average annual growth rate of 8.97—2.39%, and Panyu, Zhongshan, Shunde and Nanhai, in the core had the lowest growth rate. Generally, there is a tendency for the town population to grow faster in the peripheries, and slower in the core, except for in a few counties and cities.

Making a linear regression by using the growth rate of the town populations and the total production value of industry and agriculture of each county or city, we discover that the correlation was not remarkable. It showed that the growth of town populations was not as fast or slow as the growth of economy. For example, total production value of industry and agriculture developed at an average annual growth rate of 19.21% in the core from 1980 to 1986, while its town population only had an average annual growth rate of 4.36%. In the meantime, the total production value of industry and agriculture, and town population increased at an average annual growth rate of 14.21% and 20.09%, respectively in the peripheries. So, because the economic growth rate is not enough to explain the increasing town population, other reasons must also be considered. One reason is that the bases were

diffeent. With better town facilities and a larger population, town population in the core grew relatively slowly. The towns in the peripheries have a weaker base and a smaller population, therefore town population grew relatively rapidly. The other reason is the difference in economic development patterns. Based on more developed economy and higher labour productivity, economic development in the core didn't primarily result from the increase of labour forces. The RMB 10,000 yuan increase in total production value of industry and agriculture or town industrial value created 0.23—0.75 town population; while there was a less developed economy and lower labour productivity in the peripheries and so labour forces still were a main factor of economic development. The same increase as the above needed 2.13 to 5.10 town population. Therefore, on the condition that economic development speeds are equal, town population increased more quickly in the peripheries than in the core.

Thirdly, industrial towns are concentrated in the core, but they have been expanding to the peripheries. By analysing the function of towns, we find that the industrial towns were concentrated in the core, such as Shunde, Nahai, zhongshan and Panyu, etc. in 1986. Although the above distribution feature existed more or less in 1980, the concentrating degree of the industrial towns was much higher. In 1980, there were 45 industrial towns in the Zhujiang River Delta, 35 of which (that is, 77.8% of the total towns), were concentrated in the core. However, in 1986, the total number of industrial towns were 81, 53 of which were situated in the core and took a proportion of 65.4%. These show that the rate of industrial towns in the peripheries have gradually increased. Consequently, the expansion of industrial towns was mainly pushed to Dongguan City and Bao'an County, which are in the east of the delta. In 1980, Bao'an had only 2 industial towns. But in 1986, the number already rose to 13, with an increase of 11 towns which made up 58% of the whole increase in the peripheries.

There are two reasons to explain the expansion of towns. One is that the industry of the peripheries has developed rapidly in recent years, and the greatly increasing industrial employment are having more and more share in the total town employment. Take the example of Bao'an County. Because of its location on the border of Shenzhen City and Hongkong, "Sanlaiyibu" enterprises in Bao'an increased by a large scale, and so, towns usually have transformed from central places into industrial towns. The other reason is that the town industry in the core, which has been developing relatively well in recent years, promotes the development of tertiary industry, such as commerce, services and banking, which have thus change town functions from being simple to complex. The proportion of industrial employment increased in some towns and decreased in other towns. For example, the towns Chenchun and Rongqi in Shunde County. The rate of workers to the total employment number came down to 58.23% and 69.94% in 1986 respectively, from 65.32% and 71.22% in 1980. Another example is Daliang Town. Its proportion of workers dropped to 46.8% in 1986, while it was 57.62% in 1980. At that same time, the proportion of com-

merce and services employment rose from 15.89% to 24.64%. Therefore, these towns haven't specialized in industry, but have had various other functions.

Fourthly, the spacial distribution of towns has changed from being centralized to balanced. The analyses mentioned above have revealed that the spacial difference in the region has been reduced. So, the spacial distribution of towns must have been influenced. To explore the changing tendency, we used the Lorenz Curve to analyse the spacial distribution of towns in 1978, and in 1986, respectively. It was computed that the centralization indexes was 62.66% in 1978. The result shows that the distribution pattern of the towns was centralized. At that time, most towns were situated in the core, for instance; Nanhai, Panyu, Shunde. But in 1986, the centralization index came down drastically to 24.22%, which shows that the spacial distribution of the towns became balanced. Three reasons led to the change.

The first is the increase of organic towns. Before 1978, organic towns were composed of the county's towns and fewer district's towns. The number of towns was small and towns mainly concentralized in the core. In 1986, because of canceling the districts in the counties and the setting up towns, it formed a town in every district. Since the area of one district is similar to another, and the distribution of districts is relatively balanced, the distribution of towns have equal features.

The second is the change of the spacial economic structure. Prior to the reforms and open policies, the spacial economic structure of the region radiated toward southern areas of the region from only one center—Guangzhou City. The closer the counties or cities near Guangzhou, the faster the towns grew, and the more the number of towns also grew. So, a centralized pattern of town distribution was formed. After that time, Hongkong and Macau gradually become new radiant centers as well, and participated in the action of the region's economy. The new pattern of "two centers and two radiations" had been formed[4]. In addition to that, there are eight channels to the ocean in the Zhujiang River Delta, by which each town can be directly connected with Hongkong and Macau. So, every town has a relatively equal chance of development . This easily leads to a balanced distribution of towns.

The improvement of transportation is another reason. In the past, the Delta's road transportation was very unconvenient because of the divisions caused by the network of waterways. Since 1987, with the development of the economy and the strength of connections within the region and outside the region, various counties or cities have built up new highways and bridges. Consequently, the accessibility in the region has been greatly raised, and the network of highways has replaced the radiant system. Thus this accelerated the change of town distribution to being balanced.

In a word, the features of town development in the Zhujiang River Delta are high in number, high in growth speed, specialized in industry, and balanced in spacial distribution.

REFERENCES

[1] 许学强等，珠江三角洲的发展与城市化，中山大学出版社，广州，1988.

[2] 许学强，张文献，对外开放地区农村城镇化动力初探—以广东四邑为例，热带地理，6 (2)，1986.

[3] 许学强，胡华颖，对外开放对珠江三角洲市镇发展的影响，地理学报，43 (3)，1986.

[4] 许学强，珠江三角洲市镇发展空间模式的转化，中山大学学报（自然科学版）论丛 (12)，地理学论文集，(2)，1987.