CHARACTERISTICS OF GEOTEMPERATURE FIELD AND THE TECTONICS OF CRUST AND UPPER MANTLE IN EASTERN CHINA

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The characteristics of geotemperature distribution in Eastern China

Almost active hydrothermal areas distribute in the epicontinental region of Dashinganling-Taihangshan-Wulingshan gradient zone of gravity in Eastern China, and the water temperature is intermediate or low. The gradient of geotemperature in the sedimentary blanket falls with increasing in basement depth. The temperature profile corresponds to the relief of basement. The higher geothermal anomalies appear in uplifted region of the upper mantle, and the strike of the deep geotemperature anomaly corresponds to that of the tectonic structure.

As a whole, the temperature distribution of the geotemperature field in Eastern China has an increscent trend from the north to the south and from the west to the east. This trend correspondes to the change of the decrease in the crustal thickness.

The relation between the geothermal anomalies and the tectonic of the crust-upper mantle

1. The geotemperature increases in the region of the uplifted basement

From statistical analyses of the geophysical data in Shungliao plain, Huabei plain and Jianghan plain it is clear that the geothermal anomalies closely relate with the basement relief. On the positions of the uplifted basement usually exist higher heat flow, higher geotemperature gradient or upward geotemperature contour(Fig.1).

2. The relation between heat flow and the thickness of the crust

In the Eastern China the geotemperature increases from the west to the east, which corresponds to decreasing in the crustal thickness from the west to the east(Fig.2).

All sedimentary basins in the epicontinental region of Eastern China are placed on uplifted regions of the upper mantle, where the thickness of the crust is more thiner. Figs. 3 and 4 show the crustal structure of some typical regions in Eastern China and the profile of the crustal structure of Shishui-Lianyungang, respectively.

3. The high heat flow values appear on the uplifted positions of the high conductive layer in the crust and upper mantle

The researches of the seismic prospecting, the MT method, the gravity method and the Curie point method show a quantitative relation between the heat flow and the depth to the conductive layer of the crust-upper mantle in Huabei region (See Fig.5).This relation can be well explained by Adam's(1978) experience formula $h=h_0 q^{-a}$(h: depth to the conductive layer, q: heat flow), if h_0=155Km and a=1.46, where q is in HFU.

In other tectonic regions of China also exist these correlations between the heat flow and the depth to the high conductive layer in the upper mantle, but only the constants h and a take different statistical values in the formula.

4. The relation between the heat flow and the change in material states of the crust as well as the mantle

The MT method presents that there is a thin high conductive layer in the crust as well as in the mantle some regions. The regions of the high heat flow in China, for example Huabei Cenozoic rift valley, Xialiaohe rift valley and Tancheng-Lujiang Fault System etc. almost all have high conductive layers in the crust, which correspond with low velocity layers(See table 1). But in the Hunan tectonic region, and Erduoshi platform the high conductive layer were not discovered, and there the heat flow is low, about 1.0HFU.

The high conductive layer is originated by partial melting of the layer.

5.The relation between Curie temperature and the heat flow

In recent years many researchers calculated the depth of Curie temperature by using the materials of aeromagnetic survey in some regions. The result in the Xiayangzi region is shown in Fig.6. On both sides of the Tancheng-Lujiang Fault System disparity in the depth of Curie temperature is about 5-7 Km, and in the west side is deeper than that in the east side. This characteristic feature just corresponds to the fact that the heat flow in the east side is higher than that in the west side.

A preliminary result of the tectonic background in Easten China

The deep tectonic background of the geotemperature field in the epicontinental region of Eastern China is directly connected with the motions of the Pacific and Eurasian plates.

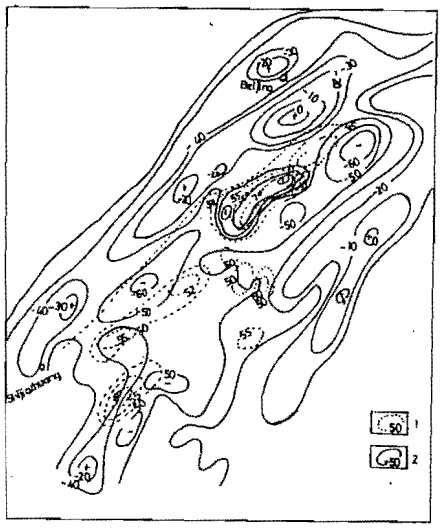

Fig.1 The gravity anomaly and background temperature(1000m) contours in Huabei
1. geotemperature, 2. gravity anomaly

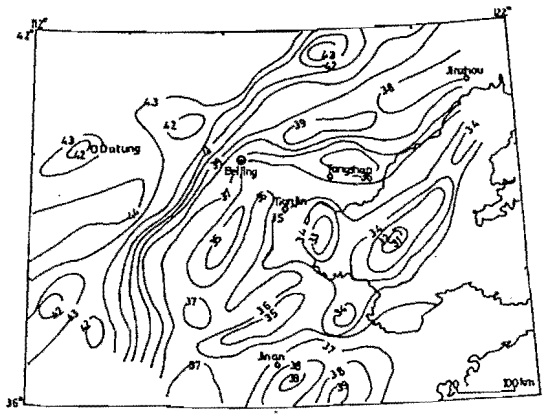

Fig.2 Moho depth contour in Huabei region (Unit:Km)

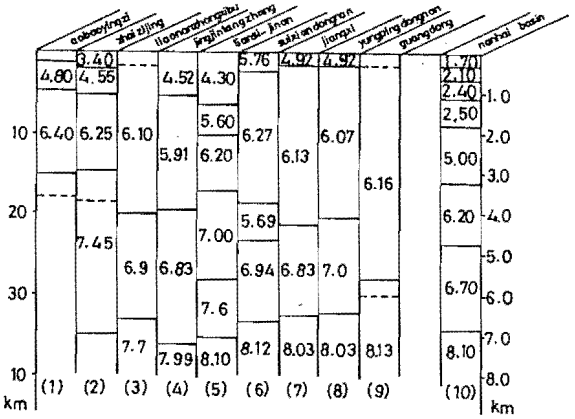

Fig.3 The crust structure of some typical regions in eastern China (Unit:Km/Sec.)

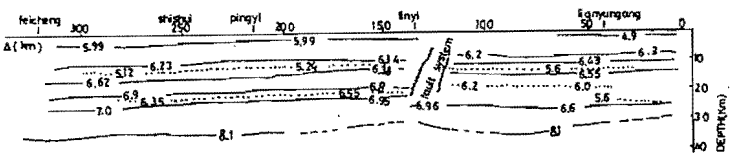

Fig.4 The profile crust structure of Shishui-Lianyungang (Unit:Km/Sec.)

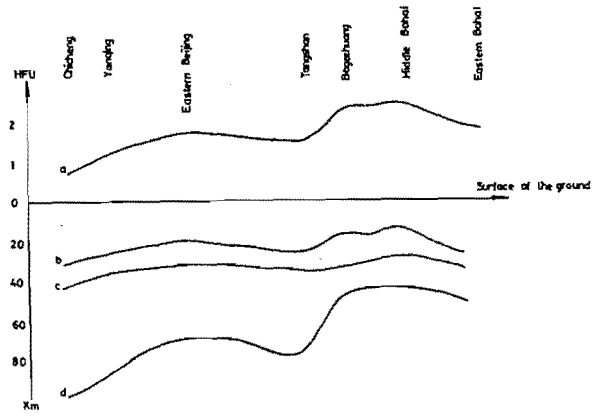

Fig.5 The relational figure between the heat flow and the structure of the crust-upper mantle in north region of Huabei
a. Heat flow, b. Curie temperature
c. Moho discontinuity, d. High conductive layer in upper mantle(1a-mi)

The heat flow and the depth of high conductive layer in some regions of eastern China

Table 1

REGIONS \ DEPTH(Km) LAYER	IN CRUST	IN UPPER MANTLE	HEAT FLOW (HFU)
The south region of Dongbei	15—18	70—80	2.14
Erduoshi	———	100	1.0*
Bogezhuang	13—15	45—50	2.32
Huaitai	28	90—95	1.77
In the depresion of Jizhong	20	60—70	>2.0*
In the depresion of Dongliu	27	74	
The basin of Beijing	20	50—60	1.28—1.84
Tancheng—Lujiang Fault System	16	50—60	1.49—2.36
Jiaodong	———	>300	1.15—1.20
Tangshan	20—23	70	1.29—1.66
Haicheng	17	?	>1.5*
Bohai	?	45—50	1.72—2.36
Hunan	———	180—220	1.0*

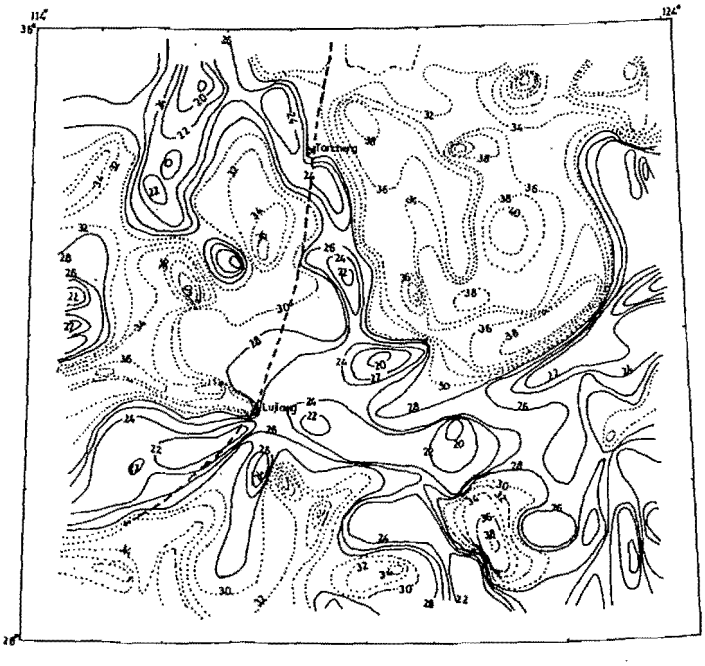

Fig.6 Curie temperature contour in Xiayangzi region (Unit:Km)