Round Sky and Square Earth (Tian Yuan Di Fang): Ancient Chinese Geographical Thought and its Influence

Zhao Zhongshu, Peking University, Department of Geography, Beijing, PR China

ABSTRACT: “Round sky and square earth” is a basic concept in the tradition of ancient Chinese geography. It appeared at least two thousand years ago and has influenced Chinese geography significantly — both for good and for ill. As an academic subject in China, the history of geographical thought is new. It has become “the center of geographical history” (Yang 1989, p. 7; Wang 1982, p. 4). This transformation began in the 1980s. Earlier studies of the history of ancient Chinese geography paid more attention to the history of exploration, cartography, and geographers themselves. It neglected serious study of the concept and influence of the idea of round sky and square earth. This paper discusses this concept, its influence on ancient Chinese cartography, and its significance in early geographical literature, specifically the Geographical Society Yu Gong (Tribute of Yu).

Evolution of Round Sky and Square Earth Concept

Geographical thought, gradually evolving as part of human development, relates to the environment, scientific thought, and human productivity. As we all know, China’s main territory consists of a landmass of continental proportions. The original centers of Chinese civilization are such places as the Yellow River and the Yangzi River. Large mountains, big rivers, and other natural features presented obstacles to ancient people’s activity, and consisted of a closed and differentiated geographical hierarchy. To survive, the people had to use the attributes of their natural environment in accordance with their basic perceptions and productivity requirements. Their perceptions gradually accumulated and became summarized in ideas or concepts. “Round sky and square earth” is such a concept. In the Zhou Dynasty (1100-770 BC), it was said that one must “raise one’s head to see astronomy (heaven), hang one’s head to watch the earth (geography)”. Because astronomy was connected with the four seasons, determining periods of sowing, harvest, and storage, much attention was paid to it. Accordingly, astronomy and geography have been closely connected from the very beginning of Chinese history.

What could be called the “scientists” of the time sought to learn the structure of sky and earth. One opinion held that “the sky is like a round plant, the earth like a square chess plant.” (Fang 1975). According to Zhou Bi Suan Jing (astronomical algorism), the earth is considered as a great square. One side is as long as 810,000 Li (405,000 km), with the height of the sky from earth at about 80,000 Li (40,000 km). The earth is perceived as a stable body.

In the Han Dynasty (25-220 AD), Zhang Hong, a famous astronomer (78-139 AD), pointed out: “The sky is like an egg. The earth is like the yellow core inside. Half of the sky is above the earth, half below the earth. Moreover, the sky is like a moving ring, and enables us to see the 28 stars change their positions.” (Wei 1972). Opinions and discussions concerning the structure of sky and earth varied. But although each historical period had a new one, no single period made any basic change to the general principle of round sky and square earth. Accordingly, the survey of the altitudinal angle of the sun (at noon) and the polaris (at night) in equinoctial times made by ancient Chinese, was not related to the idea of spherical earth. Therefore, unlike the thinkers of ancient Greece, the ancient Chinese were not able to calculate the perimeter of the earth (Song 1990, pp. 2-21).
“Round Sky and Square Earth” as it Applied to Cartography

It has been said that early geographic knowledge was perhaps first expressed by map rather than in words (Hou 1962, p. 2). The earliest record about maps dates back to the Jiu Ding map of the Xia Dynasty (2100-1600 BC) (Gao 1979, p. 530). But as old maps were printed on wood or other materials, the scale was generally larger than that used in books. It was difficult to transmit these to later periods. In many map and record books, the maps were lost, though the records remained. For example, Yun He Jun Xian Zhi Tu (Record and Maps of Counties of the Tang Dynasty, 618-917 AD) was published in 813 AD, but the maps were lost during the North Song Dynasty (960-1127 AD). The title had to be changed to Yun He Jun Xian Zhi (Record of Counties of the Tang Dynasty).

In 1973, three ancient maps unearthed from the Mawangdui Han Tomb surprised the whole world. They were from at least 1200 years ago (Tan et al. 1975, p. 13). In 1986, another seven ancient maps were unearthed from the Fangmatan Qin Tomb (Gansu Province). They are the earliest Chinese maps known to survive in the world today, (Cao 1990, pp. 4-5) and many experts are today studying them. They show that the ancient Chinese developed their own theories and methods of cartography, which were closely tied to the idea of round sky and square earth.

i) No evidence of longitude and latitude has been found among the ancient maps. Longitude and latitude are two important components in map making. They are connected to the concept of a spherical earth which appeared in the Western world long ago.

ii) No global map has been found. The ancient Chinese considered their world to be the center of the greater world. This is the meaning of China as the Middle Kingdom. As they did not advance a spherical earth concept, no global map was made.

iii) High level regional maps. Pei Xiu, a famous cartographer (223-271 AD) summarized the six principles of geographic description and map making. The method of Hua Li Ji Fang (drawing checked with distance as the foundation of map making) may be traced back to the geographical thought of square earth. It expresses the plane coordinate concept, which enables us to give any object an accurate position in space. From this point of view, the round sky and square earth concept speeded up the development of ancient Chinese regional cartography.

For our purposes, regional maps can be divided as follows:

1) Topographic maps, which included mountains, rivers, roads, and residential areas.

2) Garrison maps with color, which included troop names and numbers, passes, and other military information (Cao 1975, p. 13).

3) Economic maps. Among the 7 maps of the Fangmatan Qin Tomb, there are three on forestry which included the kinds of wood, the areas of growth, the places where trees were felled, and the degree of timber growth linked with roads and residential areas.

4) Administrative division maps. A county map of Qin Dynasty (221-206 BC) was found in the Fangmatan Qin Tomb (Zhu 1990, p. 3).

5) Land maps, which served the needs of agricultural production.

6) Zhao Yu maps, (tomb maps) which show the architectural planning of a tomb.

In the early Zhou Dynasty (1100-770 BC), the King of Zhou wanted to build a new town near Luo River. He sent someone to measure the land and make a map, and finally used the map to arrive at decisions concerning the area (Hou 1962, p. 3). Maps therefore played an important role in solving practical questions.

Round Sky and Square Earth’s Influence on Early Geographic Works – Yu Gong

Yu Gong (Tribute of Yu) is the earliest work of geography in China. In the 1930s, Professors Gu Jiegang (1893–1980) and Tan Qixiang (1911 – ) organized a learned society called the “Institute of Yu Gong” and published a new journal entitled Yu Gong, recognizing Yu Gong as “the first chapter in the Chinese evolutionary history of geography” (Yu Gong 1934). The English name of this journal is “The Chinese Historical Geography”. A total of 7 volumes, 82 issues, and 708 papers have been published to date (Xu 1981, pp. 211-219). Chinese historical geography has changed gradually from “evolution geography” into an academic subject, becoming one of the necessary branches of geography. But for Yu Gong research itself, we still need to know which parts are reflections of the real world, which parts are only an ideal, and how the Yu Gong reflected the square earth concept.

The Conception of Nine States (Regions)

Yu Gong is the first book to express the concept of 9 States (regions). As the idea of 9 States is an ideal geographical concept, there is no connection here with classical struggles and real states. The territory among the 9 States is divided by mountains or rivers. It is a natural regional planning concept reflecting people’s desire for a united country. Since Chinese cosmography was oriented toward the notion of square earth, it limited ancient Chinese efforts to the exploration of the unknown world and to a more focused attention on one’s immediate environment. The book described soil divisions, travel conditions, products, natural features, articles of tribute among each state, and regional differences between states. In fact, it is a regional physical geography. In later years, State planning became a synonym of China.