The latest Tectonic Map of China

The latest tectonic map of China — the 1:5000,000-scale Tectonic Map of China and Adjacent Regions, with a guide titled "The Tectonics of China from a Global View", has been published both in Chinese and in English by the Geological Publishing House, Beijing, China (1999). On the basis of regional geological mapping of China and comprehensive research into geology, geochemistry and geophysics, the map was compiled by the Tectonic Division of the Institute of Geology, Chinese Academy of Geological Sciences (CAGS). It is the fruit of the collective labor of leading Chinese geoscientists specializing in various disciplines of the earth science, and shows the latest achievements in the study of Chinese tectonics.

First, the map portrays the continental crusts formed and recycled in various geological times, with crustal ages represented by climactic orogeny or principal deformation. Second, numerous major tectonic elements are marked out, such as sutures, transform and strike-slip faults, rift zones, modern Benioff zones and other important fault belts, high-pressure and ultrahigh-pressure metamorphic (HP-UHP) belts, and ophiolites and ophiolitic melanges. Third, the distribution and formation environments of the main rock types, e.g., granitoids and volcanic rocks, are indicated. Fourth, the information provided by the map also includes sedimentary basins which have not been subjected to strong tectonism, magmatism or metamorphism. The present map thus clearly shows the tectonic evolution of China in terms of space-time as well as the geological background of resources, environment and disasters.

The coverage of the map extends to the surrounding regions of China: the northern sector includes the southern Siberian platform, the southern one reaches as far as the northern Indian shield, the western one covers much of Kazakhstan, and the eastern one stretches to the Japanese islands. So, from the map one can readily see the relationships between the tectonics of China and the major tectonic belts of the globe, the typical representatives of which are the grand Mongolian arcuate structure encircling Siberia, the structural feature of the collision between the Indian plate and the Eurasian plate along the Yarlung Zangbo suture, and the West Pacific trench-arc-basin system.

The publication highlights the tectonics of China from the viewpoint of global geodynamics, with its development dominated by three tectonic domains — the paleo-Asian domain, the Tethyan domain and the circum-Pacific domain. The first one was formed under the influence of the paleo-Asian Ocean dynamic system, while the second and the third ones came into being as the result of the action of two successive dynamic systems — the Tethyan-paleo-Pacific and Indian-Pacific dynamic systems, respectively. Because of the effects of those global dynamic systems in succession, with their superposition and compounding in China, one and the same area has undergone different dynamic processes in different tectonic episodes, which caused, in China and its adjacent regions, the highly complicated polycyclic processes of tectonic evolution by stages, the quite distinct mosaic structure and the layered decoupling relations of the crust-upper mantle, i.e. the overpass-type architecture. That is why China is the most complex region in global tectonics.

Compared with other continents, Asia, where China is located, is a composite continent created in the Phanerozoic and consisting of the three continental block assemblages of the Siberia-affiliated, the Gondwana-affiliated and the paleo-Chinese, and the huge orogenic belts as well. In geological history, the paleo-Chinese blocks comprising those of Sino-Korea, Yangtze and Tarim were right at the junction between the two gigantic continents of Gondwana and Siberia (Siberia-North America), and belonged to the interchange tectonic domain between them. In the Paleozoic, its main body was situated to the south of the paleo-Asian Ocean and was a part of the structurally complicated northern margin of Gondwana, whereas during the Mesozoic, it was located to the north of the Tethys, and was part of the structurally complicated southern margin of Laurasia.

The Phanerozoic tectonic evolution of China has been manifested, on the whole, as the break-up of the northern margin of Gondwana, the accretion of the southern margin of the Siberian continent and the formation of the three tectonic domains of the paleo-Asian, the circum-Pacific and the Tethyan. The soft collision and polycyclic suturing between the complicated margins of the two great continents and resulting polycyclic composite orogens, polycyclic superimposed basins, as well as polycyclic tectonomagmatic metallogeny formed the salient features of the continental tectonics of China.

While absorbing the quintessence of the plate tectonic theory, the compilers emphasize the multisphere interaction of the earth and the cyclical character of geological processes, and adhere to the view of the nonuniformitarian and nonlinear tectonic evolution taking place spirally or cyclically, with gradual change and abrupt change coexisting. They point out that, like the ocean crust, the continental crust has also gone through the cycle of creating, developing and disappearance. Thus, in tectonic research it is necessary to search for not only the missing oceans but also the missing continents. The continental lithosphere is uneven and multilayered in structure, and the continental structure is, in most cases, considered thin-skinned plate tectonics of the continental crust. For this, the tectonics of China and its adjacent regions provides a good example.

To make it convenient for readers to comprehend the tectonics of China, 12 small sketch maps and 2 tables are given in the guide. They are: Fig. 1 Major lithospheric plates of the globe; Fig. 2 Simplified tectonic map of the Atlantic hemisphere; Fig. 3 The three tectonic domains of Asia; Fig. 4 Simplified tectonic map of Asia; Figs. 5 and 6 Major tectonic units of East Asia; Fig. 7 Meso-Cenozoic tectonics of East Asia; Fig. 8 Representative profiles showing the thin-skinned plate tectonics of the Chinese continent; Fig. 9 Sutures and faults of East Asia; Fig. 10 Crust-upper mantle overpass-type structure of China and adjacent regions; Fig. 11 Paleogeographic-tectonic map of the Tethys and paleo-Pacific; and Fig. 12 Sketch map showing the tectonic evolution of Asia; Table 1 Tectonic cycle subdivision and tectonic timescale of China and adjacent regions; and Table 2 Tectonic evolution of China and adjacent regions.

Following is a photograph of the Tectonic Map of China and Adjacent Regions.

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