

SHI Yafeng, ed. 2006. *The Quaternary glaciations and environmental variations in China*. Shijiazhuang, Hebei Science and Technology Publishing House. 618pp. ISBN 7 5375 3247 8, hardback. 190.00 yuan.

This book is a summary presentation of Quaternary research work accomplished in China during the last half-century. It is written in Chinese with a substantial English summary and additional summaries for each chapter. In geographical scope, the book covers virtually the entirety of continental China including Tibet and Taiwan. In timescale it ranges from possibly the oldest traces of the Quaternary glaciation to the present. The book is authored by 19 scientists under the editorship of Shi Yafeng, supported by Cui Zhijiu and Su Zhen. The editors and authors are active scientists whose names are familiar to those who have worked in China and neighbouring countries. The main methodologies used for the book besides classic geomorphology and glacier deposit stratigraphy are ice-core analyses and the science of loess.

The book comprises 19 chapters, divided into two parts: macroscopic treatments covering all of China (chapters 1–5) and detailed regional descriptions (chapters 6–19). It is accompanied by a Quaternary glacial distribution map of China at a scale of 1:5 000 000.

The book starts with a historical review and an overview of current Quaternary research in China (chapter 1), condensed in five points: a brief summary of the history since the Last Glacial Maximum (LGM), a rejection of hypotheses of low-altitude glaciation in eastern China and of the existence of an ice sheet in Tibet, ice-core results for western China, early- to mid-Quaternary history, and observed glacier and climate changes in the 20th century. The temperature decrease and permafrost expansion during the LGM, which are presented numerically, are especially interesting.

Chapter 2 is dedicated to ice-core analyses. The region covered is necessarily the western and northwestern part of the country, and the time covered extends back to the last interglacial period. Besides reconstructing paleoenvironment, this chapter studies the relationship between isotopic compositions and the observed climate. This latter aspect is especially valuable, as studies on isotopic fractionation in the interior region of the continent are rare.

Chapter 3 is the major chapter. It presents, in effect, a summary of all the regional results appearing in more detail in part two. It begins with the oldest known trace of glaciation, speculated to be older than 1 Ma BP, moving to the oldest dated trace of 0.57–0.76 Ma BP (compared to marine isotope stages (MIS) 16–18). The ice surface area reached the Quaternary maximum, and there was an estimated temperature decrease of 7–8°C and an increase by a factor of 1.3–3.2 in precipitation compared with the present. The last interglacial is estimated to have been 5°C warmer than the present and 4°C warmer than the last interstadial. A substantial part of this chapter deals with the LGM, when temperatures were 5–11°C lower, and precipitation 30–70% lower, than the present. The total glacier surface area in China during the LGM is estimated at $500 \times 10^3 \text{ km}^2$, about 8.4 times the present area. The postglacial climatic optimum, dated at 8.5 kyr BP, is estimated to have been 2–3°C warmer than the present. A secondary warm period is found at 3.0 kyr BP. These values

appear to represent unusually large fluctuations for those who are used to more maritime regions such as Europe and North America. They will no doubt be a focus of debate and intense study in the future.

Chapter 4 is dedicated to glacier deposits and the problems of dating. It includes a table of key deposits, their absolute dates and the stratigraphic positions of the samples.

Chapter 5 concerns the Little Ice Age (LIA). It contains a substantial section on the reconstruction of glaciers and climate for well-investigated regions, especially for the second half of the LIA. The peak-time cooling in western China during the 17th century is estimated to be 1.3°C lower, and the glacier surface area 20% higher, than at present.

Part two of the book (chapters 6–19) provides detailed regional information on glaciers, especially their location, area and ice volume. The chapter subjects are the Himalaya, Karakoram, Pamirs, Qangtang Plateau and Gangdise Range, Tanggula Range, Kunlun Mountains, Qilian Mountains, Nyainqêntaglha Range, Hengduan Mountains, an ice-sheet hypothesis for the Tibetan Plateau, the Tien Shan, the Altay Mountains, eastern mountain regions including Taiwan, and a summary of environmental change in eastern China. Among these chapters with regional presentations, chapter 15 on the ice-sheet hypothesis in Tibet is especially interesting. Based on a massive amount of evidence, the authors clearly demonstrate how some workers came to grossly overestimate the equilibrium-line altitude (ELA) descent during the ice ages. Misunderstanding or poor analysis of deposits and insufficient dating are concluded to be responsible for creating a hypothesis of an ice sheet that did not exist.

Much new information is presented in the book. It may, however, initiate controversy. Some dating results show different ages compared to the rest of the world, for example with respect to the peaks of the postglacial hypsithermal. The higher temperature of the last interstadial (compared to MIS 3a) certainly needs further scrutiny, but will no doubt be a stimulus to look at the established values of interstadial conditions in other parts of the world.

Accompanying the map of the Quaternary glacial distribution (scale 1:5 000 000) are ten additional larger-scale maps of intensely studied regions. They contain cartographic representations of past glacier deposits of various stages, glacier limits, the ELA of the LGM and other glacial geological and geomorphological features, including submarine Quaternary geology of the East and South China Seas. Most of the geographical names used in the text are indicated on these maps.

This monograph is without doubt an enormous accomplishment based on the progress of the last half-century in China. Substantial English summaries following each chapter and a price of 190 yuan, equivalent to US\$25, make the book accessible to all seeking Quaternary information on China.

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