Taihe Zhou · Richard J. Goldfarb · G. Neil Phillips

Tectonics and distribution of gold deposits in China – an overview

Received: 30 November 2000 / Accepted: 10 October 2001 / Published online: 17 January 2002
© Springer-Verlag 2002

Abstract Gold exploration in China has expanded rapidly during the last two decades since a modern approach to economic development has become a national priority. China currently produces 180 tonnes (t) of gold annually, which is still significantly less than South Africa, USA, and Australia. However, China is now recognized as possessing significant gold resources in a wide range of mineral deposit types. Present estimates of gold resources in China exceed 4,500 t, which comprise 60% in gold-only deposits, more than 25% in base metal-rich skarn, porphyry, and vein deposits, and more than 10% in placer accumulations. The major gold provinces in China formed during the main episodes of Phanerozoic tectonism. Such tectonism involved interaction of China’s three major Precambrian cratons, North China, Tarim, and Yangtze (or South China when combined with Cathaysia block), with the Angara (or Siberian), Kazakhstan–Kyrgyzstan, and Indian cratons. Resulting collisions included deformation of accreted oceanic sequences between the cratonic blocks. The most important ore-forming orogenies were (1) the late Paleozoic Variscan (405–270 Ma), which led to amalgamation of the Angara, North China and Yangtze cratons, (2) the Indosinian (270–208 Ma), which led to the collision of North China and South China cratons, (3) the Yanshanian (208–90 Ma), which was largely influenced by the subduction of the Izu–Bonin–Mariana plates beneath eastern China, and (4) the Himalayan (<90 Ma) indentation of the Indian continent into Eurasia. No important Precambrian gold systems are recognized in China, mainly because of reworking of exposed Precambrian rocks by these younger orogenies, but there are a few Caledonian (600–405 Ma) gold-bearing systems in northern Xinjiang. Most of China’s orogenic, epithermal, and Carlin-like gold deposits are in the reworked margins of major cratonic blocks and in metasedimentary rock-dominated fold belts adjacent to these margins. Accordingly, the major gold provinces are present along the northern, southeastern and southern margins of the North China craton, along the southwestern and northwestern margins of the Yangtze craton, in the Tianshan and Altayshan orogenic belts in northern Xinjiang, and throughout the southeastern China fold belt. Gold-placer deposits derived from these primary deposits are concentrated in the northermost part of northeastern China and along the northwestern margin of the Yangtze craton. The major provinces with significant gold in porphyry-related copper systems and base metal skarns are present in the Yangtze River area along the northeastern and southeastern margin of the Yangtze craton, in the fold belt in southwestern China, and scattered through northern China. Three-quarters of the Chinese gold-only deposits occur within the North China craton margins. Half are located in the uplifted Precambrian metamorphic rocks and most of the remainder are hosted in the Phanerozoic granite-granitoids that intruded the reworked Precambrian terranes. The abundance of granite-hosted gold contrasts the
North China craton with other Precambrian cratons, such as those in Western Australia, central Canada, and Zimbabwe, where gold is mainly hosted in the Archean greenstone belts. This difference may be explained by the multiple episodes of Phanerozoic tectonism along the North China craton margins resulting from the collision of the Angara, North China, and South China cratons, and from subduction of the Izanagi–Pacific oceanic plates underneath the eastern China continent.

Keywords China · Gold · Tectonics

Introduction

China's annual gold production has increased significantly during the last 20 years, from approximately 25 tonnes of gold (t Au) in 1980 to 180 t in 1999 (Institute of Geology, unpublished data; Cun and Ju 1999). More importantly, as major new gold resources have been delineated in many parts of China, the country has attracted growing interest from the international exploration community. In addition, a better understanding of these resources is now possible because of the recent detailed reviews in English on the tectonics of China (Wang and Mo 1995; Sengör and Natal’iin 1996; Yin and Nie 1996; Zhao et al. 1996), and a few papers that have attempted to present some aspects of China's gold resources (Xu et al. 1992; Nie 1997). However, detailed information on Chinese gold deposits is uncommon in the international literature, and there have been no comprehensive reviews in English relating regional geology and plate tectonics to the distribution of different types of gold deposits for the entire country.

This paper provides a general overview of the distribution of gold deposits in China, and specifically relates the deposits to orogenic episodes that define the tectonic evolution of China. The geology of the Chinese gold deposits mainly is compiled from recent data and information in Chinese government reports and both the western and Chinese literature, as well as from our recent visits to China and the senior author’s work in China from 1974 to 1986. The paper emphasizes links between gold deposit distribution and plate tectonics in order to increase understanding of the regional genetic controls on the gold deposits of China.

Gold exploration and the state of mining in China

China has been producing gold for more than 4,000 years (Xu et al. 1992). However, there were no detailed official records of gold production before the establishment of the People's Republic of China in 1949. Gold exploration and China's mining industry grew slowly between then and the late 1970s, but growth has been substantial since economic development began to dominate China's policies.

The definition of gold “resource” and “reserve” in China is very different from that in Western countries and this has typically led to confusion when the resource/reserve figures are translated into English. In China, resources are divided into categories A through E according to the extent of knowledge of ore control. Although categories A and B may sometimes be used to describe a “reserve” in China, in general, only part of category A is used to indicate a “reserve” within a resource. Categories A to C mainly are used to define “resources” (e.g., measured, indicated, and inferred reserves, respectively), whereas categories D and E are geologically inferred potential resources categories (e.g., undiscovered and speculative resources, respectively).

The total gold production in China has been more than 1,000 t since 1949. Currently, combined gold resources (categories A through C) in China are more than 4,500 t (Cun and Ju 1999). These combined 5,500 t Au comprise about 60% (3,300 t) from gold-only deposits (e.g., epithermal veins, orogenic lodes, Carlin-like deposits), 27% (1,500 t) from gold-enriched base metal-rich deposits (e.g., skarn-Cu, porphyry-Cu deposits), and 13% (700 t) from placer gold deposits (Fig. 1a).

Gold exploration has traditionally been carried out by geological brigades from the Ministry of Geology and Mineral Resources (MGMR), which is now a part of the Ministry of Land and Resources (MLAR), the China National Nonferrous Corporation (CNNC), the Gold Bureau of the Ministry of Mining and Metallurgy Industries (MMI), and the Gold Army. There are approximately 500,000 geologists that have carried out detailed surface