

The Sino-Korean Craton and supercontinent history: Problems and perspectives

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Abstract

The Sino-Korean Craton (SKC) is an enigmatic block in the history of supercontinents older than Pangea. Its accretion to Eurasia and the effect of the broad region of Mesozoic–Cenozoic extension in northern Eurasia that crosses the eastern part of the SKC are among several problems that need to be resolved in understanding the configuration of SKC and the overprinting of earlier histories in this block. We present a synopsis of these problems and perspectives for future research.

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Keywords: Sino-Korean Craton; Configuration; Accretion; Extension; Supercontinents

The Sino-Korean Craton (SKC: North China Block) sits squarely in the middle of one of geology's major enigmas. Its position in the Paleozoic supercontinent Pangea is well known (Fig. 1), and its role in the assembly of Pangea is becoming increasingly understood. The position and history of the SKC prior to Pangea, however, is highly controversial. Many models of the configuration of the Grenville (ca. 1 Ga) supercontinent Rodinia omit the SKC because of uncertainty about its relationship to other terranes (Hoffman, 1991; Karlstrom et al., 1999; Meert, 2001), although Zhai et al. (2003) suggested that the SKC was attached to Siberia in Rodinia, rifted away, and was then reattached during the assembly of Pangea. One of the two major models of the Mesoproterozoic supercontinent Columbia omits the SKC (Rogers and Santosh, 2002), while the other places it next to modern India (Zhao et al., 2002, 2004).

The growth of Asia as part of Pangea began in the Middle to Late Paleozoic, with its southern margin continuing to build up throughout the rest of Phanerozoic (Rogers and

Santosh, 2004; Chap. 8) involving the accretion of several exotic blocks. The blocks that form the basement of most of southern Asia were largely derived from Gondwana, but whether the SKC was ever attached to Gondwana is unknown.

In addition to the questions about the pre-Pangea history of the SKC, and its accretion to Eurasia, several important problems related to the extension of northern Eurasia during the Mesozoic and Cenozoic remain unresolved. A broad region of extension from Lake Baikal to the Gulf of Bohai crosses the eastern part of the SKC (Fig. 2; Delvaux et al., 1997), and its effect on modifying the configuration of SKC and overprinting the earlier history are unknown.

These uncertainties leave several major questions to be resolved:

- (1) When did the SKC become a craton with the approximate shape that it has today? Recent work suggests that the SKC became a coherent block at approximately 1.8 Ga when eastern and western blocks fused along the Trans North China Orogen (Wilde et al., 2002). This fusion was followed by extensive rifting (Lu et al., 2002), and the effect of this rifting on the configuration of the SKC is unclear.

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- (2) When, or over what period of time, did the SKC accrete to Siberia during the assembly of Pangea? Current information suggests that the attachment began in the west during the Permian, with closure continuing eastward through the Triassic (Fujiwara et al., 2004), but this complex process clearly needs further investigation.
- (3) How did the ocean between the SKC and Siberia close? Subduction seems to have occurred beneath Siberia during formation of the Mongolian Orogenic Belt (Buslov et al., 2004), but the effects of closure on the northern margin of the SKC are unclear.
- (4) When did the SKC attach to the South China (Yangtze) craton, partly along the Qinling–Dabei Orogenic Belt? The South China craton is generally regarded as a Cimmerian block, separated from Gondwana during the early stages of rifting of Pangea, with attachment to the SKC in the Mesozoic (Metcalf, 1996; Meng and Zhang, 2000). The possibility that the SKC fused with the South China block in the Paleozoic (Li, 1998), however, suggests that both blocks might be regarded as a single Cimmerian terrane.
- (5) Where was the SKC after the breakup of Rodinia and prior to its accretion to Pangea? The SKC apparently moved northward during the Paleozoic, but it has not been firmly linked to Gondwana either by paleontological or paleomagnetic information (Scotese and McKerron, 1990; Cocks and Torsvik, 2002).
- (6) What was the configuration of the SKC prior to post-Pangea extension? The broad region of Cenozoic extension that includes the eastern part of the SKC has had an unknown effect on the pre-Cenozoic shape of the craton and on the isotopic systems in older rocks (Liu et al., 2001; Ren et al., 2002).

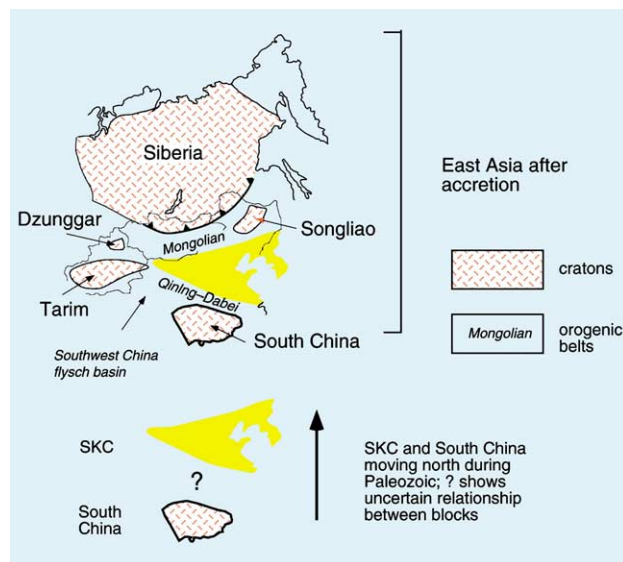


Fig. 1. Possible movements of SKC and South China to accretion into Asia.

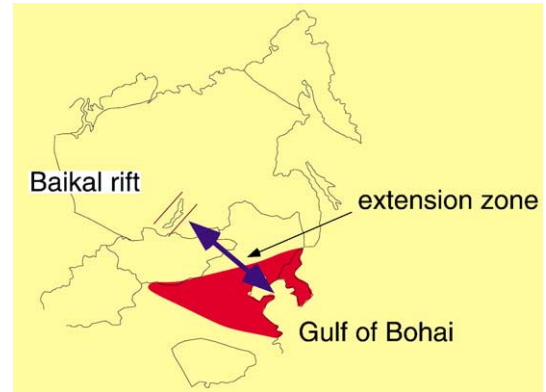


Fig. 2. Extensional zone from Lake Baikal rift to Gulf of Bohai.

The papers in this Special Issue of *Gondwana Research* are welcome additions to the information needed to resolve some of these questions.

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