Paleocontinents in Xing'an-Mongolia Orogenic Belt (XMOB)

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Abstract According to new data of field observation, the youngest detrital zircon age and magmatic zircon age, four Precambrian blocks have been recognized in the Xing'an-Mongolia orogenic belt (XMOB), including the Erguna block (EB), Xing'an-Airgin Sum block (XAB), Songliao-Hunshandake block (SHB), and Jiamusi block (JB).

Keywords Xing'an-mongolia orogenic belt · Precambrian · Paleocontinents

1 Precambrian Blocks in Xing'an-Mongolia Orogenic Belt

The Central Asian Orogenic Belt (CAOB) extends from Ural area of Russia in the west, via Mongolia, to Far East area of Russia and Inner Mongolia, and Xing'an areas of China (Jahn et al. 2000; Jahn 2004; Windley et al. 2007). The CAOB takes a wide area from Xinjiang in the west, via Inner Mongolia, to northeast China in China. East segment of the CAOB extends across Inner Mongolia, Heilongjiang, Jilin, and Liaoning provinces and is called Xing'an-Mongolia orogenic belt (XMOB, Ren et al. 1980). According to new data of field observation, geochronology and geochemistry, four blocks have been recognized in the XMOB (Fig. 1, Xu et al. 2015), including the Erguna block (EB), Xing'an-Airgin Sum block (XAB), Songliao-Hunshandake block (SHB), and Jiamusi block (JB, Fig. 2).

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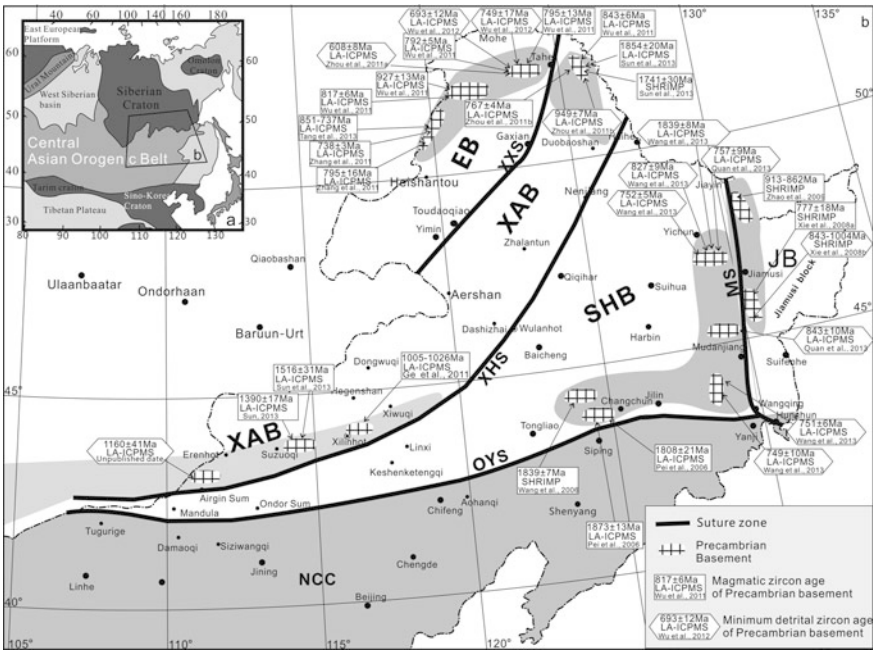

Fig. 1 Pre-Devonian blocks of the XMOB. **a** Location of the CAOB, **b** blocks in the XMOB (after Xu et al. 2015)

2 Erguna Block (EB)

The oldest Neoproterozoic intrusion in the EB includs alkali feldspar granites with ages of 792–927 Ma in Mangui and Bishui areas (Wu et al. 2011) and four stages of magmatic rocks (about 851, 792, 762 and 737 Ma) in Shiwei–Enhe area, which are characterized by syenogranites, bimodal igneous rock associations, and granodiorites that formed in an extensional environment related to the breakup of the Rodinia supercontinent (Tang et al. 2013). The Neoproterozoic Xinghuadukou Group and Ergunhe Group distribute in northern and southwestern margins of the EB, respectively. The Xinghuadukou Group is characterized by metamorphic supracrustal rocks with age of 749 ± 17 Ma and two zircon age groups of 2.0 Ga and 1000–800 Ma and has the provenance of the Paleoproterozoic and Mesoproterozoic (Wu et al. 2012). The Ergunhe Group contains dolomites, limestones, two-mica schists and sandstones, from which detrital zircon age populations around 738–1050 Ma have been reported, suggesting a Neoproterozoic sedimentary sequence (Zhang et al. 2014). Another later Precambrian sequence called the Mohe complex occurs in the northern part of the block, with the youngest zircon age of 608 ± 8 Ma from biotite plagioclase gneiss samples (Zhou et al. 2011a). These Precambrian sequences and the Neoproterozoic intrusions suggest that the EB was a later Neoproterozoic block.

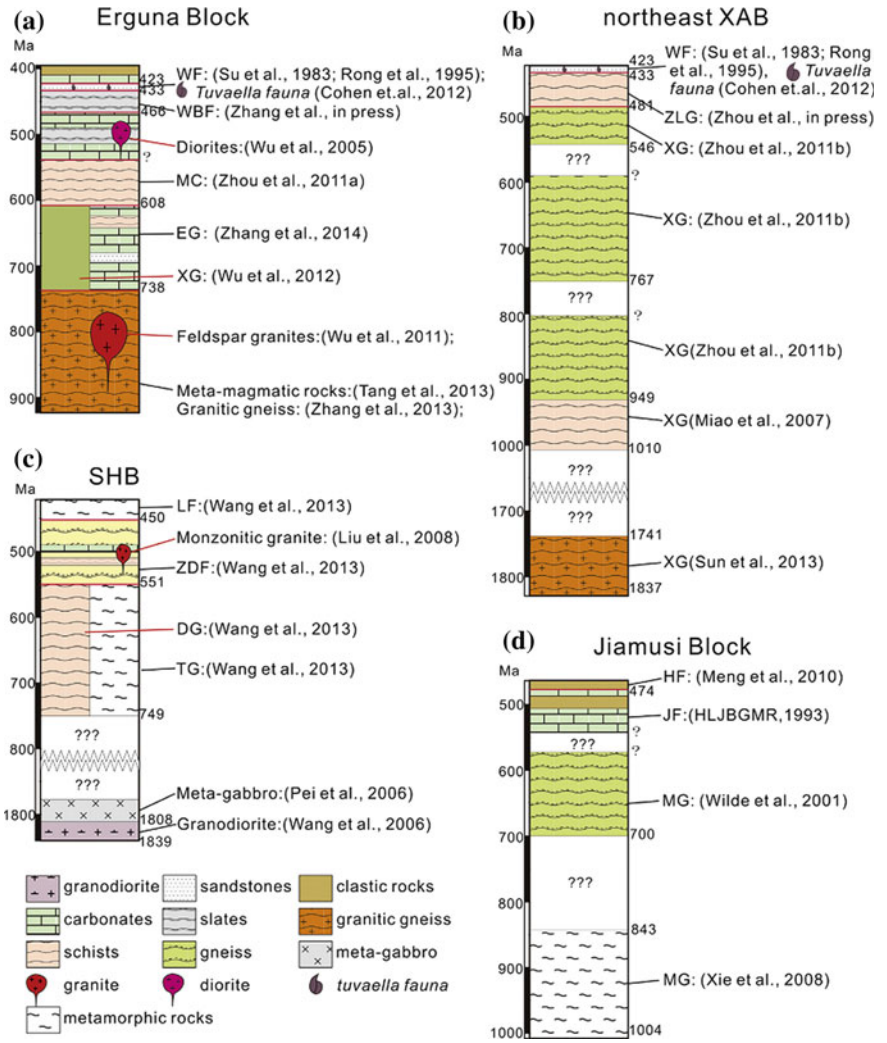

Fig. 2 Stratigraphic column for the blocks. **a** EB, **b** Northeast XAB, **c** SHB, **d** JB. See text for the ages in the right side of column. *DG* Dongfengshan Group, *EG* Ergunhe Group, *HF* Heital Formation, *JF* Jinyinku Formation, *LF* Lalagou Formation, *MC* Mohe complex, *MG* Mashan Group, *SHB* Songliao–Hunshandake block, *TG* Tadong Group, *WBF* Wubinaobao Formation, *WF* Wuduhe Formation, *XAB* Xing'an block, *XG* Xinghuadukou Group, *ZDF* Zhudundian Formation, *ZLG* Zalantun Group (after Xu et al. 2015)

3 Xing'an–Airgin Sum Block (XAB)

This block outcrops in Xing'an area in the northeast and Airgin Sum area in the west. The northeast part is called Xing'an block, which is represented by the Xinghuadukou Group in Shiqizhan area where two ages of 1837 ± 5 and 1741 ± 30 Ma from augen granitic and banded gneisses have been reported, respectively (Sun et al. 2013a, b). The Xinghuadukou Group in Hanjiayuanzi near to Shiqizhan area consists of staurolite garnet two-mica schist with a lot of detrital zircon ages older than 1010 Ma (Miao et al. 2007). The Neoproterozoic biotite plagioclase gneiss with igneous protolith ages of 767 ± 4 Ma, and garnet sillimanite gneiss with detrital zircon age peak of 949 ± 7 Ma have been reported from Xinghuadukou area (Zhou et al. 2011b).

The Precambrian basement of the west XAB includes the Airgin Sum Group in west segment, Baoyintu Group in middle segment, and Xilingol Complex in east segment. The Airgin Sum Group consists of mica quartzite with a youngest peak age of 1180 Ma, sericite quartz schists, gneisses, and gneissic granites (Fig. 3; Xu et al. 2015). In middle segment of the XAB the Baoyintu Group of the Precambrian basement is characterized by gneisses and gneissic granites with zircon ages of

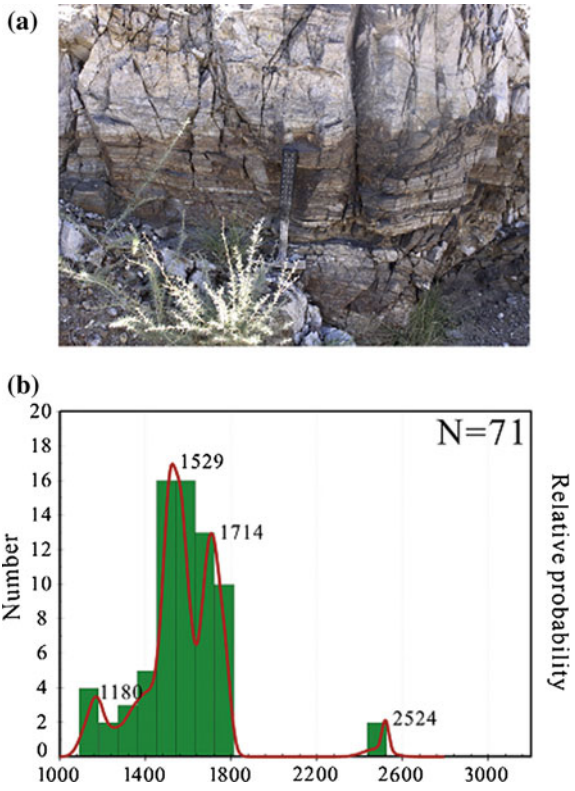

Fig. 3 Field photo and detrital zircon ages of mica quartzite in the Airgin Sum Group (after Xu et al. 2015)

1516 ± 31 and 1390 ± 17 Ma (Sun et al. 2013a, b). In the eastern segment of the west XAB, the Xilingol Complex is characterized by metamorphic core ages of detrital zircons range from 1005 to 1026 Ma in an aluminum-rich argillaceous rock, indicating that it belongs to the Precambrian basement (Ge et al. 2011).

4 Songliao–Hunshandake Block (SHB)

The oldest ages of basement rock comes from bore core in southeast margin of the block, including a SHRIMP U–Pb zircon age of 1839 ± 7 Ma from granodiorite (Wang et al. 2006) and ICP-MS U–Pb age of 1808 ± 21 Ma from metagabrro (Pei et al. 2007). The Neoproterozoic ages have been acquired from the Dongfengshan Group in the north and Tadong Group in the south along the eastern margin of the SHB, containing youngest detrital zircon age of 752 ± 5 and 751 ± 6 Ma from two-mica quartz schist and biotite quartz schist, respectively (Wang et al. 2013).

5 Jiamusi Block (JB)

The oldest rocks occur in Liumao and Ximashan areas in the southern part of the JB, which is called the Mashan Group. SHRIMP U–Pb zircon analyses from sillimanite gneiss of the Mashan Group reveal that there are two kinds of zircons: unmetamorphic zircons are characterized by high Th/U ratio and age populations from 700 to 1600 Ma. Xie et al. (2008) report magmatic zircon ages from 843 to 1004 Ma in the Mashan Group migmatite in Mulin area. These data suggest that there was a Mesoproterozoic to Neoproterozoic basement in the JB (Wilde et al. 2001; Xie et al. 2008).

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