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Ages of Jurassic volcano-sedimentary strata in the Yanshan Fold-and-Thrust Belt and their implications for the coal-bearing strata of northern China

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ABSTRACT
Jurassic coal-bearing strata are widely distributed in the North China Craton (NCC) and other areas of northern China. These coal-bearing strata were previously considered to be Early–Middle Jurassic in age based on plant fossils, particularly the fossil assemblage of \textit{Coniopteris–Phoenicopsis}. Since coal-bearing strata are interbedded with volcanic units in the basins of the Yanshan Fold-and-Thrust Belt (YFTB), northern NCC, isotopic dating of the volcanic units can therefore provide age constraints on the coal-bearing strata and the \textit{Coniopteris–Phoenicopsis} assemblage. In this paper, we performed a systematic geological survey and present the results of zircon U–Pb dating of the volcanic units and a plu ton in typical basins of the YFTB. These data, combined with the results of previous studies, indicate that the ages of the Nandaling/Xinglonggou, Haifanggou, Jiujiangshan, and Tiaojiang/Lanqi formations are 180–168, 169–161, 161–157, and 161–153 Ma, respectively. The ages of the interbedded coal-bearing Yaopo and Beiopao formations are constrained to be 169–161 and 177–169 Ma, respectively. Our results demonstrate that both the coal-bearing strata and the \textit{Coniopteris–Phoenicopsis} assemblage are Middle Jurassic in age, which is younger than that previously considered. This fossil assemblage plays a critical role in age constraints on the Jurassic coal-bearing strata. The refinement of its age permits a more precise dating of the coal-bearing strata, especially in northwestern China, where datable interbedded volcanic units are lacking.

- Stratigraphical framework for the Jurassic strata of Yanshan region is established.
- The fossil assemblage of \textit{Coniopteris–Phoenicopsis} occurred in Middle Jurassic.
- The Jurassic coal-bearing strata in northern China are mainly Middle Jurassic.

Introduction
The global average temperature throughout the Jurassic was significantly warmer than at present (Ree \textit{et al.} 2004; Sellwood and Valdes 2006, 2008; Deng \textit{et al.} 2017), which provided favourable conditions for the formation of coal measures. Jurassic coal-bearing strata are widespread throughout Europe (e.g., Fisher and Hancock 1985; Petersen 1993; Petersen and Andbsjerg 1996; Petersen and Brekke 2001; Barron \textit{et al.} 2012), northern Africa (e.g., Baioumy 2009; Edress and Abdel-Fatah in press), central Asia (e.g. Moore and Esmaeili 2012; Rajabzadeh \textit{et al.} 2016), western and southern Mongolia (Sun \textit{et al.} 2009), and northern China (e.g., Vakhrameyev and Doludenko 1977; Hendrix \textit{et al.} 1995; Wang \textit{et al.} 2005, 2012; Dai \textit{et al.} 2009; Ao \textit{et al.} 2012; Li \textit{et al.} 2014b, 2018; Guo \textit{et al.} in press). The coal-bearing measures in Europe are usually interlayered with marine strata (Cox and Sumberl 2002; Husinnc and Read 2007), and their ages have been well constrained to be Middle Jurassic. However, the coal-bearing strata in northern China are non-marine, making it difficult to determine their ages due to the highly endemic nature, moderate to poor preservation of Jurassic fossils (although the strata are highly fossiliferous), and lack of volcanic units (Hendrix \textit{et al.} 1995). Although many studies have been conducted, as a result, there is general agreement that the strata are as old as Triassic and as young as Middle Jurassic (e.g., Mi \textit{et al.} 1980; Wu and Zhang 1983; Zhang 1983; Chen \textit{et al.} 1984; He and Wu 1986; Wu and Zhou 1986; Li \textit{et al.} 1988; HBGMR 1989; Zhang and Li 1990; BBGMR 1991; QBGMR 1991; Hendrix \textit{et al.} 1995; Deng \textit{et al.} 2003, 2017; Liu and Li 2006; Zhang and Jiang 2010). Fortunately, the contemporary
coal-bearing strata in the YFTB (Figures 1 and 2) are interlayered with volcanic units, providing age constraints on the basis of isotopic ages of volcanic units (Figure 3). Zircon U–Pb dating of volcanic units by laser ablation–inductively coupled plasma–mass spectrometry (LA–ICP–MS) and sensitive high mass-resolution ion

Figure 1. Distribution of Jurassic strata in northern China (modified after Deng et al. 2003).

Figure 2. Simplified tectonic map of the Yanshan Fold-and-Thrust Belt, showing major structures and plutons (modified from Darby et al. 2004; Liu et al. 2013). The study areas are labelled and include (from west to east) the Western Hills of Beijing, Xiabancheng and Jin–Yang basins. Abbreviations are as follows: NCB = North China Block; SCB = South China Block; WHB = Western Hills of Beijing; XBCB = Xiabancheng Basin; BPB = Beipiao Basin; JYB = Jin–Yang Basin; YP = Yamenzi Pluton.
microprobe (SHRIMP) were performed with an aim to establish the Jurassic stratigraphic framework of the YFTB, and provide age constraints on both the coal-bearing strata and their fossil assemblage zones. The *Coniopteris–Phoenicopsis* plant fossil assemblage is widely distributed in Eurasia and plays a crucial role in constraining the ages of Jurassic coal-bearing strata (Sze 1955, 1959; Harris 1964; Mi et al. 1980; Chen et al. 1984). Refinement of plant fossil ages enables more precise dating of terrestrial coal-bearing strata, especially in northwestern China where the interbedded volcanic units are lacking.

**Geological background**

**Regional geology**

Jurassic coal-bearing strata are widely distributed in the NCC and other areas of northern China. Divided by the Taihangshan, the Jurassic basins are classified into two types: huge, stable basins in the western part of northern China; and small, intermontane basins in the eastern part (Figure 1; Deng et al. 2003; Liu and Li 2006; Li et al. 2018). The Jurassic stratigraphic successions in these basins are characterized by coal measures in the lower part and red clastic beds in the upper part (Figure 3). Volcanic units are present in the basins of eastern North China, but not in those of northwestern China. In the volcano-sedimentary basins, the volcanic units provide age constraints on the coal-bearing strata and fossil assemblages therein; while the ages of the coal-bearing strata in northwestern China were mainly determined based on fossils, without isotopic age constraints. Therefore, refinement of the fossil assemblage is helpful in constraining the age of the coal-bearing strata in basins that lacking datable volcanic units. Three typical basins (from west to east, the Western Hills of Beijing, Xiabancheng, and Jin-Yang basins) in the YFTB were selected for study (Figure 2(b)), with the aim of establishing the stratigraphic framework and providing age constraints on both the coal-bearing strata and their fossil assemblages.

The YFTB is located in the northern NCC and is considered to be an intraplate deformation belt that formed during the late Permian to Early Triassic after collision of the Mongolian arc terranes and the NCC along the Solonker Suture Zone (Figure 2(a); e.g., Chen 1998; Davis et al. 2001; Xiao et al. 2003; Wang et al. 2007; Liu et al. 2013). The belt experienced a key transformation from the E–W-trending Paleo-Asian tectonic domain to the NNE-trending Paleo-Pacific tectonic domain (e.g., Zhao 1990; Zhao et al. 1994, 2004a, 2004b; Zhai et al. 2004; Dong et al. 2008), and a series of volcano-sedimentary basins formed during the Mesozoic (Liu et al. 2004; Liu 2007). The Jurassic stratigraphic successions in the YFTB are characterized by...
two volcanic units interlayered with coal-bearing strata. The Middle Triassic–Jurassic stratigraphy in previous researches is shown in Figure 3.

**Chronostratigraphic control**

The ages of the early Mesozoic strata have previously been constrained by fossils. The Xingshikou Formation (consisting of fluvial gravels) was assigned to the Late Triassic (Mi et al. 1984) or Early Jurassic (Liu 1988) based on plant and fish fossils, respectively. The coal-bearing Yaopo and Beipiao formations were considered to be Early–Middle Jurassic (Chen et al. 1984; HBGMR 1989; BBGMR 1991) and Early Jurassic (Mi et al. 1980; Wu and Zhang 1983; LBGMR 1989) in age based on flora and sporopollen. The underlying Nandaling/Xinglonggou Formation was therefore constrained to the Early Jurassic based on the ages of the overlying units.

Isotopic age dating of volcanic or pyroclastic beds can be used to constrain the ages of interbedded strata (Meng et al. 2014). The detrital zircon grains in the Xingshikou Formation of the Xiabancheng Basin are as young as 197 ± 6 Ma (Liu et al. 2012), implying an Early Jurassic age. Inherited zircon grains from the Nandaling flood basalt in the Western Hills of Beijing yielded a peak age of 174 ± 8 Ma, which was inferred to represent the eruption age of the Nandaling Formation (Zhao et al. 2006). A biotite ⁴⁰Ar–³⁹Ar age of 180 ± 2 Ma was reported from the base of the Nandaling Formation in northern Hebei (Davis et al. 2001), and a similar SHRIMP zircon U–Pb age of 177 ± 4 Ma was obtained from the equivalent Xinglonggou Formation in the Beipiao Basin in western Liaoning (Yang and Li 2008). An LA–ICP–MS zircon U–Pb age of 163 ± 1 was reported from a tuff layer in the lower part of the Jiulongshan Formation (Chen et al. 2014; Zhang et al. 2014). Chang et al. (2014) reported a plagioclase ⁴⁰Ar–³⁹Ar age of 167 ± 1 Ma for interbedded tuff in the middle part of the Haifanggou Formation in the Beipiao Basin. Recently, Huang (2017) also reported a similar zircon U–Pb age of 167 ± 1 Ma from the tuffaceous breccia at the base of the Haifanggou Formation. The lower age limits of volcanic rocks from the Tiaojishan Formation (in western Beijing and northern Hebei) are 161–157 Ma (Davis et al. 2001; Cope 2003; Zhao et al. 2004b; Liu et al. 2006; Cope et al. 2007). Two plagioclase ⁴⁰Ar–³⁹Ar ages of 161 ± 1 Ma and 159 ± 1 Ma were obtained from tuff at the base of the Lanqi Formation in the Beipiao Basin (Chang et al. 2009).

**Samples and methods**

**Sampling and description of cross-sections**

Volcanic and clastic deposits occur alternately in the volcano-sedimentary basins of the present study, meaning that the volcanic units can provide valuable absolute age constraints on the stratigraphic framework. Jurassic volcanic rocks and plutons in typical basins of the YFTB have been dated to establish the stratigraphic framework in the YFTB.

In the Western Hills of Beijing, geochronological studies have been performed on the Nandaling and Tiaojishan formations, while data on the latter are more robust than those on the former (e.g., Davis et al. 2001; Liu et al. 2006; references therein). The Nandaling volcanic rocks disconformably overlie the Xingshikou Formation (BBGMR 1991) and unconformably overlie the Paleozoic strata (Bao et al. 1983; Yang et al. 2006). The Tiaojishan Formation overlies the Jiulongshan Formation (Figures 3, 4(a) and 5; Wong 1927, 1929) across an angular unconformity. Andesite samples were collected from the lower part of the Nandaling Formation in the Fachengkou Section (sample 150904–1) and from the base of the Tiaojishan Formation (sample 010907–4). The sampling locations are marked in Figure 5.

In the Xiabancheng Basin, the Yamenzi syenite pluton is overlain by the Jiulongshan Formation across a nonconformity (Figure 6). The age of the pluton provides a reliable constraint on the age of the Jiulongshan Formation. Sample 1021 was collected from the pluton (Figure 6).

Figure 7 provides cross-sections of the Haifanggou Formation in Nanpiao County at the southeastern margin of the Jin–Yang Basin. The Haifanggou Formation in Nanpiao was previously considered to be the Early Jurassic Xinglonggou Formation. A typical Middle Jurassic fossil assemblage (Coniopteris–Phoenicopsis) was identified in the sedimentary layers, and this formation was reassigned to the Middle Jurassic Haifanggou Formation (LBGMR 1989). The Haifanggou Formation in Nanpiao County overlies the Triassic Hongla or Houfulongsan formations, and underlies the Late Jurassic Lanqi Formation across angular unconformities (Figure 4(b); LBGMR 1989). The Haifanggou Formation is divided into three units: conglomerates in the lower part (Figure 4(c)); volcanic and pyroclastic rocks in the middle part (Figure 4(d–g)); and coal-
bearing sandstones and mudstones in the upper part (Figure 4(h)). Cross-sections and sample locations are marked in Figure 7. Four andesitic samples were collected from the Dawopu–Aijiagou and Houfulongshan–Pandaogou sections. Field photographs of the samples are shown in Figure 4.
Figure 5. Geological sketch map of the Western Hills of Beijing and cross-section (modified from BBGMR 1991). A–A’: Fachengkou section.

Figure 6. Geological sketch map, photograph and cross-section of the Yamenzi Pluton in the Pingquan region of northern Hebei (modified from Liu et al. 2006, 2012).
Methods

The samples were cleaned prior to zircon separation, and the separated zircon grains were mounted in epoxy resin, polished, and gold-coated. The grains were photographed in transmitted and reflected light, and imaged by cathodoluminescence (CL) (Figure 8). The zircon U–Pb isotopic analyses were conducted using an Agilent 7700 LA–ICP–MS instrument at Sample Solution Analytical Technology, Wuhan, China, and using an Agilent 7500 LA–ICP–MS instrument at the State Key Laboratory of Continental Dynamics, Northwest University, Xi’an, China. The analytical procedure is described in detail by Liu et al. (2008, 2010). The off-line data selection and integration of background and signals, time-drift correction, and quantitative calibration were conducted using ICPMSDataCal 8.3 (Liu et al. 2010) and GLITTER 4.0 (Macquarie University) software. Zircon U–Pb concordia and weighted mean age plots were produced using Isoplot/Ex_ver3 (Ludwig 2003). The analytical results are listed in Supplementary Table 1.

Zircon SHRIMP U–Pb analyses were conducted using a SHRIMP II at the Beijing SHRIMP Centre, Beijing, China, following the procedures and methods of Williams et al. (1998) and Jian et al. (2003). Isoplot version 3 (Ludwig 2003) was used for off-line data processing. The analytical results are listed in Supplementary Table 2.

Results

The zircon grains from the volcanic rocks and pluton are euhedral with sizes of 20–200 μm and length:width
ratios of 4:1. The analyzed grains exhibit a wide range of Th and U contents, with Th/U ratios of 0.14–4.52. Most of the zircon grains are elongate columnar in shape, and others are short columnar in CL (Figure 8). The majority of the grains are igneous zircons, and those with obvious oscillatory zoning in CL and smooth signals in ICPMSDataCal 8.3 were selected for isotopic age calculation. The age data are listed in Supplementary Tables 1 and 2, and the concordant analyses are shown in concordant and weighted mean plots in Figure 9.

Andesite sample 150904–1 was collected from the base of the Nandaling Formation (Figure 5). In total 19 of the 25 analyses yield a weighted mean age of 172 ± 2 Ma (MSWD = 1.7; Figures 9a and 10). Andesite sample 010907–4 was collected from the Tiaojishan Formation near Malan (Figure 5). Six zircon grains are inherited, and 14 concordant analyses from the other 18 grains yield a concordia age of 157 ± 2 Ma and a weighted mean age of 157 ± 3 Ma (MSWD = 0.26; Figure 9b). The analyzed ages of the Yamenzi syenite pluton (Figure 6; sample 1021) are 168–153 Ma, and 12 of 15 analyzed grains yield a concordia age of 161 ± 2 Ma (MSWD = 2.2) and a weighted mean age of 161 ± 3 Ma (MSWD = 0.58; Figure 9c). Sample 15132 is an autochthonous andesite collected from the lowest volcanic unit overlying the conglomerates at the base of the Haifanggou Formation (Figures 4d, 7 and 10). Seven concordant analyses of 16 grains from this sample yield a concordia age of 169 ± 1 Ma and a weighted mean age of 169 ± 2 Ma (MSWD = 1.6; Figure 9d). Sample 15127 is an andesite collected from the base of the Haifanggou Formation (Figures 4e, 7 and 10), which yields ages of 160–170 Ma. Nine concordant analyses yield a concordia age of 164 ± 1 Ma and a weighted mean age of 164 ± 2 Ma (MSWD = 1.2;
Figure 9(e). Sample 08077–1 is an andesite collected from the lower part of the Haifanggou Formation (Figures 4(f), 7 and 10). Six inherited zircon grains from the 22 analyses yield ages of 2500–2210 Ma, and the other 13 concordia ages are 170–156 Ma with a concordia age of 166 ± 3 Ma and a weighted mean age of 164 ± 2 Ma (MSWD = 0.78; Figure 9(f)). The andesitic sample 08079–2 was collected from the middle part of the Haifanggou Formation.
the Haifanggou Formation (Figures 4(g), 7 and 10). Eight concordant analyses of the 16 analyzed grains yield a concordia age of 165 ± 2 Ma and a weighted mean age of 165 ± 3 Ma (MSWD = 2; Figure 9(g)).

**Discussion**

**Ages of volcanic strata**

**Nandaling/Xinglonggou formation**

The Nandaling and Xinglonggou formations were previously considered to be equivalent strata (Figure 2; LBGMR 1989; Xu et al. 2005). Yang and Li (2008) reported a SHRIMP zircon U–Pb age of 177 ± 4 Ma for a tuff sample collected from the Xinglonggou Formation (Figure 11). The andesite sample 150904–1 collected from the base of the Nandaling Formation in the Fachengkou Section yields a LA–ICP–MS zircon age of 172 ± 2 Ma (Figures 10 and 11). We reported zircon U–Pb ages of 175–168 Ma for the Nandaling Formation from the Caihongqiao Section in the Western Hills of Beijing (Figures 10 and 11; Gao et al. 2018). Davis et al. (2001) reported a biotite 40Ar–39Ar age of 180 ± 2 Ma for silicic tuff in northern Hebei (Figure 11). The earliest Jurassic magmatic activity in the YFTB is therefore constrained to 180–168 Ma (Figure 11).

**Jiulongshan Formation**

The andesite sample 010907–4 was collected from the base of the Tiaojishan Formation in the Western Hills of Beijing and yields a zircon SHRIMP U–Pb age of 157 ± 3 Ma (Figures 5 and 11), providing an upper limit age for the Jiulongshan Formation. In northern Hebei, the reported lower age limit of the Jiulongshan Formation is 163 ± 2 Ma (Chen et al. 2014; Zhang et al. 2014). The emplacement age of the Yamenzi Pluton (sample 1021) is 161 ± 3 Ma. The Jiulongshan Formation nonconformably overlies the pluton, thus suggesting that the Jiulongshan Formation is younger than 161 ± 3 Ma (within error of the 163 ± 2 Ma age). For convenience, we provisionally refer to the age of 161 ± 3 Ma for the lower limit age of the Jiulongshan Formation in this paper. The lower age limits of the Tiaojishan/Lanqi Formation are 161–157 Ma (Zhao et al. 2004a; Liu et al. 2006; references therein; Ma and Zheng 2009; Chang et al. 2014; Yu et al. 2016). Therefore, the age of the Jiulongshan Formation is constrained to 161–157 Ma.
Haifanggou Formation

In the western Liaoning area, samples from the lower to middle parts of the Haifanggou Formation yielded ages of 169–164 Ma (Figure 9). The lower age limit of the tuff at the base of the Lanqi Formation is 161 ± 1 Ma (Chang et al. 2009). Therefore, the age of the Haifanggou Formation is constrained to 169–161 Ma.

Tiaojishan/Lanqi Formation

Previous studies have constrained the eruption ages of the volcanic units of the Tiaojishan/Lanqi Formation to ~161–153 Ma (Liu et al. 2006; references therein; Ma and Zheng 2009; Chang et al. 2014; Li et al. 2014a, 2016; Yu et al. 2016).

Ages of coal-bearing strata

The coal-bearing strata in the YFTB were previously considered to be Early–Middle Jurassic in age due to the abundant plant fossils correlating with the Jurassic Yorkshire Flora in the UK (Harris 1964; Chen et al. 1984; Zhao et al. 2002). The Jurassic strata in the UK are subdivided into stages based on the widely distributed and fast-evolving ammonites (Cox and Sumbler 2002). The Yorkshire Flora occurs mainly in the Middle Jurassic Ravenscar Group, whose age is authentic owing to the constraints of ammonites in marine strata. More than 20 species (~20% of the identified fossils) in the Western Hills of Beijing are the same as, or similar to, the Yorkshire Flora (Harris 1964; Chen et al. 1984). Some typical Early–Middle Jurassic species occur in both Yorkshire and western Beijing, such as Coniopteris hymenophyllaoides, C. tatungensis, and Ehoracia lobifolia (Chen et al. 1984). Some species that are commonly preserved in the Triassic–Early Jurassic strata are also found in the lower part of the Yaopo Formation (Chen et al. 1984). The Yaopo Formation was therefore constrained to the Early–Middle Jurassic on the basis of the above observations (Chen et al. 1984; BBGMR 1991). Mi et al. (1980) constrained the Beipiao Formation to the Early Jurassic based on large numbers of Neocalamites, Dictyophyllum, and Clathropteris, few Conopteris, and no typical Triassic species. Abundant floral fossils (including Coniopteris) were identified in the Haifanggou Formation and assigned as Middle Jurassic flora (Mi et al. 1980; Pan 1983). The dating of strata on the basis of slowly evolving flora is not sufficiently accurate; instead, isotopic ages of volcanic units can provide more precise age estimates.

The ages of the coal-bearing strata can be constrained by dating the volcanic units. As shown in Figure 3, the overlying strata are the Longmen, Jiulongshan, and Haifanggou formations, and the underlying strata are the Nandaling and Xinglonggou formations. Their ages are listed in Supplementary Table 3. The age of the Jiulongshan
Formation is 161–157 Ma (Zhao et al. 2004a; Li et al. 2014a; this study) and the upper age limit of the Nandaling Formation is 168 ± 2 Ma (Gao et al. 2018). Therefore, the age of the coal-bearing strata in the Western Hills of Beijing is constrained to 168–161 Ma. The ages obtained for the Haifanggou Formation (169–164 Ma) and the reported age of the Xinglonggou Formation (177 ± 4 Ma; sample collected from the middle part of the formation; Yang and Li 2008) suggest that the age of the Beipiao Formation is 177–169 Ma (Figure 9). The Beipiao Formation is therefore older than the Yaopo Formation. The disparity in ages of the two formations explains the abundant Coniopteris in the Yaopo Formation, and the scarcity of the fossil in the Beipiao Formation. The coal-bearing strata in the YFTB were formed mainly during the Middle Jurassic, not the Early Jurassic as previously suggested (Chen et al. 1984; Mi et al. 1984; LBGMR 1989; BBGMR 1991).

As one of the typical Middle Jurassic fossil assemblages, Coniopteris–Phoenicopsis, occurs in the upper part of the Beipiao Formation in the YFTB (177–169 Ma; Yang and Li 2008; this study). This fossil assemblage has been considered to be Early–Middle Jurassic in age in China (Sze 1955, 1959; Chen et al. 1984). Some strata containing this fossil assemblage, such as the Yongdinghe and Fuxian formations (Figure 3), are still considered to be Early Jurassic in age. Many Jurassic units in northern China were assigned older ages by previous studies, which has been proved by recent studies (Ge 2004; Yang et al. 2006; Zhao 2007; Ge et al. 2010; Li et al. 2013, 2014c). Based on the plant fossil, the stratigraphic correlations are revised and shown in Figure 11.

A global arid climate was indicated by the appearance of Late Jurassic evaporites in Europe and northern Africa, and the mottled and red Upper Jurassic sediments in central Asia and northern China (Vakhrameyev and Doludenko 1977; Zheng and Zhang 1990). The basins in northern China experienced compressional deformation and were completely or partially uplifted during the Middle–Late Jurassic (Hendrix et al. 1992; Jolivet 2015; Van Der Voo et al. 2015; Fang et al. 2016; Yang et al. 2017). The disappearance of coal-bearing strata was exacerbated by both the arid global climate and the uplift of northern China during the Late Jurassic.

Conclusions

(1) The ages of the Nandaling and Haifanggou formations in the YFTB are constrained to 180–169 Ma and 169–161 Ma, respectively.

(2) The Jurassic coal-bearing strata in the YFTB are mainly Middle Jurassic in age, not Early Jurassic as was previously suggested. The Beipiao Formation in western Liaoning (177–169 Ma) is older than the Yaopo Formation in the Western Hills of Beijing (168–161 Ma).

(3) The Coniopteris–Phoenicopsis fossil assemblage, previously considered to be Early–Middle Jurassic in age, is revised to the Middle Jurassic based on our dating of volcanic units in the YFTB. The revised age of this fossil assemblage suggests that the coal-bearing strata in northern China are mainly Middle Jurassic in age.

Geolocation information

The study area is located at the northern margin of the NCC (39°30′–42°30′ N, 114°–123° E).

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Disclosure statement

No potential conflict of interest was reported by the authors.

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