



Provenance analysis of pottery from the Neolithic Diaolongbei site, Hubei Province, China by using NAA and petrography analysis



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ABSTRACT

The Neolithic Diaolongbei site in Zaoyang city, Hubei Province, China is located in an important communication channel called as the Sui-Zao corridor between north and south China. Many artifacts from diverse cultures including: Yangshao culture in north China, Daxi and Qujialing culture in south China as well as local artifacts were found at the site. In this study, some pottery sherd samples from these four different culture styles found in different phases at this site were tested through instrumental neutron activation analysis (NAA) and petrographic analysis to discuss the provenance of the pottery and culture communication. The results indicate that during the first phase of the Diaolongbei Site (6300–5800 BP), all samples with Yangshao culture style were from the same source. During the second phase (5800–5300 BP), the source of all samples with Yangshao, Daxi or local culture styles was also the same and there was a manufacturing technique spread. During the third phase (5300–4800 BP), the imported pottery was identified so both cultural diffusion and pottery exchange existed in this phase. According to the results and the archaeology background, it is deduced that there was a close connection between the Diaolongbei site and other cultural regions and the imported sample supports that the Diaolongbei site might be a trade center.

1. Introduction

The Diaolongbei site in Zaoyang city, Hubei Province, China, was a very important settlement site in Neolithic China, and is located in the west of the Sui-Zao Corridor, which was between the Tongbai Mountain and Dahong Mountain (Fig. 1). This region is of great significance since it connects the regions of the Yellow and Yangtze River Basins (Su and Yin, 1981) and is an important geographical channel between south and north China. Multiple cultures from both south and north China coexisted in this region and previous research revealed some information about the cultural interactions in this area. During the early Yangshao Culture Period (ca. 5000 to 4000 BCE), the Yangshao Culture in north China expanded southwards and interacted with the Daxi Culture of the middle reaches of the Yangtze River, near Zaoyang and Suizhou. Then during the transition between the Middle and Late Yangshao Culture Period, the Qujialing Culture (ca. 3300–2600 BCE) appeared in the Jiangnan Plain and diffused northwards during the late Yangshao Culture period (Li et al., 2015).

Because of the special geographic location of the Diaolongbei site,

multiple cultures from both south and north China together existed here. Previous research revealed that the occupation of the Diaolongbei site can be divided into three phases, e.g., the first phase (6300–5800 BP), the second phase (5800–5300 BP), and the third phase (5300–4800 BP). Most scholars agree that the artifact style of the first phase is close to the Yangshao Culture (7000–5000 BP), specifically the local Xiawanggang Type (CASS, 2006). During the second phase, the cultural artifacts retain some characteristics of the former phase, but also show influence from the Miaodigou Type of the Middle Yangshao Culture as well as some influence from the southern Daxi Culture (6900–5100 BP), specifically the Youziling Type (Wang, 1997). In addition, there are also some local cultural factors that were established and presented during this second phase. The cultural characteristics of the third phase are complex. Some researchers suggest that the third phase was the result of the cultural mixing of the southern Qujialing Culture (5000–4600 BP) and the late Yangshao Culture (CASS, 2006) or belonged to a local type of Qujialing Culture (Lin, 1997). Others argue that it may represent a mixing of the Daxi Culture (Youziling Type) and the third phase of the Yangshao Culture (Liu et al., 2012) or even an entirely new

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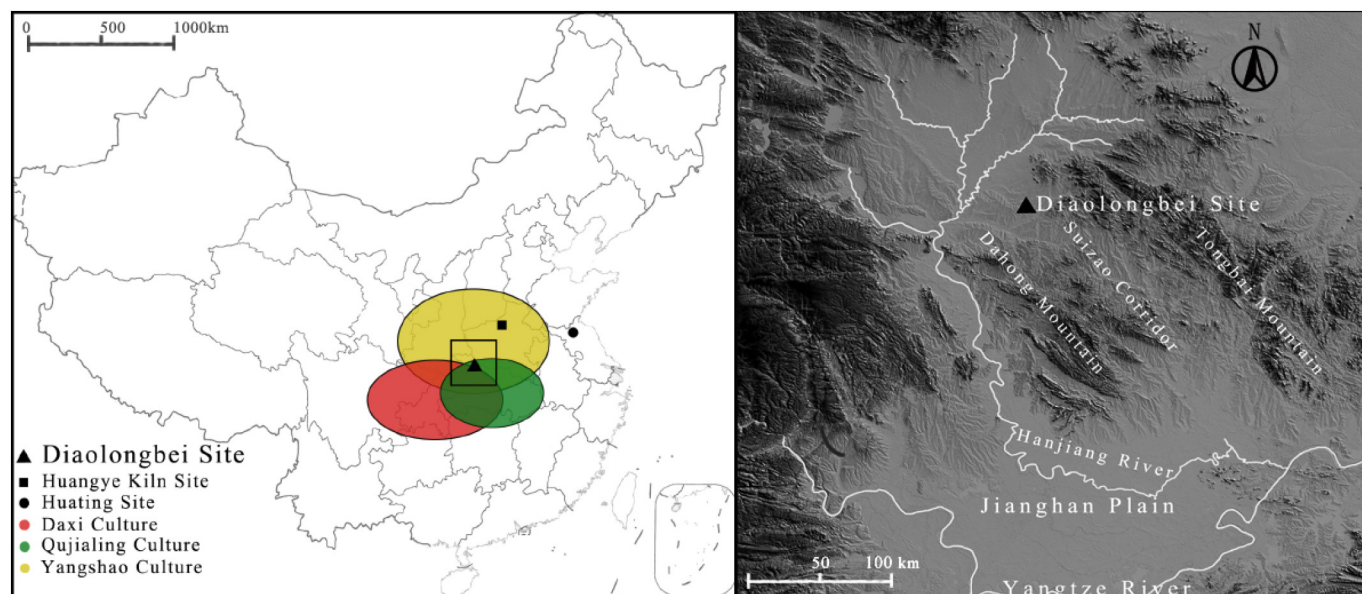


Fig. 1. Map of China and the location of the Diaolongbei site in Hubei Province.

culture based on these two cultures (He and Zhao, 2014).

Since the Diaolongbei site connects the Yellow River Valley and Yangtze River Valley, it seemed to be an interaction point for cultures between north and south China. Considering its importance, we intend to make a scientific research for the pottery remains of the Diaolongbei site about whether there was a cultural communication between the Diaolongbei site and other regions. The typological change of pottery is so quick that it can reveal a great deal of information with respect to cultural change. The analysis of pottery typology is a common and important method in pottery study since it is useful for many archaeological studies such as the research of how an archaeological culture is influenced by interactions with other cultures in the adjacent region. In the previous studies of the Diaolongbei site, it is difficult to reach the agreement of the culture characteristics and the development of the Diaolongbei site only through the analysis of pottery typology and decorative patterns (He and Zhao, 2014; Wang RX, 2009; Wang Y, 2009). Here we conduct pottery provenance study using neutron activation analysis (NAA) and petrographic analysis to provide a new perspective for the contact between cultures.

NAA and petrographic analysis have been well established to distinguish the sources of the pottery in archaeological studies. NAA could determine the concentration of elements in a pottery sherd and petrography could determine the mineral composition of a pottery sherd. Both techniques could provide important information about the possible location of pottery production and pottery manufacturing technology (Finley et al., 2018; Ownby et al., 2014; Stoner, 2016; Stoner et al., 2008). Chemical and mineral compositions differ in accordance with several natural, cultural and artificial factors (Stoner et al., 2008; Valera et al., 2017). Factors that can influence ceramic composition include but are not limited to: selection of materials, the addition of tempering agents (Stoner, 2016; Stoner et al., 2008). Thus, the compositions of pottery may vary in different communities and time (Arnold et al., 1991; Arnold et al., 2000; Stoner et al., 2003; Stoner et al., 2008). This forms the basis of using NAA and petrography to distinguish the provenance of pottery and influence of other cultures at a special archaeological site.

In this study, neutron activation analysis (NAA) and petrographic analysis were carried to characterize the provenance and manufacturing technology of pottery with different cultural styles at the Diaolongbei site to explore whether they were produced locally or not, and to better understand the pottery circulation and cultural influences (pottery exchange or technical spread) at the Diaolongbei site from

different Neolithic cultures (e.g., Yangshao Culture, Daxi Culture, Qujialing Culture and so on).

2. Experimental

2.1. Material

Twenty-six pottery sherds (Fig. 5) were selected at random from three culture phases at the Diaolongbei site according to cultural styles (including the Local Culture in Diaolongbei site, Daxi Culture, Qujialing Culture and Yangshao Culture). The information of these sherd samples is listed in Table 1 and their cultural style information was identified through typological analysis.

Table 1
Information about the pottery selected at the Diaolongbei site.

Number	Site	Phase	Style	Type
D1	T2309⑥	First	Yangshao	Sandy
D2	T2309⑥:18	First	Yangshao	Sandy
D3	T2116⑤	First	Yangshao	Sandy
D4	T2910③B	Second	Yangshao	Sandy
D5	T2722②A	Second	Yangshao	Clay
D6	T1906④B	Second	Yangshao	Sandy
D7	T2114④A	Second	Yangshao	Clay
D8	T2208③B	Second	Yangshao	Sandy
D9	T2016④A	Second	Yangshao	Clay
D10	T2910 F6	Second	Daxi	Clay
D11	T2207②A	Second	Daxi	Clay
D12	T2816②A	Second	Daxi	Clay
D13	F1	Second	Banpo	Clay
D14	T1909③	Second	Local	Clay
D15	T2207②B	Second	Local	Clay
D16	T2308②A down W29	Second	Local	Sandy
D17	T1806W20:2	Second	Local	Sandy
D18	F13	Third	Qujialing	Clay
D19	T2619F17	Third	Qujialing	Clay
D20	F20	Third	Qujialing	Clay
D21	T1909③	Third	Yangshao	Clay
D22	F19	Third	Yangshao	Sandy
D23	T2209①	Third	Yangshao	Clay
D24	T2520F19	Third	Local	Sandy
D25	F15	Third	Local	Sandy
D26	F19②A down	Third	Local	Sandy

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