

Archaeological prospection of kiln sites in the Samurai era

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INTRODUCTION

The purpose of this study is to examine the possibility and effectiveness of archaeological prospection for detecting ceramic kiln sites from the Samurai era using geophysical remote-sensing equipment. The Samurai was a class of military nobility that ruled Japan during the medieval and early modern periods.

In the Samurai era, there were significant developments in ceramic production and technology. These developments had a global influence, particularly in Europe, where Japanese pottery was highly appreciated.

The authors have studied pottery production and distribution from diverse archaeological perspectives, including excavation and pottery reconstructions. However, acquiring data to assist in reconstructing the design of archaeological kiln sites is difficult. A great many kiln sites have been demolished, and the type and structure of the kilns cannot be identified by simple surface observation. The authors believe that employment of geophysical prospection methods is proving to be an effective method to help discover and reconstruct the details of historical kiln sites (Kaneda and Nishimura 2007; Nishiguchi 2012: 16–20).

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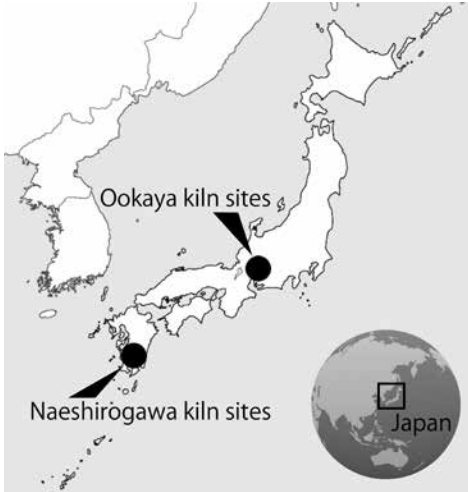


Fig. 1. Location of the Naeshirogawa and Ookaya kiln sites where geophysical surveys were conducted

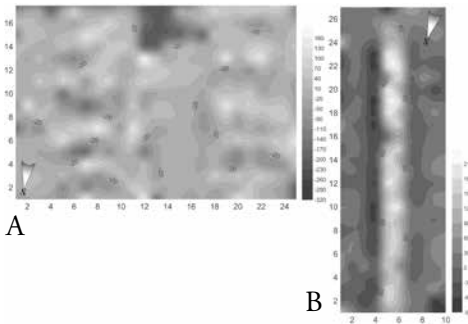


Fig. 2. Magnetometry survey results of the Naeshirogawa kiln sites (sites: A – Nan-kin Sarayama; B – location of B-2 kiln)

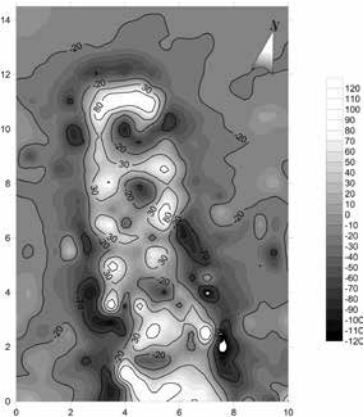


Fig. 3. Magnetometry survey result of the Yashichida kiln site

SURVEY AND RESULTS

This article introduces results from two well-known archaeological kiln sites in Japan (Fig. 1), the Miyama Naeshirogawa kiln sites (Kagoshima prefecture, southern Japan) and the Ookaya kiln sites (Gifu prefecture, central Japan).

NAESHIROGAWA KILN SITES

Satsuma pottery was produced at the Naeshirogawa kiln sites in the Kagoshima region from the 17th century AD and was known for its raised enamel design on the vessel surface. The Archaeological Laboratory at Kagoshima University conducted a ground survey of the area in 2006. They collected various data about the sites in addition to detailed topographic maps indicating the presence of anomalous elevations at certain locations. Many of these elevation changes are thought to have been caused by human activity related to kiln sites that had been demolished, eroded and buried over the years. Kagoshima University and the Nara National Research Institute for Cultural Properties undertook joint archaeological prospection and excavation in 2008–2009 (Watanabe 2012). These studies incorporated geophysical surveys employing FM-36 fluxgate magnetometers (Geoscan Research). Data were recorded with a spatial resolution of 0.5 m. Two anomalies, one long elliptical shape and one ladder-shaped, were recorded at this site. The authors interpreted these subsurface anomalies as reflecting the remains of magnetised floors from one type of kiln (Fig. 2). The long elliptical anomaly corresponds to a long, single-chamber, inclined kiln called the “Tanshitu Nobori Kama”. This specialized kiln does not have a barrier separating the combustion chamber and firing chambers, the two being located together.

A second uniquely designed kiln is interpreted from the ladder-shaped anomaly and this is believed to correspond to a “Renboshiki Nobori Kama” kiln, which is characterized by consecutive chambers built on an incline, having their combustion chambers and several additional firing chambers separated by walls. The magnetometry result suggests that the ladder-like anomaly is related to the thermoremanent alteration of the magnetic field stored in the kiln walls. Based on these considerations, we conducted an archaeological prospection and partial excavation of the Nankin Sarayama kiln, which is representative of the Naeshirogawa kiln sites. The magnetometry data clearly indicated that there were two consecutive-chamber kilns present in the study area (Kaneda and Watanabe 2009).

Ground penetrating radar (GPR) and electrical resistivity were among the other methods employed in the archaeological prospection. A SIR-3000 data acquisition system (GSSI, USA) with a 400 MHz antenna was used for GPR survey. Data were recorded with survey lines at 0.5 m intervals. The GPR survey shows a ladder-shaped reflection similar to that on the magnetic map. The GPR survey strongly suggests the remains of a single-chamber inclined kiln adjacent to the two-consecutive-chamber inclined kiln.

The electrical resistivity method used a Handy-ARM (OYO, Japan) with 32 electrodes. The electrical resistivity survey shows high resistivity anomalies at the same location where the strongest magnetic anomalies were recorded. Targeted archaeological excavations were conducted, using the geophysical prospection results and they confirmed that the ladder-shaped anomaly was in fact due to a consecutive-chamber inclined kiln.

OOKAYA KILN SITES

Shino ware was a famous Japanese kind of pottery that was highly valued in Samurai society and was made at the Ookaya kiln sites in the 17th and 18th centuries. These ceramics were typified by white glazes made of feldspar and were manufactured in what is known today as the Gifu prefecture. Local government researchers have identified nine production locations; however, their existence and the actual position of the kilns have to be sufficiently established. In 2012–2014, the Nara National Research Institute for cultural properties and the Kani City Board of Education undertook archaeological prospection to find undiscovered kilns (Kaneda *et al.* 2014). A fluxgate magnetometer FM-36 (Geoscan Research, UK) was employed. Data were recorded with a spatial resolution of 0.5 m. The results indicated that there were six kilns in the survey area. The Yashichida kiln, which is located in the northern part of the Ookaya kiln site, was recognized in a ladder-shaped anomaly on the magnetic map (Fig. 3). GPR and electromagnetic (EM) methods were used. GPR used a SIR-3000 with a 400MHz antenna. Data were recorded with survey lines at 0.5 m intervals. The result of the GPR survey showed a ladder-shaped reflection; however, the strong reflections are wider than those found at the Naeshirogawa sites. In addition, pieces of the kiln body were found scattered on the ground surface around the target area. The authors believe that these data show the upper part of the kiln was destroyed and only the floor of the kiln remains buried and intact.

The EM method used a CMD Mini-Explorer (GF Instruments, Czech Republic) (Bonsall *et al.* 2013). Data were recorded with a spatial resolution of 0.5 m. The results of the EM survey show both the quadrature (apparent conductivity) and in-phase (apparent magnetic susceptibility) components of the kiln.

CONCLUSION

The recent accumulation of archaeological prospection results has provided new information about kiln type and condition, in addition to confirming the existence and number of kilns. This information can support not only future archaeological studies, which employ non-destructive methods when investigating historical kiln sites, but also cultural resource management policies.

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