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Geo-environmental changes and human activities in Japanese lowland archaeological site

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Abstract: Alluvial lowlands occupy about 13% of the total area of the Japanese Islands, and widely distribute along the coasts and the lower reaches of the rivers. In this paper, attempts have been made to make clearer the geomorphic development and regional difference of alluvial lowlands in Japan based on the geographical and the archaeological data. We analyzed the changes of relationship between geo-environment and human activities in lowland archaeological site, central Japan, based on sedimentary facies analysis and pollen analysis. Some conclusions are as follows: (1) Yayoi period, is located in the environment lowland basis, there is no stagnant water permanent, but there is an environment lowland basis floods temporary, such as those generated, peripheral vegetation covered in mainly evergreen forest. (2) Fluvial activity is active at the Kofun period, the ground surface was unstable and the landscape mainly of laurel was formed in the peripheral vegetation. (3) Ground drier is in progress since the Middle Ages, agricultural land development has been progressed.

Key words: Lowland, Geo-environment, pollen analysis, archaeological site, Nobi plain.

Introduction

The disappearance and formation of the archaeological site, it is closely related to the change in short time geo-environmental changes have been pointed out (Takahashi, 2003). These studies is an area that is focused geological and geomorphological data in archaeological sites. In other words, has been possible to consider detailed geo-environmental evolution in alluvial plain from analysis in archaeological site location (Miyamoto *et al.*, 2001). It is important to consider the detail change for the study of the landform evolution in alluvial lowland.

From this point of view, the author tried to make clear the change of geo-environment and human activities in the Nobi lowland (Hirate-cho archaeological site) based on the detail analysis of the recent sediments and and pollen analysis. Then the author discussed on the paleoenvironmental changes and landform evolution of the alluvial plain in the Nobi lowland, central Japan.

Materials and Methods

Geographical Setting: The Nobi Plain underlain by young sediments is situated in the central part of Japan and is about 1800 km² in area. This plain faces Ise Bay, where the Ibi, Nagara, Kiso, and Shonai rivers discharge, and is composed of alluvial fans, flood plains, deltaic plains, terraces, reclaimed lands, and filled-up ground.

Hirate-cho ruins, is located in the alluvial lowland of Shonai river, in the lowlands in valleys, and ridges are some extending to the east-west direction are distributed (Fig. 1; Kito, 2004). It is pointed out that the Hirate-cho site is located in the ridge (Palynosurvey, 2006). In the previous study, such as the remains of the medieval moat trace in mid-Yayoi period (*ca.* 400 BC to 50 AD) has been detected. And various natural scientific analysis has also been carried out at the same time (Nagoya Land Development Corporation, 2006). The field survey was carried out primarily in the fourth excavation area mainly.

Sedimentary facies: Fig. 1 shows the surveyed site locality from Umitsu (1991). Soil profiles were observed at various exposures along paths and trench at the trench in archaeological site. The sedimentary facies and structure of each locality were described, and sediment samples were collected for pollen analysis.

Pollen Analysis: Pollen and spore fossils were extracted by the following procedures: Samples of *ca.* 2 g were taken and were treated with 10 % KOH, sieved through a 0.5 mm mesh, decanted to remove organic macro materials, treated with wash and ZnCl₂, dehydrated with acetic acid, and treated for 2.5 min. by the acetolysis method. The residue was saturated in 50 % glycerine, and was mounted on glass slide. All pollen and spores on each slide were counted. The percentages of pollen taxa and spore types were calculated based on the total arboreal pollen counts including *Alnus*.

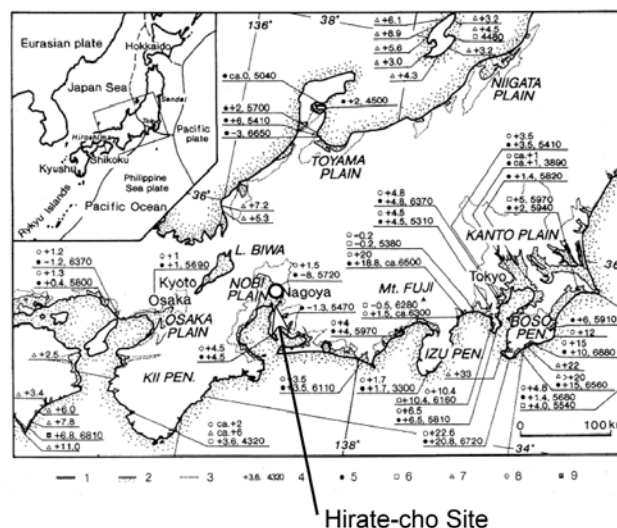


Figure 1. Locality of the Hirate-cho Site, Nobi plain, central Japan (from Umitsu, 1991)

Results and Discussion

Changes in geo-environment and vegetation: Changes in geo-environment and vegetation were discussed on each period based on the results of sedimentary facies and pollen taxa as have been shown in Figs. 2 to 4.

Formation of lowland (Yayoi period; *ca.* 300 BC to AD 300): It is suggested to be a time when by the first 10 to 15 layers shown in Fig. 1 is composed of silty sediments were indicated a temporary small floods repeatedly. It is estimated that the formation time of the deposition, to be a time to mainly Yayoi period including archaeological

remains and reconstructed as the beginning of the dry-up in land. This period is repeated periodically soil of supply and flood sediment by a small flood by organic layer in 10b layer. Also from the previous archaeological excavation in Hirate-cho site (Palyno survey, 2006), that there was on the ground surface environment, such as stagnant water temporary have been pointed out time said,

that there was in terrain environment as well the point is estimated.

In this period, increase in *Quercus Cyclobalanopsis* at 7 to 11 layers indicate spread in evergreen forest around the Hirate-cho site. And, increasing in *Typha* as non-arboreal pollen, suggesting the wet ground surface environment same as the results in sedimentary facies.

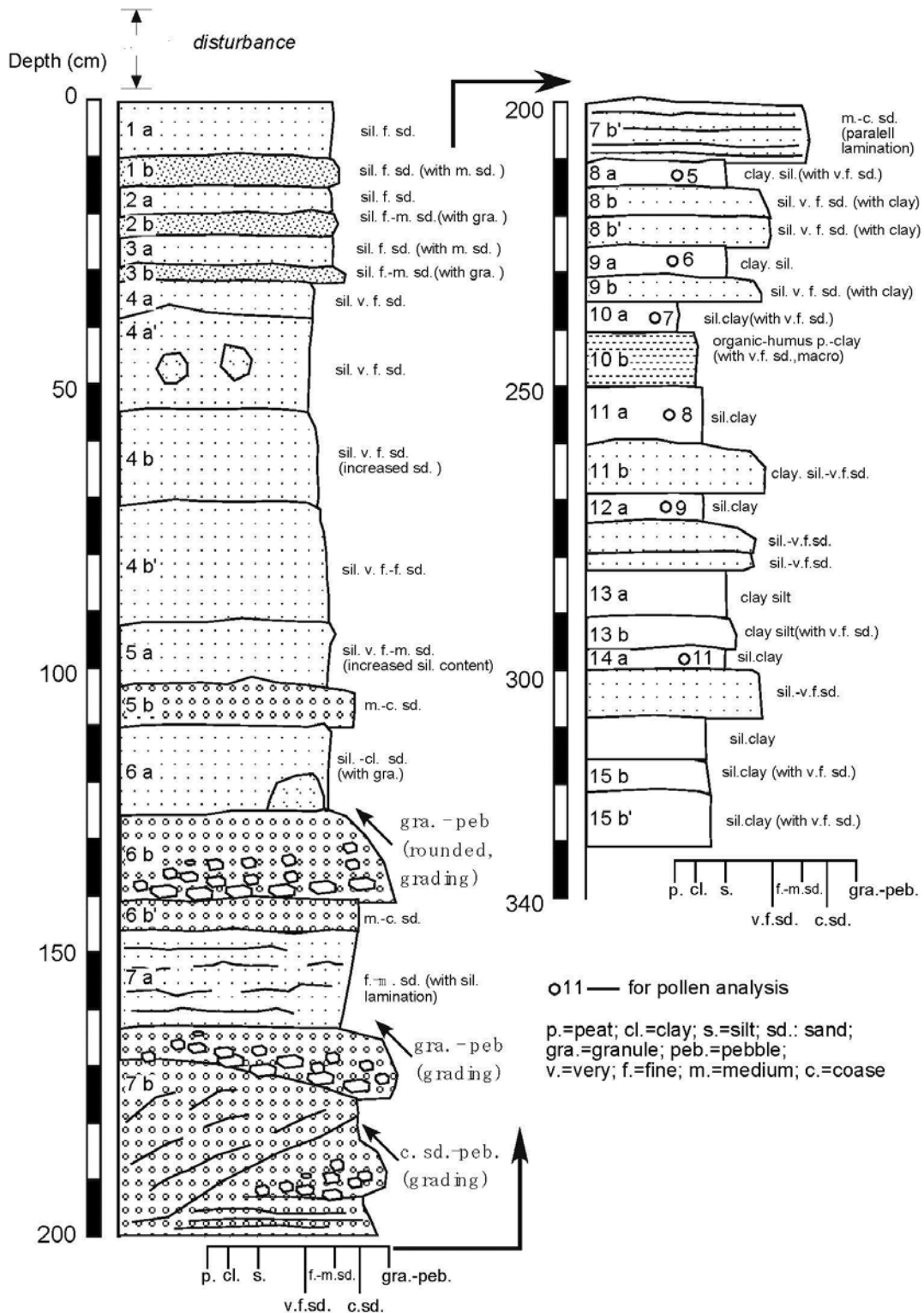


Figure 2. Sedimentary facies in Hirate-cho Site, Nobi plain, central Japan

Activation in fluvial activity (Kofun period; ca. AD 250 to 538): This period is characterized in activation in peripheral fluvial activity from the silty fine sand sediments are detected at 8 and 9 layers. Increase in *Q. Cyclobalanopsis* from 8 and 9 layers pollen indicate the reconstruction of evergreen forest around the Hirate-cho site. In non arboreal pollen, temporary dry-up ground

environments from the based in the emergence in Gramineae and *Artemisia* pollen. After that of this period, it is suggested that the point-bar and cross lamination sediments have detected at 6 and 7b layers. Fluvial sediments have including Kofun period archaeological remains (Fig. 3).

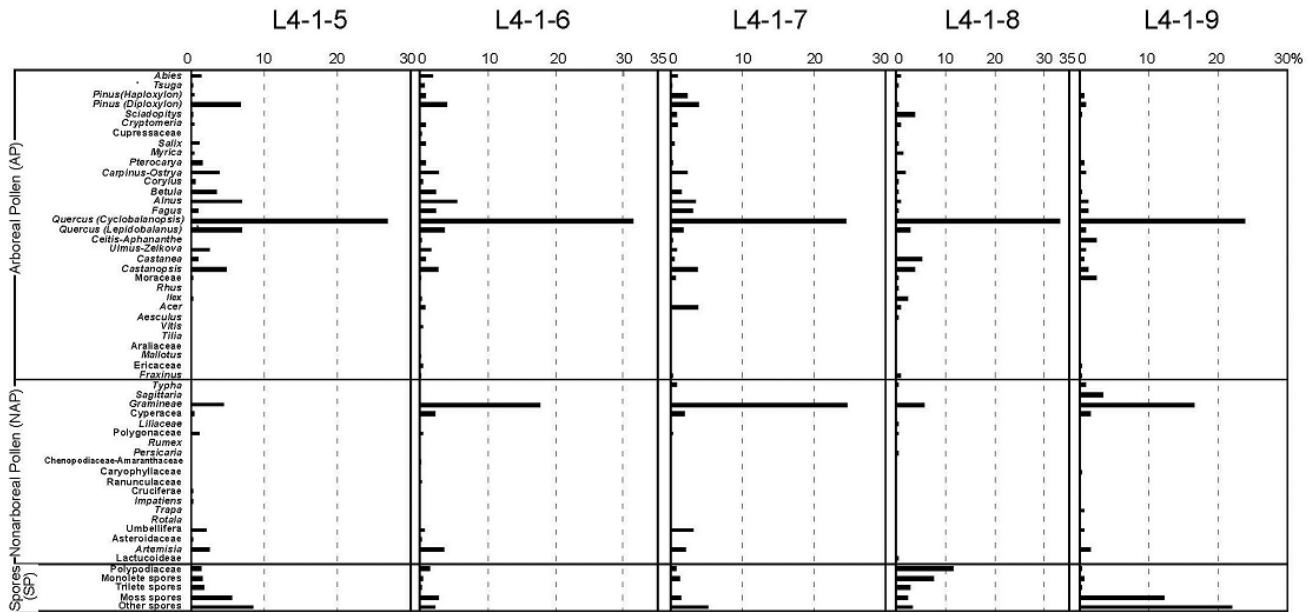


Figure 3. Pollen diagram from Hirate-cho Site, Nobi plain, central Japan

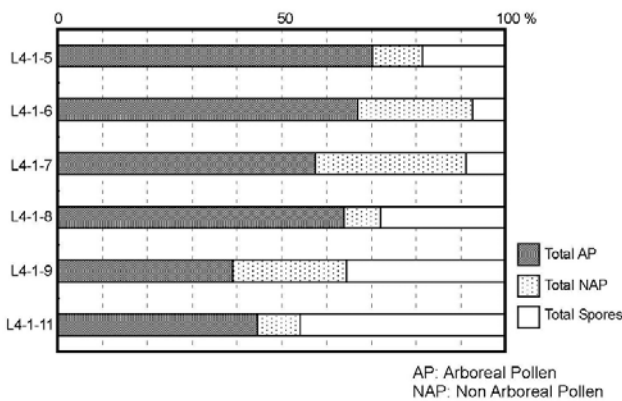


Figure 4. Pollen and Spore ratio diagram from Hirate-cho Site, Nobi plain, central Japan

Expansion of production areas (Medieval to Modern period; ca. 12th to 17th): This period is characterized in development in soilization than that before period without upper of 6 and 5b lalers including sand (flood) sediments. However, it can be interpreted as the soil of a layer has progressed by farming, because of a layer indicate the progress in soilization. Also from the fact that the sediment of block shape is mediated in part, it can be interpreted as human activities has been happened at the past e.g. in farming or making paddy fields (Fig. 4). Especially, it is interpreted than that geo-environment in drastic change, because of dry up the land than that of

period. The reason of above changes are reported in another areas (Takahashi, 2003).

Based on the characteristics of the sediments and the change of fossil pollen taxa, the landform evolution around the Hirate-cho site, in the Nobi plain, central Japan is considered as follows:

1. Yayoi period, is located in the environment lowland basis, there is no stagnant water permanent, but there is in an environment lowland basis floods temporary, such as those generated, peripheral vegetation covered in mainly evergreen forest.
2. Fluvial activity is active at the Kofun period, the ground surface was unstable and the landscape mainly of laurel was formed in the peripheral vegetation.
3. Ground drier is in progress since the Middle Ages, agricultural land development has been progressed.

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