

Human adaptations to alpine landscape during 30-19 ka: exploitation of obsidian sources in the Last Glacial Maximum

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The paper focused on the human-environment interaction between climatic impacts of the Last Glacial Maximum (LGM) and obsidian exploitation of the Upper Palaeolithic (UP) hunter-gatherers. The correlations were examined using three datasets. First, changes in obsidian use in the Chubu-Kanto region during ca. 38-19 ka were reconstructed by using ca. 80,000 obsidian sourcing data assigned to cultural horizons in the UP chronology. Second, how changed site distribution patterns during the UP in the obsidian source area of Central Highlands 1200-1400 m were described. Finally, chronological control was established by means of calibrated radiocarbon dates between palaeoenvironmental record for the past 30,000 years obtained from the Hiroppara bog situated 1400 m in the Central highlands (Yoshida et al., 2016) and the archaeological record mentioned above. To compare these datasets, four periods divided into before 30 ka, 30-25 ka, 25-20 ka, and 20-19 ka were adopted.

Results are as follows. (1) The use of Central Highlands obsidian in the Chubu-Kanto region before 30 ka shows the highest percentage, while the use frequency suddenly declines during the early LGM 30-25 ka. The pollen record (pollen accumulation rate for tree: PART) during 30-25 ka clearly indicates that the tree line retreated below 1400 m and the alpine landscape prevailed in the source area. No sites are distributed in the area, indicating human activities for stone tool production were very sparse. (2) Pollen record in the LGM cold phase 25-20 ka shows that the tree line remains descended below 1400 m and the climatic condition in the alpine landscape gradually deteriorated from 25 ka to 20 ka. A number of large-sized lithic industries, however, are distributed in the alpine landscape, indicating vitalization of obsidian procurement and stone tool production in the area. (3) The tree line gradually ascended during 20-19 ka and reached above 1400 m by 17 ka, reflecting climatic amelioration in the deglaciation period. In spite of warming, the number of sites in the alpine landscape decreased and the use frequency of the Central Highlands obsidian in the Chubu-Kanto region also declined. In contrast, the use of obsidian from the Kozu Island transported by seafaring suddenly increased and competed with that of the Central Highlands obsidian. Additionally, the distribution of the Central Highlands obsidian clearly prevailed in the northern half of the Chubu-Kanto region, while that of the Kozu Island obsidian heavily biased in the southern half of the region.

Human adaptations during 30-19 ka to the alpine landscape in the source area of Central Highlands show a complex history. In the early LGM 30-25 ka, the climate deterioration and the decrease in frequency of access to the Central Highlands show a strong correlation. In this period, the exploitation of the Hakone and the Izu-Amagi source areas where the sources were located in lower altitudes was preferred. The hunter-gatherer groups during 25-20 ka, however, actively exploited the alpine landscape where the cold and dry climate still dominated. Cultural adaptations such as skills for occupation in the alpine landscape were likely improved. In 20-19 ka, the sudden increase in the use of Kozu Island obsidian strongly implies that the emergence of the northern regional group mainly exploiting the Central Highlands for obsidian procurement and the southern regional group preferred to use the Kozu Island obsidian. Accordingly, the development of forest landscape in the Central Highlands after 20 ka was not likely related to the obsidian use dynamics. Instead, the societal change impacted on human activities for the natural resource exploitation.

Yoshida, A., Kudo, Y., Shimada, K., Hashizume, J. and Ono, A. 2016 Impact of landscape changes on

obsidian exploitation since the Palaeolithic in the central highland of Japan. *Vegetation History and Archaeobotany*, 25: 45-55.

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