

## The Natural Environment during the Last Glacial Maximum in Northeast Asia

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### 1. Introduction

The natural environment during the last glacial period, which was continued from 70,000 BP to 10,000 BP, was not kept in constance owing to the climatic fluctuation.

The last glacial period is classified to three substages, such as early stadial -, interstadial- and late stadial sub-stage based on the data of deep sea cores. The late stadial substage among them, so called the last glacial maximum, was continued from 20,000 BP to 18,000 BP. The natural environment of Korea at that time was restored in this study with the special reference to the northeastern Asia.

### 2. Data and Model Description

The most characteristic phenomena, such as, 'monsoon', location of Polar front and the distribution of vegetation were analyzed on the clarification of the natural environment.

### 3. Main contents

A remarkable feature of the 18,000 BP biome reconstructions for China is the mid-latitude (30-40°N) extention of steppe and desert biomes to the modern eastern coast. Terrestrial deposits of glacial maximum

age from the northern part of Yellow Sea between 33°N and 40°N suggest that this region of the continental shelf was occupied by desert and steppe vegetation. The presence of single site with temperate deciduous forest at 31°N suggest that temperate forests could have been displaced southwards.

The shift from temperate forest to steppe and desert implies conditions very much drier than present in eastern China. This conclusion is fully consistent with other paleodata, including the huge thickness of last glacial loess deposits drying up of numerous lakes in eastern China. Dry conditions might be explained by a strong winter monsoon and/or a weak summer monsoon, both of which are plausible for the glacial maximum.

In addition, relative sea level along the East China Sea coast was as low as -140m and the coastline was located at the far edge of the continental shelf at 125-127°E.

The northern boundary of broad leaved evergreen/warm mixed forest at 18,000BP has previously been reconstructed at 23°N or 21-22°N, in broad agreement with the results. This boundary was displaced southwards by c. 1,000km. Together with the extention of cool mixed forests c. 1000km eastwards into the lowlands, this displacement indicates a very strong depression of winter temperatures in southern China at LGM and contrasts with the rather slight change since Mid-Holocene. The equatorward shifts of the northern forest biomes also imply large reductions in winter and/or growing

season temperature over the whole of northeastern China.

One site from the Tibetan Plateau showed tundra at 18,000BP in the far western region where today there is steppe or desert. This finding could be taken to imply conditions that were wetter than present, consistent with high LGM water levels reconstructed from inland lake on Tibetan Plateau. However, there is no evidence for wetter conditions at lower elevations (extensive deserts were still present in western China).

The reconstruction of year-round conditions much colder than today right across China is consistent with biome reconstruction from adjacent regions including Japan and western Beringia at the LGM, and testifies to the global scale of the climatic impacts of glacial boundary conditions on climate and vegetation.

The vegetation of Hokkaido was subarctic thin forest with a group of *Pinus pumila*,

subarctic needle leaves forest distributed on the northern area of middle Honshu and cool and temperate mixed forest at southern area of middle Honshu.

The vegetational landscape of mountain- and East coast areas of Korea was that nonarbooreal plants were dominant with sparse arctic or subarctic trees.

The climate of yellow sea surface and west region of Korea was dry and temperate steppe landscape was extended broadly. It is supposed that a temperate desert appeared on the west coast area of Pyeongan-Do and Cheolla-Do of Korea.

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