

## Significant changes of vegetation and extinction of plants in the formation of the boreal forests of Northeast Asia

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Recently, the vegetation in Northeast Asia is characterized by cool temperate and boreal elements of plants. There are mixed forests mainly composed of deciduous broad-leaved trees with conifers, taiga composed mainly of conifers on mountainous areas and steppe mainly composed of shrubs and grasses on the plains of arid areas. The vegetation in the north hemisphere became by environmental changes from sub-tropical or warm-temperate to cool temperate or arctic conditions during Paleogene and Neogene 1. The Pliocene and Pleistocene floras in Northern Asia appeared on the assemblages of steppe or sub-desert under the arid conditions and the mixed and conifer forests repeated oscillatory and changed to the boreal forests 2. Here a palynological study using the samples taken from 6m to 200m in depth of the BDP96-1 core and from 200 to 600m in depth of the BDP98-2 core of Lake Baikal has unquestionably clarified that the vegetation changed completely during 12 million years in the Baikal region. The vegetation changed drastically from warm-temperate mixed forest to coniferous forest around 8.5Ma. After that change, it seems that forests began to change as coniferous forest on high mountainous areas and mixed forest made up with broad-leaved deciduous trees with conifers on lower mountainous areas. On the plane, steppes appeared under arid conditions in cooler period. It suggests that taiga forests, which characterized the boreal vegetation of Northeast Asia, basically started to form and expand to the mountainous areas of Northeast Asia in Late Miocene. In Late Miocene, the cooling began at 9.6Ma in Greenland 3 reflecting of expansion of cooling over the north hemisphere. As such, it is suggested that some of the vegetation changes recorded in the BDP98 core were due to that global climatic cooling.

The climatic oscillation such as overall cooling<sup>4</sup> and frequently arid in the Baikal area 5 caused the inevitable extinction of many deciduous broad-leaved species such as Ulmaceae, Fagaceae and others between 1.5 and 1.0Ma in Baikal region. As such, the vegetation of the region mainly consisting of conifers and taiga forests, has been completely stable in since that time.