

Environmental conditions and spreading process of *Abies mariesii* forest distributions from 2,500 years ago

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The typical vegetation in the subalpine zones of northern Japan includes coniferous forest dominated by *Abies mariesii*. However, in some areas of northern Japan, the dominance of *A. mariesii* is not observed. The predominant vegetation is instead composed of shrubs, the dwarf bamboo *Sasa kurilensis*, and the broad-leaved tree *Betula ermanii* in subalpine zones. These areas are referred to as “pseudo-alpine zones.”

It is presumed that the geomorphic and climatic conditions of these regions are not favorable for *A. mariesii*, and that *A. mariesii* which is still expanding its distribution range, has not yet spread to subalpine zones.

Previous studies focusing on the pseudo-alpine zone progressed on each of the aspects such as morphologic and climatic conditions. However, its extent and maturity vary even in adjacent areas corresponding to some local factors such as landform and snow cover, unified understanding of the factors effected spreading *A. mariesii* forest are not yet clear.

This study focuses mainly on three aspects, Firstly, it aimed at clarifying the trends of *A. mariesii* distribution and the environmental factors that determine moisture conditions in wet meadows, such as landform, surface geology, and snow depth, in the pseudo-alpine and subalpine zones. In addition, it aimed to determine whether *A. mariesii* forests are still expanding, based on forest structures.

Overall, thick *A. mariesii* forests tended to be distributed around wet meadows on volcanic original surface. In the landslide area, *A. mariesii* frequently stood on rocks. These environmental conditions appeared to be favorable for the establishment of *A. mariesii* forests. The cause might be sparse distribution of other competing vegetation, particularly *S. kurilensis*, which could have prevented the establishment of *A. mariesii* seedlings. However, the distribution of *A. mariesii* forests varied even when the extent of wet meadows was the same. These results indicate that the present distribution of *A. mariesii* forests was possibly determined by the distribution of wet meadows and the expansion period of *A. mariesii*.

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