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## HOLOCENE VEGETATION CHANGES INFERRED FROM SOIL STRATIGRAPHY ON MT. SUMON-DAKE, CENTRAL JAPAN

ABSTRACT: SASAKI A., *Holocene vegetation changes inferred from soil stratigraphy on Mt. Sumon-dake, Central Japan*. (IT ISSN 1724-4757, 2003).

Geo-historical surveys of slopes and soil stratigraphy shows the changes in vegetation on the present-day upper montane zone of Mt. Sumon-dake (1,538 m a.s.l.; 37°23'N, 139°08'E) since the Late Glacial when the slopes were covered poorly vegetation. The snowpatch meadows widely covered the crest gentle slopes between the summit and 1,250 m in altitude in the early Holocene, indicated by initiation of the herbaceous peaty soil layer. Although the vegetation zones shifted upward in response to the warming after the Last Glacial, the upper limit of the continuous montane vegetation area represented by *Fagus crenata* trees remained at 1,200-1,300 m in altitude, 100-250 m lower than present, in the early Holocene. The widely distributed snowpatch meadows continued to exist on the slopes above 1,200-1,300 m in altitude during the early to middle Holocene instead of *F. crenata* forest. The changes in vegetation were strongly controlled by heavy snow accumulation since the Late Glacial.

KEY WORDS: Japanese snowy mountains, Montane zone, Peaty soil, Tephrochronology, Holocene.

### INTRODUCTION

On a part of Japanese snowy mountains, the upper montane vegetation zone is occupied by deciduous broad-leaved scrub, *Sasa* grassland and snowpatch meadow, instead of *Fagus crenata* forest which normally makes the montane vegetation zone in central and northern Japan. Previous biogeographical studies suggested that *F. crenata* trees can not establish their stand owing to the present heavy snowfall and/or prevailing strong winds of the winter monsoon in the upper montane zone of the

snowy mountains (e.g., Miyawaki & alii, 1968; Sugita, 1988; Hatase & Okuda, 1999). In addition, the historical change of the vegetation should be considered for the establishment of the present-day vegetation landscape (e.g., Davis & alii, 1986; Slatyer & Noble, 1992).

The change in vegetation is recorded in the soil-stratigraphic sequence (Birkeland, 1984). Sasaki (2001) reported that a buried peaty soil layer can be seen widely in the deciduous broad-leaved scrub on Mt. Sumon-dake (37° 23' N, 139° 08' E; fig. 1), situated in the northern Echigo Mountains which are one of the Japanese snowy mountains. This fact indicates more extensive distribution of the snowpatch meadow on Sumon-dake than the present because such a peaty soil is considered to have been formed in the snowpatch meadow where snow-melting water is supplied from late-lying snowpatches until late July (e.g., Yamanaka, 1983).

This paper presents first the relation between slope processes and vegetation on mountain slopes of Sumon-dake to clarify the stands of the vegetation. Second, the stratigraphy of the peaty soil layer and its distribution on the slopes above the present-day upper limit of *F. crenata* forest are discussed to reconstruct the snowpatch meadow history. Changes in vegetation during the Holocene will be discussed on the basis of the peaty soil layer formation and the change in stands of vegetation.

### STUDY AREA

Mt. Sumon-dake (1,538 m a.s.l.) is an andesitic volcano of latest Pliocene or middle Pleistocene (Niigata Prefectural Government, 1989). Sumon-dake and its surrounding areas are one of the heavy snowfall regions in Japan because of their location in the first range against the winter monsoon which blows from Japan Sea (fig. 1). Snow covers on the main ridges disappear in late June.

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