



## Characterization of transition zone of forest soil and vegetation in Mt. Chokai, northern Japan

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The objective of this study is to elucidate characteristics of transition zone by survey and analysis on relationship between soil properties and forest location along a transitional sequence. Seven representative sites (Ch1-7) were selected for examination on the western slope of Mt. Chokai (N39°05'57", E140°02'55", site elevation 550-1,100m), where transition zones of soils from brown forest soils to podzolic soils and vegetation from *Quercus mongolica* to *Fagus crenata* were expected. The annual mean temperature and total precipitation at Mt. Chokai (2,059m asl) are 0.5°C and 3,285mm, respectively. The parent materials of the soils were weathered Andesite associated with non-tephric loess deposits.

The vegetation profile and the projection diagram of canopy for each site (10×10m plots) were depicted based on field observation. Growth rates of *Fagus* were estimated by the tree rings of increment core samples. As for the soil analyses, the values of soil pH(H<sub>2</sub>O, KCl, NaF) were measured by the glass electrode method in the suspension mixture of soil with a 2.5 times volume of H<sub>2</sub>O/1N KCl and 50 times volume of 4% NaF. The total carbon (T-C) and nitrogen (T-N) contents were measured by the dry combustion method using NC-22A. Pyrophosphate, acid ocalate and dithionite-citrate extractable Al (Al<sub>p</sub>, Al<sub>o</sub>, Al<sub>d</sub>), Fe (Fe<sub>o</sub>, Fe<sub>d</sub>) and Si (Si<sub>o</sub>) contents were determined by ICP-AES. The content of exchangeable Al (Al<sub>Ex</sub>) was obtained by titration of extract with 1N KCl. The ratio of easily decomposable C (ED-C) and hardly decomposable C (HD-C) were estimated by the loss on ignition at 350°C and 550°C. The content of sclerotia formed by ectomycorrhizal fungi (*Cenococcum geophilum*) was roughly estimated by hand picking method for each horizon.

The transition zone of soil type between brown forest soil and podzols and vegetation community between *Quercus mongolica* and *Fagus crenata* distributed from 710 to 780m asl. on the western slope of Mt. Chokai, where the altitude and horizontal difference were 70m and 750m, respectively. The characterization of transition zone based on the relationship between soil properties and forest environment is summarized as follows.

Extremely high precipitation and the non-andic mineralogical properties regulated the low pH values and high content of exchangeable Al in soils. Based on the analytical results, Ch1 and Ch2 were defined as brown forest soils and Ch6 and Ch7 were classified as Podzols. Ch3, located at lower elevation among the transition zone sites, was more likely to brown forest soil. The soil properties of Ch4 located in the internal of transition zone showed unique characteristics and Ch5, located as the highest site of the transition zone, showed complicated characteristics. The soil profile of Ch5 was more similar to the characteristics of Ch3 though its chemical property was more likely to be Podzols. Although the distribution of soil transition zones did not show exact correspondence with vegetation transition zones, a close relationship between soil properties and vegetation, particularly growth condition of *Fagus* was recognized.

Among entire 7 sites, the growth rate of *Fagus* was the largest at Ch3 where the soil pH value was above 4.0 and exchangeable Al content was relatively low. The oldest and highest *Fagus* was observed at Ch4 where sclerotia content in soil was the largest. The vegetation diversity was the highest at Ch5 where soil porous ratio was highest.

Forest soils developed in the transition zone of the studied area revealed specific and heterogeneous characteristics and were associated with the high vegetation diversity, the fast growth of *Fagus*, and the large density of mycorrhizal fungal sclerotia.