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Effect of atmospheric deposition to alpine ecosystem in Mt. Tateyama

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Forest soils are often produced by the weathering products of bedrock and litter supplied from the forest, but in which the influence of the substance supply by air deposition is not much considered. However, the strong influence of the monsoon brings many rain and snow in Japan, and leaching from plant and soil is prevailing. Therefore, the influence of bedrock is directly observed limited on the outstanding region serpentine and limestone, geomorphic elements such as slope direction, inclination and position on the slope are major impact on plants growth and distribution. This suggests that atmospheric deposition is significant impacts on the nutrient circulation in places other than the valley and plains the sediment from the top is supplied. In particular, the main nutrient flows source on the vicinity of the ridge line of the mountainous areas is only to wet and dry deposition, so it is considered to be able to understand the actual condition of the nutrient circulating in the alpine ecosystem by assessing atmospheric deposition.

Result of observation of material dynamics on canopy of *Pinus pumila* Regal in Jodo-daira (2839m a. s. l.) in Chubu-Sangaku mountainous area in central Japan, P. pumila uptakes ˜70% of inorganic nitrogen supplied from rain and fog adhering to the needle surface. In addition, considerable amounts of potassium (K^+) and magnesium (Mg^{2+}) ions are supplied to the soil as throughfall, which was derived from canopy leaching. The $^{87}Sr/^{86}Sr$ ratio of groundwater and surface water are almost identical to that of soil and bed rock, suggesting that Sr in the surface and ground water is largely derived bedrock through chemical weathering. The $^{87}Sr/^{86}Sr$ ratio of forest rain of *P. pumila* is 0.70934, and similar to rain and sea water value. The ratio of leaf and branch of *P. pumila* are different from surface water and bedrock, and similar to yellow sand dust. The most notable feature is that *P. pumila* has high $^{87}Sr/^{86}Sr$ ratios. Most small alpine plants have lower $^{87}Sr/^{86}Sr$ ratios.

In order to examine the nutrient circulation changes in each forest types at different altitude in Tateyama, we measured chemical properties of forest rain and $^{87}Sr/^{86}Sr$ ratio of shoot and litter and surface horizon soil at Bijo-daira (*Cryptomeria japonica*, 977m a. s. l.) , Buna-daira (*Fagus crenata*, 1200m a. s. l.), and Midaga-hara (*Abies mariesii* forest, 1930m a. s. l.). $^{87}Sr/^{86}Sr$ of *C. japonic*a and *A. mariesii* leaves, branches, litter and forest rain are close to rain, but F. crenata leaves and forest rains are almost the same as the value of the yellow sand dust. Results of ion analyses suggested the existence of interaction between canopy and rain in any type of canopies. A large amount of K^+ leaching has occurred in the *F. crenata* forest and calcium (Ca^{2+}) leaching has occurred in the A. mariessi forest. In addition, the values of $^{87}Sr/^{86}Sr$ in the surface horizon soil of any soils closed to the value of yellow sand dust.

These results suggested that in any of the forest stand in Tateyama, ion supply from atmosphere forms a main body of material circulation, the influence of the bedrock is very small, and also yellow sand dust has become an important cation source, nutrients such as Ca^{2+} supplied to the forest floor salts, to form a nutrient pool in root zone containing litter, and nutrients are used by circulating to resorption by root.

Keywords: Asian dust, Alpine, Sr isotope, plant ecophysiology, Forest hydrology, material cycle