[JJ] Evening Poster | M (Multidisciplinary and Interdisciplinary) | M-IS Intersection

[M-IS14]Biogeochemistry

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Biogeochemistry is an interdisciplinary study field including ecology, geochemistry, oceanography, limnology, hydrology, soil science and environmental sciences. Respective researches have tended to be conducted separately so far. This session aims to provide a common platform for biogeochemists of different disciplines, which facilitates the interactive discussion and information exchanges for further development of biogeochemical studies.

[MIS14-P08]The effect of Sasa dwarf bamboo on dynamics of Aluminum in forest soil.

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Since large amount of carbon accumulation in soil can contribute to suppression of global warming, it is important to understand the fates, patterns and mechanism of carbon accumulation in soil. One of the mechanisms is known that metal ions such as aluminum (Al) and iron associate with organic matter (OM) in the soil. It has been reported that chemical weathering related by plants affect the relationship between metal ions and OM. Previous studies indicated that exudates of plant roots increase production of secondary minerals, enhancing the leaching of metal ions from soil. It was also suggested that Si leaching due to chemical weathering was enhanced in soil under gramineous plants such as bamboo and rice, which is known to take up a large amount of Si. Furthermore, it was reported that the amount of Al associated with OM increased in the soil under gramineous plants. However, the effect of chemical weathering on Al dynamics in the soil due to Si uptake by Sasa dwarf bamboo, a Si accumulating plant has not been clarified yet. In this study, we focused on differences of Si uptake by Sasa dwarf bamboo, and investigated their influence on Al dynamics in soil, by comparing with trees. Since Sasa dwarf bamboo absorbs takes up much of Si than tree, we hypothesized that chemical weathering was promoted by existing of Sasa dwarf bamboo, resulting in an increase in the amount of Al in the soil. We established at four plots in the naturally mixed conifer and broadleaf forest in Nakagawa Experimental Forest of Hokkaido University located in the northern part of Hokkaido. In these four plots, oak (*Quercus crispula Blume*) and fir (*Abies sachalinensis*) and Sasa dwarf bamboo (*Sasa senanensis*) are dominant species as upper trees and understory vegetation, respectively. All plots are located on sedimentary rocks and dominant soil is Cambisols (acidic brown forest soil). Two type of sub-plots were established in each site; one is the points with low density of Sasa dwarf bamboo that was about 1 m apart from the tree stem of oak, and the other is the points under canopy gap with high density of Sasa dwarf bamboo (hereafter called Sasa). Three spots were established as replicates in each sub-plot. To evaluate the influence of root invasion and nutrient uptake, we conducted a field incubation experiment of soil with an ingrowth core and a root blocking core during about 3 months at all spots. In each spot, 10 cm of soil was collected from the surface of A layer excluding organic litter layer. The coarse root was removed from soil sample using a 4 mm mesh sieve, and then soil sample was filled into each core. The soil before the in-situ incubation was collected and analyzed as the initial soil condition. Aluminum in the soil was extracted and analyzed for their concentration using inductively coupled plasma atomic

emission spectrometry (ICP-AES). For the Al associated with OM, copper chloride extraction method was used. The Al strongly associated with OM was fractionated by sequential extraction method by extraction with sodium pyrophosphate (pH 10.0). There was a significant difference ($p < 0.01$) in the amount of Al associated with OM in the surface soil between the plots with high and low density of Sasa, while no significant difference was found in the Al contents between with and without roots and nutrient uptake. In addition, there was no significant difference in the Al content by sodium pyrophosphate extraction with respect to the density of Sasa and the presence of roots. Our results suggested that the amount of Al associated with OM in the soil changed due to the long-term environmental difference between under tree canopy and canopy gap. It was also suggested that the long-term effect includes the influence of high Sasa density at the canopy gap. It is important to consider the timescale in the influence of Sasa root invasion because significant changes in the amount of Al in the soil between with and without roots were not observed for the three months experiment.