Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)
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BGM22-02 会場:415 時間:4 月 30 日 09:15-09:30

# 微生物生態情報の把握は森林の窒素循環メカニズムの理解を深めるのか
# Does microbial ecology expand our understandings of nitrogen cycle in forests?

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Forests cover approximately 70% of Japan's total land area, representing a largest reservoir of diversity of organisms including plants, animals, fungi, protists and prokaryotes on land. These organisms are closely associated each other in material cycles if not directly. Thus, we need to know how materials are cycling between the organisms in order to address a fundamental question in ecosystem ecology: why do forests have the richest biodiversity on land? However, it is not easy to understand the material cycles in a forest because the forest has the various environmental heterogeneity which greatly affect the cycle. For example, nitrogen dynamics can be different in soils around hills and valleys in forests. Such spatial heterogeneity of the dynamics in the soils has been explained mainly from phenomenological perspectives using abiotic information such as soil moisture, soil temperature or litter quality. However, these perspectives have not fully explained the dynamics. Here, we suggest that such heterogeneity need to be explained in the context of ecology of microbial communities which mediate the nitrogen dynamics. More specifically, we suggest that understanding the nitrogen dynamics based on the physiology, population dynamics and diversity of the microbial communities can provide the mechanistic insights into the nitrogen cycle in forests.

We analyzed the spatial heterogeneity of nitrogen dynamics and associated microbial communities in natural and planted forest soils in Asia. Specifically, we focused on nitrification in which ammonium are oxidized to nitrate and found the close association between gross nitrification rates and population size of nitrifiers in the soils. Additionally, nitrification rates cannot be fully explained by using environmental properties including substrate supply, soil moisture, soil temperature and litter quality, but can be explained by using the population size of nitrifiers. This shows that the better understandings of the microbial ecology allows us to more accurately predict the spatial heterogeneity of material cycles. In this presentation, we would like to discuss how information on microbial ecology expands our understandings of nitrogen cycle in forests.

キーワード: 微生物生態, 窒素循環, 森林
Keywords: microbial ecology, nitrogen cycle, forest