A big difference in acidification of forest watersheds in East Asia among different climatic zones

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1. Introduction

In East Asia, it has become a big concern about soil acidification in forest ecosystems, caused by increased atmospheric deposition. A comparative research of soil and stream water was conducted in forest watersheds of 3 areas in East Asia laying different 3 climatic zones; subtropical, temperate and sub-boreal zones. It is expected that in subtropics the soil developed under much rainfall and warm climate would be heavily-weathered and poor in base cations. The ecosystems in subtropical zone may be more fragile against significant acidic deposition than ones in temperate and sub-boreal zones. Here we report and discuss a big difference of acidification at forest watersheds belong to different 3 climatic zones in East Asia.

2. Sampling sites and methods

[Sampling sites]We studied 5 undisturbed forest watersheds for sampling sites in China and Japan. Subtropical sites A (Dinghushan), B (Heishiding), C (Dayaoshan): these sites place 70, 150, 330km distant from Guangzhou city respectively in south China. A (Dinghushan) site is suggested as a nitrogen saturation forest (Fang et al. 2006). Temperate site (Tama): this site is in Tokyo in Japan and also has been known as a nitrogen saturation forest (Yoh et al. 2001). Sub-boreal site (Changchun): this site is in north China.

[Methods]Sampling: we collected soil samples from 3 soil profiles per each site as deep as possible (45-120cm deep). Stream water sample was collected from the watersheds where we took soil samples. Analysis: we measured pH (H_2O), dissolved major cations, exchangeable major cations, dissolved aluminum for soil samples, and pH, dissolved major ions, dissolved aluminum for stream water samples.

3. Results and Discussions

Base cations were abundant in all layers of the soil profiles in the sub-boreal site. In contrast, the content of base cations in soil was remarkably low in the subtropical sites even at the deepest part of soil profiles. The temperate site showed a medium level. The pH value of stream water was 3.9 at the subtropical A site, but 6.2, 6.6, 5.6 in the subtropical B, C and the temperate sites, respectively. In the subtropical A site, the concentration of dissolved aluminum was as high as 8 micro mol/L. Therefore we suggest that the stream water at the subtropical A site have acidified by atmospheric deposition, because only this site showed strong acidity among subtropical 3 sites. In conclusion, we clarified that the subtropical soil originally has fewer base cations than other two climatic zones and the watershed at the subtropical A site have acidified by atmospheric deposition.