Factors controlling the acid neutralizaing capacity in Japanese cedar forest watersheds of various stand ages

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The combination of future increase of acid deposition (external factor) and intensive forest management including clearcut (internal factor) undoubtedly lead to the streamwater acidification, especially in the acid sensitive area (Stoddard et al., 1999). In the Japanese archipelago, there are more regions that are insensitive to acidic depositions than in North America and Europe, though the sensitivity to internal acidification due to forest clearcut is little reported. In order to clarify the controlling factors of ANC, we observed the chemistry of streamwater draining from Japanese cedar (*Cryptomeria japonica*) forest watersheds of various stand ages (i.e. 0 to 90 years after clearcut and subsequent reafforestation) and analyzed the relationship among streamwater chemistry, stand ages and topographic characteristics (such as area, maximum and minimum elevation, relief ratio and topographic index) for all the watersheds.

In our study sites, spatial heterogeneity of Acid Neutralizing Capacity (ANC) among watersheds existed. In addition, no effect of clearcut and subsequent growth of replanted vegetation on stream acidity was observed due to high ANC (more than 0.05 meq L^{-1}) regardless of $NO_3{}^-$ flush. The negative relationships between the concentrations of weather-derived solutes, pH and ANC in streamwater and the minimum elevation were found. In lower elevation watersheds (lower than 1100 m a.s.l.), it is suggested that the relatively high contribution of soil water with longer mineral soil contact times should realize higher ANC in watersheds, which is caused by the existence of water flowpath through deep mineral soils. In contrast, in upper slope watershed where soils are considered to be thin (higher than 1100 m a.s.l.), the ANC in streamwater tends to be low, indicating the future risk to stream acidification by acidic deposition and forest management. These results suggest that the locality of acid sensitivity is determined by the hydrological and geomorphologic factors such as the difference of the contact time of soil water and the soil process generated by the steep topography. It is also considered that the spatial heterogeneity of ANC in small watershed is attributed to lead the local stream acidification and even increased toxic aluminum loss. To understand more detailed mechanisms on the contribution of contrasting subsurface and groundwater, the intensive hydrologic observation of subsurface flow and groundwater seepage in addition to streamwater is needed.