The Eighth Senior Technical Managers' Meeting
of Acid Deposition Monitoring Network in East Asia
1-3 August 2007, Bogor, Indonesia

Report on Joint Research Project on Catchment Study in Thailand

Network Center for EANET

1. Introduction

Integrated monitoring based on the biogeochemical elemental cycle should be considered for the total evaluation of ecological impacts of acid deposition. Catchment-scale monitoring is one of the solutions for this purpose but has not enough been promoted in tropical region. A study site (approx. 35 ha) was established in 2005 in a dry-evergreen forest in the Sakaerat Silvicultural Research Station, Nakhon Ratchasima Province, Thailand, in cooperation with Royal Forest Department (RFD), Environmental Research and Training Center (ERTC), Department of Environmental Quality Promotion, and Kyoto University. The project is carried out by using the Global Environment Research Fund (C-052: Project Leader, Dr. Junko Shindo, NIAES), the Ministry of the Environment of Japan.

2. Output from the previous two years

As for the input, precipitation samples including throughfall (TF), stemflow (SF), and rainfall outside the forest canopy are collected basically at two-week interval. Measurements of air pollutants, such as SO_2, NO_2, NO_X, NH_3, and O_3, are also carried out using passive samplers to estimate dry deposition. As for the output, continuous monitoring of the discharge and measurement of the stream water at two-week interval are also carried out. Continuous surveys of input and output were started in October 2005. In addition to these continuous surveys, to clarify the temporal-spatial variation of soil acidity, soil sampling plot (40m×350m) was set up crossing the stream in the catchment. Soil samples were collected using auger at each point of 10 m interval grid at the different depths (0-5cm, 5-15cm, 25-35cm and 45-55cm) in October 2005 (rainy season) and March 2006 (dry season).

Deposition amounts of all ions from sum of throughfall and stemflow (TF+SF) significantly increased in the middle of March, the beginning of wet season. Especially, SO_4^{2-} showed the largest amounts in this season. It was suggested that air pollutants including much SO_4^{2-} and NO_3^- were suspended in the atmosphere during dry season and washed out by the first precipitations in the beginning of wet season. In the early wet season, specific phenomena could be seen in the stream water chemistry (Figure 1). The pH and EC increased with alkalinity and concentrations of cations from May to June. Then, the concentration of SO_4^{2-} increased significantly in July. The pH and alkalinity decreased with increase of SO_4^{2-}. It was suggested that pH-dependent charge of

high-weathered soil in this area might be related to retention/ release of SO_4^{2-}, resulting in temporary acidification of the stream water.

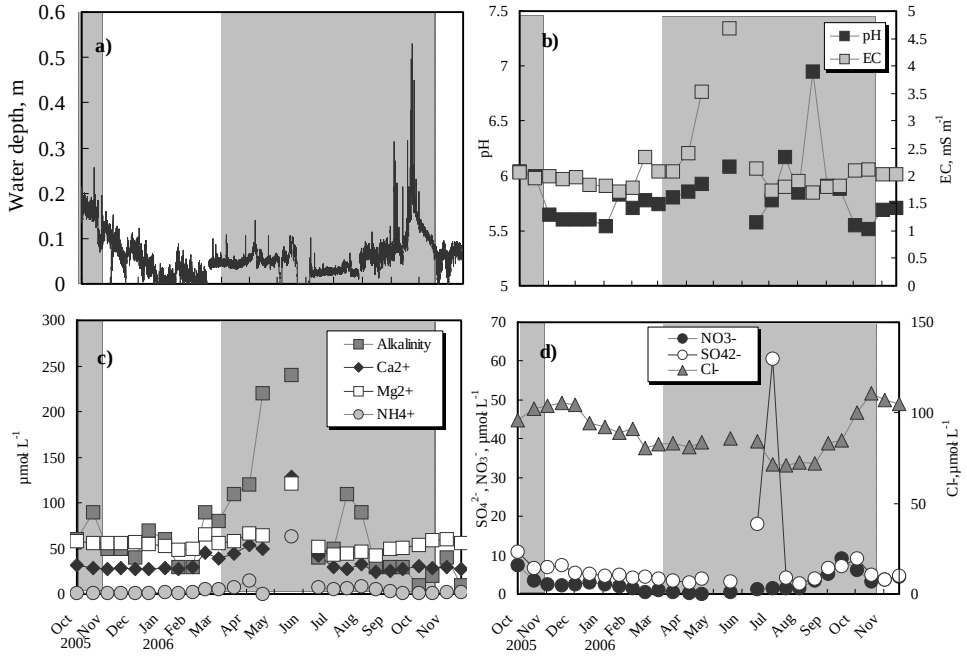

Figure 1. Seasonal changes of the water depth (a), pH and EC (b), alkalinity and cations (c), and anions (d) in the stream water. Shadow part represents wet season.

As for the soil acidity, pH (H_2O) was 5.4(±0.5) in rainy season and 5.1(±0.6) in dry season. Pronounced spatial variation was observed in a surface soil, but not in deeper soil for each season. In all depth, pH (H_2O) in rainy season was significantly higher than in dry season. Sum of exchangeable cations in a surface soil also showed large spatial variation on the slope, and was correlated with pH (H_2O) in each season. However, seasonal difference was not found in exchangeable cations. It was suggested that pH (H_2O) showed the spatial variation affected by the variation in exchangeable cations but the factors affecting seasonal variation in soil pH is not still unknown. Because the concentration of nitrate ion in stream water was high in dry season, lower soil-pH might be caused by high nitrification activity in dry season.

3. Perspective

Outcomes of this project will be imperative to evaluate impacts of acid deposition on terrestrial ecosystems in tropical region including Thailand as well as other regions in East Asia. A monitoring guideline for the catchment analysis in the tropical ecosystems will also be developed for EANET.