

# Long-term trends of bulk precipitation, stream water, and soil water chemistry under nitrogen saturated and unsaturated deciduous forest ecosystems

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## Introduction

Nitrogen (N) saturation is one of the environmental issues causing soil acidification, N (mainly nitrate ( $\text{NO}_3^-$ )) leaching from forest ecosystems via streams, and even forest decline. However, the mechanism of N saturation has not been clarified completely yet.

Imizu hill (IM) and Kureha hill (KR) are located in Toyama prefecture adjacent to each other. It is reported that the recent N loadings on both hills are almost same as about  $15\text{kgNha}^{-1}\text{yr}^{-1}$ , however, large amount of N leaching has been found only in KR.

## Methods

$\text{NO}_3^-$  concentration and other chemical properties as well as pH of bulk precipitation, stream water, and soil water were measured to clarify the difference in N saturation stages between the two hills from 1998 to 2013.

## Results and Discussion

$\text{NO}_3^-$  concentrations in the soil water taken from the depths of 20, 50, 100, 200cm in KR were significantly higher than those in IM, and  $\text{NO}_3^-$  concentration of the stream water in KR were significantly higher than those in IM through the period. The pH values of the soil water from the depths of 20, 50, 100, 200cm in KR were also significantly lower than that in IM. Accordingly, N saturation has been taken place at least for recent 14 years in KR but not in IM, indicating that the N saturation in KR would not be caused by the recent N loading.

In KR, the  $\text{NO}_3^-$  concentration in the soil water from the depths of 100, 200cm in 2008 significantly decreased from 1998, and the  $\text{NO}_3^-$  concentration in the stream water during the base flow periods in 2012 significantly decreased from 1998, though bulk precipitation  $\text{NO}_3^-$  concentration had not significantly changed over the 14 years.