

Estimation of the origin of sulfate in throughfall and stemflow

Masaharu Sakai^{1*}, Naoki Okada²

¹Forestry and Forest Products Research In, ²Kyoto University

Introduction

The precipitation changes its quality when it falls through forests as throughfall and stemflow. Usually, many kinds of substance are added to the precipitation, and as a result the pH will rise/drop. This change in the chemistry of precipitation through forest canopy is especially important in Japan. Previous our findings show that a lot of sulfate with light sulfur isotopic value are loaded

to precipitation flowing down as throughfall and stemflow. We expect that the origin of the isotopically light sulfur will be dry deposition. In this paper, we measure the sulfur isotopic ratio of dry deposition (aerosol and sulfur dioxide gas) and we discuss the origin of sulfate in the throughfall and stemflow.

Method

The experimental forest is evergreen broad-leaved forest. Precipitation, throughfall and stemflow were monitored at Kojii (*Castanopsis cuspidata*) forest in the southern region of Japan. Aerosol and gaseous samples were collected by two-stages filter pack method above the forest canopy. The sulfate contents in samples were analyzed by ion chromatography and sulfur isotope ratios were analyzed with a mass spectrometer (Finnigan MAT 252).

Results

The mean sulfur isotopic ratio of aerosol and gas were +4.2permil and +0.1permil, respectively. The sulfur isotopic ratios of gas were always smaller those of aerosol at 9 measurements. In our previous results, the sulfate concentrations increased in the order of precipitation, throughfall and stemflow, on the other hands the sulfur isotopic ratios decreased in the order of precipitation, throughfall and stemflow (Table). Furthermore numerous reports indicate that folia leaching in sulfur are small relative to the dry deposition input. The above results suggest that the sulfur dioxide in dry deposition is the main substance in the sulfate of throughfall and stemflow.

Keywords: sulfur isotopic ratio, aerosol, sulfur dioxide, throughfall, stemflow

Table The sulfate concentration and sulfur isotope ratio.

Period	Rainfall mm	Deposition	Concentration mg/l	Isotope ratio $\delta^{34}\text{S}$
030307-0317	53.6	Aerosol		2.7
		Sulfur dioxide		-2.1
		Precipitation	1.17	3.2
		Throughfall	3.36	1.2
		Stemflow	5.62	0.6
041115-1206	87.5	Aerosol		5.1
		Sulfur dioxide		-0.2
		Precipitation	0.61	5.9
		Throughfall	2.27	3.9
		Stemflow	2.71	3.1