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題目(和文)	三種酸素同位体を利用した都市大気と植物葉圏における窒素酸化物の動態に関する研究
Title(English)	A study of nitrogen oxides dynamics between urban atmosphere and the phyllosphere using triple oxygen isotopes
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Abstract

This dissertation is organized into five chapters. In chapter 1, background and objectives of my study are described. Phyllospheric (on/in the leaves) is one of the important sinks and sources of atmospheric nitrogen oxides. However, the nitrogen oxides dynamics between atmosphere and the phyllosphere has not been understood quantitatively because of complex mechanisms. In this study, I focused on the triple oxygen isotopes to understand the nitrogen oxides dynamics between atmosphere and the phyllosphere.

In chapter 2, I developed novel on-line analytical system to measure the triple oxygen isotope of N_2O and nitrate using microwave discharge to decompose N_2O to N_2 and O_2 . The advantages of this method are that it is easy to operate and that the method does not require removing volatile organic matter which disturbs accurate analysis.

In chapter 3, I observed isotopic compositions of atmospheric nitrate near the highways throughout a year. The nitrogen isotopic composition was the same as that of NO_x emitted from vehicles and its variation throughout a year was smaller than that reported previously. From the results, the nitrogen source is almost constant throughout a year and its source could be the NO_x emitted from vehicles.

In chapter 4, I analyzed the triple oxygen isotopes in the phyllosphere for broadleaved plant and conifer plant for the first time. The proportions of atmospheric nitrate in the plant body was 7-45% for broadleaved plant and 48-98% for conifer plant were calculated based on the triple oxygen isotopic compositions. I found that the proportion of atmospheric nitrate obviously differed in each species for the first time.

In chapter 5, results obtained in chapter 3 and chapter 4 are discussed holistically. In this study site, main NO_x source is vehicle and it is removed by plant leaves from atmosphere. If it is assumed that the total area of plant leaves in the earth ($6.4 \times 10^8 \text{ km}^2$) are occupied by *Cinnamomum camphora* we studied, ca. 400 GgN of atmospheric nitrogen oxides are removed by plant leaves and it cannot be ignored compared to the total nitrogen oxides deposition to the terrestrial environment in a year (25 TgN). To understand a role of phyllosphere to remove the nitrogen oxides from atmosphere in more detail, studying various environments and various plants is required.