

論文 / 著書情報  
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題目(和文)	日本の畑地および水田におけるN <sub>2</sub> O生成、消費過程および土壌表面からの放出過程のアイソトポマー比による解析
Title(English)	Isotopomer analysis of production, consumption and soil-to-atmosphere emission processes of N <sub>2</sub> O in Japanese upland and paddy fields
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In order to elucidate the effect of soil types, fertilizers, cropping systems and elevated atmospheric CO<sub>2</sub> concentrations on production, consumption, and soil-to-atmosphere emission processes of N<sub>2</sub>O in Japanese upland and paddy fields, microbial metabolic processes were analyzed using isotopomer ratios of N<sub>2</sub>O (bulk nitrogen and oxygen isotope ratios,  $\delta^{15}\text{N}^{\text{bulk}}$  and  $\delta^{18}\text{O}$ , and intramolecular <sup>15</sup>N-site preference, SP). In well-drained Andisol upland fields, fertilizer application had the most significant influence on N<sub>2</sub>O emission. Isotopomer analyses revealed that the contribution of nitrification for N<sub>2</sub>O emission was promoted by synthetic ammonium fertilizer application, while denitrification was dominant in the same soils amended with poultry manure. In poorly drained upland Fluvisol fields which are characterized by high bulk density, N<sub>2</sub>O emissions were affected by not only soil inorganic nitrogen concentrations but also soil water content and soil temperature. To investigate the effect of soil water content on production and consumption processes of N<sub>2</sub>O, measurements were conducted in Fluvisol paddy fields. At the beginning of irrigation, it is indicated that surface-emitted N<sub>2</sub>O is produced at shallow depths above the rising groundwater table, and that it is emitted by diffusive transport through air-filled soil pores. Immediately after soil surfaces are submerged, N<sub>2</sub>O accumulates in the soil because of the low diffusivity and high solubility of N<sub>2</sub>O in water. Isotopomer analysis revealed that high N<sub>2</sub>O emissions during the flooding process resulted mainly from N<sub>2</sub>O production by bacterial denitrification. Moreover, as soil submergence progressed, declining soil NO<sub>3</sub><sup>-</sup> concentration promoted the use of N<sub>2</sub>O as an electron acceptor. Thereby, most of the N<sub>2</sub>O was reduced to N<sub>2</sub>. The effect of elevated atmospheric [CO<sub>2</sub>] during a growing season on N<sub>2</sub>O emission after drainage for harvesting was also investigated in the paddy fields.