

Sesquiterpene emission from Sugi (*Cryptomeria japonica*)

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1. Introduction: Biogenic volatile organic compound (BVOC); which is emitted mainly from terrestrial vegetation, is known to have an important role on atmospheric chemistry and also has remarkably larger emission rate compares to that of anthropogenic VOC emission in a global scale (Guenther et al., 2006). Isoprene (C₅H₈) and monoterpenes (C₁₀H₁₆) are known to be major BVOCs. However, recent studies have revealed that there are also many other BVOCs including sesquiterpenes. Sesquiterpenes (C₁₅H₂₄) generally have significantly higher reactivity and have a potential to contribute aerosol formation with a higher yield than the other BVOCs (Shu and Atkinson, 1997). On the other hand, Sugi (*Cryptomeria japonica*) is very rare tree species in the world although it is one of the most dominant trees in Japan. Therefore, unfortunately, there are quite a few studies on BVOCs from Sugi. In this study, we will present that Sugi is found to emit sesquiterpene in a significant rate larger than monoterpenes.

2. Method and experiment: BVOCs are generally collected on solid adsorbent and desorbed by heat (thermal desorption), however, the thermal desorption has a difficulty to analyze VOCs which have high molecular weights such as sesquiterpenes and oxygenated sesquiterpenes. We developed and applied a liquid extraction technique to analyze the heavy BVOCs. The BVOCs are extracted from the adsorbent with a solvent and are injected into a gas chromatography-mass spectrometer after a concentration (Matsunaga et al., 2009). Five field experiments were conducted at Tanashi (35°44'21" N, 139°32'18" E) in Tokyo metropolitan and Shiiba (32°22'01" N, 131°08'19" E) in Miyazaki prefecture on January, April, August, September and November in 2009.

3. Result and discussion: Sesquiterpene samples were collected at Tanashi on the August and November and at Shiiba on the September. Only Farnesene was detected and calculated to be emitted in a rate of 0.3-1.5 micro g dwg⁻¹h⁻¹; which is comparable emission rate to the monoterpenes, only from the samples at Tanashi. No sesquiterpenes were detected from the samples at Shiiba. Farnesene is known to be induced by environmental stress such as pollution, excess nitrogen in the soil, heat and/or water shortage. This suggests that the emission of Farnesene can be induced by the environmental change and that the environmental change can have an interaction between biosphere and atmosphere through the vegetation.

References

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