

森林域におけるイソプレン由来有機エアロゾルの観測 Characterization of Organic Aerosols from Isoprene at a Forested Site in Japan

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Figure 1. GC-MS total ion chromatogram

Introduction

Organic compounds are major components of atmospheric aerosols which affect the global radiative balance by directly scattering sunlight and indirectly as cloud condensation nuclei. A significant fraction of atmospheric organic aerosols are formed through gas-to-particle conversion process with oxidation of precursors such as volatile organic compounds (VOCs) in the gas phase. These are referred to as secondary organic aerosols (SOA). Recently, SOA formation from biogenic volatile organic compounds (BVOCs), especially isoprene has been paid attention. Global isoprene emission is far higher than those of biogenic terpenes and anthropogenic VOCs. Claeys et al. (2004) first identified oxidation products of isoprene in the Amazonian rain forest aerosols. Since then, some studies have been conducted to detect the oxidation products in ambient air samples, however, there is little data in Asian regions. We have measured organic compounds in the aerosols collected at a forest with strong isoprene emitters in Japan.

Methods

Atmospheric aerosols were collected at a tower above a forest canopy in southern Kyoto, Japan, between 2009 and 2010. YMS is in a mixed temperate forest with *Quercus serrata* (Japanese oak); one of the major tree species in Japan. The oak is a strong isoprene emitter (Okumura et al., 2008). A high-volume sampler with a PTFE filter was installed in a tower (about 30m above ground) to collect aerosol samples. Organic compounds on a part of the PTFE filter were extracted in a 1:1 dichloromethane/methanol mixture under ultrasonic agitation. The extracts were filtered through a Teflon filter and the filtrate was concentrated by reducing the volume with a rotary evaporator. The concentrates were dried under a nitrogen stream. The dry residue was derivatized by adding bis(trimethylsilyl)trifluoroacetamide (BSTFA, with 1% TMCS) and pyridine. Samples were heated for 2h at 70°C to complete the derivatization reaction and then subjected to GC-MS analysis. To determine the quantity of compounds, glycerol and meso-erythritol were used for internal standard substances.

Results and Discussion

We have identified carboxylic acids and tetrol compounds as well as levoglucosan, a tracer of biomass combustion. Based on the retention time data, etc., the detected tetrols were likely to be isoprene SOA tracers (e.g. 2-methyltreitol and 2-methylerythritol), reported in the previous experiments (e.g. Claeys et al., 2004). A strong relationship between temperature and total mass concentration of the tetrols is quite similar to the temperature dependence of isoprene emissions (Okumura et al., 2008), also suggesting that they are isoprene SOA tracers.

Claeys, M. et al., (2004). *Science*, 303, 1173-1176.

Okumura, M. et al., (2008). *J. Agric. Meteorol.*, 64, 49-60.

