Development of measurement system for dissolved isoprene using curie point pyrolyzer

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Isoprene (2-methyl-1,3-butadiene; C_5H_8) is one of the dominant and highly reactive non-methane hydrocarbons and is rapidly oxidized in the atmosphere, contributing to secondary organic aerosol (SOA) formation. Although terrestrial vegetation is the main source of atmospheric isoprene emissions, isoprene is also produced by marine organisms such as phytoplankton, seaweeds and bacteria. Globally, emission of isoprene to the atmosphere is substantially lower from marine systems (0.1–1.9 Tg C yr^{-1}) than from terrestrial systems (400–750 Tg C yr^{-1}). However, the large input from terrestrial sources has no impact on remote ocean regions because of the short atmospheric lifetime of isoprene (1–5 h). Data coverage of isoprene in seawater is still limited to understand its production factors in seawater while the contribution of isoprene to in-situ atmospheric chemistry such as SOA production is considered to be important. The usual method for oceanic isoprene measurements involves discrete sampling and analysis by gas chromatography (GC) on board, however, we need the large space and expendables such as refrigerant to maintain GC measurements. To improve the data coverage of isoprene in seawater, we tried to develop a new conceptual measurement system using a curie point pyrolyzer. This measurement system is characterized by the simpler composition than the conventional purge & trap extraction-GC detection. Extracted isoprene from seawater sample was trapped on Carbopack absorbent filled in a small tube called mini-PAT in room temperature, and then trapped isoprene was desorbed and introduced to GC by rapid heating up to 358˚C on the basis of pulse heating method. This method doesn’ t require both refrigerant and large space for the extraction. If the mini-PAT can preserve isoprene for a while, we can separately measure isoprene on land after the cruise. The simpler extraction and preservation and the smaller space on board will realize the improvement data coverage of dissolved isoprene. In this presentation, we will show the performance of the system such as detection limit, extraction and trapping efficiency, preservation period, and its dependence in filled absorbents.

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