

Production of organic gases associated with phytoplankton growth and death

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Ocean is a main source of natural organic gases (organic sulfur gases, non-methane-hydrocarbon, and halocarbons) in the atmosphere. High concentrations of organic gases in seawater are found in high productive area. Marine microorganisms (mainly phytoplankton) are thought to produce these organic gases. Previous culture experiments demonstrated that isoprene (C₅H₈) is produced by phytoplankton associated with their photosynthesis, and that organic iodine gases (methyl iodide and ethyl iodide) are also produced by phytoplankton. However, we don't know the factors to determine the spatial-temporal distributions of oceanic organic gases in seawater. We conducted time-series observation of organic gases in the Funka-bay, Hokkaido, Japan, in 2014 –2017. Isoprene concentration in seawater started to increase in spring bloom period (March). The highest concentration was found in post bloom period (June –August). The concentration maximum of vertical profile was found below the mixed layer in euphotic zone. It is suggested that isoprene was produced by phytoplankton associated with photosynthesis, and accumulated in seawater below mixed layer from spring bloom to post bloom period. In the bottom layer water (90m depth) below the euphotic zone, isoprene concentrations increased in post bloom period. The concentrations of methyl iodide (CH₃I) and ethyl iodide (C₂H₅I) also increased in the bottom layer water. We should focus on the phytoplankton productions of organic gases in the dark.

Keywords: Isoprene, halocarbon, iodine