

Marine and atmospheric observations of volatile organic compounds during early spring in the Oyashio region

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A variety of volatile organic compounds (VOCs), including dimethylsulfide (DMS), isoprene and acetone, are emitted from the ocean to the atmosphere, and have strong influence on photochemical oxidation and aerosol formation. Since these marine VOCs are originated from microbial metabolisms of phytoplankton and bacteria, the VOC concentrations in seawater show seasonal and latitudinal variations associated with microbial activity and taxonomy as well as ocean physics. However, it has been largely unknown whether the variations of VOCs in seawater due to microbial activity affect the variations and distributions of VOCs in the air.

In order to examine the linkage between biological activities and VOCs dynamics both in the ocean and atmosphere, we made observations of spatial and temporal variations of VOCs during KH-15-1 cruise by R/V *Hakuho Maru* on March 2015 in the Oyashio region, western subarctic Pacific. The VOCs concentrations in the surface seawater and the overlying atmosphere were continuously measured by Proton Transfer Reaction-Mass Spectrometry during the cruise.

Phytoplankton (measured as Chl. *a* concentrations) gradually increased from the beginning to end of March. This seems a sign of springtime phytoplankton bloom in the Oyashio region. With the increase in Chl. *a*, the concentrations of several microbiologically produced VOCs (i.e., DMS, methanethiol, acetone, isoprene, acetaldehyde and propene) in the surface seawater increased. The VOCs concentrations in the air did not show clear increase except for DMS. The DMS concentration in the air showed positive correlation with that in the seawater, suggesting that marine organisms (i.e., phytoplankton) contributed to the increase of DMS concentrations in the air.

Keywords: volatile organic compounds, Oyashio region, Sea-Air flux